Structures and Materials Group Conference

4TH AIRCRAFT STRUCTURAL DESIGN CONFERENCE

QUEEN’S UNIVERSITY BELFAST / 7 - 9 OCTOBER 2014

Sponsors:

Supporters:

ANSYS
MSC Software
CEAS
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base
Altair
Composites
4TH AIRCRAFT STRUCTURAL DESIGN CONFERENCE

The Royal Aeronautical Society’s 4th Aircraft Structural Design Conference, undertaken with the support of Queen’s University Belfast, will address the challenges facing the designers of the next generation of aircraft. These challenges arise because the new designs will need to meet strict environmental constraints, be subject to ever increasing pressures to reduce manufacturing and life-cycle costs, and provide continual improvements in overall performance/efficiency factors.

The resulting aircraft will be complex, requiring multi-disciplinary design approaches that often call for the use of interdisciplinary and dynamically interactive design methods. In addition, today’s design teams are multinational, being distributed across the globe, and the computational methods must be able to support a distributed work environment. The control of such complexity in the designs and the design process is a major issue that the conference will address.

The conference will cover current research focused on the design and manufacture of future civil and military air-vehicle structures, both manned and uninhabited. This includes consideration of innovative forms and design scenarios, together with the challenges resulting from considering the complete aircraft life-cycle from initial concept to final disposal. The design and analysis of structures constructed from CFRP and novel materials is also a key topic area for the conference.

VENUE
Riddel Hall
Queen’s University
185 Stranmillis Road
Belfast, BT9 5EE, UK

WHO SHOULD ATTEND
- The aircraft design and manufacturing industry
- Aerospace departments within Universities from across the world
- Structural design researchers and programme managers from academia, industry and research establishments
- Engineers involved in the civil and military design, manufacture and entry into service of aircraft
08.00 | Registration & Refreshments

09.00 | CHAIRMAN’S WELCOME
Dr Malcolm Nash, Chairman, RAeS Structures and Materials Group, UK

09.05 | Welcome to Queen’s University Belfast
Professor Tom Millar, Dean of Engineering and Physical Sciences, Queen’s University Belfast, UK

09.15 | Keynote: Title TBC
Gavin Campbell, Director - Design Engineering and Technology Department, Bombardier Aerospace, UK

ROOM 1
SESSION A – COMPOSITES (PART 1)
10.00 | (A.1) Practical Analysis of Composites Failures, Going Beyond First Ply Failure
Andrew Main, Senior Consultant Engineer, MSC Software, UK

10.30 | (A.2) Development of a New Fuselage Concept
Kristian Zimmermann, Researcher, Airbus Group Innovations, Germany

11.00 | Networking Refreshment Break

SESSION C – COMPOSITES (PART 2)
11.30 | (C.1) Manufacturing Process Simulation and Structural Evaluation of Grid Stiffened Composite Structures
Wouter van den Brink, R&D Engineer, NLR, The Netherlands

12.00 | (C.2) Variable Stiffness Composites for Spinning Pre-Twisted Plates
Matt Thomas, University of Bristol, UK

12.30 | (C.3) Multiphysics Simulation of Thermal Plasma Produced by Lightning Strike on Aircraft Structures
Dr Adrian Murphy, Director of Research, Queen’s University Belfast, UK

13.00 | Networking Lunch

SESSION E – OPTIMISATION & MDO (PART 1)
14.00 | (E.1) A Non-Intrusive Adaptive Strategy to Support Real-Time Structural Assessment
Dr Laura Mainini, Postdoctoral Associate, Massachusetts Institute of Technology, USA

14.30 | (E.2) Novel Designs for Lightweight Aerospace Components
Dr Stuart Nixon, Senior Technical Specialist, Dassault Systemes, UK

15.00 | (E.3) Identification of Dynamic Properties of Assembled Structures by Optimization of the Modal Assurance Criterion (MAC)
Professor Santiago Hernandez, Professor of Structural Engineering, University of Coruña, Spain

