



Engineering

Books and Journals from
Cambridge University Press

Cambridge publishes a range of high-quality books and journals on the theory and practice of engineering, in communications, information theory, signal processing, networks, RF and microwave, circuits and devices, materials science and polymer research, applied photonics, thermal-fluids, mechanics, aerospace, and chemical engineering.

For further details visit:
[cambridge.org/core-engineering](https://www.cambridge.org/core-engineering)

Cambridge
Core

 **CAMBRIDGE**
UNIVERSITY PRESS

Cambridge Core

Access
leading
journals in
your subject

Explore today at [cambridge.org/core](https://www.cambridge.org/core)

Cambridge **Core**



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.
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 125 (2021), which includes print and electronic access, is £672 (USA, Canada and Mexico US\$1,006) and includes delivery by air; single parts are available at £64 (USA, Canada and Mexico US\$96) plus postage. The electronic-only price available to institutional subscribers is £588 (USA, Canada and Mexico US\$882). 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, University Printing House, 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 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 Neeral Patel
partners@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

© 2021 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 Great Britain by Bell & Bain Ltd, Glasgow.



CONTENTS

Volume 125 Number 1285

March 2021

Predicting the fuel flow rate of commercial aircraft via multilayer perceptron, radial basis function and ANFIS artificial neural networks T. Baklacioglu	453
Mechanical properties of UN-5100 envelope material for stratospheric airship W.-C. Xie, X.-L. Wang, D.-P. Duan, J.-W. Tang and Y. Wei	472
Estimation of aerodynamic parameters near stall using maximum likelihood and extreme learning machine-based methods H.O. Verma and N.K. Peyada	489
The aerodynamic optimisation of a low-Reynolds paper plane with adjoint method Y. Zhang, X. Zhang and G. Chen	510
The formulation of the RANS equations for supersonic and hypersonic turbulent flows H. Zhang, T.J. Craft and H. Iacovides	525
Analyses of criticality for multiple-site delaminations in the flap spar of Finnish F/A-18 aircraft J. Jokinen, M. Kanerva, M. Wallin and O. Saarela	556
Air pollutant emissions from aircraft landing and take-off cycles at Chinese airports J.-I. Yu, Q. Jia, C. Gao and H.-Q. Hu	578

Front Cover: Sceye is a Swiss technology company currently aiming to launch high-altitude airships to monitor crops and improve communications. (Sceye)