

The JOURNAL of NAVIGATION

VOL. 31, NO. 3

SEPTEMBER

1978

Strategic or Tactical Air Traffic Control? S. RATCLIFFE	337
Developments in Marine Traffic Operations and Research A. WEPSTER	348
Marine Encounter Rates ELISABETH M. GOODWIN	357
A Decade of Navigation in the Antarctic P. LE PLA AND J. DRAPER	370
Numerical Models of Tide and Surge Propagation as an Aid to Navigation D. PRANDLE	378
The Risk of a Ship Encounter Leading to a Collision G. R. G. LEWISON	384
Determination of Mariners' Reaction Times R. G. CURTIS	408
The Admiralty Chart—V D. W. HASLAM, G. A. MAGEE, F. A. PIELOU, H. R. W. HALLIWELL, D. W. NEWSON	418
Escape Time: The Crucial Factor in Collision Avoidance Situations and Systems F. J. WYLIE	438
An Outline History of Marine Pilotage in Britain H. M. HIGNETT	453
Automated Charting W. A. A. HUDDY, G. E. MURT, L. A. HOLDER, J. VICKERS AND R. F. HANSFORD	465
Automatic Landing Systems or Fog-dispersal Devices? D. V. WARREN, M. BERNARD, I. L. McGRATH	479
Estimating the Average Taxi Speed of Departing Aircraft S. NAGAOKA, P. T. MUTO AND E. YOSHIOKA	494

FORUM

A Standard-Time Sundial R. d'E. ATKINSON	500
Record	501
Reviews	506

THE ROYAL INSTITUTE OF NAVIGATION
AT THE ROYAL GEOGRAPHICAL SOCIETY
1 KENSINGTON GORE LONDON SW7 2AT

SCOTTISH ACADEMIC PRESS LTD., 33 MONTGOMERY STREET, EDINBURGH EH7 5JX

PRICE FOUR POUNDS FIFTY (£4.50)

THE ROYAL INSTITUTE OF NAVIGATION

Patron

H.R.H. THE PRINCE PHILIP DUKE OF EDINBURGH, K.G., K.T., O.M.

OFFICERS AND COUNCIL 1977-8

President

Sir Edward Fennessy, C.B.E.

Vice Presidents

Captain R. Maybourn

S. Ratcliffe

Honorary Treasurer

Mrs. Mary Pera

Chairman of the Technical Committee

Dr. J. F. Kemp

Chairman of the Membership & Fellowship Committee

Rear Admiral D. W. Haslam, O.B.E.

Other Members of Council

Prof. A. N. Black

Miss A. M. Ferrar

Captain B. J. Calvert

Captain K. D. Jones

Group Captain D. Clare, D.F.C.,

Lieut. Commander P. Le Pla, R.N.

R.A.F. (ret)

Captain A. M. MacLean

Captain G. Dudley

J. W. McIvor

Captain R. K. N. Emden, D.S.C., R.N. (ret)

Director M. W. Richey, M.B.E.

