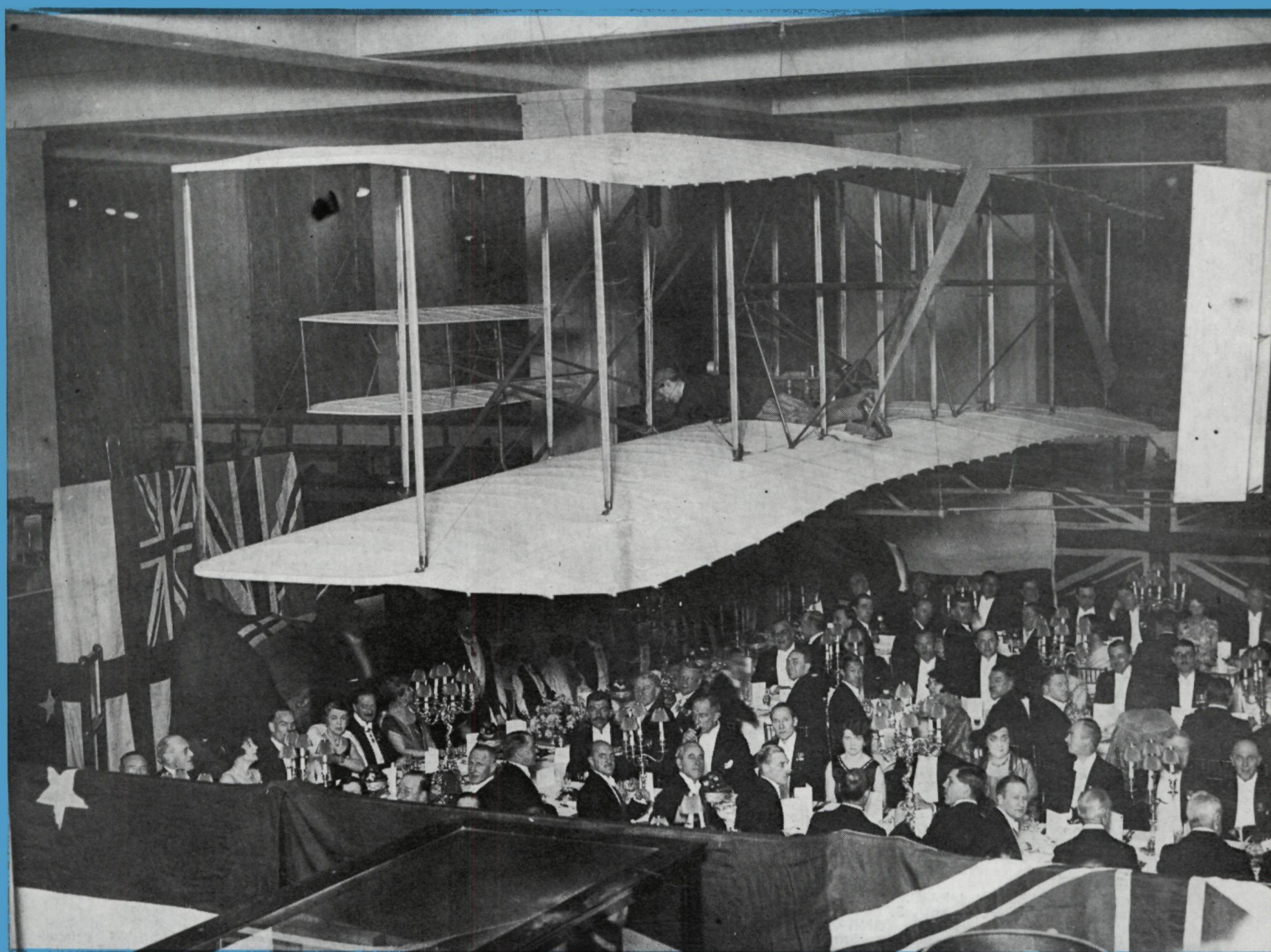




DECEMBER 1978

THE **aeronautical** JOURNAL



This Month

EUROPEAN AEROSPACE INDUSTRY

COMPUTER AIDED DESIGN

DIVISIONS AND BRANCHES OF

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: G. A. FORD, 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: W. R. HEALD, FRAeS. Hon. Secretary: M. E. MURRAY, MRAeS, Shell Oil New Zealand Ltd, PO Box 2091, 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: A. McVITIE, College of Aeronautics, Cranfield Institute of Technology, Bedford.

Belfast

President: Dr P. F. FOREMAN, CBE, FRAeS.
Chairman: Prof P. P. BENHAM.
Hon. Secretary: T. E. MORRISON, MRAeS, Dept. of Mech. Eng., College of Technology, 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: E. V. HOWARD, MBE, CEng, MRAeS, A & AEE, Boscombe Down, Amesbury, Salisbury. Wilts. Tel: 098 02 3331. Ex. 2483.

Bristol

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

Brough

President: N. V. BARBER.
Chairman: R. MELLING, MRAeS.
Hon. Secretary: M. EDWARDS, MRAeS, c/o British Aerospace, Aircraft Group, Brough, North Humberside, HU15 1EQ. Tel: 0482 667121. Ex 383.

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: R. CRONIN, MRAeS.
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.
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: J. BUSH, FRAeS.
Hon. Secretary: J. M. ROBERTSON, MRAeS, Rolls-Royce (1971) Ltd, Derby, DE2 8BJ. Tel: 0332 42424, Ex. 158.

