

THE JOURNAL OF NAVIGATION

Volume 40

1987

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL
EDITED BY J. F. KEMP

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

THE ROYAL INSTITUTE OF NAVIGATION

PATRON

H.R.H. THE PRINCE PHILIP DUKE OF EDINBURGH, KG, KT, OM

OFFICERS AND COUNCIL 1986–87

PRESIDENT

J. E. D. Williams

VICE PRESIDENTS

Sir John Charnley, CB

D. W. Newson

TREASURER

G. A. B. King, CBE

CHAIRMAN OF THE TECHNICAL COMMITTEE

M. G. Pearson

CHAIRMAN OF THE MEMBERSHIP & FELLOWSHIP COMMITTEE

Commander A. E. Fanning, MBE, DSC, RN

Other Members of Council

H. J. Agnew

J. C. Bell

W. F. Blanchard

Wg Cmdr D. W. Broughton, MBE, RAF

N. Dahl

Captain J. D. Eames

P. F. C. Griffiths

D. Halliwell

S. G. Smith

Rear Admiral A. F. R. Weir, CB

DIRECTOR

Rear Admiral R. M. Burgoyne, CB

CONTENTS

EARLY NAVIGATION: THE HUMAN FACTOR (DUKE OF EDINBURGH LECTURE). TIM SEVERIN	1
NAVIGATION OF SPACECRAFT ON DEEP SPACE MISSIONS. JAMES F. JORDAN	19
THE DISTRIBUTION OF NAVIGATIONAL ERRORS. CAPTAIN PETAR ČUMBERLIĆ	32
ATS AND VTS—SOME OBSERVATIONS TOWARDS A SYNTHESIS. R. BOOTSMA AND K. POLDERMAN	42
THE CALCULATION OF CROSSING COLLISION RISK AT SEA. W. G. P. LAMB	52
SEARCH AREA DETERMINATION AND SEARCH UNIT DEPLOYMENT. JOHN ASTBURY	63
SEA TRIALS OF A NAVIGATION SYSTEM BASED ON COMPUTER PROCESSING OF MARINE RADAR IMAGES. G. L. AUSTIN, A. BELLON AND E. BALLANTYNE	73
COORDINATE CONVERSION TECHNIQUES IN MICROPROCESSOR-BASED RE- CEIVERS FOR HYPERBOLIC RADIO-NAVIGATION SYSTEMS. DAVID LAST AND CHRISTOPHER SCHOLEFIELD	81
PRACTICAL WEATHER ROUTEING OF SAIL-ASSISTED MOTOR VESSELS. H. HAGIWARA AND J. A. SPAANS.	96
FLIGHT INSPECTION PROCEDURES AND POSITION FIXING TECHNIQUES. D. R. REIFFER	130
MILITARY FLIGHT CHECKING OF NAVIGATION AND LANDING AIDS. WING- COMMANDER M. A. RADFORTH, RAF	132
PROPOSAL ON THE MODIFICATION OF SAILING CALCULATIONS (Forum). T. HIRAIWA	138
JESTER'S ULTIMATE STORM. MICHAEL RICHEY	149
WORLDWIDE NAVIGATION INTO THE 21ST CENTURY—AN AIRLINE VIEW. P. MOORE AND D. M. PAGE	158
MOBILE SATELLITE COMMUNICATIONS AND NAVIGATION. OLOF LUNDBERG	164
GPS IN THE YEAR 2000 AND BEYOND. PHILLIP J. BAKER	175
MODERN NAVIGATION AND POSITIONING TECHNIQUES. M. E. NAPIER AND V. ASHKENAZI	183
INTEGRATED NAVIGATION, COMMUNICATION AND SURVEILLANCE SYSTEMS BASED ON STANDARD DISTANCE MEASURING EQUIPMENT. A. BECKER	194
COLOUR DEPENDENCE AND SURPLUS INFORMATION IN AIRPORT VISUAL AIDS DURING VFR OPERATIONS. ROBERT K. MCKELVEY	206
SOURCE DATA FOR NAUTICAL CHARTS: PROBLEMS IN THE GULF OF SUEZ. P. G. COX	227
AN OMEGA/TRANSPONDER DISPLAY SYSTEM. GEORGE B. LITCHFORD AND JOSEPH T. SAGANOWICH	235
ACCURATE AND RELIABLE LONG-RANGE DYNAMIC RADIOLOCATION USING GPS AND DGPS—GEOLC HYBRIDIZATION. GEORGES NARD	249
STANDARDIZATION WITHIN NATO ON THE METHOD OF EXPRESSING NAVI- GATION ACCURACIES. D. W. BROUGHTON	267
SMALL HORIZONTAL ANGLES AND THE ACCURACY OF TRANSIT LINES. LEONARD EYGES	274
PRACTICAL WEATHER ROUTEING OF SAIL-ASSISTED MOTOR VESSELS. H. HAGI- WARA AND J. A. SPAANS	278
RECORD	279
REVIEW	281
THE CONFLICT RESOLUTION PROCESS FOR TCAS II AND SOME SIMULATION RESULTS. R. L. FORD	283
PLANNING OF THE NAVIGATIONAL CHANNELS IN THE GULF OF SUEZ FOLLOW- ING IMO REGULATIONS. G. A. MOKHTAR AND I. HUSSEIN	304
OMEGA IN THE LAND ENVIRONMENT. ANDREW STRATTON	322

