

THE
AERONAUTICAL JOURNAL
VOL.—LXVIII

THE ROYAL AERONAUTICAL SOCIETY

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

AUGUST 1964

NUMBER 644

CONTENTS

| | Page |
|---|--------------------|
| Notices | LVII |
| <p style="margin-left: 2em;">Honours Awarded to Members—Acknowledgment—Society of British Aerospace Companies Ltd.—Elections—The July Journal—BALPA Symposium—Diary—Rotorcraft Section Annual Dinner—Convention on Lubrication and Wear—Course on Quality and Reliability Principles and Practices—The Canadian Aeronautics and Space Institute—Other Meetings—News of Members.</p> | |
| The Branches | LIX |
| Graduates' and Students' Section | LX |
| The Transonic Flow Past Two-Dimensional Aerofoils | D. W. Holder 501 |
| Gas Turbine Development—Thirteen and a Half Years in Commercial Aircraft | A. C. Lovesey 517 |
| Heliport Location and Design | A. E. Slocombe 529 |
| All-Day Symposium on Agricultural Aviation | 535 |
| Factors Affecting the Application of Low-Volume Sprays | R. C. Amsden |
| Trends in Land Tenure and Ownership | E. S. Dobb |
| The Use of Agricultural Aircraft in the Frozen Food and Canning Industry | R. F. Norman |
| The Biology of Tsetse Flies in Relation to Control Methods | A. B. Hadaway |
| Forest Fire Control Aircraft in Canada | D. G. Fraser |
| Legal Liabilities Arising out of Crop Spraying Operations | J. L. Brooks |
| Some Views on Legislation and Regulations in Agricultural Aviation | W. J. Maan |
| Summary of Discussions | |
| Technical Notes | 561 |
| <p style="margin-left: 2em;">On the Performance of Lanchester's "Aerial Tourbillion"—G. V. Parkinson. The Simplified Vibration Damper Problem and its Solution—A. W. Morley.</p> | |
| The Library | 568 |
| <p style="margin-left: 2em;">REVIEWS: Aircraft Instrument Manual—The Dynamics of Real Gases—Spaceflight Today—Cosmic Dust—Matrices: their Meaning and Manipulation—This High Man: The Life of Robert H. Goddard—Spacecraft and Boosters—An Introduction to Random Vibration.</p> | |
| 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.

PRINTED BY THE LEWES PRESS WIGHTMAN & CO. LTD., LEWES, SUSSEX, ENGLAND, AND PUBLISHED BY THE ROYAL AERONAUTICAL SOCIETY, 4 HAMILTON PLACE, LONDON W.1, ENGLAND.

THE ROYAL AERONAUTICAL SOCIETY

OVERSEAS DIVISIONS

AUSTRALIA

President: L. P. COOMBES, C.B.E., F.R.Ae.S.
Hon. Secretary: W. ISBISTER, F.R.Ae.S., Science House, Gloucester & Essex Streets, Sydney, New South Wales.

Branches at: Canberra, Sydney, Melbourne, and Adelaide.

NEW ZEALAND

President: B. CORNTHWAITE, A.F.R.Ae.S.
Hon. Secretary: T. T. N. COLERIDGE, A.F.R.Ae.S., The Shell Company of New Zealand Ltd., Box 2091, Wellington.

Branches at: Auckland, Wellington, Palmerston North, and Christchurch.

SOUTHERN AFRICA

President: E. P. BEDFORD, A.R.Ae.S.
Acting Hon. Secretary: Mrs. C. G. BEDFORD, P.O. Box 4409, Johannesburg.

Branches at: Bulawayo, Johannesburg, Pretoria, and Salisbury.

BRANCHES IN THE UNITED KINGDOM

BELFAST

President: D. KEITH-LUCAS, F.R.Ae.S.
Chairman: E. G. COLLINSON, F.R.Ae.S.
Hon. Secretary: D. SAUNDERS, A.F.R.Ae.S., Short Bros. & Harland Ltd., Castlereagh, Belfast. Tel: Belfast 59271.

BIRMINGHAM AND WOLVERHAMPTON

President: A. RATCLIFFE.
Chairman: Dr. L. W. J. NEWMAN, A.F.R.Ae.S.
Hon. Secretary: G. O. FRAMPTON, A.F.R.Ae.S., H. M. Hobson Ltd., Fordhouses, Wolverhampton, Staffs. Tel: Fordhouses 2381.

BOSCOMBE DOWN

President: Air Cdre. J. F. ROULSTON, C.B.E., D.S.O., D.F.C.
Chairman: G. MACLAREN-HUMPHREYS, M.B.E., A.F.R.Ae.S.

Hon. Secretary: Sqn. Ldr. H. H. HORSHAM, M.B.E., A.R.Ae.S., A. & A.E.E., Boscombe Down, Amesbury, Wilts. Tel: Amesbury 3331, Ext. 2143.

