THE JOURNAL OF NAVIGATION

Volume 26 1973

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

THE ROYAL INSTITUTE OF NAVIGATION

AT THE ROYAL GEOGRAPHICAL SOCIETY

1 KENSINGTON GORE, LONDON SW7

JOHN MURRAY (PUBLISHERS) LTD., 50 ALBEMARLE STREET W.1

THE ROYAL INSTITUTE OF NAVIGATION

PATRON

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

OFFICERS AND COUNCIL 1972-73

PRESIDENT G. E. Beck

VICE-PRESIDENTS

Captain V. A. M. Hunt, C.B.E. Captain A. J. R. Tyrrell

HONORARY TREASURER F. A. Haworth

CHAIRMAN OF THE TECHNICAL COMMITTEE
H. E. Smith, O.B.E.

CHAIRMAN OF THE MEMBERSHIP AND FELLOWSHIP COMMITTEE

Captain C. H. Cotter

MEMBERS OF COUNCIL

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

S. S. D. Jones
P. G. Reich
Captain I. S. S. Mackay, R.N.
Captain P. A. Thompson
Colin Mudie
Captain R. J. Turner

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

CONTENTS

THE DUKE OF EDINBURGH LECTURE: H.M.S. CHALLENGER AND THE	
DEVELOPMENT OF MARINE SCIENCE. H. CHARNOCK	1
THE PRE-FLIGHT HANDLING OF INERTIAL NAVIGATION SYSTEMS.	
K. R. Brown and W. H. McKinlay	13
SEA-BREEZE 1899–1972. H. W. TILMAN	2 1
THE GROWTH OF AIRCRAFT MOVEMENTS BY 1985. THE I.A.T.A. SECRE-	
TARIAT	26
AIR TRAFFIC CONTROL BY PROGRAMMED NAVIGATION. K, RAMSAYER	33
A PRECISION POSITION AND TIME SERVICE FOR THE AIR TRAFFIC OF	33
THE FUTURE, L. F. FEHLNER and T. A. McCarty	37
HOW CAN WE USE AREA NAVIGATION IN THE TERMINAL AREA? N. H.	3,
Hughes	55
THE CAPACITY OF A SINGLE-RUNWAY S.T.O.L./R.T.O.L. AIRPORT.	33
V. W. ATTWOOLL and C.P. HAYFIELD	61
TRAFFIC SURVEYS, D. R. JOHNSON.	
CIRCUMSTANCES OF COLLISIONS AND STRANDINGS. J. H. W. WHEATLEY	75
THE DISTRIBUTION OF COLLISIONS IN JAPAN AND METHODS OF ESTI-	92
MATING COLLISION DAMAGE, Y. Fujii and H. Yamanouchi.	
SHIP MANŒUVRING CHARACTERISTICS. J. A. H. PAFFETT	108
THE FUTURE OF THE KNOT AS A UNIT OF SPEED (Forum). O. STEWART	113
	123
COLLISION AVOIDANCE IN A TRAFFIC SYSTEM. E. S. CALVERT	137
OBSTACLES TO THE ESTABLISHMENT OF MOBILE SATELLITE COMMUNI-	
CATIONS. D. O. Fraser	145
AQUINO'S SHORT-METHOD TABLES. C. H. COTTER	152
NAVIGATION IN THE VERTICAL PLANE. B. J. CALVERT	167
JESTER'S TRANSATLANTIC PASSAGE, 1972. M. W. RICHEY	176
MANŒUVRING LARGE SHIPS IN SHALLOW WATER—I. J. P. HOOFT	189
A MARINER'S VIEW. K. D. Jones	202
SOME NAVIGATION RADAR PROBLEMS. P. J. Houseley	205
A NEW APPROACH TO THE PRESENTATION OF MARINE RADAR INFOR-	·
MATION. S. R. Parsons and J. P. Stewart	218
VOYAGE DELAY DECISIONS. A. WEPSTER	230
TIME-SCALES (Forum). D. H. SADLER	235
ERRORS OF SOME SEXTANT SIGHTS WITH A BUBBLE, FROM THE QUEEN	- 3 3
ELIZABETH 2 (Forum). F. W. WRIGHT	236
THE LEAP-SECOND OF 31 DECEMBER 1972 (Forum). D. H. SADLER	238
HENRY RAPER'S SPHERICAL TRAVERSE TABLE (Forum). C. H. COTTER .	240
PROGRESS IN PORT APPROACHES (Forum). R. B. RICHARDSON	244
A CAUTIONARY TALE (Forum). P. R. J. REYNOLDS	245
MARINE AND AIR TRAFFIC CONTROL (Forum). J. D. PROCTOR	
TRAINING FOR SAFE AND EFFICIENT SHIP OPERATIONS. L. A. HOLDER	247
SIMULATION OF ANTI-COLLISION PROBLEMS. L. REYNOLDS	25I 258
TRAINING METHODS FOR NAVIGATION IN THE AIR. W. P. ROBINSON .	261
THE B.O.A.C. NAVIGATION PROCEDURES TRAINER. J. C. Burt	
THE R.A.F. AIR NAVIGATION SIMULATOR. K. ROBERTSHAW and J. A. TIFFEN	262
A QUANTITATIVE ANALYSIS OF AVOIDING ACTION. K. HASEGAWA, K.	266
Kasahara, Y. Yamazaki and Y. Kai	
THE ACCURACY OF PREDICTIONS FROM PRIMARY RADAR AND SECON-	274
	- -
DARY RADAR, F. Marshall	282
SITUATION DISPLAY, P. O. PRIOR	290
THREE CLASSIC COLLISIONS. F. W. FRICKER	299

