The JOURNAL of THE INSTITUTE OF NAVIGATION

OL. 22, NO 2 APRIL	196
Inter-relation of Temperature and Wind on the Route London-New York at 50 mb A. F. Crossley	ıçı
Maritime Area Control T. F. PEPPITT	160
The Accuracy Contours of a Running Fix Y. NAMIKAWA AND Y. YAMAZAKI	169
The Dioscures Project B. Manuali	172
The Presentation of Navigational Information M. G. TREADGOLD AND D. J. WALTERS	184
Comparison of Radar Sea Echoes with Stereophotogrammetric Pictures of the Sea Surface H. C. Freiesleben	198
A New Marine Radar Display System J. WATT AND B. C. PIERCY	205
Amending the Collision Regulations G. V. PARMITER	229
Authority at Sea L. Ouder	235
Exploration with a Computer on Rhumb-line Sailing B. J. Moss	242
FORUM	
Direction Indication Lights H. V. Anguish	253
Visual Signals for Manœuvre at Sea F. SOHNKE	253
A Navigational Glossary	258
E. W. Anderson 'The Schuler Pendulum and Inertial Navigation' J. A. Lee	267
Calvert's Manœuvres and the Collision Regulations P. C. H. CLISSOLD	269
Reviews	274
Correspondence	283

THE INSTITUTE OF NAVIGATION

AT THE ROYAL GEOGRAPHICAL SOCIETY

1 KENSINGTON GORE LONDON SW 7

JOHN MURRAY (PUBLISHERS) LTD., 50 ALBEMARLE STREET, LONDON WI

THE INSTITUTE OF NAVIGATION

Patron

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

OFFICERS AND COUNCIL 1968-9

President Professor A. Stratton

Vice-Presidents

Air Vice Marshal D. C. McKinley, C.B., C.B.E., D.F.C., A.F.C., R.A.F. (Ret.) Rear Admiral G. S. Ritchie, C.B., D.S.C.

> Honorary Treasurer Mr. F. A. Haworth

Chairman of the Technical Committee Dr. G. E. R. Deacon, C.B.E., F.R.S.

Chairman of the Membership and Fellowship Committee Mr. D. H. Sadler

Other Members of Council

Air Commodore D. Bower, O.B.E., A.F.C.,

R.A.F. Mr. W. O. Broughton Mr. W. J. Charnley Captain C. H. Cotter

Captain R. Hart, C.B.E., D.S.O., D.S.C., R.N. (Ret.).

Captain G. A. B. King

Captain F. L. Main

Commander G. V. Parmiter, R.N. (Ret.). Mr. H. E. Smith

Mr. R. Whalley

Executive Secretary: M. W. Richey

The Journal of the Institute of Navigation

THE Journal is published quarterly 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. In the case of some papers Crown Copyright may be reserved.

The Journal is issued free to all members of the Institute. It is sold to the public at thirty shillings per copy or, by subscription, at one hundred and twenty-five shillings per annum (post free) and may be obtained through all booksellers and John Murray (Publishers) Ltd., 50 Albemarle Street, London W1.

Contributions, which are welcomed from both members and non-members, should be addressed to the Editor.

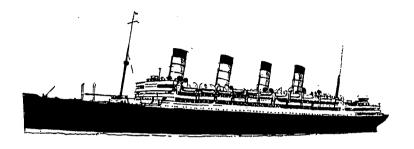
Enquiries for advertising space should be addressed to the Institute offices.

The postal address of the Institute is:

The Institute of Navigation, at The Royal Geographical Society, 1 Kensington Gore, London SW7

Telephone: 01-589 5021

SPERRY RAND



R.M.S. Aquitania 1919

For Britain's finest ships the finest Navigational Equipment

Half-a-century ago, RMS Aquitania made history by becoming the first British merchant vessel to navigate by gyro compass. Since 1919 she and every Cunarder after her, have depended on Sperry equipment.

RMS Queen Elizabeth 2, for example, relies on a twin system of Sperry gyro compasses and Sperry automatic steering. Sperry are the world's largest manufacturers of marine navigational systems.



GYROSCOPE DIVISION BRACKNELL BERKSHIRE ENGLAND

The Institute of Navigation

INSTITUTE PUBLICATIONS

The Use of Radar at Sea

A Handbook on Marine Radar. (Hollis & Carter, 70s.)

Observational Errors

An elementary account of the ideas behind the statistical theory of errors, by E. W. Anderson & J. B. Parker. (John Murray, 5s.)

The Geometrical Seaman

An illustrated work on early navigational instruments, by E. G. R. Taylor & M. W. Richey. (Hollis & Carter, 30s.)

The Mathematical Practitioners of Tudor and Stuart England

by E. G. R. Taylor. (Cambridge University Press, 70s. Members 55s. plus 2s. postage.)

