MADE AND PRINTED IN GREAT BRITAIN BY
WILLIAM CLOWES AND SONS LIMITED
LONDON AND BECCLES

# THE JOURNAL OF THE INSTITUTE OF NAVIGATION

Volume 23 1970

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL EDITED BY M. W. RICHEY

## THE INSTITUTE OF NAVIGATION

AT THE ROYAL GEOGRAPHICAL SOCIETY

1 KENSINGTON GORE, LONDON SW7

JOHN MURRAY (PUBLISHERS) LTD., 50 ALBEMARLE STREET W1

### THE INSTITUTE OF NAVIGATION

#### PATRON

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

#### OFFICERS AND COUNCIL 1969-70

PRESIDENT

A. Stratton

VICE-PRESIDENTS

G. E. Beck

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

HONORARY TREASURER

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

Captain V. A. M. Hunt, C.B.E.

#### MEMBERS OF COUNCIL

J. H. Beattie

W. O. Broughton

W. J. Charnley

Captain C. H. Cotter

Group Capt. D. F. H. Grocott,

C.B.E., A.F.C.

Captain R. Hart, C.B.E., D.S.O.,

D.S.C.\*

G. A. B. King

Captain F. L. Main

H. E. Smith

R. Whalley

EXECUTIVE SECRETARY M. W. Richey, M.B.E.

# **CONTENTS**

THE DUKE OF EDINBURGH LECTURE: NAVIGATION AND EDUCATION	
E. W. Anderson	I
NAVIGATION AND TRAFFIC CONTROL IN THE 1970's	20
THE WORK OF THE NORTH ATLANTIC SYSTEMS PLANNING GROUP.	
D. A. Blake	20
V.L.F. TECHNIQUES FOR NAVIGATION. S. S. D. Jones	23
A HYBRID SYSTEM OF WORLD-WIDE NAVIGATION. F. S. Stringer .	26
ASSESSMENT CONDITIONS IN THE EVALUATION OF AN AIRBORNE	
NAVIGATION RADAR. H. F. HUDDLESTON	45
EFFECTS IN OMEGA FROM PROPAGATION VARIATIONS. B. Burgess and	
D. Walker	49
ELECTRONIC INSTRUMENTS AND COMPUTERS FOR SAILING YACHTS.	_
R. N. B. GATEHOUSE	60
THE REVISION OF THE RULES. J. GARCÍA-FRÍAS	71
REVISED RULES FOR PREVENTING COLLISIONS AT SEA. P. A. THOMPSON.	81
AN INVESTIGATION INTO THE USE OF RADAR FOR COLLISION AVOID-	
ANCE. J. Brough and K. D. Jones	87
THE INSTITUTES OF NAVIGATION IN THE 1970's. M. W. RICHEY	99
ACCIDENT BLACK SPOTS IN THE LOWER NORTH SEA. L. OUDET	108
RHUMB-LINE AND GREAT-CIRCLE SAILINGS (Forum). M. R. H. LLEWELLYN	119
PILOTAGE OR CONNING RADAR (Forum). J. WATT	121
SAILING VESSELS AND THE COLLISION REGULATIONS (Forum). M. W.	
RICHEY	122
NAVIGATION FOR APOLLO LUNAR LANDINGS. J. P. MAYER and R. K.	
OSBURN	131
THE USE OF A WEATHER RADAR AS A TERRAIN WARNING SYSTEM.	
V. J. Cox	149
TEMPERATURE TRIAL FORECASTING FOR S.S.T. CRUISE LEVELS, W. WEHRY	164
INTEGRATED NAVIGATION BY LEAST SQUARE ADJUSTMENT. K. RAMSAYER	•
A BRIEF HISTORY OF NAUTICAL LOGS TO a.D. 1800. C. H. COTTER	174
ON THE STOPPING DISTANCES OF GIANT VESSELS. H. Tani	187
	196
MARKETING A NEW RADAR. J. H. BEATTIE	212
INERTIAL NAVIGATION FOR THE MERCHANT MARINE. D. A. VIDELO and D. L. WRIGHT	••-
RHUMB-LINE SAILING WITH A COMPUTER. R. J. Turner	221
THE TORREY CANYON COMMISSION OF INQUIRY. L. OUDET	233
<del>-</del>	238
COLLISION AND THE PERSPECTIVITY (Forum), F. C. Bell	251
DISTANCE OFF BY VERTICAL SEXTANT ANGLE (Forum). J. W. CROSBIE .	253
CAPTAIN MÁRIO GAMA'S DIRECT METHOD FOR STAR-SIGHT REDUCTION (Forum). C. H. COTTER	
AMENDMENTS TO THE RULES (Forum), A. N. COCKCROFT	255
GUIDANCE AND CONTROL PHILOSOPHY FOR ALL-WEATHER LANDING.	258
C C D Javes	222
5. 5. D. JONES	277