THE NAVIGATOR – MAN OR MACHINE? RALPH MAYBOURN	334
RADAR REFLECTORS, RADAR BEACONS AND TRANSPONDERS AS AIDS TO NAVIGATION. IAN McGECH AND W. B. STAWELL	344
THE AUTOMATIC DETECTION OF REAL-LIFE SHIP ENCOUNTERS. ROBERT G. CURTIS, ELISABETH M. GOODWIN AND MARK KONYN	355
THE NUCLEAR MAGNETIC RESONANCE GYROSCOPE: A REVIEW. K. F. WOOD- MAN, P. W. FRANKS AND M. D. RICHARDS	366
NAVIGATIONAL IDEAS AND THE YORKSHIRE RIPPER INVESTIGATION (Forum). STUART S. KIND	385
POSITION FIXING WITH NEITHER DEAD RECKONING NOR GMT (Forum). W. B. FU	393
RESURRECTING THE LUNAR DISTANCE (Forum). BRUCE STARK	394
RECORD	396
REVIEWS	400

THE ROYAL INSTITUTE OF NAVIGATION

Aims and Objects

THE OBJECTS of the Institute are to unite in one body those who are concerned with or who are interested in navigation and to further its development. Navigation is conceived as applying to locomotion of all kinds and is perceived as encompassing aspects of: command and control, psychology and zoology, operational research, risk analysis, theoretical physics, operation in hostile environments, instrumentation, ergonomics, financial planning and law as well as electronics, astronomy, mathematics, cartography and other subjects traditionally associated with navigation.

The aims of the Institute are to encourage the creation and dissemination of knowledge through research and development, to co-ordinate information from all the disciplines involved, to provide a forum in which new ideas and new products can have the benefit of informed and professional scrutiny and to further education and communication.

The Institute initiates conferences and symposia on specific subjects and has a programme of meetings at which lectures are given and discussed. There are standing Study Groups which keep under constant review pertinent aspects of navigation. The success of these Study Groups is crucially dependent on the active involvement of members.

The Institute publishes *The Journal of Navigation* three times a year. It contains papers which have been presented at meetings together with the ensuing discussion, other original papers, selected papers and reports from Study Groups, and book reviews. The Institute also publishes a News Magazine which contains a full account of the Institute's proceedings and activities. This includes Branch News, a record of current navigational work, a diary of events, topical articles, news about Membership and advertising. A great deal of the Institute's work is international in character and is co-ordinated with that of similar organisations in other countries. There are also active Branches throughout the United Kingdom.

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

(1) HONORARY MEMBERS: Distinguished persons upon whom the Council may see fit to confer an honorary distinction.

(2) FELLOWS: Members, of at least three years' standing, holding certain qualifications laid down in the by-laws; these qualifications include having made a contribution of value to navigation.

(3) MEMBERS: Persons over twenty-one years of age who satisfy the Council of their interest in navigation.

(4) STUDENT MEMBERS: Persons under twenty-five years of age studying at a recognized school or university with a view to making navigation, or an allied interest, their career.

