



MARCH 1978

THE  
**aeronautical**  
JOURNAL

VOLUME 82

No. 807

MARCH 1978



*This Month*

AIRCRAFT PROPULSION

LIGHT AIRCRAFT CERTIFICATION

ENGINEERING STANDARDS

# THE ROYAL AERONAUTICAL SOCIETY

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

President: R. J. YATES, FRAeS. Hon. Secretary: B. A. J. SCOLES, MRAeS, 191 Royal Parade, Parkville, Victoria 3052.

**Rhodesia** Branches at: Bulawayo, Gwelo and Salisbury.

Hon. President: Sir HUMPHREY GIBBS, KCMG. President: M. MADDERS, FRAeS. Hon. Secretary: Mrs. MARGARET HEAP, Assoc RAeS, P.O. Box 3759, Salisbury.

**New Zealand** Branches at: Auckland, Wellington, Palmerston North, Christchurch, Hamilton and Blenheim.

President: F. W. FAHY, FRAeS. Hon. Secretary: R. L. WILLIAMS, AMRAeS, New Zealand National Airways Corp'n, P.O. Box 96, Wellington.

**Southern Africa** Branches at: Johannesburg, Pretoria, Cape Western and Durban.

President: N. A. H. BARRAUD, CEng, MRAeS. Hon. Secretary: Wg Cdr N. F. HARRISON, MRAeS, P.O. Box 27335, Sunnyside 0132, RSA.

**Bedford**

President: Air Cdre A. H. WHEELER, CBE, FRAeS.  
 Chairman: D. CLAYSON, MRAeS.  
 Hon. Secretary: K. PALLISTER, MRAeS,  
 16 Lilac Walk, Kempston, Bedford  
 MK42 7PE. Tel: Bedford 851284.

**Belfast**

President: P. F. FOREMAN, CBE, FRAeS.  
 Chairman: M. I. WILD, MRAeS.  
 Hon. Secretary: T. E. MORRISON, MRAeS,  
 Dept. of Mech. Eng. College of Techno-  
 logy, College Square East, Belfast BT1  
 6DJ. Tel: Work—Belfast 27244. Home  
 —Dundonald 3403.

**Birmingham and Wolverhampton**

President: J. H. GOODIER, MRAeS.  
 Chairman: D. E. HAMMOND, MRAeS.  
 Hon. Secretary: E. V. G. ALBRECHT,  
 MRAeS, 2 Stonehouse Avenue, The  
 Dingle, Willenhall, West Midlands, WV13  
 1AP. Tel: 0902 67755.

**Boscombe Down**

President: Air Cdre B. BROWNLOW, OBE,  
 AFC, AMRAeS, RAF.  
 Chairman: C. REDMAYNE, CEng, MRAeS.  
 Hon. Secretary: T. J. HOWARD, MBE,  
 CEng, MRAeS, A & AEE, Boscombe  
 Down, Amesbury, Salisbury, Wilts. Tel:  
 098 02 3331, Ex. 2483.

**Bristol**

President: P. H. CALDER, MRAeS.  
 Chairman: B. RAYBOULD, CEng, MRAeS.  
 Hon. Secretary: Dr. R. K. NANGIA, MRAeS,  
 Dept of Aero Engng, University of Bristol,  
 Queens Building, Bristol BS8 1TL. Tel:  
 0272 24161, Ex. 459.

**Brough**

President: N. V. BARBER.  
 Chairman: R. J. CHANDLER, AMRAeS.  
 Hon. Secretary: R. MELLING, CEng,  
 MRAeS, c/o British Aerospace, Brough  
 Division, Brough, North Humberside,  
 HU15 1EQ. Tel: 0482 667121, Ex. 311.

**Cambridge**

President: Professor W. A. MAIR, CBE,  
 FRAeS.  
 Chairman: N. A. J. HARRY, FRAeS.  
 Hon. Secretary: G. T. ATKINS, MRAeS,  
 Marshall of Cambridge (Engineering)  
 Ltd, Newmarket Road, Cambridge. Tel:  
 0223 61133.

**Chester**

President: R. GRIFFITHS, FRAeS.  
 Chairman: V. W. CLARKSON, MRAeS.  
 Hon. Secretary: J. R. YOUNG, AMRAeS,  
 British Aerospace, Hatfield Chester  
 Division, Broughton, Chester. Tel:  
 0244 535333.

**Christchurch**

President: P. S. MACGREGOR, MBE,  
 FRAeS.  
 Chairman: D. E. CAILES, MRAeS.  
 Hon. Secretary: R. WELLS, AMRAeS,  
 British Aerospace, Weybridge Bristol  
 Division, Bournemouth (Hurn) Airport,  
 Christchurch, Dorset. Tel: 020-16 3201.

