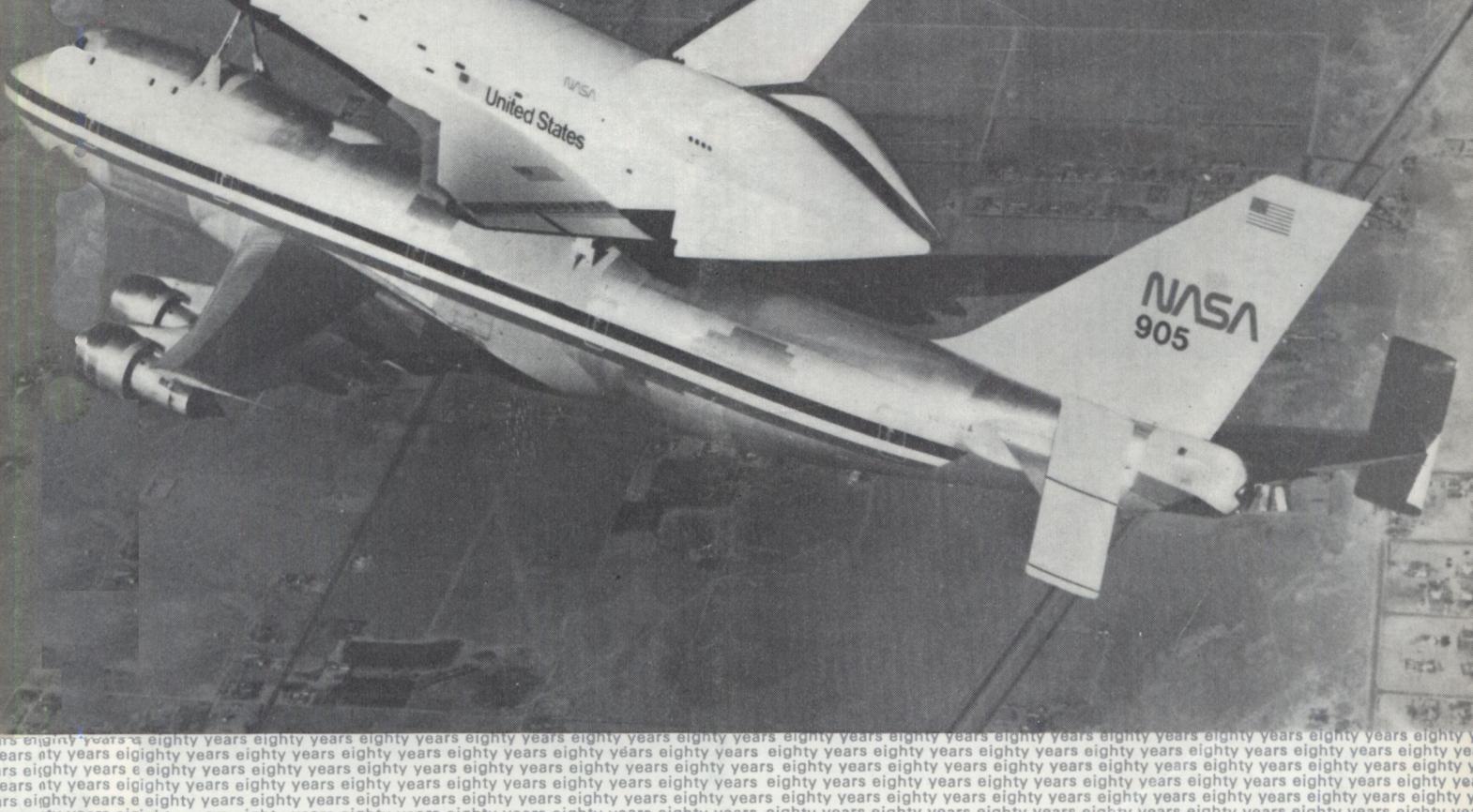


APRIL 1977

Aeronautics JOURNAL



THE ROYAL AERONAUTICAL SOCIETY



LYNX

Westland Lynx, Britain's new world-beating advanced technology helicopter. Fast, agile, all-weather, twin-engined, with comprehensive armaments and multi-role capability.

Lynx, a NATO project, is now in full-scale production to meet extensive orders from armed forces throughout the world.

Westland®
WESTLAND HELICOPTERS YEOVIL ENGLAND

*The Queen's Award to Industry has been won
7 times by Companies in the Westland Group.
Winners of the MacRobert Award
for innovation in engineering.*



VOLUME 81
NUMBER 796
APRIL 1977

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 Scallan.