15.30 | Networking Refreshment Break

SESSION G – OPTIMISATION & MDO (PART 2)
16.00 | (G.1) A Two-Step Optimisation Approach for the Optimal Design of Composite Structures, Including Geometric Non-Linear Behaviour, Design Rules and Manufacturing Constraints
Dr Michael Bruyneel, R&D Team Manager, SAMTECH s.a., Belgium

16.30 | (G.2) Two-Level Multidisciplinary Design Investigations of High-Aspect-Ratio Wing with Swept-Wing Tip
Vasily Chedrik, Head of Division on Multidisciplinary Design Optimisation, Central Aerohydrodynamic Institute, Russia

17.00 | (G.3) Optimisation of a Composite Lattice Fuselage Structure
Professor Vassili Toropov, Professor of Aerospace Engineering, Queen Mary College, University of London, UK

SESSION B – AIRCRAFT LOADING (PART 1)
10.00 | (B.1) Loads Alleviation using Folding Wings Designs
Andrea Castrichini, Research Engineer, Siemens / University of Bristol, Belgium

10.30 | (B.2) Uncertainty Quantification of Correlated Aircraft Loads
Irene Tartaruga, PhD Researcher, University of Bristol, UK

11.00 | Networking Refreshment Break

SESSION D – AIRCRAFT LOADING (PART 2)
11.30 | (D.1) Load Case Characterisation for Gradient Based Optimisation with an Aircraft Global Finite Element Model
Atipong Dharmasaroja, PhD Student, Queen’s University Belfast, UK

12.00 | (D.2) Loads Estimation for a Future of Derivative Aircraft
Anna Torkington, Loads Engineer, Airbus Operations Ltd, UK

12.30 | (D.3) Analysis of In-Service Overload Incidents at Airbus
Thomas Wilson, Technical Competence Leader for Gust Loads and Aeroelastics, Airbus, UK

13.00 | Networking Lunch

SESSION F – MORPHING (PART 1)
14.00 | (F.1) Aerodynamic Modelling for a Morphing Rudder
Miguel A. Castillo Acero, VP Technology Development, Aernnova, Spain

14.30 | (F.2) Camber and Span Morphing Wing Design for a Micro-UAV
Dr Rafic Ajaj, Lecturer in Aerospace Structures, University of Southampton, UK

15.00 | (F.3) Aeroelastic Modelling of Morphing Wing Aircraft
Dr Senthil Murugan, Post Doctoral Research Assistant, Swansea University, UK

15.30 | Networking Refreshment Break

SESSION H – MORPHING (PART 2)
16.00 | (H.1) Range Performance Improvement with Morphing Wing Configurations
Dr Antonio Filipponi, Senior Lecturer, University of Manchester, UK

16.30 | (H.2) Design and Morphing of a Droop Nose Demonstrator with the Assistance of Shape Memory Alloys
Dr Dimitrios Stamatelos, Stress Engineer, AEROTRON Research, Greece
### PROGRAMME – TUESDAY 7 OCTOBER 2014 (CONTINUED)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>17.30</td>
<td>(G.4) A Leading-Edge Engineering Delivery Model: Altair’s Optimisation Centres&lt;br&gt;Diana Teodoreanu, Project Engineer, Altair, UK</td>
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<tr>
<td>18.00</td>
<td>End of day 1</td>
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<tr>
<td>18.15</td>
<td>DRINKS RECEPTION&lt;br&gt;The Great Hall, Queen’s University Belfast</td>
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### PROGRAMME – WEDNESDAY 8 OCTOBER 2014

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>08.00</td>
<td>Registration &amp; Refreshments</td>
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<tr>
<td>09.00</td>
<td>Announcements</td>
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<tr>
<td>09.15</td>
<td>Keynote: Incorporation of Optimisation Tools in the Aircraft Structural Design Process at Saab Aeronautics&lt;br&gt;Torsten Bråmå, Technology Leader Structural Dynamics and Technical Fellow, Saab Aeronautics, Sweden</td>
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#### ROOM 1