(5) CORPORATE MEMBERS: Organizations such as universities, navigation schools, government departments or companies, 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 its publications. They are encouraged to take an active part in the Institute's work. Applications should be sent by letter addressed to the Director.

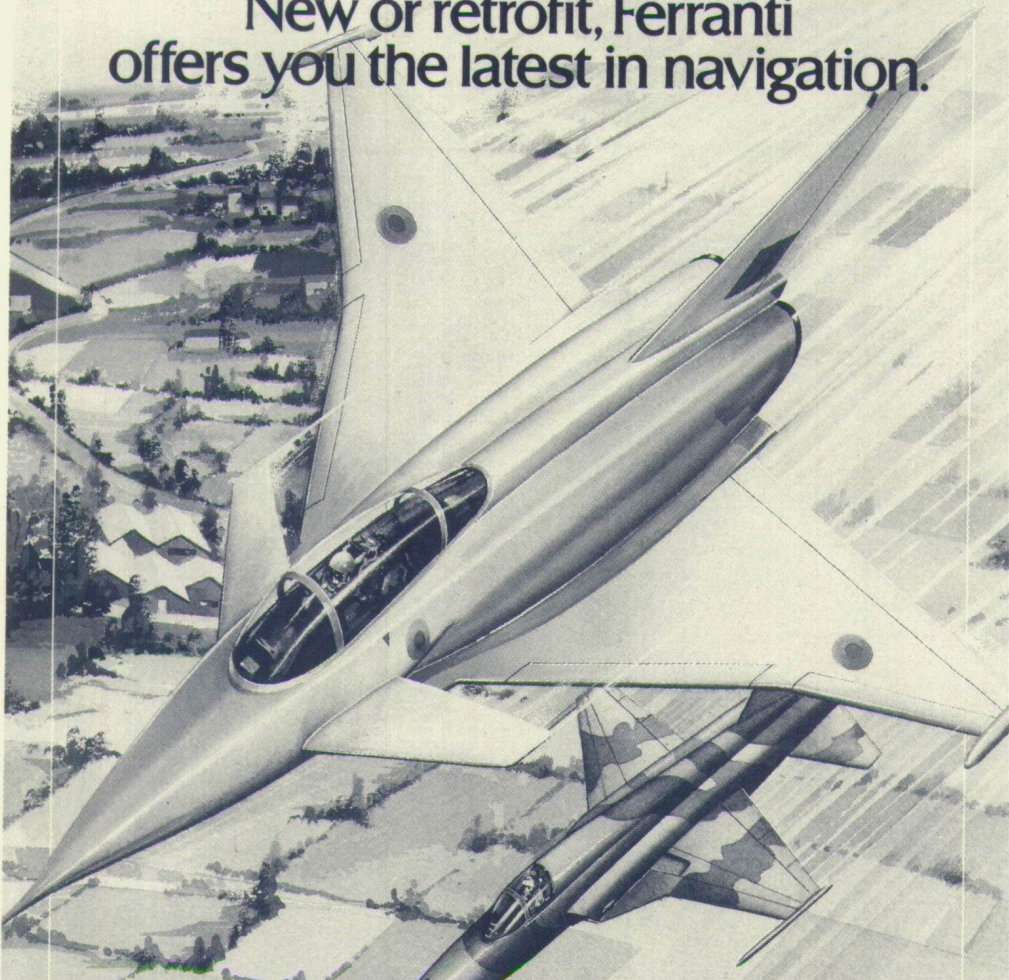
Subscriptions. Annual subscriptions to the Institute are payable in advance as follows:

Members and Fellows	£28.00
Student Members	£5.00
Corporate Members	£200.00

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.

NAVIGATION SYSTEMS

New or retrofit, Ferranti offers you the latest in navigation.



Latest in the proven line of Ferranti inertial navigation systems, the Ferranti ring laser gyro has been specially developed for the fastest, most demanding military avionic applications – both for new airframes and retrofits.

The ultimate in navigation systems for the aircraft of today and tomorrow – Ferranti Ring Laser Gyro Systems. To find out more, contact:

Ferranti Defence Systems Limited
Navigation Systems Department
Silverknowes Edinburgh EH4 4AD Scotland
Telephone: 031-332 2411 Telex: 727101

FERRANTI

Printed in Great Britain by the University Press, Cambridge