

Journal of
THE ROYAL AERONAUTICAL SOCIETY

INCORPORATING THE INSTITUTION OF AERONAUTICAL ENGINEERS AND THE HELICOPTER ASSOCIATION OF GREAT BRITAIN

Published Monthly at 4 HAMILTON PLACE, LONDON, W.1
Telephone: Grosvenor 3515-9 Telegrams: Didaskalos, London, W.1

Subscriptions: £10 10s. 0d. per annum, post free Single Copies: 17s. 6d.

Advertisements only : J. W. Williams, D.F.C., Magazine Advertising Ltd., 36-38 Whitefriars St., London, E.C.4. Fleet Street 7539

VOLUME 68

NOVEMBER 1964

NUMBER 647

CONTENTS

	Page
Secretary's News Letter	LXXVII
Notices	LXXVII
New Fellows—Acknowledgments—Proposed Bulletin on Stress Analysis—Elections—Diary—Associate Fellowship Examination Results—Elliott Memorial Prize—Other Meetings—News of Members—Lecture Summaries.	
The Branches	LXXXI
Graduates' and Students' Section	LXXXII
The Diploma in Technology in Aeronautical Engineering: Report by a Working Party of the Education Committee of the Society	713
Propelling Nozzle Research	W. G. E. Lewis 717
Theoretical and Experimental Investigation of Indoor Flying Models	M. Hacklinger 728
Future Relationships between Air and Ground Transport	J. R. Cooper 735
Some Basic Studies of Liquid Propellant Injection Processes	J. D. Lewis 743
Thrust Throttling of Large Liquid Propellant Rocket Engines	I. E. Smith 751
The Sampling of Rocket Combustion Gases	R. Bryan 759
Some Problems Arising from the Use of Hydrogen-Fuelled Propulsion Systems	L. E. Maher 765
Technical Notes	773
Shear Buckling of Simply-Supported Rectangular Elastic Plate—B. T. Fang. Elastic Stability of Cylindrical Shells under Axial and Lateral Loads—C. Lakshminantham and G. Gerard. A Finite-difference Approximation to a Non-self Adjoint Eigensystem—B. Saravanos. Investigation of the Possibilities of Rotating Cylinders as an Auxiliary Lift Device—J. E. Chacksfield.	
The Library	781
REVIEWS: Recent Advances in Matrix Methods of Structural Analysis—Filament Winding—Non-steady Flame Propagation—An Introduction of the Mechanics of Machines.	
Additions to the Library	Reports

All communications for publication in the JOURNAL should be addressed to the Editor, JOAN BRADBROOKE, A.R.Ae.S.; all communications on general matters affecting the Society should be addressed to the Secretary, A. M. BALLANTYNE, T.D., B.Sc., Ph.D., F.R.Ae.S., Hon.F.C.A.S.I., F.A.I.A.A.—at 4 HAMILTON PLACE, LONDON, W.1.

Reproduction in whole or in part of any of the papers and contributions published in this Journal is not permitted without the written consent of the Royal Aeronautical Society.

None of the papers or paragraphs must be taken as expressing the opinion of the Council of the Royal Aeronautical Society unless otherwise stated.

The Royal Aeronautical Society

FOUNDED 1866

INCORPORATED BY ROYAL CHARTER 1949

Patron: HER MAJESTY THE QUEEN

COUNCIL 1964-1965

President: H. H. GARDNER, B.Sc., F.R.Ae.S.

President-Elect: SIR GEORGE GARDNER, K.B.E., C.B., D.Sc., Hon.F.R.Ae.S.

Past-Presidents:

AIR MARSHAL SIR OWEN JONES, K.B.E., C.B., A.F.C., B.A., D.I.C., F.R.Ae.S.,
R.A.F.(retd.)
B. S. SHENSTONE, M.A.Sc., F.R.Ae.S., F.A.I.A.A., F.C.A.S.I.
PROFESSOR A. R. COLLAR, C.B.E., M.A., D.Sc., F.R.Ae.S., F.A.I.A.A., F.C.A.S.I.

Vice-Presidents:

A. D. BAXTER, M.Eng., F.R.Ae.S.
AIR COMMODORE F. R. BANKS, C.B., O.B.E., C.G.I.A., F.R.Ae.S., Hon.F.A.I.A.A.
M. B. MORGAN, C.B., M.A., F.R.Ae.S.

Members:

E. P. BEDFORD, A.R.Ae.S. (*President of the Southern Africa Division*)
PROFESSOR J. A. J. BENNETT, D.Sc., Ph.D., F.R.Ae.S., F.A.I.A.A.
(*Also Chairman, Rotorcraft Section*)
MAJOR G. P. BULMAN, C.B.E., B.Sc., F.R.Ae.S.
R. H. BURRIN, Grad.R.Ae.S. (*Chairman, Graduates' and Students' Section*)
SIR SYDNEY CAMM, C.B.E., Hon.F.R.Ae.S.
DR. W. CAWOOD, C.B., C.B.E., B.Sc., F.R.Ae.S.
A. V. CLEAVER, F.R.Ae.S., A.F.A.I.A.A.
(*Chairman, Astronautics and Guided Flight Section*)
SIR ROBERT COCKBURN, K.B.E., C.B., M.Sc., Ph.D., F.R.Ae.S.
L. P. COOMBES, C.B.E., D.F.C., B.Sc.(Eng.), F.C.G.I., Hon.F.R.Ae.S., F.A.I.A.A.
(*President of the Australian Division*)
B. CORNTHWAITE, A.F.R.Ae.S. (*President of the New Zealand Division*)
E. B. DOVE, A.F.R.Ae.S.
SIR WILLIAM FARREN, C.B., F.R.S., Hon.F.R.Ae.S., Hon.F.A.I.A.A.
SIR ARNOLD HALL, M.A., F.R.S., F.R.Ae.S., Hon.F.A.I.A.A.
DR. G. S. HISLOP, B.Sc., A.R.C.S.T., F.R.Ae.S.
WING COMMANDER E. J. HOLDEN, M.B.E., B.Sc., A.F.R.Ae.S., R.A.F.
D. KEITH-LUCAS, M.A., F.R.Ae.S.
DR. M. J. LIGHTHILL, F.R.S., F.R.Ae.S., Hon.F.A.I.A.A.
P. G. MASEFIELD, M.A., F.R.Ae.S., Hon.F.A.I.A.A.
DR. E. S. MOULT, C.B.E., B.Sc., F.R.Ae.S.
PROFESSOR E. J. RICHARDS, O.B.E., M.A., D.Sc., F.R.Ae.S.
DR. E. W. STILL, B.Sc., A.C.G.I., F.R.Ae.S.
G. T. WANSBROUGH-WHITE, A.R.Ae.S.
K. G. WILKINSON, B.Sc., D.I.C., A.C.G.I., F.R.Ae.S.

Officers:

Hon. Treasurer: MAJOR G. P. BULMAN, C.B.E., B.Sc., F.R.Ae.S.
Solicitor: L. A. WINGFIELD, M.C., D.F.C., A.R.Ae.S.
Secretary: DR. A. M. BALLANTYNE, T.D., B.Sc., F.R.Ae.S., F.A.I.A.A., Hon.F.C.A.S.I.

Note: The President of each Division and the Chairman of each Section of the Society is a Member of Council by reason of his office.

NOVEMBER 1964