



THE AERONAUTICAL JOURNAL

OCTOBER 1969

- T. E. Went** COMMONWEALTH CARIBBEAN AIR TRANSPORT
- T. James** CHARLES GREY AND HIS PUNGENT PEN
- SYMPOSIUM ON FACILITATION
- Air Cdre. E. D. Crew** AIR RECONNAISSANCE IN THE ROYAL AIR FORCE, PAST, PRESENT AND FUTURE
- Maj. Gen. K. R. Van der Spuy** MAJOR ALLISTER MACINTOSH MILLER: 1892-1951
- M. E. Grayley** TECHNICAL NOTES
The Limitations of Wide Strut Analyses for Determination of the Optimum Proportions of Panels Having Unflanged Integral Stiffeners
- Shin-Ichi Suzuki** Effects of Solid Viscosities, Loading Velocities and Initial Deflections to Dynamic Buckling Loads of a Column
- A. M. Abu-Sitta and D. G. Drake** Oscillating Flow in Ducts of Arbitrary Cross Section

THE LIBRARY

Reviews. Additions to the Library. Reports

LECTURE SUMMARIES

SUPPLEMENTARY PAPERS

- A. J. English** THE DESIGN AND CONSTRUCTION OF TWO-SEATER HOVERCRAFT
- A. J. Musker** SELECTION OF INTERPLANETARY TRAJECTORIES
- P. R. Openshaw** ELECTRIC PROPULSION DEVELOPMENT. PART I. ION THRUSTERS

THE ROYAL AERONAUTICAL SOCIETY

4 HAMILTON PLACE LONDON W1

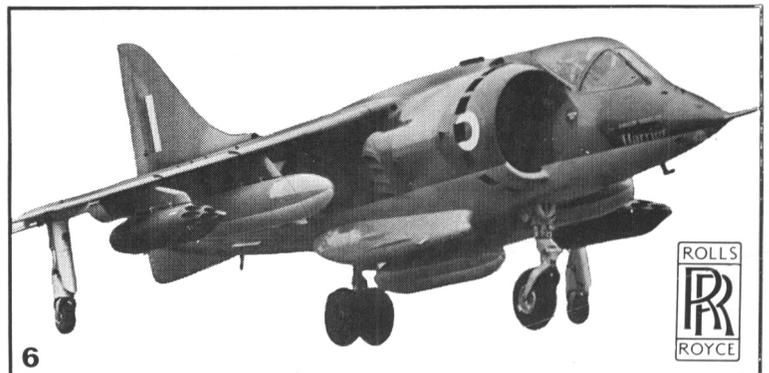
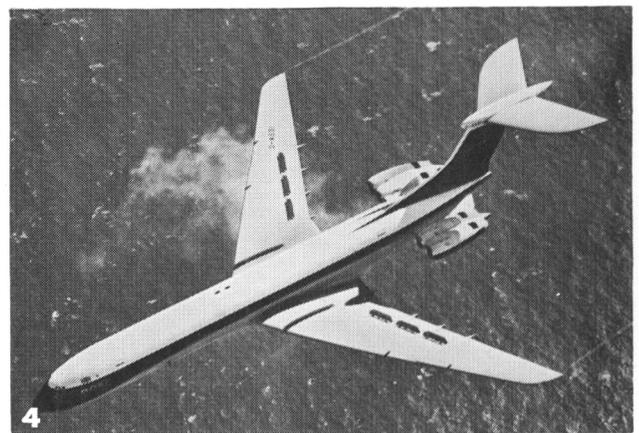
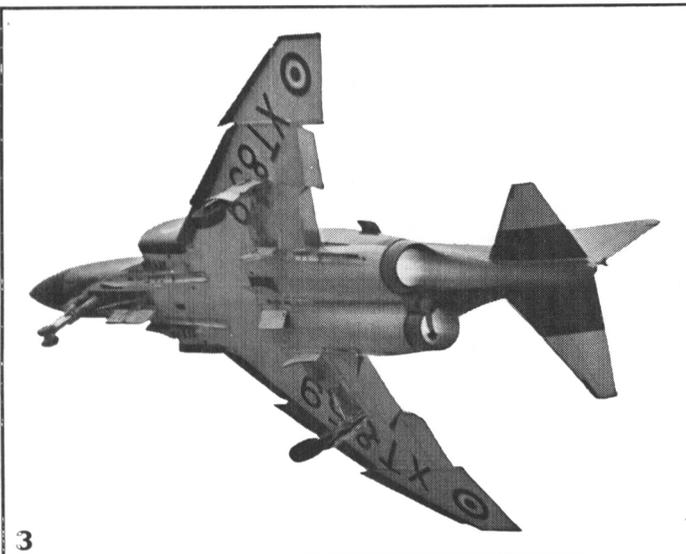
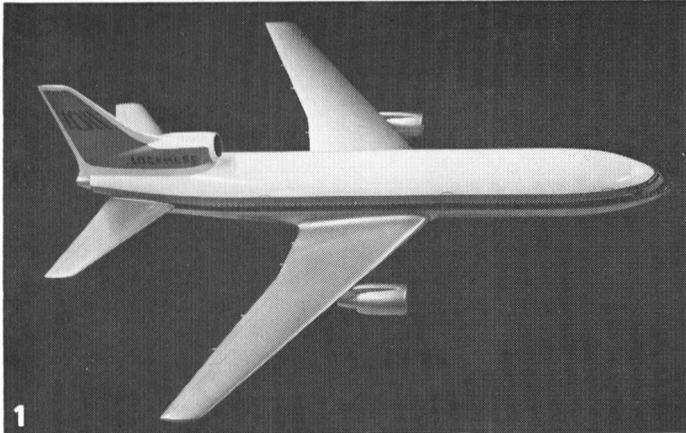
27s 6d

