

# The AERONAUTICAL Journal



## Contents

**R.M. Krek and R.J. Stalker**  
Experiments on Space Shuttle  
Orbiter models in a free piston  
shock tunnel.

**R.W. Howard**  
Breaking through the  $10^6$  barrier.

**G. Buresti, G. Lombardi and  
P. Petagna**  
Wing pressure loads in canard  
configurations: A comparison  
between numerical results and  
experimental data.

**N. Singh and S. Bhattacharya**  
A low speed aerodynamic model  
for harmonically oscillating aircraft  
configurations.

**Library reviews, additions and  
reports.**

Incorporating  
**The Aeronautical Quarterly**

Volume 96 Number 957 August/September 1992

# THE AERONAUTICAL JOURNAL

## Aims and scope

The aims and scope of The Aeronautical Journal are intended to reflect the objectives of the Society as expressed in the Charter of Incorporation. Briefly these are to encourage and foster the advancement of all aspects of aeronautical and space science. Thus the topics of the Journal include all those which are covered by the various Sections and Groups of the Society such as fluid mechanics and aerodynamics, propulsion, structures and materials, rotorcraft, astronautics and guided flight, dynamics and control, aeromarine technology, aviation medicine, air transport, test flying, flight simulation, air law, management studies, history of aviation and manpowered aircraft. Thus papers are solicited on all aspects of research, design and development, construction and operation of aircraft and space vehicles. Papers are also welcomed which review, comprehensively, the results of recent research developments in any of the above topics.

## Notes on the preparation of papers

Acceptance of a submitted paper will depend on the results of rigorous technical review by at least two referees and on the judgement of the Editors as to the importance of the paper to readers of the Journal.

Three clear copies of the manuscript, each complete with illustrations, should be submitted. Papers should be typed in double spacing and should preferably not exceed 10 000 words. Handwritten manuscripts cannot be accepted.

A list of symbols used, both in the illustrations and in the text, should be given in alphabetical order at the beginning of the paper whether or not they are standard. All unfamiliar terms must be explained.

Symbols and formulae should be typewritten if possible. The use of dots, bars, and similar characters over symbols, or the use of dots as multiplication signs and bars for brackets should be avoided. Suffixes (subscripts) and indices (superscripts) must be clearly indicated. Complicated suffixes and indices also should be avoided where possible.

References should be numbered in the text where they occur, and a complete list of references given at the end of the paper. The Aeronautical Journal uses the BSI Numeric System for references — e.g. author(s), title of contribution, title of periodical, year of publication, volume number, issue number, page numbers.

Illustrations should be kept to a minimum. When the paper is first submitted they can be clear prints or graphs, sketches or photographs. If the paper is accepted, authors are asked to provide the original drawings if possible, and clear, glossy, black and white photographs. All diagrams should be produced to the same scale.

Manuscripts should be read critically, for example by a colleague, before submission, in order to avoid small errors which might otherwise prolong the refereeing process.

## Conditions of publication

An author must obtain consent, where necessary, to use any material in a paper which is copyright or the property of any other persons and of his/her or their employers.

Security clearance, if appropriate, must be obtained by the author before the paper is submitted.

The copyright of papers printed in The Aeronautical Journal is the property of The Royal Aeronautical Society. Permission to reprint or to use any paper will not be refused unreasonably.

Following the acceptance of a submitted paper, publication of the paper will not be unreasonably delayed.

Authors are entitled to 50 complimentary reprints of their papers. Authors may order any number of additional reprints at the time of printing and quotations can be provided.

## Technical Notes

The increasing flood of technical information makes it difficult to publish even abstracts of such information and it has become still more difficult to publish technical items of information which do not reach the status of full length papers.

Under this general heading of Technical Notes it is hoped that readers will help in providing just those very items of useful information which normally might not see the light of the printed page.

There will be no set form for these Notes. They may or may not be illustrated. They can be short papers of up to two thousand words; abstracts and comments upon unpublished papers or upon papers in publication with limited circulation; or notes of some interim results of research in hand and notes for further research; or in the form of a letter raising technical points or asking questions; or letters commenting on Notes published.

These pages are intended to be a technical forum where our readers can argue and discuss; where they can inform and be informed, and pass on their own experience, or air their technical difficulties. Contributions will be reviewed by a single referee and published as soon as possible.

No reader need ever say any particular subject does not receive the space it deserves as it can be brought to notice through these pages.