**Coventry**

President: A. H. POPE, FRAeS.  
 Chairman: A. J. WEBBER, MRAeS.  
 Hon. Secretary: A. J. EAGLES, 30 Lupton  
 Ave, Coventry CV3 5BQ. Tel: Work—  
 0203 452152, Ex. 3336. Home—0203  
 415412.

**Cranwell**

President: Air Vice Marshal D. HARCOURT-  
 SMITH, DFC, RAF.  
 Chairman: Wg Cdr D. M. F. BRIGHT,  
 CEng, MRAeS, RAF.  
 Hon. Secretary: Sqn Ldr R. C. HOLLIDAY,  
 CEng, MRAeS, RAF, Dept of Specialist  
 Ground Training, RAF College, Cranwell,  
 Sleaford, Lincs NG34 8HB. Tel: 0400  
 61201, Ex. Trenchard 254.

**Derby**

President: D. A. HEAD, MRAeS.  
 Chairman: A. D. JACKSON, FRAeS.  
 Hon. Secretary: C. HORNBLOWER,  
 AMRAeS, Rolls-Royce Ltd, Derby DE2  
 8BJ. Tel: 0332 42424, Ex. 515.

**Dublin**

President: Capt. J. C. KELLY-ROGERS,  
 OBE, FRAeS.  
 Chairman: M. C. MCGOVERN, CEng,  
 MRAeS.  
 Hon. Secretary: BRIAN KEOGH, AMRAeS,  
 13 Stockton Court, Castleknock, Co.  
 Dublin. Tel: Dublin 370011, Ex. 2800.

**Glasgow**

President: Dr. A. W. BABISTER, MRAeS.  
 Chairman: F. FRENCH, MRAeS.  
 Hon. Secretary: T. K. BLACK, 43 Partick-  
 hill Road, Glasgow G11 5BY. Tel: 041  
 221 9600, Ex. 2410. Home—041 334  
 7193.

**Gloucester and Cheltenham**

President: R. F. HUNT, FRAeS.  
 Chairman: K. BEST, MRAeS.  
 Hon. Secretary: R. W. WHITE, MRAeS,  
 c/o Smiths Industries Ltd, Bishops  
 Cleeve, Cheltenham, Glos. Tel: 024-267  
 3333.

**Halton**

President: Air Cdre M. P. STANTON, CBE.  
 Chairman: Gp. Capt. E. E. LAKE, MRAeS.  
 Hon. Secretary: Sqn. Ldr. B. NOBLE,  
 Student Wing, RAF Halton, Bucks HP22  
 5PG. Tel: 0296 623535.

**Hatfield**

President: Sir HARRY BROADHURST.  
 Chairman: D. R. NEWMAN, FRAeS.  
 Hon. Secretary: G. B. EVANS, FRAeS,  
 Drawing Office, British Aerospace, Hat-  
 field Chester Division, Hatfield, Herts.  
 Tel: 30 62345.

**Isle of Wight**

President: Sir CHRISTOPHER HARTLEY,  
 KCB, GBE, DFC, AFC.  
 Chairman: R. L. WHEELER, MRAeS.  
 Hon. Secretary: D. S. B. FLIPPANCE,  
 Design Office, British Hovercraft Cor-  
 poration Ltd, East Cowes, Isle of Wight.  
 Tel: 098-382 4121.

**London Airport**

President: E. R. MAJOR, FRAeS.  
 Chairman: H. G. ROSSITER, FRAeS.  
 Hon. Secretary: D. S. FORSYTH, AMRAeS,  
 3 Mole Abbey Gardens, West Molesey,  
 Surrey. Tel: Office—759 3131, Ex. 4755.  
 Home—979 7588.

**Loughborough**

President: Professor D. J. JOHNS, FRAeS.  
 Chairman: F. G. MACCABEE, MRAeS.  
 Hon. Secretary: L. E. WOODFIELD,  
 AMRAeS, Transport Technology Dept,  
 Loughborough University of Technology,  
 Loughborough, Leics. LE11 3TU. Tel:  
 Loughborough 63171, Ex. 470.

**Luton and Stevenage**

President: G. D. PEACOCK, FRAeS.  
 Chairman: C. H. MARTIN, CEng, FRAeS.  
 Hon. Secretary: M. F. RICKETT, British  
 Aerospace, Hatfield Lostock Division,  
 Gunnels Wood Road, Stevenage, Herts.  
 SG1 2AS. Tel: 0438 3456, Ex. 325.

