The JOURNAL of NAVIGATION

VOL. 43 NO. 3	SEPTEMBER	1990
Navigators G. A. B. King		295
Air Navigation Systems. T Techniques for Air Navi Brian Kendal	The Beginnings of Directional Radio igation, 1910–1940	313
The Channel Navigation II H. J. NEILL	nformation Service for the Dover Strait	331
Some Human Factors Aspe V. David Hopkin	ects of Single Manning	343
The Weather of the 1979 F ALAN WATTS	Fastnet Yacht Race	353
Decision Support to Maste Expert System Martha Grabowski	ers, Mates on Watch and Pilots: The Piloting	364
Computer-drawn Charts fo W. P. Lawrence	or EROPS Flights	385
A New Threat Detection C Systems R. L. Ford and D. L. Pow	Criterion for Airborne Collision Avoidance	391
ACAS in Europe – a UK View A. G. Thorning		404
GDOP, Ridge Regression and the Kalman Filter R. J. Kelly		409
Proposal for Low Cost Ocean Weather Routeing C. DE WIT		428
Air Navigation Systems. Heading References 1909–1959' KEITH R. GREENAWAY		440
The Beginnings of Directional Radio Techniques for Air Navigation' F. C. RICHARDSON AND D. PAGE		
Computation of an Astronomical Running Fix R. WILLIAMS		444
Astronomical Fixes without Bernard Spencer	ut an Assumed Position	449
Record		452
Reviews		453

THE ROYAL INSTITUTE OF NAVIGATION OXFORD UNIVERSITY PRESS

THE ROYAL INSTITUTE OF NAVIGATION

Patron

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

OFFICERS AND COUNCIL 1989-1990

President

Sir John Charnley, CB

Vice Presidents

N. B. Dahl

W. F. Blanchard

Treasurer

J. H. Beattie

Chairman of the Technical Committee

Air Cdre D. F. H. Grocott, CBE, AFC, RAF

Chairman of the Membership & Fellowship Committee

D. M. Page

Other Members of Council

Professor V. Ashkenazi

R. W. Bridge, AFC Captain A. N. Cockcroft

B. D'Oliviera

Air Marshal Sir Barry Duxbury, KCB, CBE, RAF

Dr R. Johannessen

L. Lee I. Mitchell

Rear Admiral R. O. Morris, CB

R. D. Pike

Director Rear Admiral R. M. Burgoyne, CB

THE JOURNAL OF NAVIGATION

Editor John Kemp Assistant Editor Rebecca Archer

The Journal is published three times a year by Oxford 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 Journal (ISSN 0373-4633) is issued free to all Members of the Institute. The subscription price to non-members for Volume 43, 1990, is £67 (US \$120 in N. America, £63 in EEC countries and £59 in the UK); single parts are available at £27 (US \$48 in N. America, £25 in EEC countries and £23 in the UK). Prices include postage by surface mail or, for subscribers in the USA, Canada, Japan, Australia and New Zealand, by Air Speeded Post. Airmail rates are available on request. Back issues are sold at the current single issue rate. Please send orders and requests for sample copies to the Journals Subscriptions Dept, Oxford University Press, Pinkhill House, Southfield Road, Eynsham, Oxford OX8 1]J, UK. Payment is required with all orders and subscriptions are accepted and entered by the volume.

Enquiries for advertising space should be addressed to the Journals Advertising Coordinator, Journals Production Dept., Oxford 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: 071-589 5021).