THE AERONAUTICAL JOURNAL

Editor-in-chief: Prof Peter Bearman

Associate Editors

Chairman: Prof Mike Graham

Professor David Allerton University of Sheffield

Professor Ken Badcock University of Cambridge

Wg Cdr Mike Bratby RAeS Air Power Group

Professor Laurent Dala
Witwatersrand University, Johannesburg SA

Mr Chris Fielding BAE Systems, Warton

Professor Ismet Gursul University of Bath

Professor Michael Henshaw Loughborough University

Professor Gareth Padfield University of Liverpool

Professor Howard Smith Cranfield University Professor Chris Atkin City University, London

Professor Rene de Borst University of Glasgow

Professor Richard Brown University of Strathclyde, Glasgow

Professor Dimitris Drikakis Cranfield University

Professor Victor Giurgiutiu University of South Carolina

Professor Keith Hayward RAeS Head of Research

Professor Richard Hillier Imperial College, London

> **Dr Arthur Richards** University of Bristol

Professor Marilyn Smith
Georgia Institute of Technology, USA

Professor Holger Babinsky University of Cambridge

Dr Trevor Birch
DSTL

Professor Jonathan Cooper University of Bristol

Professor Brian Falzon Queen's University, Belfast

Dr John GreenConsultant Chief Scientist, ARA

Professor Li He University of Oxford

Dr M R NayakNational Aerospace Laboratories, India

Professor Shahrokh Shahpar Rolls-Royce, Derby

Professor Constantinos Soutis
University of Manchester

Professor John Stollery
Cranfield University

Professor Anthony Waas University of Michigan, USA

Aims and scope

The aims and scope of The Aeronautical Journal are intended to reflect the objectives of the Royal Aeronautical Society as expressed in its 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 Aeronautical Journal include most of those covered by the various Specialist Groups of the Society, which include:

Aircraft design, aerodynamics, air law, air power, air transport, air navigation, airworthiness and maintenance, aviation medicine, avionics and systems, environmental issues, flight operations, flight simulation, fluid dynamics, fluid mechanics, general aviation, guided flight, human factors, human powered flight, light aviation, management studies, propulsion, rotorcraft, safety, space, structures and materials, structural mechanics, systems and test procedures and UAVs.

Papers are therefore 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.

We recognise the inhibiting pressures of time and confidentiality and acknowledge that many of the design testing, manufacturing and operational problems that industry has to solve contain important information for the whole aerospace community. The Aeronautical Journal provides a platform for refereeing and presenting your work to an international audience.

Papers will be considered for publication in The Aeronautical Journal if they meet the terms and conditions listed in The Instructions for authors. If these are not met, the Editor reserves the right to withdraw the paper without redress, which may be at any time up to publication.

Papers should be sent to: Prof Peter Bearman, Royal Aeronautical Society, No.4 Hamilton Place,



CONTENTS

Volume 117 Number 1190

April 2013

M.D. Pavel, M. White, G.D. Padfield, G. Roth, M. Hamers and A. Taghizad Validation of mathematical models for helicopter flight simulators past,	
present and future challenges	343
B. Burrage Enabling technologies for a centre-line tiltrotor	389
C. Çetek, F. Aybek, E. Çınar and A. Cavcar New directions for air traffic control simulators: A discussion to guide the selection and renovation of simulators	415
S. Hamidi and M.J. Kermani High resolution computation of compressible condensing/ evaporating moist-air flow for external and internal flows	427
M.S. Chandrasekhara and B.K. McLain Aerodynamic studies over a manoeuvring UCAV 1303 configuration	445
Book Reviews	466



Editor-in-Chief

Professor Peter Bearman

Publishing Manager Chris Male

Production Editor

Wavne J Davis

Publications Officer Annabel L Hallam

Production

Bill Read

Tim Robinson

Book Review Editor

Brian Riddle

Publisher

Royal Aeronautical Society (RAeS)

No.4 Hamilton Place London W1J 7BQ, UK

Tel: +44 (0)20 7670 4300 Fax: +44 (0)20 7670 4309

e-mail: publications@aerosociety.com

http://www.aerosociety.com

RAeS Chief Executive Simon Luxmoore

Subscriptions

Non-members

Annual subscription (12 issues) £436, Single copies, including back issues £39; Non-member subscription orders are available from; Royal Aeronautical Society, Publications Subscriptions Department, Dovetail Services Ltd, 800 Guillat Avenue, Kent Science Park, Sittingbourne, Kent ME9 8GU, UK.

Tel: +44 (0)844 848 8426, Fax: +44 (0)844 856 0650, email: ras@servicehelpline.co.uk

RAeS members

Annual subscription (12 issues) £75, Single copies, including back issues £6·80; member subscription orders are available from; Membership Department, Royal Aeronautical Society, No.4 Hamilton Place, London W1J 7BQ, UK. Tel: +44 (0)20 7670 4300, Fax: +44 (0)20 7670 4309, email: membership@aerosociety.com

RAeS Conference Proceedings

Details, price and availability of Royal Aeronautical Society Conference Proceedings can be obtained from; RAeS Conference and Events Department, No.4 Hamilton Place, London W1J 7BQ, UK. Tel: +44 (0)20 7670 4300, email: conference@aerosociety.com or via www.aerosociety.com/proceedings

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

The content does not necessarily express the opinion of the Council of the Royal Aeronautical Society.

The Royal Aeronautical Society is a registered charity: No 313708



Advertisement Sales

Emma Bossom +44 (0)20 7670 4342 emma.bossom@aerosociety.com Printer

Wyndeham Gait Ltd Victoria Street Grimsby Lincolnshire DN31 1PY

ISSN: 0001-9240

Published monthly

All papers are available to view free of charge for subscribers and to purchase by others at: www.aerosociety.com/news/publications/aero-journal