## Engineering Notes

Communicating solutions to practical problems on the shop floor or in the laboratory, Engineering Notes are a maximum of one page. The notes will be judged by the editors on their relevance and suitability and will be published in the next available issue. Appealing to both scientists and technologists alike, this is an opportunity to cross fertilise ideas.

# The AERONAUTICAL Journal

Volume 96 Number 957 August/September 1992

Incorporating the Aeronautical Quarterly



Editor:  
J.M. Ramsden

Production Editor:  
Stewart Penney

Published by:  
The Royal Aeronautical Society  
4 Hamilton Place, London W1V 0BQ.  
Tel: 071-499 3515.  
Telex: 262826 RAESOC.  
Fax: 071-499 6230.

Advertisements:  
David Harrison  
The David Harrison Partnership  
1 Cotton Hill, Bromley, Kent BR1 5RT.  
Tel: 081-698-9456.  
Fax: 081-460 7908.

Reproduction of any of the papers published in this journal is not permitted without the written consent of the Editor.

None of the pages or paragraphs must be taken as expressing the opinion of the Council unless otherwise stated.

Printed by  
Manor Park Press Ltd.  
Unit 7, Highfield Industrial Estate,  
Edison Road, Hampden Park,  
Eastbourne.

Subscriptions: £180 per annum,  
post free.

RAeS members: £20.00 per annum.

Single Copies, including back numbers: £20.00.

Non-member subscriptions from  
The Royal Aeronautical Society  
Publications Subscriptions Department,  
PO Box 139, Tonbridge, Kent  
TN9 1EW, UK.  
Tel: 0732 770823.  
Fax: 0732 361708.

ISSN: 0001-9240

The Royal Aeronautical Society is a registered charity.

**PUBLISHED MONTHLY  
EXCEPT JUNE AND  
AUGUST**

## Contents

249

**R.M. Krek and R.J. Stalker**  
Experiments on Space Shuttle  
Orbiter models in a free piston  
shock tunnel.

260

**R.W. Howard**  
Breaking through the  $10^6$  barrier.

271

**G. Buresti, G. Lombardi and  
P. Petagna**

Wing pressure loads in canard  
configurations: A comparison  
between numerical results and  
experimental data.

283

**N. Singh and S. Bhattacharya**  
A low speed aerodynamic model  
for harmonically oscillating aircraft  
configurations.

289

**Library reviews, additions and  
reports.**

Incorporating the Journals of The  
Institution of Aeronautical Engineers  
and The Helicopter Association of  
Great Britain.

# Editorial Advisory Board

To enhance further the standard and scope of The Aeronautical Journal an editorial advisory board has been established. The following have kindly agreed to be members:

Dr E.W.E. Rogers, formerly Deputy Director RAE, *Chairman.*

R. Ashford, Group Director Safety Regulation, *Civil Aviation Authority.*

D.E.H. Balmford, *Westland Helicopters.*

Professor P.W. Bearman, Head of Department, *Department of Aeronautics, Imperial College.*

Professor E.G. Broadbent, *Department of Mathematics, Imperial College.*

Professor R. Doganis, Head of Department, *Department of Air Transport, Cranfield Institute of Technology.*

R. Gibson, Special Director to the Director General Inmarsat.

P.A. Hearne, Chairman, *GEC Avionics.*

Air Vice Marshal P. Howard, *former Commandant RAF Institute of Aviation Medicine.*

G.C. Howell, former Chief Scientist, *Civil Aviation Authority.*

Captain W.D. Lowe, Director of Flight Crew, *British Airways.*

Professor D. McLean, Head of Department, *Department of Aeronautics & Astronautics, University of Southampton.*

G.B. Ratcliffe, Chairman, *RAeS Airworthiness and Maintenance Committee.*

T. Sharples, Director of Design Engineering, *Military Aircraft Division, BAe Defence.*

Professor P. Stow, Chief of Design Sciences, *Rolls-Royce.*

## Terms of Reference

The purpose of the Editorial Advisory Board is to provide the editor with advice and assistance in achieving high quality and coverage of the entire range of aerospace disciplines.

The board will meet at least once a year, with the editor in attendance, to discuss how best to fulfil its role; many of its contributions will, however, be made by the interaction between the editor and individual members.

Members will encourage, in their fields of expertise, the submission of good quality papers, including those presented at Society meetings.

When so requested by the editor, they will advise on the choice of referees.

When so requested by the editor, they will arbitrate where referees disagree.

The editor will continue as a normal rule to appoint two referees for each submitted paper; only one will generally be called if a paper is submitted with the strong support of a Board member.