

# The JOURNAL of THE INSTITUTE OF NAVIGATION

---

VOL. 21, NO. 2

APRIL

1968

<b>The Reverse Stopping Ability of Supertankers</b> H. TANI	119
<b>Handling Large Vessels in the Port of Hirohata</b> T. ONISHI	133
<b>An Anti-collision Indicator</b> O. MITROPANGY	161
<b>A Controlled Azimuth Avoidance Manœuvre</b> R. N. LORD	171
<b>Instrument Approach Criteria</b>	
I—Decision Height and RVR Minima J. W. BEANCHARD	181
II—Autoland and Safety D. J. MAYES	197
III—An Operator's View F. ORMONROYD	207
<b>Wind Variations along a Glide Path</b> T. W. HARROLD AND K. A. BROWNING	221
<b>Long-range Navigation Techniques for the S.S.T.</b> R. H. WALDMAN	229
<b>FORUM</b>	
'Longitude without Time' D. H. SADLER	234
Captain Flinders R. ST. J. FANGOURT	235
'The Metrication of Navigation' D. H. SADLER	236
<b>Record</b>	238
<b>Reviews</b>	242
<b>Correspondence</b>	242

---

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

---

JOHN MURRAY (PUBLISHERS) LTD., 30 ALBEMARLE STREET, LONDON W1

---

PRICE THIRTY SHILLINGS

THE INSTITUTE OF NAVIGATION

*Patron*

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

*OFFICERS AND COUNCIL 1967-8*

*President*

Professor A. Stratton

*Vice-Presidents*

Captain A. F. Dickson

Air Vice Marshal D. C. McKinley, C.B.E., C.B., D.F.C., A.F.C.

*Honorary Treasurer*

Captain M. E. Butler Bowdon, O.B.E., R.N.

*Chairman of the Technical Committee*

G. E. Beck

*Chairman of the Membership and Fellowship Committee*

D. H. Sadler, O.B.E.

*Other Members of Council*

J. H. Beattie

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

W. O. Broughton

Captain W. R. Colbeck, R.N.R. (Ret.).

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

F. A. Haworth

Captain G. A. B. King

Commander G. V. Parmiter, R.N. (Ret.).

Rear Admiral G. S. Ritchie, C.B., D.S.C.

H. E. Smith

*Executive Secretary:* M. W. Richey

*Deputy Secretary:* Sqn. Ldr. K. H. Houghton, D.F.C.

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:

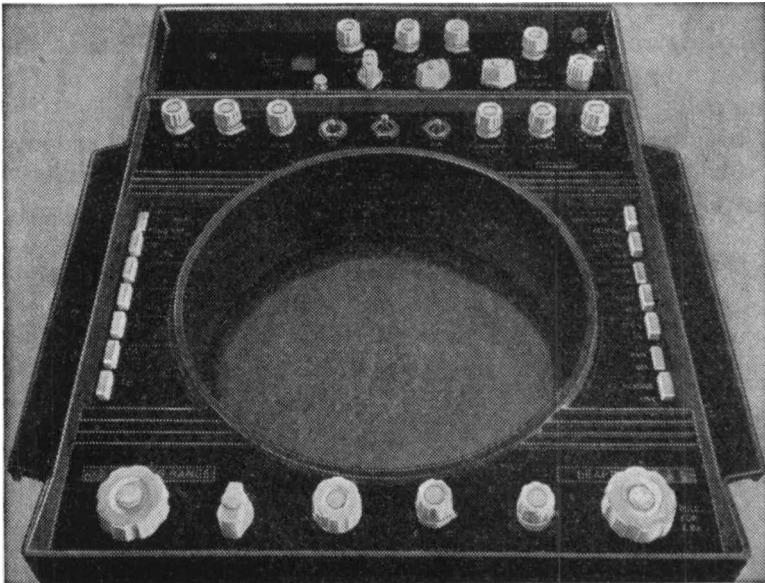
The Institute of Navigation,  
at The Royal Geographical Society,  
1 Kensington Gore, London SW7.

Telephone: Kensington 5021

You get a good deal from

# Marconi MARINE...

... let's deal with **RADAR**



THE NEW 'RAYMARC' Series offers the finest radar value in the world. Choice of 12-inch or 16-inch displays, with or without true motion, or 12-inch high definition version for canal, river and harbour navigation.