The Journal of Navigation

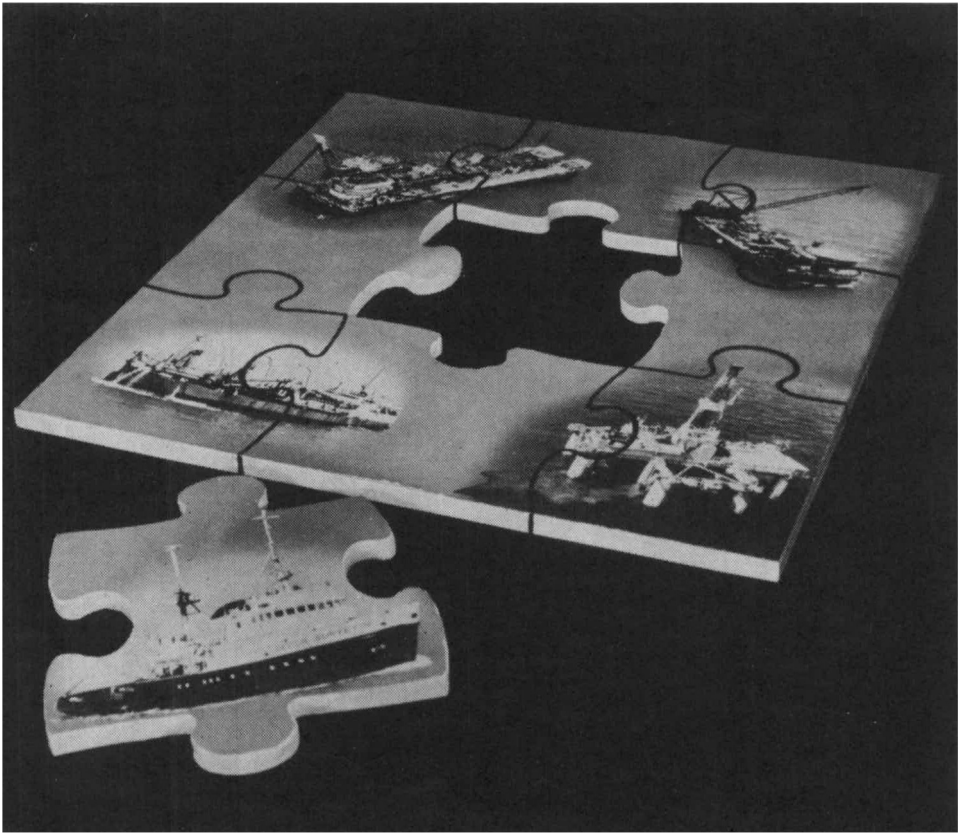
THE *Journal* is published three times a year by the Institute and is edited by M. W. RICHEY. It contains original papers contributing to the science of navigation, including those presented at meetings of the Institute together with the ensuing discussion. In addition the *Journal* includes a record of current navigational work, reviews of important books, and other matters of concern to those interested in navigation. The views expressed in the *Journal* are not necessarily those of the Institute, or of any organization or department to which the authors may belong. Crown Copyright may be reserved.

The *Journal* is issued free to all Members of the Institute. It is sold to the public at four pounds fifty per copy or, by subscription, at fourteen pounds twenty-five per annum (including postage) and may be obtained through all booksellers and Scottish Academic Press Ltd., 33 Montgomery Street, Edinburgh EH7 5JX. Back numbers dated two years prior to the current volume may be obtained from William Dawson & Sons, Ltd., (Back Issues Department), Cannon House, Folkestone, Kent.

Enquiries for advertising space should be addressed to The Advertisement Manager (Noel S. O'Doherty) Lewin House, Dorking Road, Tadworth, Surrey KT20 7RT. (Telephone: Tadworth 3063).

The postal address of the Institute is The Royal Institute of Navigation, at The Royal Geographical Society, 1 Kensington Gore, London SW7 2AT. (Telephone: 01-589 5021).

Volumes of the *Journal* can be bound for three pounds seventy five including postage. The parts should be sent, together with the appropriate remittance, to Fowler-Wilson Bookbinders, Unit 4, Middlefield Industrial Estate, Sandy, Beds.



We're great at putting everything in its proper place—precisely.

Because positioning is our business. And because we've been doing it for a long time now. For over 30 years, we have been steadily developing and improving electronic positioning aids.