BRISTOL

President: Dr. W. J. STRANG, F.R.Ae.S.
Chairman: K. B. CHAMBERLAIN, F.R.Ae.S.
Hon. Secretary: W. O. LEE, A.R.Ae.S., British Aircraft Corporation (Operating) Ltd., Filton Division, Filton, Bristol 7. Tel: Bristol 693831, Ext. 90.

BROUGH

President: Capt. E. D. G. LEWIN, C.B., C.B.E., D.S.O., A.F.R.Ae.S.

Chairman: A. G. SMITH, F.R.Ae.S.
Hon. Secretary: A. D. HOWARTH, A.R.Ae.S., c/o Hawker Siddeley Aviation Ltd., Hawker-Blackburn Div., Brough, Yorkshire. Tel: Brough 667121 Ext. 314.

CAMBRIDGE

President: Professor W. A. MAIR, F.R.Ae.S.
Chairman: R. O. GATES, A.F.R.Ae.S.
Hon. Secretary: E. M. J. SCHAFFTER, A.F.R.Ae.S., Marshall of Cambridge (Engineering) Ltd., Aircraft Division, Airport Works, Cambridge. Tel: Cambridge 56291.

CHESTER

President: C. B. V. NEILSON, A.F.R.Ae.S.
Chairman: F. G. EVANS, F.R.Ae.S.
Hon. Secretary: G. W. MONNINGTON, Electro-Hydraulics Ltd., Liverpool Road, Warrington, Lancs. Tel: Warrington 35241.

CHRISTCHURCH

President: E. W. J. GRAY, F.R.Ae.S.
Chairman: H. E. VINCENT, A.F.R.Ae.S.
Hon. Secretary: J. F. BRENNAN, A.R.Ae.S., c/o British Aircraft Corporation (Operating) Ltd., Weybridge Division, Bournemouth (Hurn) Airport, Christchurch, Hants. Tel: Northbourne 3201.

COVENTRY

President: J. WRIGHT, C.B.E., F.R.Ae.S.
Chairman: D. A. WOODLEY, A.F.R.Ae.S.
Hon. Secretary: J. G. LUM, A.F.R.Ae.S., Wind Tunnel Dept., Hawker Siddeley Dynamics Ltd., Whitley, Coventry, Warwickshire. Tel: Tollbar 3271, Ext. 121.

DERBY

President: Sir DENNING PEARSON, F.R.Ae.S.
Chairman: A. A. RUBBRA, F.R.Ae.S.
Hon. Secretary: J. F. COPLIN, Grad. R.Ae.S. Rolls-Royce Ltd., Dept. 61, Derby. Tel: Derby 42424.

GLASGOW

President: Dr. A. W. BABISTER, A.F.R.Ae.S.
Chairman: Wm. H. G. W. FINLAY, A.R.Ae.S.
Hon. Secretary: W. N. ALCOCK, Shenstone, Dumbuck Crescent, Dumbarton.

GLOUCESTER AND CHELTENHAM

President: K. FEARNSIDE, F.R.Ae.S.
Chairman: J. G. RUSSELL, A.F.R.Ae.S.
Hon. Secretary: C. E. HUTT, A.R.Ae.S., c/o S. Smith & Sons (England) Ltd., Bishops Cleeve, Cheltenham, Glos. Tel: Bishops Cleeve 3333.

HALTON

President: Air Vice-Marshal J. K. ROTHERHAM, C.B., C.B.E., A.F.R.Ae.S.

Chairman: Gp. Capt. R. C. FORDHAM, C.B.E., A.F.R.Ae.S.
Hon. Secretary: Sqn. Ldr. J. MACKINTOSH, Officers' Mess, R.A.F. Halton, Bucks. Tel: Wendover 2242, Ext. 310.

HATFIELD

President: Sir GEOFFREY DE HAVILLAND, O.M., C.B.E., A.F.C., Hon.F.R.Ae.S.
Chairman: F. MARKING, A.F.R.Ae.S.
Hon. Secretary: G. B. EVANS, A.F.R.Ae.S., Drawing Office, Hawker Siddeley Aviation Ltd., de Havilland Division, Hatfield, Herts. Tel: Hatfield 2345, Ext. 274.

HENLOW

President: J. HANSON, F.R.Ae.S.
Chairman: Wg. Cdr. W. S. C. WATKINS, A.F.R.Ae.S.
Hon. Secretary: Sqn. Ldr. A. H. CRAVEN, A.F.R.Ae.S., Officers' Mess, R.A.F. Technical College, Henlow, Beds. Tel: Henlow Camp 391, Ext. 261.

ISLE OF WIGHT

President: H. KNOWLER, F.R.Ae.S.
Chairman: W. H. J. DIBBENS, A.F.R.Ae.S.
Hon. Secretary: B. J. SUMMERS, Grad.R.Ae.S., Design Office, Westland Aircraft Ltd., Saunders-Roe Division, Osborne, Isle of Wight. Tel: Cowes 2211.