Standard equipment includes variable range marker and electronic bearing indicator with digital readouts, performance monitor, visual tuning indicator and manual override of automatic pulse switching. *Yet these new 'Raymarcs' cost less to buy, less to install, less to hire and maintain than any comparable radar. Make the cost comparison.*

ALL AVAILABLE FOR OUTRIGHT SALE. ECONOMICAL RENTAL/MAINTENANCE TERMS IN THE U.K. AND MOST OTHER COUNTRIES

**Marconi  
MARINE** shipping's name for a good deal in electronics

THE MARCONI INTERNATIONAL MARINE COMPANY LIMITED  
ELETTRA HOUSE · WESTWAY · CHELMSFORD · ESSEX · TELEPHONE CHELMSFORD 57201  
TELEX 99228, and at London and all principal ports

# Marconi complete naval communications

**A complete range of communications equipment using s.s.b, i.s.b and all other modes of h.f and m.f transmissions, designed specifically for naval communications systems.**

- Simple, precise and highly accurate continuous decade selection of frequencies in 100 Hz steps.
- Rigid stability controlled by a single high accuracy frequency standard.

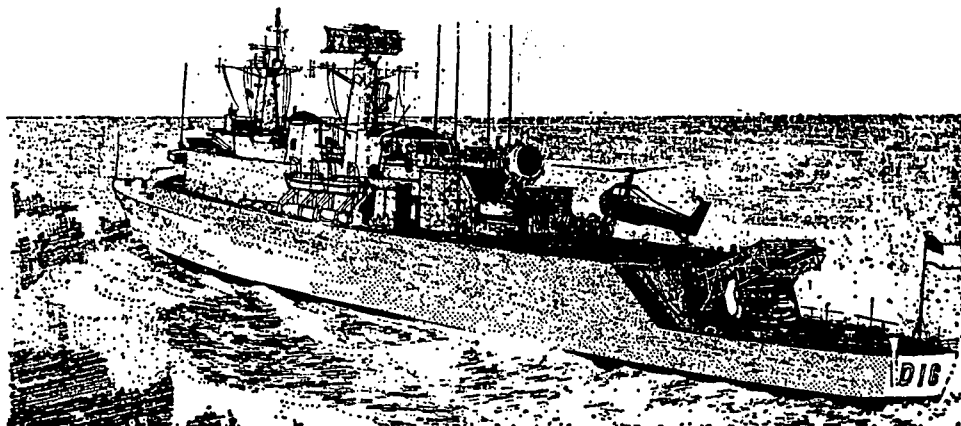
- Extreme simplicity of operation combined with versatility of service and high quality performance.

- Synthesizers and wideband amplifiers employed in these systems, which make maximum use of semiconductors.

- NATO codified.

- Complete system planning and installation.

This new range of Marconi equipment has already been used in the modernization of the communications of 10 Navies.