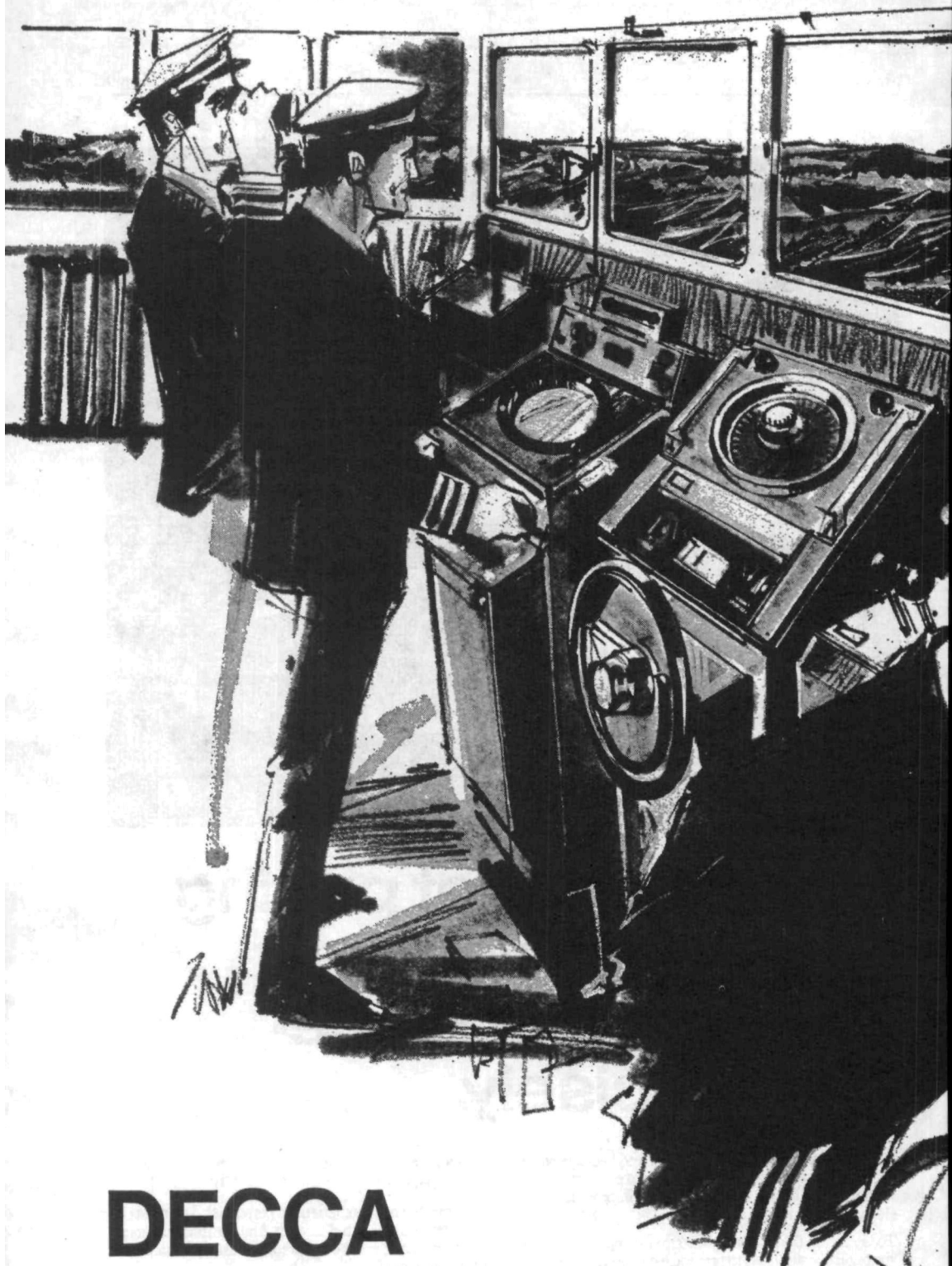
Today, as the Decca Survey Group of companies, we are strategically stationed to provide a comprehensive survey service anywhere on demand. Precisely positioning rigs and platforms in the search for oil and minerals offshore. Undertaking the vital survey work associated with dredging and port and harbour maintenance and

development. And surveying the routes for pipes and cables in the seas and oceans of the world.

We have the most experienced personnel. The most comprehensively fitted vessels. And the most advanced electronic equipment—including acoustic and satellite positioning aids.