Dublin

President: Capt. J. C. KELLY-ROGERS, OBE, FRAeS.
Chairman: M. C. MCGOVERN, CEng, MRAeS.
Hon. Secretary: T. J. MORRISSEY, MRAeS, 109 Foxfield Grove, Raheny, Dublin 5. Tel: Dublin 370011. Ex. 2814.

Glasgow

President: Dr. A. W. BABISTER, MRAeS.
Chairman: Capt. E. A. STARLING, MRAeS.
Hon. Secretary: C. SNOWDON, AMRAeS, 18 Torwood Brae, Hamilton ML3 9XB. Tel: East Kilbride 20200. Ex. 395.

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, Ex. 2423.

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. Ex. 436.

Hatfield

President: Chairman: D. R. NEWMAN, FRAeS.
Hon. Secretary: G. B. EVANS, FRAeS, Drawing Office, British Aerospace, Hatfield 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 Corporation Ltd, East Cowes, Isle of Wight. Tel: 098-382 4121.

London Airport

President: E. GREGORY, FRAeS.
Chairman: D. W. FEARON, MRAeS.
Hon. Secretary: D. S. FORSYTH, AMRAeS, 3 Mole Abbey Gdns, 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: T. G. KENT, MRAeS.
Chairman: C. H. MARTIN, CEng, FRAeS.
Hon. Secretary: M. F. RICKETT, AMRAeS, British Aerospace, Dynamics Group, Gunnels Wood Rd, Stevenage, Herts. SG1 2AS. Tel: 0438 3456. Ex. 325.

Manchester

President: C. E. FIELDING, OBE, FRAeS.
Chairman: A. J. TROUGHTON, FRAeS.
Hon. Secretary: M. J. TAYLOR, CEng, MRAeS, Flight Development Dept, British Aerospace, Woodford, Stockport, Cheshire. Tel: 061-439-5050. Ex. 556.

Medway

President: P. A. HEARNE, FRAeS.
Chairman: M. MOULTON, MRAeS.
Hon. Secretary: F. H. WOOD, MRAeS, c/o Marconi Avionics 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: J. CHEERS, MRAeS.
Hon. Secretary: P. BERRY, MRAeS, 9 Carluia 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, Hants. 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, Ashingdon, 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, PO Box 44, Swindon. Tel: Stratton St. Margaret 3241.

Thames Valley

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

Weybridge

President: J. FERGUSON SMITH, 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: S. J. LOVE, MRAeS, Development Instrumentation, Westland Helicopters Ltd, Yeovil, Somerset. Tel: 0935 5222. Ex. 160.

VOLUME 82
NUMBER 816
DECEMBER 1978

THE
aeronautical
JOURNAL

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

Published Monthly

*Editor: Jay Wolff.
Assistant Editor: David Scallan.*

*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.

contents

75th ANNIVERSARY OF FIRST POWERED CONTROLLED FLIGHT	495
A. Greenwood THE FUTURE OF THE EUROPEAN AEROSPACE INDUSTRY	496
F. T. Lynch RECENT APPLICATIONS OF ADVANCED COMPUTATIONAL METHODS IN THE AERODYNAMIC DESIGN OF TRANSPORT AIRCRAFT CONFIGURATIONS	503
TECHNICAL NOTES	
E. Large Optimal flight paths for a winged supersonic rocket vehicle	517
D. G. Antonaras and G. I. Tzivanidis Pure bending of an I-Section beam having initial curvature	523
Library, Reviews, Additions and Reports	527
Index to Volume 82	iii

Cover picture:

This month marks the 75th anniversary of the first powered controlled flight of an aeroplane in the world. The cover picture was taken at the dinner held by the Society on the 17th December 1928 to celebrate the 25th anniversary of this flight in 1903 by the Wright brothers. The dinner was held at the Science Museum, London, under the original Wright machine which was at the museum from 1928 until 1948.

The Royal Aeronautical Society

FOUNDED 1866

INCORPORATED BY ROYAL CHARTER 1949

Patron: HER MAJESTY THE QUEEN

COUNCIL

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

President-Elect: R. P. PROBERT, CB, MA, CEng, FRAeS

Vice-Presidents:

M. J. BRENNAN, BSc, CEng, FIMechE, FRAeS

P. A. HEARNE, DCAe, DLC, CEng, FRAeS

J. T. STAMPER, MA(Cantab), FEng, FRAeS

Past Presidents:

AIR MARSHAL SIR CHARLES PRINGLE, KBE, MA, FEng, FBIM, FRAeS,
RAF (Ret'd)

CHARLES ABELL, OBE, CEng, HonFSLAET, HonFRAeS

HANDEL DAVIES, CB, MSc, CEng, FAIAA, FRAeS

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)

PROF. I. C. CHEESEMAN, PhD, BSc, ARCS, CEng, FCIT, FRAeS (*Chairman,
Rotorcraft Section*)

J. H. COOK, CEng, MRAeS

N. FALCONER, MA, BSc, MRAeS

PROF. M. G. FARLEY, CEng, FIMechE, FIProdE, MBIM, FRAeS

J. W. FOZARD, DCAe, BSc(Hons), CEng, FIMechE, FRAeS

W. R. HEALD, FRAeS (*President, New Zealand Division*)

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

B. P. LAIGHT, OBE, MSc, 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

G. K. C. PARDOE, BSc(Eng), DLC, CEng, FBIS, FRAeS

A. C. SOUTHGATE, BSc, DCAe, CEng, FRAeS (*Chairman of Astronautics and
Guided Flight Section*)

G. E. WELLER, BTech(Hons), MAIAA, AMRAeS (*Chairman, Graduates' and
Students' Section*)

DR K. G. WILKINSON, HonDSc, BSc, DIC, FCGL, CEng, FCIT, FRAeS

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