An account of the ideas, instruments and methods in navigation and surveying between 1485 and 1715 with lists of the mathematical practitioners with biographical notes and details of their work.

The Mathematical Practitioners of Hanoverian England

by E. G. R. Taylor. (Cambridge University Press, 84s. Members 63s. plus 2s. postage.)

This book, a sequel to the earlier volume, takes the story up to 1840, by which time the independent mathematical practitioner had virtually disappeared, absorbed into the large firm or organization as a consequence of industrial and social change.

The Separation of Traffic at Sea

A Working Group Report

(5s.)

from The Institute of Navigation
1 Kensington Gore, London SW7

PHOTOPLOT INSTANT ASSIMILATION



* Instant assimilation of radar information. * Direct viewing in daylight. * 24" Direct Plotting P.P.I. * Digital computer for True Motion Feed * Fully Transistorised.

The combination of the Series 21 Photoplot and 21/16P True Motion Radar provides the most advanced commercial radar system ever.

KELVIN HUGHES

A DIVISION OF SMITHS INDUSTRIES LIMITED St. Clare House, Minories, London, EC3. Tel: 01-481 8741. Cables: Marinst, London



'NAVIGATION, U.S.A.'

Navigation, the quarterly Journal of the American Institute of Navigation, is available to members of this Institute at a reduced subscription of £1 a year. Volume 15, No. 4 (Winter 1968-69) contains the following papers.

SIGHT REDUCTION TABLES FOR ORBITAL PLANE DETERMINATION William P. Devereux

A PRACTICAL MECHANICAL CALCULATOR SPHERICAL TRIGONOMETRY Mitchell E. Timin and Alan M. Schneider

IRRADIATION AND MANUAL NAVIGATION Richard F. Haines and William H. Allen

NOTE ON DETERMINING RANGE FROM SEXTANT ALTITUDE Dr. William H. Guier

OMEGA-INERTIAL HYBRID RECEIVER Winslow Palmer

EXTENDED CAPABILITY FROM EXISTING NAVAIDS Loren E. DeGroot and John Larsen

THE INTEGRATION OF AIR NAVIGATION SYSTEMS

RECENT PROGRESS IN NAVIGATION SATELLITES L. M. Keane

TERMINAL PHASE NAVIGATION
Charles Broxmeyer and Duncan MacKinnon

ON THE ACCURACY OF CELESTIAL MPP'S IN AIR NAVIGATION Major Ronald A. Briggs, U.S.A.F.

THE INSTITUTE'S PROFESSIONAL FILE

Reviews of Recent Books

Index to Volume 15

ROYAL GEOGRAPHICAL SOCIETY

Just published:

The first map produced by automatic cartography THE BATHYMETRY OF THE GULF OF ADEN

Scale 1: 2M at latitude 33°

Mercator projection. Contours in metres

Sheet size: 76.3×85.8 cm

Contours and soundings compiled by the National Institute of Oceanography, Automatic Cartography by the Experimental Cartography Unit of the Royal College of Art.

This map is being exhibited at the 21st International Geographical Congress at New Delhi.

A limited supply of this interesting map is available from the Office of the Society, I Kensington Gore, London, S.W.7, price, inclusive of postage and packing, Inland 13s od, Overseas 14s od (U.S.\$1.75).



Scrapped flight schedules are waste paper you can't afford!

Lost revenue through CAT II cancellations can be avoided. Smiths SEP6 Autopilot has full cat 2 capability. With SEP6 you can maintain flight schedule regularity and ensure maximum aircraft utilisation in low weather minimal conditions. This low-cost, lightweight Autopilot—only 55 lbs.—offers the fullest range of automatic capabilities and is based on experience accumulated since the fledgling days of flight. The versatility is such that the pilot's workload is reduced to a minimum while modular construction and inbuilt self-test

facilities make for ease and economy of maintenance. Service support is world-wide. Conforming to ARINC recommendations, the SEP6 Autopilot is part of Smiths Series 6 Flight Control System, which also includes the SFS6 Flight System. The Autopilot can be integrated with this, or any other Flight Director system. SEP6 Autopilot for CAT 2 gives you autopilot monitor, automatic throttle control, go-around guidance, and PVD head-free flight director. It will cost you nothing, and could profit you greatly, to let us tell you more.



Enquiries to Technical Sales Manager,

Cheltenham Road, Bishops Cleeve, Cheltenham, Gloucestershire. Telephone: Bishops Cleeve 3333

Flight Control Systems Engine Equipment Fuel Gauging Equipment General Instruments and Components

THE INTERNATIONAL HYDROGRAPHIC BUREAU

Avenue Président J. F. Kennedy, MONACO

publishes

twice a year, in January and July, an English and a French edition of

THE INTERNATIONAL HYDROGRAPHIC REVIEW

This publication contains articles of topical interest on hydrography, hydrographic surveying and related subjects.