Whenever you need precise positioning services, you need us. The Decca Survey Group. In positioning, we're *precisely* the people who matter.





DECCA

for the greater efficiency
and safety of ships at sea

THE DECCA NAVIGATOR COMPANY LIMITED. DECCA RADAR LIMITED. LONDON

<https://doi.org/10.1017/S0373463300041862> Published online by Cambridge University Press





Congratulations to Timothy Severin and the crew of *Brendan* on their historic crossing of the Atlantic. They used HOMER DF.

BROOKES & GATEHOUSE LTD

Pioneers and world leaders in electronic instrumentation for yachts
 Bath Road, Lymington, Hants. Tel: (0590) 74252. Telex 477724

and a branch in the U.S.A. **BROOKES & GATEHOUSE INC**

154 East Boston Post Road, Mamaroneck, New York 10543

'NAVIGATION'

NAVIGATION (Paris), the quarterly Journal of the French Institute of Navigation, is available to Members of the Institute at the preferential subscription rate of £7.00. The July 1978 issue contains the following papers.

I. LES NOUVEAUTÉS TECHNIQUES—

- 1.—La précision du système DECCA à la mer
- 2.—Vers les navires non conventionnels à 100 noeuds per A. GRIHANGNE (2^{ème} partie)
- 3.—La charge de pilote dans les années à venir par D. CANAUX and J. C. WAUNER

II. CHRONIQUE DU NAVIGANT—

- 1.—Système anti-collision maritime-etude d'intégrité par C. G. ROWSELL (2^o partie)
- 2.—Règle de gestion carburant par R. CATHODEAU
- 3.—Nous. . . les derniers navigateurs par J. M. BARRAULT

III. INFORMATIONS—

- 1.—Compte-rendu de l'Assemblée Générale de l'IFN
- 2.—Le Groupe de Travail intersession sur l'OMEGA différentiel (3 au 7 Avril 78)
- 3.—La situation de la navigation en Manche
- 4.—Le symposium international de Liverpool sur le trafic côtier et les approches portuaires (3 au 6 Avril 78) par le Commandant BECHHOEFER
- 5.—Le Congrès International des Instituts de Navigation de 1979
- 6.—Projet de convention internationale sur la formation des gens de mar et la délivrance des brevets.