Rolls-Royce the power in the air

Aircraft powered by Rolls-Royce turbofan, turbojet, turboprop or turboshaft engines are in service with or on order for more than 180 airlines, 250 corporate operators and 60 armed forces all over the world.

Some of these aircraft are shown below.

1. Lockheed L.1011 TriStar—RB.211
2. Concorde—Olympus 593.
3. McDonnell Douglas Phantom—Spey
4. VC10—Conway.
5. Westland Sea King—Gnome
6. Hawker Siddeley Harrier V/STOL—Pegasus.



ROLLS-ROYCE LIMITED · DERBY · ENGLAND · Aero Engine Division · Bristol Engine Division · Small Engine Division



THE AERONAUTICAL JOURNAL

THE ROYAL AERONAUTICAL SOCIETY

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

Telephone: 01-499 3515 Telegrams: Didaskalos, London, W1

Published Monthly at 4 HAMILTON PLACE, LONDON W1V 0BQ

Subscriptions: £15 15s. 0d. per annum, post free Single Copies: 27s. 6d.

VOLUME 73

NUMBER 706

OCTOBER 1969

CONTENTS

	Page
T. E. Went COMMONWEALTH CARIBBEAN AIR TRANSPORT	831
T. James CHARLES GREY AND HIS PUNGENT PEN	839
SYMPOSIUM ON FACILITATION	
853	
Prof. D. H. N. Johnson Introduction to Facilitation	
L. C. Nash Annex 9	
Sir William Hildred IATA—Very Suspicious Characters	
Sir Archibald Hope The Shipper's Aspect of Facilitation	
C. H. Veale Customs Requirements	
T. Fitzgerald Immigration	
Dr. K. Bergin Health Facilitation	
Air Cdre. E. D. Crew AIR RECONNAISSANCE IN THE ROYAL AIR FORCE, PAST, PRESENT AND FUTURE	869
Maj. Gen. K. R. Van der Spuy MAJOR ALLISTER MACINTOSH MILLER: 1892-1951	881
TECHNICAL NOTES	
888	
M. E. Grayley The Limitations of Wide Strut Analyses for Determination of the Optimum Proportions of Panels Having Unflanged Integral Stiffeners	
Shin-Ichi Suzuki Effects of Solid Viscosities, Loading Velocities and Initial Deflections to Dynamic Buckling Loads of a Column	
A. M. Abu-Sitta and D. G. Drake Oscillating Flow in Ducts of Arbitrary Cross Section	
THE LIBRARY	
897	
Reviews. Additions to the Library. Reports	
LECTURE SUMMARIES	
LXXI	
SUPPLEMENTARY PAPERS	
A. J. English THE DESIGN AND CONSTRUCTION OF TWO-SEATER HOVERCRAFT	905
A. J. Musker SELECTION OF INTERPLANETARY TRAJECTORIES	910
P. R. Openshaw ELECTRIC PROPULSION DEVELOPMENT. PART I. ION THRUSTERS	916

Editor: JOAN BRUCE, BSc, CEng, AFRAeS.