**Manchester**

President: C. E. FIELDING, OBE, FRAeS.  
 Chairman: J. B. SCOTT-WILSON, MRAeS.  
 Hon. Secretary: M. J. TAYLOR, CEng,  
 MRAeS, Flight Development Dept,  
 British Aerospace, Manchester Division,  
 Woodford, Stockport, Cheshire. Tel:  
 061-439 5050, Ex. 558.

**Medway**

Chairman: P. A. HEARNE, FRAeS.  
 Hon. Secretary: M. MOULTON, MRAeS,  
 c/o Marconi Elliott Avionic Systems  
 Ltd, Airport Works, Rochester, Kent. Tel:  
 0634 44400.

**Preston**

President: F. E. ROE, FRAeS.  
 Chairman: H. C. CHANNON, MRAeS.  
 Hon. Secretary: D. K. KEMPSTON, MRAeS,  
 British Aerospace, Warton Division,  
 Warton Aerodrome, Preston. Tel: Preston  
 633333, Ex. 671.

**Prestwick**

President: R. McINTYRE, FRAeS.  
 Chairman: T. C. OVEREND, DFM, AMRAeS.  
 Hon. Secretary: P. BERRY, MRAeS, 9  
 Carclue Crescent, Ayr KA7 4SP. Tel:  
 0292 42747.

**Southampton**

President: Professor G. M. LILLEY, FRAeS.  
 Chairman: A. G. J. SMITH, MRAeS.  
 Hon. Secretary: Dr. P. TAYLOR, AMRAeS,  
 Dept. of Aeronautics and Astronautics,  
 The University, Southampton SO9 5NH.  
 Tel: 0703 559122, Ex. 2303.

**Southend**

President: J. R. BATT, MRAeS.  
 Chairman: R. R. ATWOOD, MRAeS.  
 Hon. Secretary: P. R. GROUT, AMRAeS,  
 36 Alexandra Road, Rochford, Essex.  
 Tel: 0702 546160.

**Swindon**

President: W. GILLESPIE, MRAeS.  
 Chairman: G. N. GINGELL, MRAeS.  
 Hon. Secretary: W. H. BUNTING, MRAeS,  
 Vickers Ltd, Design and Procurement  
 Div, P.O. Box 44, Swindon. Tel: Strat-  
 ton St. Margaret 3241.

**Thames Valley**

President: E. N. MOBBS.  
 Chairman: J. L. FAREHAM, MRAeS.  
 Hon. Secretary: A. G. FOSKETT, MRAeS,  
 M.L. Aviation Co Ltd, White Waltham  
 Aerodrome, Berks. Tel: 062-882 3361.

**Weybridge**

President: F. W. PAGE, CBE, FRAeS.  
 Chairman: G. ALESBURY, MRAeS.  
 Hon. Secretary: A. M. DOBSON, MRAeS,  
 British Aerospace, Weybridge Bristol  
 Division, Weybridge, Surrey. Tel: 97  
 45522, Ex. 6945.

**Yeovil**

President: B. D. BLACKWELL, FRAeS.  
 Chairman: Dr. J. P. JONES, FRAeS.  
 Hon. Secretary: F. N. R. BALLAM, MRAeS,  
 Westland Helicopters Ltd, Yeovil, Somers-  
 set. Tel: 0935 5222.

VOLUME 82  
NUMBER 807  
MARCH 1978

# THE **aeronautical**

*Incorporating The Institution of Aeronautical Engineers and  
The Helicopter Association of Great Britain*  
*Published Monthly*

JOURNAL

## contents

*Editor: G. R. Wrixon, AMRAeS.  
Assistant Editors:  
Jay Wolff, David Scallion.*

*Secretary of the Society:  
E. M. J. Schaffter, MA, CEng,  
MRAeS.  
4 Hamilton Place, London  
W1V 0BQ. Tel: 01-499 3515.  
Telegrams: Didaskalos, London, W1.*

*Reproduction of any of the papers  
published in this journal is not  
permitted without the written  
consent of the Editor.*

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

*Advertisements:  
J. G. Heller,  
Cheiron Press Ltd,  
8/10 Parkway,  
London NW1 7AD.  
Tel: 01-267 1285*

*Printed by  
Lewes Press Ltd,  
Lewes, Sussex, England.*

*Subscriptions: £43.00 per annum,  
post free.*

*Single copies, including back  
numbers: £4.00.*

*Published by  
The Royal Aeronautical Society,  
4 Hamilton Place,  
London W1V 0BQ, England.*