MANŒUVRING LARGE SHIPS I	n shall	DW WATE	R—II.	J. P.	Hoof	ľ		311
TRAFFIC ENGINEERING: SOM	ME THEC	DRETICAL	CON	SIDER	ATIO	NS.	Т.	_
Makishima	•			•				320
ERROR SYNTHESIS. R. N. LORI	· .							329
STRAPPED DOWN INERTIAL N	IAVIGATIO	ON SYSTE	MS. R.	P. G.	Corr	INSO	٧.	341
THE USE OF A COMPUTER FOR	R CORRE	CTING OC	EAN S	OUNI	DINGS	. Ru	ГН	•
Sherwood								352
SOME COMMENTS ON THE REC			REVEN	TING	COLL	ISIO	NS	
AT SEA, 1972 (Forum). F. J								365
A VOYAGE TOWARDS THE SO	UTH POL	E (Forum)	. D. L	wis				373
A VISIT TO JAPAN (Forum). M.	W. Richi	EY .					•	377
THE FUTURE OF THE KNOT AS	S A UNIT	OF SPEED	(Foru	n). G.	J. A.	Wн	TE	
and O. Stewart	•							380
AN EARLY PORTUGUESE CON	TRIBUTIO	ON TO AIF	NAV.	IGATI	ON (I	orun	1).	
C. H. Cotter	•		•				•	382
COLLISION AVOIDANCE SYSTE	EMS (Foru	m). J. Wat	T					385
FOUR-POINT MOORING (Forum								387
OPERATIONAL ASPECTS OF SH			N. Pap	ERS PF	RESENT	ED AT	Α .	• •
Seminar								390
SAFETY OF NAVIGATION IN TH	HE ENGLIS	H CHANN	EL. E.	R. HA	RGRE	AVES		399
MARINE TRAFFIC ADMINISTR							В.	***
Richardson							•.	407
BEHAVIOUR PATTERNS IN EN	COUNTE	RS BETWE	EN SH	IPS. I	. F. K	EMP		417
COLLISION AVOIDANCE AND							S.	• •
RATCLIFFE							•	423
PROPERTIES OF AIR-DERIVI	ED AND	GROUN	D-DER	İVED	AIR	CRA	FT	T-3
LANDING GUIDANCE CON								43 I
THE USE OF OMEGA FOR AIR A				Discu	SSION			450
ENCOUNTER RATES IN A MAI							Ĭ.	T)*
BARRATT								458
THE USE OF MANPOWER IN N	JAVIGATI	ON. A Disc	CUSSION	1			-	466
THE MYTH OF THE SACRED CA					ONES		·	480
ACCURACY CONTOURS FOR							ES	4
(Forum). E. M. GOODWIN ar								481
MARTELLI'S TABLES (Forum).							•	485
'A BRIEF HISTORY OF THE MET			HORIZ	ONTA	L AN	GLES	·.	3
(Forum). J. DICKSON, G. A.	GIBSON, C	С. Н. Сотт	ER					49 I
HANOVER CONFERENCE. SUM				AT C	ONFER	ENCE		497
RECORD								497
REVIEWS					131,	250,	-	
								_

THE ROYAL 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 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	•	•	10.0		• to	. £5.25
Student Members .		•	10 0	•		. £2.10
Corporate Members .				•		. £42.00

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.