## THE JOURNAL OF NAVIGATION

Volume 48

## 1995

#### 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 1994-95

PRESIDENT W. F. Blanchard

VICE PRESIDENTS Wg Cdr J. Mitchell Capt R. A. Smith, RN

TREASURER Air Cdre M. J-C. Burton, OBE

CHAIRMAN OF THE TECHNICAL COMMITTEE D. M. Page

CHAIRMAN OF THE MEMBERSHIP & FELLOWSHIP COMMITTEE Capt A. N. Cockcroft

Other Members of Council

T. J. Bartlett Air Cdre D. F. H. Grocott, CBE, AFC V. D. Hopkin P. E. G. Moore S. Morice K. Newman Dr C. Querée J. D. Reeve R. D. Stephenson A. L. Wale

DIRECTOR Group Captain D. W. Broughton, мве

## **CONTENTS**

The Use of Airborne Differential GPS to Detect Coordinate and Calibration	
Errors in DME Navigation Aids	1
V. Ashkenazi, C. J. Hill, T. Moore, W. Y. Ochieng, J. Storey, R. Rawlings	
and C. V. Cleasby	
Display Requirements for ECDIS/ARPA Overlay Systems	13
G. P. SMEATON, W. O. DINELEY AND S. M. TUCKER	
Stabilizing the Radar Picture and ARPA Data	29
B. Berking and J. Pfeiffer	
The Management of Marine Traffic, A Survey of Current and Possible	
Future Measures	53
T. Degré	
Development and Testing of a Radar Target Enhancer for Navigation Buoys	70
N. Ward	
Military Needs for Personal Navigation	77
J. A. Starbuck	-
The Application of Inertial Navigation Technology in Land Vehicles	81
J. MITCHELL	
Microwave Front End for True Ground Speed Measurements	88
J. KEHRBECK, E. HEIDRICH AND W. WIESBECK	
A Visual Interpretation of an ERS-1 SAR Image of the Thames Estuary	97
S. T. Culshaw	_
Multiple Crossing Encounters	105
W. G. P. LAMB AND J. M. HUNT	
Integration of Navigation Data	114
A. Svensson and J. Holst	
GRI Ranking Based on Cross Rate Interface	136
A. K. Nieuwland	
'Conflicts in Inshore Waters' D. Pike	153
Conflicts in Inshore Waters' – A Yachtsman's View	
	154
T. BARTLETT Around The World In Less Then Eighty Days	
Around The World In Less Than Eighty Days	161
ROBIN KNOX-JOHNSTON	166
Civil GNSS: The Inmarsat Vision for the 21st Century OLOF LUNDBERG	100
Navigation and Information Technology-a European Commission View	175
L. TYTGAT	175
GPS Wide Area Augmentation System (WAAS)	180
Robert Loh	100
Single Points of Failure in Complex Aviation Systems of Communication,	
Navigation and Surveillance	192
M. J. A. Asbury and R. Johannessen	• • • •
The Current Status of the Securicor Datatrak System	204
Tony Scorer and David Last	+
A Worldwide Database for Digital Nautical Charts	215
Adam J. Kerr	)
Meeting Mariners' Needs for Electronic Charts	227
Peter Wright	,

ECDIS-Its Impact Today	234
B. A. E. RICHES	
The Use of GPS for Low-Cost Aerial Block Photography	239
BILL EKIN	
Institutional Requirements for a Global Navigation Satellite System	249
W. F. Blanchard and D. W. Broughton	
The Evolution of Navigation Lights for Ships	256
John Kemp	
GPS and DGPS as a Challenge for Environmentally-Friendly Agriculture	268
Hermann Auernhammer, Thomas Muhr and Markus Demmel	
Long Time-Horizons for Air Traffic Flow Planning in Europe	279
S. Ratcliffe	
Clarification of the Steering and Sailing Rules of the COLREGS	289
Hanno Weber	209
A Kalman Filter Model for an Integrated Land Vehicle Navigation System	202
Allison N. Ramjattan and Paul A. Cross	293
-	
Interpretation of S-Curve and Tracking Error in a Delay-Lock-Loop	303
E. S. WARNER AND J. D. LAST	
Sailing in Ever-Decreasing Circles	307
ROGER PRINCE AND ROY WILLIAMS	
'Conflicts in Inshore Waters'	314
Captain Sven B. Gyldeń writes	
Nautical Almanac Equations and GPS Problems	316
J. M. Sharpey-Schafer	
Record	317
Andrew Stratton	
GPS – An Airline User's View	319
Andrew Shand	
The Future of Electronic Charts in Merchant Ships	335
I. Н. Веаттіе	333
A Voyage of Navigational Investigation	349
Michael Richey	512
SATCOM/ADS: The Key to CNS Integration for ATM in Europe?	361
M. E. Cox	J
Captain Vancouver's Longitudes 1792	374
Nicholas A. Doe	574
Risk of Collision at Sea	389
Werner Hinsch	5-2
Radar Transponders and Radar Target Enhancers	396
Richard M. Trim	370
Marine Accident Frequencies – Review and Recent Empirical Results	410
HANS ROMER, H. J. STYHR PETERSEN AND PALLE HAASTRUP	4.0
The Uncertainty and Uncoordination of Mariners' Behaviour in Collision	
Avoidance at Sea	425
J. ZHAO, W. G. PRICE, P. A. WILSON AND M. TAN	445
Collision Risk with Fast Ferries	426
DAG PIKE	436
'Conflicts in Inshore Waters'	439
A. T. C. Millns	
The Costs and Benefits of Maritime Traffic Management	44 I
Richard Goss	
Reviews	443