IV. CHRONIQUE DES LIVRES & REVUES—

BOOKS OF INTEREST TO SHIPPING ENTHUSIASTS

FOUR CAPTAINS

By Captain George Clark

£7.80

Per post £8.46

THE ATLANTIC OCEAN

By Charles H. Cotter

£3.75

Per post £4.41

SEA PORTS

By Captain L. G. Taylor

£4.20

Per post £4.86

THE OIL RIG MOORINGS HANDBOOK

By Captain J. Vendrell

£3.40

Per post £3.63

LIQUIFIED PETROLEUM GAS TANKER PRACTICE

By Captain T. W. V. V. Woolcott

£10.80

Per post £11.34

THE ELEMENTS OF NAVIGATION AND NAUTICAL ASTRONOMY

By Charles H. Cotter

£16.00

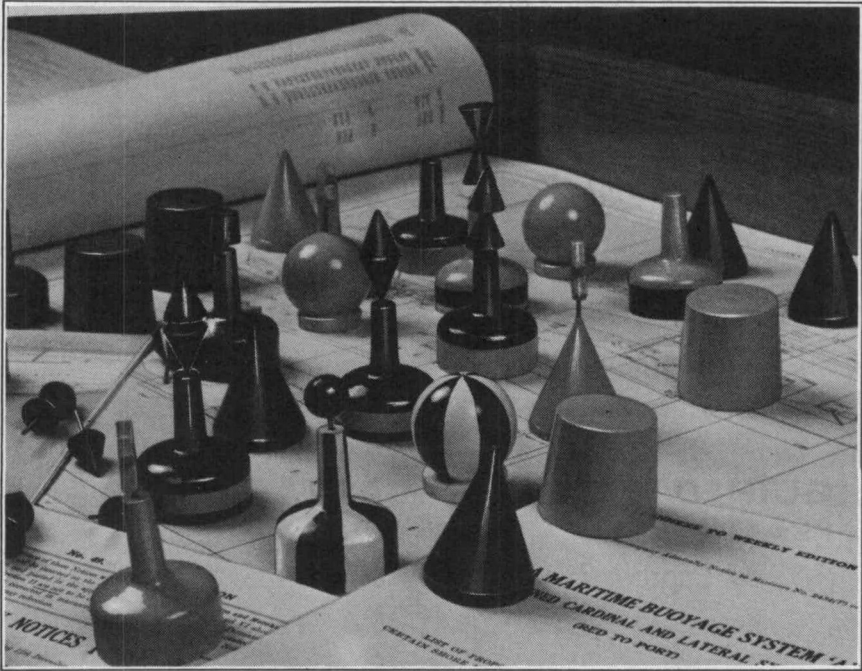
Per post £16.86

BROWN, SON & FERGUSON, LTD.,
52 DARNLEY STREET, GLASGOW, G41 2SG

I.A.L.A. MARITIME BUOYAGE SYSTEM A

At Potters, updating maritime knowledge is a continuous process. We are a focal point for receiving information and a centre for its dissemination. Notices to Mariners, Tracings to facilitate on board chart correction—New Editions of charts automatically mailed on issue—Statutory Instruments in stock on publication and a full

maritime library of books and papers is available to the shipping world with the latest facts, opinions and experiences from authors far and wide. Potters models of the new I.A.L.A. buoyage system for educational purposes is just another example of our continuing effort to provide updated information.



J. D. POTTER LTD

Serving the world of navigation since 1830. J. D. Potter Ltd., 145 Minories, London EC3N 1NH.
Tel: 01-709 9076 Cables: Adcharts, London EC3N 1NH Telex: 887386. 24 Hour Telephone System.

NEW PUBLICATION OF THE ROYAL GEOGRAPHICAL SOCIETY

SOCOTRA

with insets of *The Brothers*

Scale 1 : 125 000

Size 111 cm × 42 cm

Price £5.00

The Society has compiled and drawn a new map of the island of Socotra to include all the latest available information from air photographs and expedition reports. The map is printed in 5 colours and depicts topographic details and a comprehensive coverage of geographical names.

Obtainable from the Office of the Society :

1 KENSINGTON GORE, LONDON, SW7 2AR

'NAVIGATION (U.S.A.)'

Navigation, the quarterly Journal of the American Institute of Navigation, is available to Members of the Institute at a reduced subscription of £5.00 a year. Volume 25, No. 1 (Spring 1978) contains the following papers.