Secretary of the Society:
E. M. J. Schaffter, MA, CEng,

MRAeS.

4 Hamilton Place, London

W1V 0BQ. Tel: 01-499 3515.

Telexgrams: *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: £36.00 per annum,
post free.

Single copies, including back
numbers: £3.00.

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

ISSN: 0001-9240

K. C. Harrold and S. I. R. Nicol	
THE PREDICTION OF DESIGN AND DEVELOPMENT COSTS OF CIVIL AIRLINERS	139
Robert C. Seamans, Jr.	
ENERGY AND AEROSPACE	147
Philip F. Foreman	
THE MARKET FOR SMALL AIRLINERS TO THE EARLY EIGHTIES	171
Library, Reviews, Additions and Reports	177

Cover picture:

The Space Shuttle programme is a significant step forward to making practical use of past achievements in space technology and of developing new techniques in many different fields. In his 65th Wilbur and Orville Wright Memorial Lecture, which appears in this issue, Dr. Seamans examines the interaction between energy and aerospace and discusses the concept of the solar satellite power station. The Orbiter Enterprise is shown on its fifth flight at the beginning of the Approach and Landing Tests now under way at Edwards Air Force Base, California.

The Royal Aeronautical Society

FOUNDED 1866

INCORPORATED BY ROYAL CHARTER 1949

Patron: HER MAJESTY THE QUEEN

COUNCIL

President: CHARLES ABELL, OBE, CEng, HonFSLAET, HonFRAeS

President-Elect: HANDEL DAVIES, CB, MSc, CEng, FAIAA, FRAeS

Vice-Presidents:

PROF. L. F. CRABTREE, PhD, BSc, DIC, CEng, AFAIAA, FRAeS
M. J. BRENNAN, BSc, CEng, FIMechE, FRAeS
R. P. PROBERT, CB, MA, CEng, FRAeS

Past Presidents:

DR. G. S. HISLOP, CBE, HonDSc, PhD, BSc, ARCS, CEng, FRAeS
B. P. LAIGHT, OBE, MSc, CEng, FIMechE, FRAeS
AIR MARSHAL SIR CHARLES PRINGLE, KBE, MA, CEng, FRAeS, RAF (Ret'd)

Members:

A. J. ADCOCK, BSc(Eng), AMRAeS
AIR CDRE F. R. BANKS, CB, OBE, HonCGIA, CEng, HonFAIAA, HonFRAeS,
RAF (Ret'd)
F. R. J. BRITTEN, CBE, CEng, MRAeS
CAPTAIN E. M. BROWN, CBE, DSC, AFC, MA, FRAeS, RN (Ret'd)
J. H. COOK, CEng, MRAeS
F. W. FAHY, FRAeS (*President, New Zealand Division*)
N. FALCONER, MRAeS
PROF. M. G. FARLEY, CEng, FIMechE, FIProdE, MBIM, FRAeS
CAPTAIN J. R. HEAP, MRAeS (*President, Rhodesia Division*)
P. A. HEARNE, DCAe, DLC, CEng, FRAeS
DR W. F. HILTON, PhD, DSc, CEng, AFAIAA, FRAeS
D. J. LASCELLES, BSc(Tech), AMRAeS (*Chairman, Graduates' and Students'
Section*)
F. J. LOW, MRAeS
E. W. R. MARTIN, MNDS, LIM, AMRAeS
AIR CDRE J. R. MORGAN, OBE, BSc(Eng), CEng, FIMechE, FRAeS, RAF (Ret'd)
PROF. G. M. MOSS, MSc, CEng, MRAeS (*Chairman, Branches Committee*)
DR E. S. MOULT, CBE, BSc, CEng, FIMechE, HonFRAeS
AIR CDRE F. C. PADFIELD, CBE, BSc, CEng, MRAeS (*Chairman, Astronautics and
Guided Flight Section*)
G. K. C. PARDOE, BSc(Eng), DLC, CEng, FBIS, FRAeS
V. A. B. ROGERS, MSc, CEng, FIMechE, FRAeS
J. S. SHAPIRO, Dipl Ing, CEng, FRAeS (*Chairman, Rotorcraft Section*)
DR B. W. SKEWS, PhD, MSc(Eng), CEng, MRAeS (*President, Southern Africa
Division*)
J. T. STAMPER, MA, CEng, FRAeS
G. T. WANSBROUGH-WHITE, AMRAeS
J. M. WARNER, BSc(Eng), CEng, FRAeS (*President, Australian Division*)
K. G. WILKINSON, HonDSc, BSc, DIC, FCGI, CEng, FCIT, FRAeS

Officers:

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