#### THE ROYAL INSTITUTE OF NAVIGATION

Patron

HRH THE PRINCE PHILIP DUKE OF EDINBURGH, KG, KT, OM

OFFICERS AND COUNCIL 1994-1995

President

W. F. Blanchard

Vice Presidents

Wg Cdr J. Mitchell Capt R. A. Smith, RN

Treasurer

Air Cdre M. J-C. Burton, OBE

Chairman of the Technical Committee

D. M. Page

Chairman of the Membership & Fellowship Committee Capt A. N. Cockcroft

Other Members of Council

T. J. Bartlett Air Cdre D. F. H. Grocott, CBE, AFC V. D. Hopkin P. E. G. Moore S. Morice K. Newman Dr C. Querée J. D. Reeve R. D. Stephenson A. L. Wale

Director: Gp Capt D. W. Broughton, MBE

#### THE JOURNAL OF NAVIGATION

Editor John Kemp Assistant Editor Rebecca Dudley

The Journal is published three times a year by Cambridge University Press. It contains original papers contributing to the science of navigation, including those presented at the 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. Crown Copyright may be reserved. Any facts stated or opinions expressed in this Journal are the sole responsibility of the contributors. Neither the Royal Institute of Navigation, the Editor nor the Publishers can be held responsible for any injury or loss sustained in reliance thereon.

The subscription price (excluding VAT) to The Journal (ISSN 0373-4633) for Volume 48, 1995, is £96 (USA, Canada and Mexico US \$178) post free; single parts are available at £34 (USA, Canada and Mexico US \$62) plus postage. EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number. The Journal is issued free to all Members of the Institute. Orders, which must be accompanied by payment, may be sent to any bookseller or subscription agent or direct to the publishers: Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, or in the USA, Canada and Mexico to Cambridge University Press, Journals Department, 40 West 20th Street, New York, NY 10011-4211, USA. Japanese prices for institutions (including ASP delivery) are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan.

Enquiries for advertising space should be addressed to Cambridge University Press at the address given above.

The postal address of the Institute is The Royal Institute of Navigation, *at* The Royal Geographical Society, 1 Kensington Gore, London SW7 2AT (Telephone: 0171-589 5021 Fax: 0171-823 8671).

# THE JOURNAL OF Navigation

#### VOLUME 48 NUMBER 3 SEPTEMBER 1995

#### CONTENTS

GPS – An Airline User's View	319
Andrew Shand	
The Future of Electronic Charts in Merchant Ships	335
J. H. Beattie	
A Voyage of Navigational Investigation	349
Michael Richey	
SATCOM/ADS: The Key to CNS Integration for ATM in Europe?	361
M. E. Cox	
Captain Vancouver's Longitudes 1792	374
Nicholas A. Doe	
Risk of Collision at Sea	389
Werner Hinsch	
Radar Transponders and Radar Target Enhancers	396
Richard M. Trim	
Marine Accident Frequencies – Review and Recent Empirical Results	410
Hans Romer, H. J. Styhr Petersen and Palle Haastrup	
The Uncertainty and Uncoordination of Mariners' Behaviour in Collision	
Avoidance at Sea	425
J. Zhao, W. G. Price, P. A. Wilson and M. Tan	
Collision Risk with Fast Ferries	436
Dag Pike	
'Conflicts in Inshore Waters' A. T. C. Millns	439
The Costs and Benefits of Maritime Traffic Management Richard Goss	441
Reviews	443
Reviews	443



0373-4633(199509)48:3;1-4 https://doi.org/10.1017/50373463300012832 Published online by Cambridge University Press