AN OVERVIEW OF VIKING NAVIGATION

W. J. O'Neil

NAVIGATING THE VIKING LANDERS

E. A. Euler

FUEL CONSERVATION FOR HIGH PERFORMANCE AIRCRAFT IN THE TERMINAL AREA

S. C. Mohleji

THOMAS GODFREY'S QUADRANTS

C. H. Cotter

SUBMARINE NAVIGATION

W. G. Clautice

OMEGA NAVIGATION SYSTEM: PRESENT STATUS AND PLANS 1977-1980

E. R. Vass

NAVIGATING CANADA TO THE END OF THE TWENTIETH CENTURY

C. B. Jeffery

THE MANY FACES OF TRANSIT

T. A. Stansell, Jr.

FUTURE DOMESTIC AIR NAVIGATION SYSTEM ANALYSIS

R. Braff and A. N. Joglekar

SHUTTLE NAVIGATION SYSTEM

A. M. Madni and M. C. Chadwick

REVIEWS OF RECENT BOOKS

THE INSTITUTE'S PROFESSIONAL FORUM

THE INSTITUTE'S PROFESSIONAL FILE

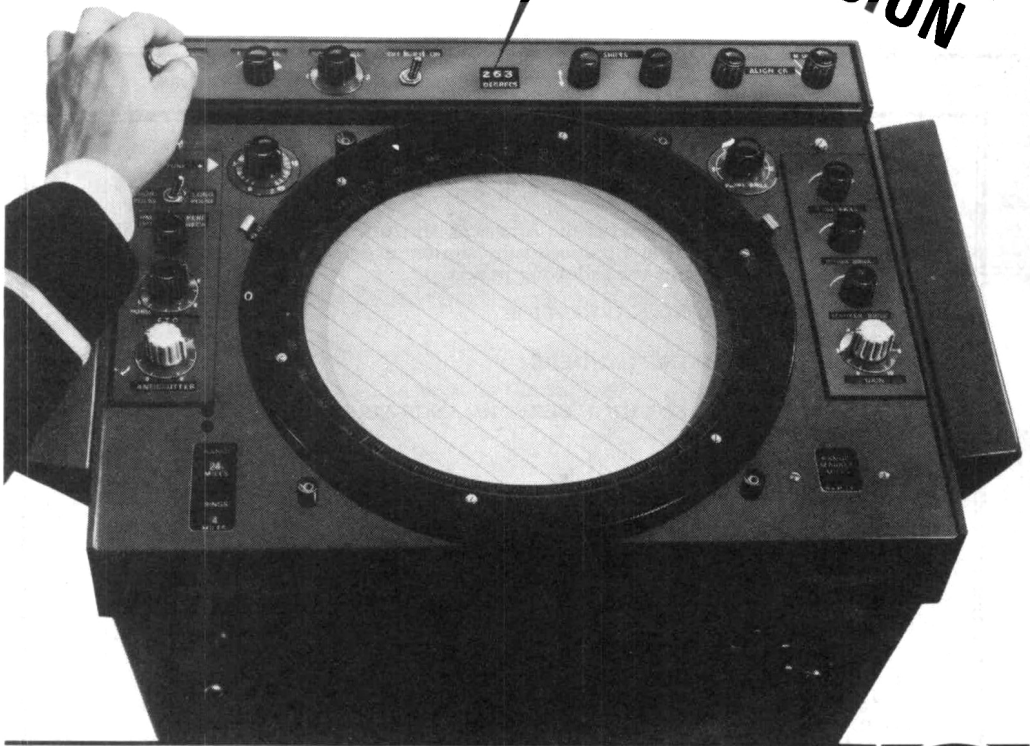
Any way, this is true

Most people keep anti-collision watch with a head-up radar presentation. When a true bearing is needed, they shift to north-up, and back again . . . if they remember. With 'Radiolocator' you needn't change the presentation. The electronic bearing indicator is *always* stabilised, so your bearings are true. It's simpler and safer. Simplicity is the keynote of the solid-state 'Radiolocators'. All normal radar facilities are standard; and a wide choice of options includes 12- or 16-inch display, True Motion, reflection plotter, dual displays and full or partial inter-switching of dual installations. Dependable, workaday radar. And at the right price.

**263
DEGREES**

RADIOLOCATOR
designed throughout for simplicity
and reliability

**WITH
INTERFERENCE
SUPPRESSION**



Marconi Marine radar

The Marconi International Marine Co. Ltd.

Chelmsford Essex England

Tel (0245) 61701 Telex 99228 · A GEC-Marconi Electronics Company

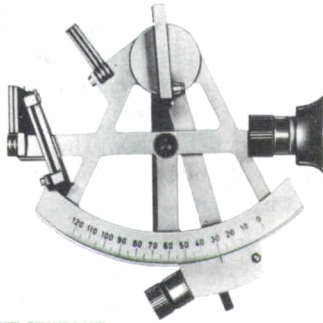


1972



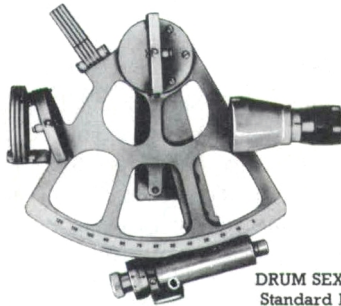
COMMUNICATION
NAVIGATION
RADAR
SOUND AND TV

