

Flight Simulation Conference



**ROYAL
AERONAUTICAL
SOCIETY**

2016 • CELEBRATING 150 YEARS

BENCHMARKING IN IMPROVING FLIGHT SIMULATION

LONDON / 13-14 JUNE 2017

This conference will ask the following questions: "How can we truly benchmark a simulator, given its intended role?" - "What is the true norm to which we must measure the device, whether it be the actual aircraft or a simulator standard?"

The call for papers are now open, please visit our website for more details.

www.aerosociety.com/events



Sponsorship and exhibition opportunities are available for this conference. To find out more please contact the Conference and Events Department on conference@aerosociety.com or call +44 (0)20 7670 4345



ISABE 2017 CONFERENCE

3 - 8 SEPTEMBER 2017
MANCHESTER, UK

(the city where The Honourable Charles Rolls met Sir Henry Royce)

Hosted by
UK Organising Committee &



Rolls-Royce

Co-Hosted by

Cranfield
UNIVERSITY

Supported by



MANCHESTER
CITY COUNCIL

Submission of Manuscripts

All manuscripts should be submitted online at: <http://www.edmgr.com/aeroj>

Any enquiries should be directed to Wayne J Davis at aerojournal@aerosociety.com.

The current set of instructions for authors are available at: <http://journals.cambridge.org/AER>

Subscriptions

The Aeronautical Journal (ISSN 0001-9240) is published monthly in 12 issues each year.

Non-Members

The subscription price (excluding VAT) to *The Aeronautical Journal* for volume 121 (2017), which includes print and electronic access, is £551 (USA, Canada and Mexico US\$827) and includes delivery by air; single

parts are available at £53 (USA, Canada and Mexico US\$79) plus postage. The electronic-only price available to institutional subscribers is £483 (USA, Canada and Mexico US\$725). EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number. Orders, which must be accompanied by payment, may be sent to any bookseller or subscription agent or direct to the publishers: Cambridge University Press, UPH,

Shaftesbury Road, Cambridge CB2 8BS, or in the USA, Canada, and Mexico to Cambridge University Press, Journals Fulfillment Department, 1 Liberty Plaza, Floor 20, New York, NY 10006, USA. Japanese Prices for institutions are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo, Japan.

RAeS Members

The subscription price for RAeS members is £89 for Hardcopy and online access and £68 for online access only.

Individual copies are £7.75. Orders are available from: Membership Department, Royal Aeronautical Society, No.4 Hamilton Place, London, W1J 7BQ, UK. Tel: +44 (0)20 7670 4304 or email: subscriptions@aerosociety.com

RAeS Conference Proceedings

Details, prices 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 4345, email: conference@aerosociety.com or via www.aerosociety.com/events/catch-up-on-events/conference-proceedings

Advertising

All advertising enquiries should be sent to Simon Levy, simon.levy@aerosociety.com

Internet Access

The Aeronautical Journal is included in the Cambridge Journals Online service and can be found at: <http://journals.cambridge.org/AER>.

The Aeronautical Journal now supports open access publications across its hardcopy and online platforms, and accepts papers to consider for publication under both the 'green' and 'gold' open access options.

Information contained within *The Aeronautical Journal* has been published in good faith and the opinions expressed do not represent those of the Royal Aeronautical Society.

The Royal Aeronautical Society is a registered charity: No 313708

© 2017 Royal Aeronautical Society

All rights reserved. No part of this publication may be reproduced in any form or by any means, electronic, photocopying or otherwise, without permission in writing from Cambridge University Press. Permission to copy (for users in the USA) is available from the Copyright Clearance Center, <http://www.copyright.com>.

This journal issue has been printed on FSC™-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see www.fsc.org for information.

Printed in the UK by Bell & Bain Limited, Glasgow.



CONTENTS

Volume 121 Number 1238

April 2017

D. Han and G. N. Barakos

Variable-speed tail rotors for helicopters with variable-speed main rotors 433

K. Fujita and H. Nagai

Robustness analysis on aerial deployment motion of a Mars aircraft using multibody dynamics simulation: effects of wing-unfolding torque and timing 449

S.T.I. Rizvi, H. Linshu, X. Dajun and S.I.A. Shah

Trajectory optimisation for a rocket-assisted hypersonic boost-glide vehicle 469

P. Balakrishnan and K. Srinivasan

Pipe jet noise reduction using co-axial swirl pipe 488

N. Li and Q. Ye

A damage mechanics model for low-velocity impact damage analysis of composite laminates 515

N.J. Lawson, R. Correia, S.W. James, J.E. Gautrey, G. Invers Rubio, S.E. Staines, M. Partridge and R.P. Tatam

Development of the Cranfield University Bulldog flight test facility 533

T. Sakthivel and C. Venkatesan

Rotorcraft control response using linearised and non-linear flight dynamic models with different inflow models 553

Front Cover: An AgustaWestland AW149 at RIAT 2015 (Airwolfhound)

Cambridge Core

For further information about this journal
please go to the journal website at:

cambridge.org/aer



CAMBRIDGE
UNIVERSITY PRESS