A TWO-COMPONENT ELECTROMAGNETIC SHIP'S LOG. M. J. Tuck	ŒR,	
N. D. SMITH, F. E. PIERCE and E. P. COLLINS		302
VELOCITY MEASUREMENT IN TANKER BERTHING. P. J. BULMAN .		317
OPERATIONAL RESEARCH AND COST BENEFIT ANALYSIS ON NA	VI-	
GATION WITH PARTICULAR REFERENCE TO MARINE ACCIDEN	TS.	
A. STRATTON and W. E. SILVER	•	325
THE SEARCH FOR MINERVE. Ingénieur Hydrographe en Chef J. PASQUAY .		340
A THREE-DIMENSIONAL SIMULATOR FOR MANŒUVRING OF SI	JR-	
FACE SHIPS. J. D. van Manen and J. P. Hooft	•	348
THE NEW REACH IN NAVIGATION AT SEA. R. B. RICHARDSON		359
THE CUMULATIVE TURN. F. C. BELL		366
REVERSAL OF THE TRAFFIC FLOW IN THE DOVER STRAIT (Foru	m).	
L. Oudet	•	371
AN EXAMINATION OF SOME SHIP RADARS WITH AUTOMATIC COM	PU-	
TATION (Forum). F. J. WYLIE	•	373
SPHERICAL TRIANGLES WITH INTEGRAL-DEGREE PARTS (Forum). D.	Н.	
SADLER		379
SIMPLIFIED TIDAL CALCULATIONS (Forum). A. N. BLACK		381
REVISED RULES FOR PREVENTING COLLISIONS AT SEA (Forum).	. J.	
García-Frías	•	383
THE COLLISION PROBLEM AND MANŒUVRING BY STAGES (Forum)	. J.	
García-Frías	•	385
METRICATION AND THE NAUTICAL MILE (Forum). R. J. Turner .		387
SURVEYING DEEP-DRAUGHT ROUTES. J. D. WINSTANLEY		411
HOW DEEP IS THE SEA? R. L. CLOET		416
POLYNESIAN AND MICRONESIAN NAVIGATION TECHNIQUES. D. LEW	ıs .	432
REVISION OF THE COLLISION REGULATIONS, An Interim Report .		448
THE SYSTEM ABOARD Queen Elizabeth II. W. E. WARWICK		456
SATELLITE SYSTEMS FOR GEOPHYSICAL EXPLORATION AT SEA. A.	В.	
Моору		458
SATELLITES FOR OFFSHORE EXPLORATION, R. MAYBOURN		466
POSITION EXPERIMENTS USING DISTANCE MEASUREMENTS OF SATELL	ITE	
ATS-3. W. GOEBEL and K. W. SCHRICK		476
SOME ASPECTS OF THE SOLUTION OF THE MAIN PROBLEM OF INERT	IAL	
NAVIGATION. A. Yu. Ishlinsky and D. M. Klimov	•	484
MANŒUVRE DEMAND CONTROL FOR AIRCRAFT. G. T. SHANKS .		492
THE DISTRIBUTION OF WIND AND TEMPERATURE ON THEORETIC	CAL	
ROUTES AT CONCORDE CRUISING LEVEL. H. P. JEFFREYS		505
DISTANCE OFF BY VERTICAL SEXTANT ANGLE (Forum). A. N. BLACK		522
RHUMB-LINE SAILING (Forum). J. E. D. WILLIAMS		523
METRICATION AND THE NAUTICAL MILE (Forum). R. J. Turner .		524
THE CASE FOR REVISION OF ROUTING (Forum). The Trinity House and	the	
Honourable Company of Master Mariners		525
- ·	390,	541
REVIEWS 124 266		

#### THE INSTITUTE OF NAVIGATION

THE OBJECT of the Institute is to unite in one body those who are concerned with or who are interested in the science and art of navigation. Membership is not restricted to those who hold professional qualifications, but is open to others who wish to further the aims of the Institute.

By coordinating the knowledge and achievements of marine and air navigators, scientists and those associated with the development and production of navigational equipment, the work of the Institute is directed towards raising the standard of navigation. In the field of education it is the aim of the Institute to bring practical navigators into contact with teachers and research workers to increase a common appreciation of the issues involved. It is an object of the Institute to encourage research in equipment and methods; through its publications it gives a wide circulation to original work on navigation so that new developments and suggestions can be appreciated by those most directly concerned with them.

The activities of the Institute include the holding of monthly meetings to discuss specific problems, the publication of a Journal and of other works concerned with different aspects of navigation, and such other activities as the Council may deem necessary to promote knowledge in navigation and its associated sciences.

The Journal of the Institute of Navigation is issued free each quarter to all members and contains a full account of the Institute's proceedings. It prints the papers which are presented at meetings, together with their ensuing discussion, and other original papers contributing to the science of navigation. It also contains a record of current navigational work, reviews of important books, and general papers of interest to navigators and those with similar interests.

The work of the Institute is coordinated with that of similar societies abroad, whose proceedings are available to members.

Membership. There are five classes of membership of the Institute:

- (1) HONORARY MEMBERS, who shall be distinguished persons upon whom the Council may see fit to confer an honorary distinction.
- (2) FELLOWS, who shall be members, of at least three years' standing who, in the opinion of the Council, have made a contribution of value to navigation.
- (3) MEMBERS, who shall be persons over twenty-one years of age who can satisfy the Council of their interest in navigation.
- (4) STUDENT MEMBERS, who shall be persons under twenty-five years of age studying with a view to making navigation, or an allied interest, their career
- (5) CORPORATE MEMBERS, who shall be companies, universities, navigation schools, government departments and other organizations, 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 the Journal, and other publications. They are encouraged to take an active part in the Institute's work. Application should be by letter addressed to the Executive Secretary.

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

Members and Fellows . . . . Five guineas Student Members . . . . . . Two guineas Corporate Members . . . . Forty guineas

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.