Each number contains an average of 160 pages, 18×27 cm., and numerous illustrations.

Price per number 50/- or \$6 (U.S.), post free in Europe.

Orders should be sent direct to the Bureau's Headquarters in Monaco, but payments can be made to the Bureau's account at Barclays Bank Ltd., Chief Foreign Branch, 152–156 Upper Thames Street, London, E.C.3. Specify English or French edition when ordering.

A reduction of 25% on the price quoted is allowed to booksellers. A reduction of 30% is granted to naval or merchant marine officers of the Bureau's Member States, provided the order is sent direct to the Bureau.

'Electronic Chernikeeff'

The ideal Log for all Mercantile purposes—backed by almost 50 years actual experience in the design and manufacture of Impeller Logs.

Log makers to the British Admiralty and Overseas Navies for more than 40 years.

- I Accurate and dependable at all speeds down to 'bare steerage way'.
- 2 Suitable for Ship's Side or Bottom Mounting—no loss of accuracy.
- 3 The Retractable Log Tube can be fitted with remotely controlled 'raising and lowering' mechanism.
- 4 Has outputs for True-Motion Radar, Data Logging Systems, Decca ISIS.
- 5 Lower installation costs—simple maintenance.

MARCONI-MARINE world wide service is available to users.

Sole Makers

The Submerged Log Company (1962) Limited, 565/569 High Road, Chiswick, London, W.4, England

Telephone: CHISWICK 01-9946685/6 Telegrams: CHERLOG LONDON W.4

The Institute of Navigation

PUBLICATIONS AVAILABLE TO MEMBERS

The following publications are available to members at a reduced subscription payable through the Institute.

Navigation (U.S.A.)

The quarterly Journal of the American Institute of Navigation (£1 a year)

Navigation (France)

The quarterly Journal of the Institut Français de Navigation (£2 a year)

Navigation (Australia)

Annual publication of the Australian Institute of Navigation (8s.)

I.E.E.E. Transactions on Aerospace and Navigational Electronics

Members of the Institute may affiliate with the Professional Technical Group on Aerospace and Navigational Electronics at \$7.50 a year (instead of \$17.50). Transactions may be obtained at \$4.50 a copy or at \$2.25 to affiliates.

from The Institute of Navigation, 1 Kensington Gore, London, S.W.7

Authoritative Sailing-Ship Books

COOLIE SHIPS AND OIL SAILERS

This book is a record of two special phases of sea life in Sailing Ships 190 Pages $9\frac{3}{4}$ " \times $7\frac{1}{4}$ " 56 Illustrations 42/- (per post 46/6)

THE COLONIAL CLIPPERS

The Great Wooden Ships of the Blackwall and other lines
400 Pages 9½" × 7½" 81 Illustrations, 4 Plans
54/- (per post 58/6)

THE CHINA CLIPPERS

A History of the celebrated Clipper Ships in the Chinese Opium and Tea Trades 310 Pages $9\frac{3}{4}$ × $7\frac{1}{4}$ 34 Illustrations 50/- (per post 54/6)

THE LOG OF THE "CUTTY SARK"

The most authentic work, compiled from her log books and captain's abstracts 344 Pages $9\frac{3}{4}$ " \times $7\frac{1}{4}$ " 52 Illustrations, 9 Plans 54/- (per post 58/6)

THE LAST OF THE WINDJAMMERS

Vol. I. The Sailing Ships of the Seventies-Eighties 535 Pages 9\frac{3}{4}" \times 7\frac{1}{4}" 126 Illustrations, 17 Plans 72/- (per post 76/6)

Vol. II. The Deep-Water Sailing Ships, 1888-1928

470 Pages $9\frac{2}{3}'' \times 7\frac{1}{4}''$ 174 Illustrations, 17 Plans 60/- (per post 64/6)

By BASIL LUBBOCK

All Lubbock's work is the product of original and comprehensive research. These books are recommended without reserve to the student of the sailing-ship

MASTING AND RIGGING

The Clipper Ship and Ocean Carrier

45/- (per post 49/6)

SAILING SHIP RIGS AND RIGGING

With authentic plans of famous vessels.

30/- (per post 31/9)

PLANK-ON-FRAME MODELS and Scale Masting and Rigging

Vol. I. 40/- (per post 41/9) Vol. II. 40/- (per post 41/9)

By HAROLD A. UNDERHILL
A leading authority on Sail and Ship Modelling

Catalogue "N" giving further titles and details, free on request

BROWN, SON & FERGUSON, LTD., 52 DARNLEY STREET, GLASGOW, S.1.