The JOURNAL of NAVIGATION

VOL. 40 NO. I JANUARY	1987
Early Navigation: The Human Factor (Duke of Edinburgh Lecture) TIM SEVERIN	ī
Navigation of Spacecraft on Deep Space Missions JAMES F. JORDAN	19
The Distribution of Navigational Errors CAPTAIN PETAR ČUMBELIĆ	30
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 Receivers for Hyperbolic Radio-navigation Systems David Last and Christopher Scholefield	91 81
Practical Weather Routing of Sail-assisted Motor Vessels H. HAGIWARA AND J. A. SPAANS	96
Flight Inspection Procedures and Position Fixing Techniques D. R. Reiffer	120
Military Flight Checking of Navigation and Landing Aids Wing-Commander M. A. Radforth, RAF	132
Forum: Proposal on the Modification of Sailing Calculations T. HIRAIWA	138

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 1986-7

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

Wing Commander 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

THE JOURNAL OF NAVIGATION

The Journal is published three times a year by Oxford University Press and is edited by Professor J. F. Kemp. 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.

The Journal (ISSN 0020-3009) is issued free to all Members of the Institute. The subscription price to non-members for Volume 40, 1987, is £43 (USA and Canada US \$100.00) post free; single parts are available at £16 (USA and Canada US \$36) plus postage. Orders, which must be accompanied by payment, may be sent to any bookseller or subscription agent or direct to the publishers, Journals Subscription Department, Oxford University Press, Walton Street, Oxford OX2 6DP. Back volumes are also available from the publishers at £27 each.

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, I Kensington Gore, London SW7 2AT (Telephone: 01-589 5021).