

**INTERNATIONAL HYDROGRAPHIC BUREAU**  
**B.P. 445**  
**7, Avenue Président J.F. Kennedy, MC 98011 MONACO CEDEX**  
**publishes**  
**twice a year, in March and September**  
**an English and a French edition of**

## **THE INTERNATIONAL HYDROGRAPHIC REVIEW**

This publication contains articles of topical interest on hydrography, oceanography, cartography, navigation, photogrammetry, geodesy and allied subjects, radio aids, automation, new instruments and techniques. The September issue is also devoted to specific topics.

Approx. 165 pages, 18 x 27 cm; numerous illustrations  
Original articles for publication are welcome

**The Bureau also published monthly the**

## **INTERNATIONAL HYDROGRAPHIC BULLETIN**

which contains topical news, reports the work undertaken by the I.H. Bureau and the world hydrographic community, covers recent developments in hydrographic instrumentation and training programmes, describes new survey vessels, etc. Charts and publications issued by Hydrographic Offices are listed each month, and there is a comprehensive monthly bibliography on hydrography and related subjects.

**The Catalogue of the IHO 1993**  
**can be obtained gratis by writing to the**

**INTERNATIONAL HYDROGRAPHIC BUREAU**  
**B.P. 445**  
**7, avenue President J.F. Kennedy**  
**MC 98011 MONACO CEDEX**  
**Telefax : +33 93 25.20.03**

---

# THE ROYAL INSTITUTE OF NAVIGATION

## *Aims and Objects*

The objects of the Institute are to unite in one body those who are concerned with or who are interested in navigation and to further its development. Navigation is conceived as applying to locomotion of all kinds and is perceived as encompassing aspects of: command and control, psychology and zoology, operational research, risk analysis, theoretical physics, operation in hostile environments, instrumentation, ergonomics, financial planning and law as well as electronics, astronomy, mathematics, cartography and other subjects traditionally associated with navigation.

The aims of the Institute are to encourage the creation and dissemination of knowledge through research and development, to co-ordinate information from all the disciplines involved, to provide a forum in which new ideas and new products can have the benefit of informed and professional scrutiny and to further education and communication.

The Institute initiates conferences and symposia on specific subjects and has a programme of meetings at which lectures are given and discussed. There are standing Study Groups which keep under constant review pertinent aspects of navigation. The success of these Study Groups is crucially dependent on the active involvement of members.

The Institute publishes *The Journal of Navigation* three times a year. It contains papers which have been presented at meetings together with the ensuing discussion, other original papers, selected papers and reports from Study Groups, and book reviews. The Institute also publishes *Navigation News* six times a year which contains a full account of the Institute's proceedings and activities. This includes Branch News, a record of current navigational work, a diary of events, topical articles, news about Membership and advertising. A great deal of the Institute's work is international in character and is co-ordinated with that of similar organizations in other countries. There are also active Branches throughout the United Kingdom.

## *Membership*

There are five classes of Membership of the Institute:

- (1) HONORARY MEMBERS: Distinguished persons upon whom the Council may see fit to confer an honorary distinction.
- (2) FELLOWS: Members, of at least three years' standing, holding certain qualifications laid down in the by-laws; these qualifications include having made a contribution of value to navigation.
- (3) MEMBERS: Persons over twenty-one years of age who satisfy the Council of their interest in navigation.
- (4) STUDENT MEMBERS: Persons under twenty-five years of age studying at a recognized school or university with a view to making navigation, or an allied interest, their career.
- (5) CORPORATE MEMBERS: Organizations such as universities, navigation schools, government departments or companies, here and abroad, who are directly or indirectly interested in the science of navigation. Corporate Members are entitled to send representatives to all Institute meetings and to receive six copies of its publications. They are encouraged to take an active part in the Institute's work. Applications should be sent by letter addressed to the Director.

## *Subscriptions*

Annual subscriptions to the Institute are payable in advance as follows:

Members and Fellows	£42.00
Student Members	£5.00
Corporate Members	£300.00

The Institute's financial year begins on 1 July. Members in any category who are elected after 1 January in any year are only due for one half of their subscription until 1 July, when the full subscription for the next year becomes due.

VOLUME 46 NUMBER 2 MAY 1993

C O N T E N T S

<b>The Duke of Edinburgh Lecture: International Hydrography</b>	159
Rear Admiral Sir David Haslam	
<b>Navigation in Birds and Other Animals</b>	174
W. Wiltschko and R. Wiltschko	
<b>British Airways ETOPS Flight Planning Systems</b>	192
P. E. Moore	
<b>Ordnance Survey Digital Data for Navigation</b>	200
P. A. G. Watts	
<b>The Use of Digital Map Data to Provide Enhanced Navigation and Displays for Poor Weather Penetration and Recovery</b>	208
Peter J. Bennett	
<b>Data Representation Using a Standard Data Transfer Specification</b>	223
James H. Killick	
<b>The Navigation Sensor System Interface Project</b>	238
Robert A. Greer	
<b>European Studies to Investigate the Feasibility of Using 1000 ft Vertical Separation Minima Above FL290: Part III – Further Results and Overall Conclusions</b>	245
G. Moek, J. M. ten Have, D. Harrison and M. E. Cox	
<b>Catharsis: The New Jester's Transatlantic Passage, 1992</b>	262
Michael Richey	
<b>ECDIS Research in China</b>	270
Zhao Depeng, Wu Dongli, Sun Wenli, Chu Chengnang and Li Yuanhui	
<b>Some Causes of Problems in the Observation of Standard Racon Marine Beacons When Observed By Means of Standard Marine Navigation Radars</b>	275
Richard M. Trim	
<b>A Step-By-Step Method of Computing Points Along the Arc of a Great Circle</b>	277
Roy Williams	
<b>Fast Ferry Navigation</b>	282
Dag Pike	
<b>Reduction to Final Speed: A Simple Formula</b>	286
Adrian Burnett	
<b>'Navigation with km and gon'</b>	288
K. K. White	
<b>Record – J. E. D. Williams (Obituary)</b>	290
<b>Reviews</b>	293



0373-4633(199305)46:2;1-P