



## **2016 CHINA INTERNATIONAL AVIONICS, AIRCRAFT TESTING & INTERIORS EXPO**



Venue: Beijing International Convention & Exhibition Center

Official Website: [www.avionichina.com](http://www.avionichina.com)

Contact: Jasper Shi

Email: [Jasper@gracefair.com](mailto:Jasper@gracefair.com)



# Call for Papers ISABE 2017

Airbreathing Propulsion Systems are at the forefront of technology and central to our way of life. Furthermore, technology transfer from propulsion to other areas of activity, beyond aerospace, has yielded great environmental, economic and utility benefits. The ISABE conference is a great forum to showcase industry trends, key developments, future concepts and ideas. It provides fertile ground for beneficial exchanges between professionals across the globe. ISABE cordially invites your paper for ISABE 2017.

## New for ISABE: a Review Process via the RAeS

For 2017 and, hopefully, for the long term ISABE will offer the established review process of the Royal Aeronautical Society (RAeS). This opportunity and service will require a modified preparation schedule of the papers by the authors and will offer the opportunity of publication in The Aeronautical Journal.

## Special for 2017: The Aeronautical Journal Special Issue

The Royal Aeronautical Society (RAeS) will publish a special issue of The Aeronautical Journal for the ISABE 2017 conference. This will contain 8-12 papers from the conference. Papers for this special issue will need to be submitted as fully completed manuscripts by July 2016 for a pre-selection by the ISABE Board. Those selected will then be submitted for the review process of the Royal Aeronautical Society.

## For ISABE 2017: three alternative routes for paper submissions:

1. Normal - abstract submission by July 2016, full paper by June 2017
2. RAeS Review - abstract submission by July 2016 - full paper by February 2017
3. RAeS Special Issue and Review - full paper submission by July 2016

## Looking forward to see you at ISABE 2017 in Manchester

ISABE very much looks forward to your presence at the 2017 ISABE Conference in Manchester, UK during 3-8 September 2017. Manchester, as I am certain you know, is the birthplace of Rolls-Royce and a major European cultural, industrial and tourist centre. Please keep an eye on our website ([www.isabe.org](http://www.isabe.org)) to keep abreast of the opportunities this conference offers you.

Structures & Material Group



**ROYAL  
AERONAUTICAL  
SOCIETY**

2016 • CELEBRATING 150 YEARS

## **5TH AIRCRAFT STRUCTURAL DESIGN CONFERENCE**

**MANCHESTER / 4 - 6 OCTOBER 2016**

This conference will provide a platform for the presentation of new ideas, computerised design methods & algorithms for the design & development of civil & military aircraft, both manned and unmanned, over the course of the next decade.

A call for papers is now open and the deadline for submitting abstracts is 15 April 2016.



**[www.aerosociety.com/5ASD](http://www.aerosociety.com/5ASD)**

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

Aerodynamics Group



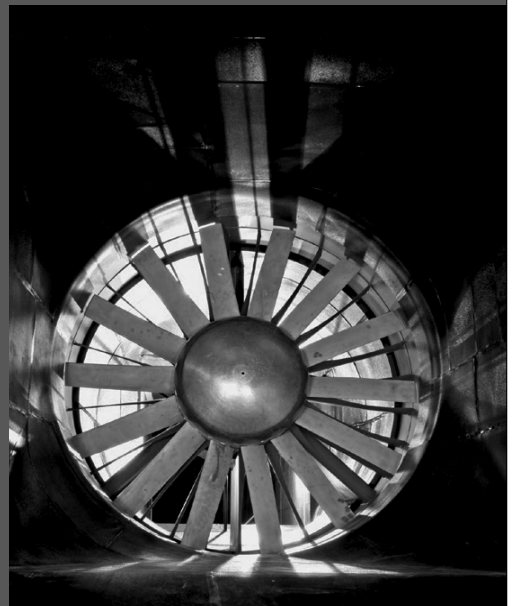
**ROYAL  
AERONAUTICAL  
SOCIETY**

2016 • CELEBRATING 150 YEARS

## **2016 APPLIED AERODYNAMICS CONFERENCE**

**BRISTOL / 19 - 21 JULY 2016**

This conference will provide a forum for the presentation and discussion of aspects of the advancement of the aerodynamic disciplines and their application through current research, nearer term conception and longer term design and operations.