NAVIGATION X3 with Veb Carl Zeiss Jena & Freiburger



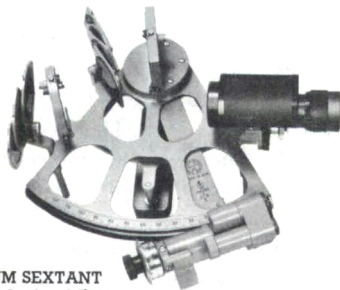
YACHT SEXTANT

A smaller sextant for the yachtsman. Features include Rubber eyeshade for telescope eyepiece and large index and Horizon mirrors. Telescope magnification x 2.4. Complete with wooden case.



**DRUM SEXTANT
Standard Model**

A full sized modern style sextant with a number of excellent features including Clamping device (Drum) fully enclosed. Large Horizon and Index mirrors. Certificate of arc errors for every 10°. Optional extra detachable Lighting unit. Telescope magnification x 3.5. Complete with wooden case.



**DRUM SEXTANT
with Optional Extras.**

e.g. Detachable lighting and extra scope 8 x 30 Carl Zeiss Jena Prismatic Monocular.

Write for leaflet to:
Carl Zeiss Jena Ltd.,
C.Z. Scientific Instruments Ltd.,
PO Box 43, 2 Elstree Way, Borehamwood,
Herts, WD6 1NH. Tel: 01-953 1688.

Quality products from the GDR



Institute Notices

COVENANTS

The Institute is not liable to income tax, and the Inland Revenue authorities will refund to the Institute any income tax that has already been paid on annual contributions, provided they are paid under a seven-year covenant. By agreeing to subscribe in this way Members can give great help to the Institute, at very little trouble and no expense to themselves. The Council therefore hopes that as many Members as possible will undertake to covenant. (Only Members who pay income tax at the full British rate are eligible to pay in this way.)

EVA G. R. TAYLOR LECTURE 1978

Professor Glyndwr Williams will present the Eva G. R. Taylor lecture, entitled *Seamen and Philosophers in the South Seas in the days of Captain Cook*, at the Science Museum, London, SW7, at 7.15 p.m. on Thursday, 12 October. Tickets can be obtained from the Honorary Secretary, Society for Nautical Research, National Maritime Museum, Greenwich, London SE10 9NF.

COURSE IN THE SCIENCE AND TECHNOLOGY OF NAVIGATION

In 1976-77, the twelfth course in the Science and Technology of Navigation was completed at the City of London Polytechnic. This course resulted from an initiative by the Royal Institute of Navigation and its intention is to provide engineers, physicists and others with a wide understanding of general navigational problems. Lectures are given on air and marine navigational techniques and equipments, and practical work is included. Many of the lecturers are drawn from industry or from the Services.

The next course runs from 27th September 1978 to May 1979 on Wednesday afternoons and evenings. Further information may be obtained from The Registrar, School of Navigation, City of London Polytechnic, 100 Minories, London, EC3N 1JY.

INTERNATIONAL NAVIGATION CONGRESS 1979

The Royal Institute of Navigation, in association with the Member Institutes of the International Association of Institutes of Navigation, is organizing an International Navigation Congress to be held at the University of Sussex, near Brighton, from 10-15 September 1979. The theme of the conference is Man and Navigation, a title intended to cover the whole relationship between navigation and society. Navigation is understood to mean navigation by sea and air and in space. Some 40 papers will be presented and it is intended to hold an exhibition, concurrently with the Congress, on the history of navigation.

Accommodation at the University is available and there are besides many hotels in Brighton. The basic registration fee for participants who are Members of IAIN Institutes will be of the order of £12.00; for other participants £20.00. For those accommodated at the University the inclusive charge will be approximately £11.00 a day.