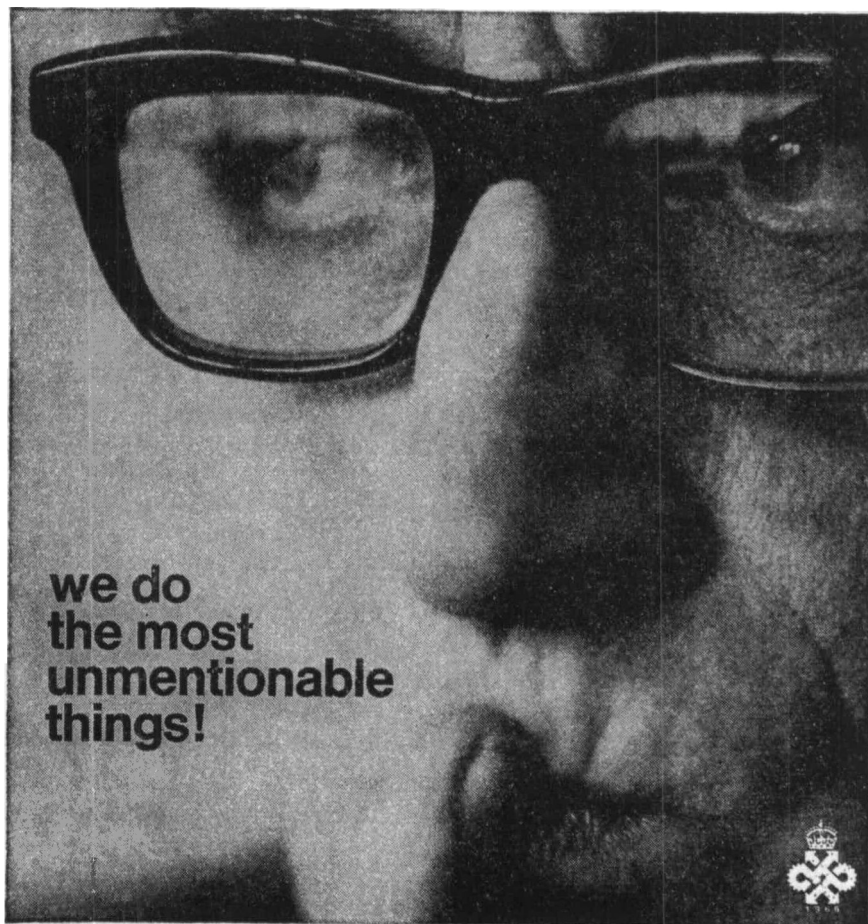


## Marconi naval radio and radar systems

AN 'ENGLISH ELECTRIC' COMPANY

The Marconi Company Limited, Radio Communications Division, Chelmsford, Essex

LTD/M661



**we do  
the most  
unmentionable  
things!**

The accent throughout Smiths Industries Aviation Division is heavily on future flight requirements—confidential of course. But design secrets at Smiths Industries are frequently revealed as technological triumphs. For their research and development programmes they spend £2½ million annually. Of the 5,000 personnel,

a quarter work solely on experimental projects in flight control, automatic landing, fuel gauging, and general instrumentation. Over 300 airlines and air forces, all users of Smiths aviation equipment, constantly look to Smiths Industries Aviation Division for leadership in design trends.



**SMITHS INDUSTRIES LIMITED**

**AVIATION DIVISION**

Kelvin House, Wembley Park Drive, Wembley, Middx.  
Wembley 8888 Airspeed Wembley Telex 25366  
Associated Companies in Toronto, New York, Sydney and Melbourne.

Flight control systems • General instruments and components • Fuel gauging equipment • Engine equipment

# **Authoritative Sailing-Ship Books**

## **GOOLIE 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 30/- (per post 34/6)

## **THE COLONIAL CLIPPERS**

The Great Wooden Ships of the Blackwall and other lines

400 Pages 9 $\frac{3}{4}$ "  $\times$  7 $\frac{1}{4}$ " 81 Illustrations, 4 Plans 36/- (per post 40/6)

## **THE CHINA CLIPPERS**

A History of the celebrated Clipper Ships in the Chinese Opium and Tea Trades

310 Pages 9 $\frac{3}{4}$ "  $\times$  7 $\frac{1}{4}$ " 34 Illustrations 36/- (per post 40/6)

## **THE LOG OF THE "GUTTY 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 45/- (per post 49/6)

## **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 50/- (per post 54/6)

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

470 Pages 9 $\frac{3}{4}$ "  $\times$  7 $\frac{1}{4}$ " 174 Illustrations, 17 Plans 50/- (per post 54/6)

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

## **SAIL TRAINING AND CADET SHIPS**

This Magnificent Volume is a most complete record

366 Pages 9 $\frac{3}{4}$ "  $\times$  7 $\frac{1}{4}$ " 132 Illustrations, 45 Folding Plans 60/- (per post 64/6)

## **DEEP-WATER SAIL**

For all Students of Sail and lovers of the Windjammer

387 Pages 9 $\frac{3}{4}$ "  $\times$  7 $\frac{1}{4}$ " Over 200 Illustrations, 28 Plates 60/- (per post 64/6)

## **PLANK-ON-FRAME MODELS and Scale Mastng and Rigging**

Vol. I. 38/- (per post 39/4) Vol. II. 34/- (per post 35/4)

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.