**[www.aerosociety.com/AA2016](http://www.aerosociety.com/AA2016)**

### **Sponsorship opportunities**

**Sponsor and exhibitor opportunities available for this conference. For more information please contact [conference@aerosociety.com](mailto:conference@aerosociety.com) or +44 (0) 20 7670 4345.**

CAMBRIDGE

JOURNALS

# Journal of Fluid Mechanics

## Editor

M. G. Worster, University of Cambridge, UK

*Journal of Fluid Mechanics* is the leading international journal in the field and is essential reading for all those concerned with developments in fluid mechanics. It publishes authoritative articles covering theoretical, computational and experimental investigations of all aspects of the mechanics of fluids. Each issue contains papers on both the fundamental aspects of fluid mechanics, and their applications to other fields such as aeronautics, astrophysics, physiology, chemical and mechanical engineering, hydraulics, meteorology, oceanography, geology, acoustics and combustion.

## Price information

is available at: <http://journals.cambridge.org/flm>

## Free email alerts

Keep up-to-date with new material – sign up at  
<http://journals.cambridge.org/flm-alerts>



## *Journal of Fluid Mechanics*

is available online at:  
<http://journals.cambridge.org/flm>

## To subscribe contact Customer Services

### in Cambridge:

Phone +44 (0)1223 326070  
Fax +44 (0)1223 325150  
Email [journals@cambridge.org](mailto:journals@cambridge.org)

### in New York:

Phone +1 (845) 353 7500  
Fax +1 (845) 353 4141  
Email  
[subscriptions\\_newyork@cambridge.org](mailto:subscriptions_newyork@cambridge.org)

For free online content visit:  
<http://journals.cambridge.org/flm>



CAMBRIDGE  
UNIVERSITY PRESS

## 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 [aerjournal@aerosociety.com](mailto:aerjournal@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 120 (2016), which includes print and electronic access, is £525 (USA, Canada and Mexico US\$788) and includes delivery by air; single parts are available at £50 (USA, Canada and Mexico US\$75) plus postage. The electronic-only price available to institutional subscribers is £460 (USA, Canada and Mexico US\$690). 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 £85 for Hardcopy and online access and £65 for online access only. Individual copies are £7.40. 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](mailto: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](mailto:conference@aerosociety.com) or via [www.aerosociety.com/proceedings](http://www.aerosociety.com/proceedings)

## Advertising

All advertising enquiries should be sent to Simon Levy, [simon.levy@aerosociety.com](mailto: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

© 2016 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](http://www.fsc.org) for information.

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



# CONTENTS

Volume 120 Number 1228

June 2016

<b>E. L. Burnett, J. A. Beranek, B. T. Holm-Hansen, C. J. Atkinson and P. M. Flick</b> Design and flight test of active flutter suppression on the X-56A multi-utility technology test-bed aircraft	893
<b>A. Murrieta-Mendoza and R. M. Botez</b> New method to compute the missed approach fuel consumption and its emissions	910
<b>J. Townsend and B. Evans and T. Tudor</b> Aerodynamic optimisation of the rear wheel fairing of the land speed record vehicle BLOODHOUND SSC	930
<b>Y. Hu, F. Du and H. L. Zhang</b> Investigation of unsteady aerodynamics effects in cycloidal rotor using RANS solver	956
<b>D. J. Moreau and C. J. Doolan</b> The generation of tonal noise from sawtooth trailing-edge serrations at low Reynolds numbers	971
<b>L. Xu, Y. Wang, Y. Cai, Z. Wu and W. Peng</b> Determination of impact events on a plate-like composite structure	984
<b>Z. Dlamini and T. Jones</b> Fly-by-wire robustness to flight dynamics change under horizontal stabiliser damage	1005

*Front Cover:* A Lockheed Martin X-56A in flight over the Mojave Desert.