

THE  
AERONAUTICAL JOURNAL  
VOL.—LXIX

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 LXIX**

**JANUARY - DECEMBER 1965**

Edited for the Council of The Royal Aeronautical Society

by

Joan Bradbrooke, ARAeS

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 69

AUGUST 1965

NUMBER 656

## CONTENTS

### Notices

Page  
LIII

August Bank Holiday—List of Members—Centenary Calendar—Honour Awarded to a Member—Acknowledgments—New Fellows—Colloquium on Aircraft Reliability: 19th - 20th October 1965—Fédération Européenne d'Associations Nationales d'Ingénieurs—Diary—Other Meetings—The Junior Institution of Engineers—Refresher Courses for Graduate Engineers and Graduate Students—Test Pilots' Group: ETPS Staff Visit to EPNER—Elections—News of Members—Royal Aeronautical Society Groups—Lecture Summary.

### The Branches

LVII

### Graduates' and Students' Section

LVIII

### Aeronautical Research at the University of Southampton

*E. J. Richards*

505

### Correspondence—Sir Roy Fedden; D. E. Lennard; Major P. L. Teed.

542

### Operational Research and Aviation Management

*R. R. P. Jackson*

543

#### Part I—An Introduction to Operational Research

*and P. A. Longton*

### Lift Turbo-fans

*G. L. Wilde and J. F. Coplin*

553

### Some Effects of Design Load Distribution on the Off-Design Behaviour of Slender Wings

*L. C. Squire*

567

### Technical Note

573

A Brief Note on the Effect of an Offset Thrust Line on the Longitudinal Static Stability of an Aero-plane—*B. N. Tomlinson.*

### The Library

575

Reviews: Engineering Systems Analysis—Cosmic International Law—Behind the Scenes in an Aircraft Factory.

Additions to the Library

Reports

All communications for publication in the JOURNAL should be addressed to the Editor, JOAN BRADBROOKE, ARAeS; all communications on general matters affecting the Society should be addressed to the Secretary, A. M. BALLANTYNE, 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 1965-1966

*President:* SIR GEORGE GARDNER, KBE, CB, HonDSc, HonFRAeS

*President-Elect:* A. D. BAXTER, MEng, FRAeS

*Past-Presidents:*

B. S. SHENSTONE, MSc, FAIAA, FCASI, FRAeS  
PROFESSOR A. R. COLLAR, CBE, MA, DSc, FRS, FAIAA, FCASI, FRAeS  
H. H. GARDNER, BSc, FRAeS

*Vice-Presidents:*

AIR COMMODORE F. R. BANKS, CB, OBE, CGIA, HonFAIAA, FRAeS  
M. B. MORGAN, CB, MA, FRAeS  
PROFESSOR D. KEITH-LUCAS, MA, FRAeS

*Members:*

PROFESSOR J. A. J. BENNETT, DSc, PhD, FAIAA, FRAeS  
(Also Chairman, Rotorcraft Section)  
MAJOR G. P. BULMAN, CBE, BSc, FRAeS  
R. H. BURRIN, GradRAeS (Chairman, Graduates' and Students' Section)  
SIR SYDNEY CAMM, CBE, HonFRAeS  
H. CAPLAN, DCAe, AFRAeS  
SIR WALTER CAWOOD, KBE, CB, PhD, BSc, FRAeS  
A. V. CLEAVER, OBE, AFAIAA, FRAeS  
SIR ROBERT COCKBURN, KBE, CB, MSc, PhD, FRAeS  
S. D. DAVIES, BSc(Eng), FRAeS  
SIR WILLIAM FARREN, CB, FRS, HonFAIAA, HonFRAeS  
DR. G. S. HISLOP, BSc, ARCST, FRAeS  
D. B. HUDSON, BSc, BE, FRAeS  
(President of the Australian Division)  
COLONEL L. E. LANG, AFRAeS  
(President of the Southern Africa Division)  
A. A. LOMBARD, FRAeS  
P. G. MASEFIELD, MA, HonFAIAA, FRAeS  
AIR COMMODORE J. R. MORGAN, OBE, BSc, FRAeS  
DR. E. S. MOULT, CBE, BSc, FRAeS  
W. N. NEAT, MA, FRAeS (Chairman, Astronautics and Guided Flight Section)  
CAPTAIN M. O'DONOVAN, AFRAeS  
(President of the Rhodesia Division)  
F. W. PAGE, CBE, MA, FRAeS  
PROFESSOR E. J. RICHARDS, OBE, MA, DSc, FRAeS  
G. T. WANSBROUGH-WHITE, ARAeS  
K. G. WILKINSON, BSc, DIC, ACGI, FRAeS  
GROUP CAPTAIN W. G. WOODWARD, OBE, BE, AFRAeS, RNZAF  
(President of the New Zealand Division)

*Officers:*

Hon. Treasurer: MAJOR G. P. BULMAN, CBE, BSc, FRAeS  
Solicitor: L. A. WINGFIELD, MC, DFC, ARAeS  
Secretary: DR. A. M. BALLANTYNE, TD, BSc, 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 1965