# CRANFIELD TRANSPORT STUDIES

Postgraduate 1 and 2 year courses in Transportation Technology and Management combining studies in transport systems assessment with a specialist course selected from :

**Aircraft project design ; Air cushion vehicle design ;  
Rotorcraft design ; Rail vehicles ;  
Pipeline flows ; Road vehicle engineering ;  
Gas turbine propulsion ; Electrical propulsion ;  
Signalling, communication and traffic control ;  
Operational research ; Transport management ;  
Transport systems analysis.**

The Science Research Council has accepted the Transportation Technology and Management courses as suitable for the tenure of its Advanced Course Studentships. The courses start in October, 1968.

Short Course in

## **Transport Systems Characteristics July 8th–19th, 1968.**

A survey of modern transport techniques including Aircraft, Rail, A.C.V., Road, Ships and Transport Systems Analysis.

Residential course fee

75 guineas

Enquiries to : The Registrar,  
The College of Aeronautics,  
Cranfield,  
Bedford.

# The Institute of Navigation

---

## INSTITUTE PUBLICATIONS

### **The Use of Radar at Sea**

A Handbook on Marine Radar. (New edition in preparation.)

### **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



# '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 14, No. 4 (Winter 1967) contains the following papers.

THE NAUTICAL ALMANAC IN ITS SEVENTH THIRD OF A CENTURY

*D. H. Sadler*

MARINE NAVIGATION: WHERE WE STAND - WHAT NEEDS TO BE DONE

*G. D. Dunlap*

NAVIGATION OF PLEASURE BOATS

*R. R. Blandford*

NAVIGATION IN OCEAN SURVEYS

*Captain Miller J. Tonkel, U.S.E.S.S.A.*

ANALYSIS OF THE CELESTIAL PLOT IN MARINE NAVIGATION

*Ernest B. Brown*

NAVIGATION SATELLITES

*Donald F. Spencer*

GROUND-BASED RADIO AIDS TO NAVIGATION

*Sven H. Dodington*

NAVIGATION OF V/STOL AIRCRAFT IN HIGH-DENSITY URBAN AREAS

*Tirey K. Vickers*

NAVIGATION FOR GENERAL AVIATION

*Glen A. Gilbert*

SPACE NAVIGATION

*William T. McDonald and Dr. Robert G. Stern*

CURVES FOR LORAN-INERTIAL ANALYSIS

*T. M. Pienkowski*

THE INSTITUTE'S PROFESSIONAL FILE

NOTES AND COMMENT

Reviews of Recent Books

INDEX TO VOLUME 14 OF NAVIGATION

## ROYAL GEOGRAPHICAL SOCIETY REPRODUCTIONS OF EARLY MAPS—VII

### Early Maps of the British Isles

A.D. 1000 — A.D. 1579

Collotype facsimiles of twenty manuscript and printed maps  
with an Introduction and Notes by

G. R. Crone, M.A.

Librarian and Map Curator, R.G.S.

15 Collotype plates in a portfolio, 21" × 16½".

The twenty maps, manuscript and printed, have been chosen to illustrate the development of the map of the British Isles from the Cotton world map of circa A.D. 1000 to the general map in Christopher Saxton's county atlas of England and Wales, A.D. 1579. They thus extend from the earliest rudimentary manuscripts to the decorative printed maps of the Tudor period. Among the MSS. are several not hitherto generally available which have been included through the cooperation of the Trustees of the British Museum.

Price 35s. plus postage: Inland 4/6, Overseas according to destination.

# **TORAN** radiolocation **TORAN**

hydrography  
oceanography  
dredging control  
airborne surveys  
geophysical operations



DIVISION RADIOLOCALISATION  
50, Rue Fabert - Paris 7<sup>e</sup> - France  
Tél : (1) 468-46-24

# **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 techniques.

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

Price per number \$5 (U.S.) excluding postage.

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, 168 Fenchurch Street, London, E.C.3.

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



## DECCA & AIR SEA RESCUE

Near enough is not good enough when men's lives are at stake. That is why Decca has come to play such a vital role in modern air-sea rescue methods. Decca provides continuous high-accuracy position fixing over wide areas—enabling both ships and aircraft to use a common reference system unaffected by either altitude or weather. Air-sea rescue is only one aspect of Decca's many capabilities. For general navigation, fishing, survey and oil exploration, ships' acceptance trials, naval operations, and for the laying and maintenance of cables and buoys Decca's continuous and accurate position fixing information is relied on by over 12,000 vessels of all types and sizes. **The Decca Navigator Company Limited, London**