Secretary of the Society: A. M. BALLANTYNE, OBE, TD, BSc, PhD, CEng, HonFCASI, FAIAA, FRAeS.

4 HAMILTON PLACE, LONDON, W1V 0BQ. Tel: 01-499 3515.

Advertisements Only:

H. E. SOUTHON

Magazine Advertising Ltd, 184 Fleet Street, London, EC4.

Tel: 01-242 0434/5.

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.

PRINTED BY THE LEWES PRESS WIGHTMAN & CO. LTD., LEWES, SUSSEX, ENGLAND, AND PUBLISHED BY THE ROYAL AERONAUTICAL SOCIETY, 4 HAMILTON PLACE, LONDON, W1V 0BQ, ENGLAND.

The Royal Aeronautical Society

FOUNDED 1866

INCORPORATED BY ROYAL CHARTER 1949

Patron: HER MAJESTY THE QUEEN

COUNCIL

President: AIR COMMODORE F. R. BANKS, CB, OBE, CEng, HonCGIA, HonFAIAA, HonFRAeS, RAF (retd)

President-Elect: PROFESSOR J. A. J. BENNETT, DSc, PhD, CEng, FAIAA, HonFRAeS

Vice-Presidents:

SIR ROBERT COCKBURN, KBE, CB, PhD, MSc, CEng, FRAeS
G. S. HISLOP, PhD, BSc, ARCST, CEng, FRAeS
S. D. DAVIES, CBE, BSc(Eng), CEng, FRAeS

Past Presidents:

A. D. BAXTER, MEng, CEng, FRAeS
SIR MORIEN MORGAN, CB, MA, CEng, FRAeS
PROFESSOR D. KEITH-LUCAS, HonDSc, MA, CEng, FRAeS

Members:

CAPTAIN E. C. BEARD, CBE, FRAeS, RN (retd)
M. J. BRENNAN, BSc, CEng, FRAeS
T. T. N. COLERIDGE, BE, CEng, FRAeS (*President of the New Zealand Division*)
H. DAVIES, CB, MSc, CEng, FAIAA, FRAeS
G. A. FORD, CEng, AFRAeS (*President of the Rhodesia Division*)
H. H. GARDNER, HonDSc, BSc, CEng, FRAeS
W. F. HILTON, DSc, PhD, DIC, CEng, AFAIAA, FRAeS
M. S. HUNT, CEng, AFRAeS (*President of the Southern Africa Division*)
E. HUTCHINSON, BSc, GradRAeS
(*Chairman, Graduates' and Students' Section*)
B. P. LAIGHT, MSc, CEng, FRAeS
P. S. LANGFORD, BE, CEng, FRAeS (*President of the Australian Division*)
PROFESSOR K. L. C. LEGG, BSc(Eng), BSc, CEng, FRAeS
P. G. MASEFIELD, MA, CEng, HonFAIAA, FRAeS
AIR COMMODORE J. R. MORGAN, OBE, BSc(Eng), CEng, FRAeS, RAF (retd)
E. S. MOULT, CBE, PhD, BSc, CEng, FRAeS
W. N. NEAT, MA, CEng, FRAeS
L. F. NICHOLSON, CB, MA, CEng, FRAeS
D. W. NORMAN, BSc(Aero), GradRAeS
G. K. C. PARDOE, BSc, DLC, CEng, FRAeS
(*Chairman, Astronautics and Guided Flight Section*)
AIR VICE-MARSHAL C. N. S. PRINGLE, CBE, MA, CEng, FRAeS
H. ROBERTS, PhD, BSc, DIC, CEng, FRAeS (*Chairman, Rotorcraft Section*)
G. T. WANSBROUGH-WHITE, ARAeS
K. G. WILKINSON, BSc, DIC, ACGI, CEng, FRAeS
J. E. D. WILLIAMS, BSc, FRAeS
N. H. WOOD, DCAe, CEng, AFRAeS

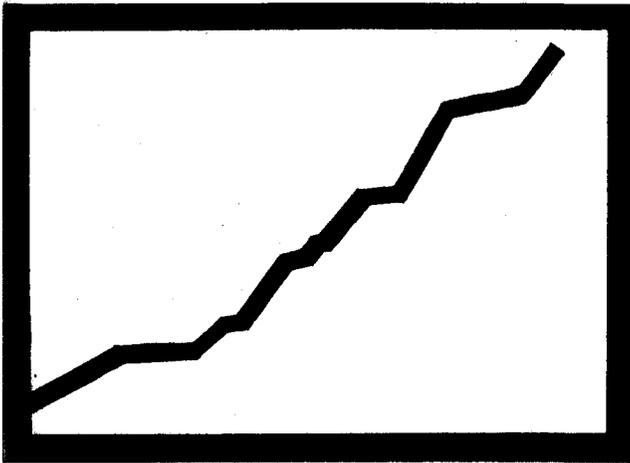
Officers:

Hon. Treasurer: C. F. HUGHESDON, AFC, ARAeS
Solicitor: L. A. WINGFIELD, MC, DFC (*Hon Companion*)
Secretary: A. M. BALLANTYNE, OBE, TD, PhD, BSc, CEng, HonFCASI, FAIAA, 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.

OCTOBER 1969

Economic miracles for sale.



Economic miracles don't happen by themselves.

They "happen" because of combined hard work by government and people in industry, communications, marketing and transport.

In these areas of development the Hawker Siddeley 748 helps economic miracles to "happen" by providing some economic miracles in its own right: profits on load factors as low as 40%; profitable short-stage lengths; simple maintenance, fast turn-round, a utilisation of 9 hours daily, month in, month out.

Its cabin layout can be changed by 5 men in 15 minutes to take all freight or all passengers.

Combining these factors with the improved performance of the new HS 748 Series 2A, which enables it to operate from even hotter, higher and shorter airstrips, you have an aircraft which is profitable and flexible enough to replace existing surface transport; and to generate new business of its own.

We can't provide a blueprint for national prosperity.

But we can sell you a remarkable economic weapon.



Hawker Siddeley 748

Hawker Siddeley - the largest aerospace group in Europe

Richmond Road, Kingston upon Thames, Surrey, England. Tel: 01-546 7741. Cables: Hawsidair, Kingston upon Thames. Telex: 23726

Hawker Siddeley Group supplies mechanical, electrical and aerospace equipment with world-wide sales and service



**We put 8
ounces of
tungsten carbide
in this engine**

**...without it
air fares
would take
off too!**



Photograph by courtesy of Trans World Airlines

Inside this jet engine costly titanium compressor blades rotate at 9,000 r.p.m; rubbing against each other all the time.

Where the wear is greatest they have a coating of tungsten carbide just 0.009 inches thick. Without it they'd wear out in 40 hours. With it they last over 10,000 hours. This means an enormous saving in maintenance costs. Union Carbide apply the tungsten carbide with a special gun that heats the coating particles to 6,000°F and blasts them onto the titanium at 1,700 m.p.h. But don't get the idea

tungsten carbide is the only coating we can provide. Nor that titanium is the only metal we can coat. We have a comprehensive range of wear-resistant coatings, and we apply them to almost every industrial material. What is more we can apply them with precision to the wearing areas of the component. And you have the choice of using the components as coated, or machining the coating to fine tolerances. Our Coatings Service is, in fact, as advanced as the jet age itself and further proof that Union Carbide is, indeed, the discovery company in action.



**Coatings Service
from the
discovery company**

UNION CARBIDE U.K. LIMITED · COATINGS SERVICE · MILLERS RD, WARWICK · TEL: WARWICK 41766 & SHEPLEY ST, GLOSSOP, DERBYSHIRE · TEL: GLOSSOP 4351

The term Union Carbide is a registered Trade Mark of Union Carbide Corporation.

CS 179



*We plan
for the safety
of just one
pair of men...*

Seebac spheres made by BAC enlarge the radar echo area of liferafts, small boats etc to guide rescue aircraft

...and for the safety of whole nations

Rapier, BAC's latest anti-aircraft weapon system, will play a vital part in the defence system of Libya as well as that of the British armed forces



Seebac spheres and Rapier missiles are both products of advanced technology but there any resemblance ends – save that both are made by British Aircraft Corporation. The spheres are compact structures; defence systems – like the one BAC is providing in Libya – are multi-million pound complexes for which BAC co-ordinates the work of many specialist companies as well as of its own factories. Contrasts like this typify the great span of activity which is one of BAC's strengths. Its products range from specialised plastics to missile systems; from subsonic and supersonic airliners to space satellites; and from high-performance military aircraft to industrial equipment. No other aerospace company in Europe can match the variety of BAC's activities, capabilities and technical and commercial achievements.



BRITISH AIRCRAFT CORPORATION 
the most powerful aerospace company in Europe

100 PALL MALL LONDON SW1