

THE  
AERONAUTICAL JOURNAL  
VOL.—LXX

THE ROYAL AERONAUTICAL SOCIETY

# *The Journal of the Royal Aeronautical Society*

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

## **VOLUME LXX**

**JANUARY - DECEMBER 1966**

Edited for the Council of The Royal Aeronautical Society

by

Joan Bradbrooke, ARAS

Printed by the Lewes Press Wightman and Co. Ltd., Friars Walk, Lewes, Sussex  
and Published by the Royal Aeronautical Society, 4 Hamilton Place, London W.1

*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 W1**

Telephone: Grosvenor 3515-9      Telegrams: Didaskalos, London, W1

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

**Advertisements only: J. W. Williams, DFC, Magazine Advertising Ltd, 36-38 Whitefriars St., London, EC4.      Fleet Street 7539**

VOLUME 70

AUGUST 1966

NUMBER 668

CONTENTS

	Page
The Future of British Aerospace— <i>The President</i>	LV
Notices New Fellows—A History of Aviation in Scotland—"British Light Aviation"—Acknowledgments— Journal of Strain Analysis—Rotorcraft Section Annual Dinner—Presentation to W. Isbister—Elections— Diary—Other Meetings—Library Note—The Birthday Honours List—News of Members—Lecture Summary—Survey of Professional Engineering Manpower—New Zealand Division Centenary Dinner.	LVII
The Branches	LX
Graduates' and Students' Section	LXI
Sir Sydney Camm	749
Symposium on Metallic Materials	757
An Approach to Economic Space Transportation <span style="float: right;"><i>T. W. Smith</i></span>	802
The Centenary Garden Party	811
Technical Note A New Approach to Airline Economics—The Vehicle Millemile (VMM)— <i>R. W. E. Willis.</i>	814
The Library	819
<i>Reviews:— Etude des transferts en mécanique des fluides monophasiques—Space Science and Engineering—Solution of Cubic and Quartic Equations.</i>	
Additions to the Library	Reports

*All communications for publication in the JOURNAL should be addressed to the Editor, JOAN BRADBROOKE, ARAS; all communications on general matters affecting the Society should be addressed to the Secretary, A. M. BALLANTYNE, OBE, TD, BSc, PhD, FRAeS, HonFCASI, FAIAA—at 4 HAMILTON PLACE, LONDON, W1.*

*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

FOUNDED 1866

INCORPORATED BY ROYAL CHARTER 1949

*Patron:* HER MAJESTY THE QUEEN

## COUNCIL

*Honorary President:* H.R.H. THE PRINCE PHILIP, DUKE OF EDINBURGH, KG (*Hon Fellow*)

*President:* A. D. BAXTER, MEng, CEng, FRAeS

*President-Elect:* M. B. MORGAN, CB, MA, CEng, FRAeS

*Vice-Presidents:*

PROFESSOR D. KEITH-LUCAS, MA, CEng, FRAeS  
AIR COMMODORE F. R. BANKS, CB, OBE, CEng, CGIA, Hon FAIAA, FRAeS, RAF (retd)  
PROFESSOR J. A. J. BENNETT, DSc, PhD, CEng, FAIAA, FRAeS  
(*Also Chairman, Rotorcraft Section*)

*Past-Presidents:*

PROFESSOR A. R. COLLAR, CBE, MA, DSc, CEng, FRS, FAIAA, FCASI, FRAeS  
H. H. GARDNER, BSc, CEng, FRAeS  
SIR GEORGE GARDNER, KBE, CB, HonDSc, CEng, HonFRAeS

*Members:*

MAJOR G. P. BULMAN, CBE, BSc, CEng, FRAeS  
R. H. BURRIN, GradRAeS (*Chairman, Graduates' and Students' Section*)  
H. CAPLAN, DCAe, CEng, AFRAeS  
SIR WALTER CAWOOD, KBE, CB, BSc, PhD, FRAeS  
A. V. CLEAVER, OBE, CEng, AFAIAA, FRAeS  
SIR ROBERT COCKBURN, KBE, CB, MSc, PhD, CEng, FRAeS  
S. D. DAVIES, BSc (Eng), CEng, FRAeS  
DR. W. F. HILTON, DSc, DIC, CEng, AFAIAA, FRAeS  
DR. G. S. HISLOP, BSc, ARCST, CEng, FRAeS  
D. B. HUDSON, BSc, BE, CEng, FRAeS (*President of the Australian Division*)  
B. P. LAIGHT, MSc, CEng, FRAeS  
A. A. LOMBARD, CEng, FRAeS  
P. G. MASEFIELD, MA, CEng, HonFAIAA, FRAeS  
AIR COMMODORE J. R. MORGAN, OBE, BSc (Eng), CEng, FRAeS, RAF (retd)  
DR. E. S. MOULT, CBE, BSc, CEng, FRAeS  
W. N. NEAT, CEng, FRAeS (*Chairman, Astronautics and Guided Flight Section*)  
CAPTAIN J. ORBELL, MBE, AFRAeS (*President of the Rhodesia Division*)  
F. W. PAGE, CBE, MA, CEng, FRAeS  
PROFESSOR E. J. RICHARDS, OBE, MA, DSc, CEng, FRAeS  
C. G. VAN NIEKERK, DSc (Eng), CEng, AFRAeS  
(*President of the Southern Africa Division*)  
G. T. WANSBROUGH-WHITE, ARAeS  
K. G. WILKINSON, BSc, DIC, ACGI, CEng, FRAeS  
J. E. D. WILLIAMS, BSc, FRAeS  
GROUP CAPTAIN W. G. WOODWARD, OBE, BE, CEng, FRAeS, RNZAF  
(*President of the New Zealand Division*)

*Officers:*

Hon. Treasurer: MAJOR G. P. BULMAN, CBE, BSc, CEng, FRAeS  
Solicitor: L. A. WINGFIELD, MC, DFC (*Hon Companion*)  
Secretary: DR. A. M. BALLANTYNE, OBE, TD, BSc, CEng, FAIAA, HonFCASI, FRAeS

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.

AUGUST 1966