LEICESTER

President: K. L. C. LEGG, F.R.Ae.S.
Chairman: K. B. AYERS, A.F.R.Ae.S.
Hon. Secretary: D. M. WATERS, A.F.R.Ae.S., 24 Roulstone Crescent, East Leake, Loughborough, Leics.

LONDON AIRPORT

President: Rear Admiral Sir MATTHEW S. SLATTERY, K.B.E., C.B., F.R.Ae.S.
Chairman: R. C. MORGAN, O.B.E., F.R.Ae.S.
Hon. Secretary: N. BROWN, A.R.Ae.S., BOAC H.Q., Technical Publications Department, London (Heathrow) Airport, Middlesex. Tel: Skyport 5511, Ext. 2883.

LUTON

President: G. R. JEFFERSON, A.F.R.Ae.S.
Chairman: H. E. CURTIS, A.F.R.Ae.S.
Hon. Secretary: L. A. WILLOTT, A.F.R.Ae.S., British Aircraft Corporation (Operating) Ltd., Luton Division, The Airport, Luton, Beds. Tel: Luton 31151.

MANCHESTER

President: C. E. FIELDING, O.B.E., F.R.Ae.S.
Chairman: M. J. BRENNAN, F.R.Ae.S.
Hon. Secretary: J. A. E. WATERFALL, 56 Manor Avenue, Ashton-on-Mersey, Cheshire. Tel: Failsworth 2020.

MERTHYR AND TREForest

President: E. J. BUSH.
Chairman: J. INGRAM.
Hon. Secretary: Dr. G. O. FORESTER, Chief of Research, Teddington Aircraft Controls Ltd., Cefn Coed, Merthyr Tydfil, South Wales. Tel: Merthyr Tydfil 3261.

PRESTON

President: F. W. PAGE, C.B.E., F.R.Ae.S.
Chairman: F. D. CROWE, A.F.R.Ae.S.
Hon. Secretary: J. T. FROUD, A.F.R.Ae.S., Project Research Office, British Aircraft Corporation (Operating) Ltd., Preston Division, Warton Aerodrome, Preston, Lancs. Tel: Freckleton 531.

PRESTWICK

President: R. McINTYRE, F.R.Ae.S.
Chairman: R. HOSIE, A.R.Ae.S.
Hon. Secretary: Ir. B. J. G. ASBEEK BRUSSE, A.F.R.Ae.S., Design Office, Scottish Aviation Ltd., Prestwick Airport, Ayrshire. Tel: Prestwick 79888.

READING

President: E. N. MOBBS.
Chairman: J. T. APPLEBY, A.F.R.Ae.S.
Hon. Secretary: E. W. C. ANGELL, A.R.Ae.S., M. L. Aviation Co. Ltd., White Waltham, Maidenhead, Berks. Tel: Littlewick Green 248.

SOUTHAMPTON

President: Professor E. J. RICHARDS, O.B.E., F.R.Ae.S.
Chairman: F. C. KIRKPATRICK, A.R.Ae.S.
Hon. Secretary: Dr. B. L. CLARKSON, A.F.R.Ae.S., The Department of Aeronautics and Astronautics, The University, Southampton. Tel: Southampton 56331.

SOUTHEND

President: F. A. LAKER, A.R.Ae.S.
Chairman: K. A. COLE, A.F.R.Ae.S.
Hon. Secretary: T. R. C. BERRETT, A.R.Ae.S., Aviation Traders (Eng.) Ltd., Southend Airport, Essex. Tel: Southend 48561.

SWINDON

President: S. R. HUGHES, A.F.R.Ae.S.
Chairman: Prof. D. S. HOUGHTON, A.F.R.Ae.S.
Hon. Secretary: D. E. J. TIPPING, A.F.R.Ae.S., Vickers-Armstrongs (Engineers) Ltd., South Marston, Swindon, Wilts. Tel: Stratton St. Margaret 3241.

WEYBRIDGE

President: Sir GEORGE EDWARDS, C.B.E., Hon.F.R.Ae.S.
Chairman: J. HEAP, A.F.R.Ae.S.
Hon. Secretary: A. M. DOBSON, A.F.R.Ae.S., British Aircraft Corporation (Operating) Ltd., Weybridge Division, Weybridge, Surrey. Tel: Weybridge 45555.

YEovil

President: E. C. WHEELDON, C.B.E.
Chairmen: R. HAFNER, F.R.Ae.S. and Dr. E. W. STILL, F.R.Ae.S.
Hon. Secretary: L. A. LANSDOWN, A.F.R.Ae.S., Westland Aircraft Ltd., Yeovil, Somerset. Tel: Yeovil 5222.

AUGUST 1964