*ISSN: 0001-9240*

**Sir William Hawthorne**  
AIRCRAFT PROPULSION FROM THE BACK ROOM 93

**Darrol Stinton**  
THE CERTIFICATION OF LIGHT AIRCRAFT 109

**S. A. White**  
A CONTRIBUTION TO EUROPEAN ENGINEERING  
STANDARDISATION FOR THE AEROSPACE INDUSTRY 117

## TECHNICAL NOTES

**I. J. Barton**  
Runway water depth measurement—a simple accurate method 128

**Belur V. Dasarathy**  
Attitude of a satellite spinning with an angular velocity  
varying in time—an exact solution 130

**Library, Reviews, Additions and Reports** 132

### Cover picture:

A new era in aviation began with the introduction of turbojet propelled aircraft, initially in the military field and, a decade later, to civil air transports. In this issue Sir William Hawthorne reviews the early days of the turbine engine and examines possible future developments in the face of the expected punitive increases in fuel prices towards the end of the century. The first turbine engine to be installed in an airliner was the de Havilland Ghost which powered the Comet I, the nose of which is seen on the cover.

# The Royal Aeronautical Society

FOUNDED 1866

INCORPORATED BY ROYAL CHARTER 1949

*Patron: HER MAJESTY THE QUEEN*

## COUNCIL

*President:* HANDEL DAVIES, CB, MSc, CEng, FAIAA, FRAeS

*President-Elect:* PROF. L. F. CRABTREE, PhD, BSc, DIC, CEng, AFAIAA, FRAeS

*Vice-Presidents:*

M. J. BRENNAN, BSc, CEng, FIMechE, FRAeS  
R. P. PROBERT, CB, MA, CEng, FRAeS  
P. A. HEARNE, DCAe, DLC, CEng, FRAeS

*Past Presidents:*

B. P. LAIGHT, OBE, MSc, CEng, MIMechE, FRAeS  
AIR MARSHAL SIR CHARLES PRINGLE, KBE, MA, CEng, FRAeS, RAF (Ret'd)  
CHARLES ABELL, OBE, CEng, HonFSLAET, HonFRAeS

*Members:*

A. J. ADCOCK, BSc(Eng), AMRAeS  
M. W. ANDERSON, MA(Cantab), CEng, MICE, MSAE, AFAIAA, FRAeS  
AIR CDRE F. R. BANKS, CB, OBE, HonCGIA, CEng, HonFAIAA, HonFRAeS, RAF (Ret'd)  
N. A. H. BARRAUD, CEng, MRAeS (*President, Southern Africa Division*)  
A. E. M. BARTON, DFC, CEng, MRAeS  
CAPTAIN E. M. BROWN, CBE, DSC, AFC, MA, FRAeS, RN (Ret'd)  
J. H. COOK, CEng, MRAeS  
F. W. FAHY, CEng, FRAeS (*President, New Zealand Division*)  
N. FALCONER, MA, BSc, MRAeS  
PROF. M. G. FARLEY, CEng, FIMechE, FIProdE, MBIM, FRAeS  
J. W. FOZARD, DCAe, BSc(Hons), CEng, FIMechE, FRAeS  
DR W. F. HILTON, PhD, DSc, CEng, AFAIAA, FRAeS  
DR G. S. HISLOP, CBE, HonDSc, PhD, BSc, ARCST, FRSE, CEng, FIMechE, FRSA, FRAeS  
A. S. HUGHES, CEng, MRAeS (*Chairman, Branches Committee*)  
G. R. JEFFERSON, CBE, BSc, CEng, MIMechE, FRAeS  
D. J. LASCELLES, BSc(Eng), AMRAeS  
F. J. LOW, MRAeS  
M. MADDERS, CEng, FRAeS (*President, Rhodesia Division*)  
E. W. R. MARTIN, MNDTS, LIM, AMRAeS  
DR E. S. MOULT, CBE, BSc, CEng, FIMechE, HonFRAeS  
G. K. C. PARDOE, BSc(Eng), DLC, CEng, FBIS, FRAeS  
J. S. SHAPIRO, Dipl Ing, CEng, FRAeS (*Chairman, Rotorcraft Section*)  
A. C. SOUTHGATE, BSc, CEng, DCAe, FRAeS (*Chairman of Astronautics and Guided Flight Section*)  
DR K. G. WILKINSON, HonDSc, BSc, DIC, FCGI, CEng, FCIT, FRAeS  
N. P. WILLIAMS, BSc(Eng), ACGI (*Chairman, Graduates' and Students' Section*)  
R. J. YATES, CEng, FRAeS (*President, Australian Division*)

*Officers:*

Hon. Treasurer: C. F. HUGHESDON, AFC, FRAeS  
Solicitor: C. L. BYWATERS, Associate RAeS  
Secretary: E. M. J. SCHAFFTER, MA, CEng, MRAeS