**SESSION I – STRUCTURAL STABILITY (PART 1)**

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<tr>
<th>Time</th>
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<tr>
<td>10.00</td>
<td>(I.1) Modelling and Characterisation of an Electro-Thermo-Mechanical De-Icing and Actuation System&lt;br&gt;Christopher Brampton, Research Officer, University of Bath, UK</td>
</tr>
<tr>
<td>10.30</td>
<td>(I.2) Postbuckling Optimisation of Composite Stiffened Fuselage Panels Using Steered Fibres&lt;br&gt;Tanut Ungwattanapanit, Research Associate, Institute of Lightweight Structures, Technische Universität München, Germany</td>
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#### ROOM 2

**SESSION J – AEROELASTICITY & ADAPTIVE STRUCTURES (PART 1)**

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<th>Time</th>
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<td>11.00</td>
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#### ROOM 1

**SESSION I – STRUCTURAL STABILITY (PART 2)**

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<th>Time</th>
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<tr>
<td>11.30</td>
<td>(K.1) Postbuckling of Variable Thickness Composite Plates with Variable Angle Tows Towards ‘Buckle-Free’ Concepts&lt;br&gt;Dr Zhongming Wu, Research Assistant, University of Bristol, UK</td>
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<tr>
<td>12.00</td>
<td>(K.2) Towards Imperfection Inensitive Buckling Response of Shell Structures - Shells with Plate-Like Postbuckled Responses&lt;br&gt;Dr Paul Weaver, Reader in Lightweight Structures, University of Bristol, UK</td>
</tr>
<tr>
<td>12.30</td>
<td>(K.3) Optimised Stiffened Composite Panels of Variable Fibre Tow&lt;br&gt;Dr Wenli Liu, Lecturer in Aircraft Structural Integrity/Stress Engineering, Cranfield University, UK</td>
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#### ROOM 2

**SESSION J – AEROELASTICITY & ADAPTIVE STRUCTURES (PART 2)**

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<td>13.00</td>
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#### ROOM 1

**SESSION M – ANALYSIS & ANALYSIS METHODS (PART 1)**

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<tr>
<td>14.00</td>
<td>(M.1) Predicting Fatigue Life in Aerospace Structures&lt;br&gt;Mike Coleman, Senior Technical Consultant, MSC Software, UK</td>
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<tr>
<td>14.30</td>
<td>(M.2) Non-Finite Element Approach to Screening Stiffened Composite Panels for Test Programme Planning&lt;br&gt;Martin Gillen, Research Engineer – Strategic Technology, Bombardier Aerospace, UK</td>
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<tr>
<td>15.00</td>
<td>(M.3) Automatic Thick Thin Decomposition of Complex Body for Hex Dominant Meshing&lt;br&gt;Liang Sun, PhD Student, Queen’s University Belfast, UK</td>
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#### ROOM 2

**SESSION M – ANALYSIS & ANALYSIS METHODS (PART 2)**

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#### ROOM 1

**SESSION O – ANALYSIS & ANALYSIS METHODS (PART 2)**

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<tr>
<td>16.00</td>
<td>(O.1) SCART - Structural Calculation and Reporting Tool&lt;br&gt;Lasse Saaby Georgsen, Lead Stress Engineer, Terma A/S, Denmark</td>
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<tr>
<td>16.30</td>
<td>(O.2) Rapid Sizing of a Composite Wing Structure&lt;br&gt;Bosco Raju, PhD Candidate, Queen’s University Belfast, UK</td>
</tr>
<tr>
<td>17.00</td>
<td>(O.3) Rapid Analysis of Variable Stiffness Plates&lt;br&gt;Matthew O’Donnell, PhD Researcher/Teaching Associate, University of Bristol, UK</td>
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#### ROOM 2

**SESSION O – ANALYSIS & ANALYSIS METHODS (PART 3)**

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#### ROOM 1

**SESSION P – STRUCTURAL DESIGN (PART 1)**

<table>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>18.00</td>
<td>(P.1) Structural Design Challenges of the OHS Configuration&lt;br&gt;George R. Seyfang, Retired - Formerly Principal Concepts Engineer, BAE Warton, UK</td>
</tr>
<tr>
<td>18.30</td>
<td>(P.2) Constructing a New Form of Safe VTOL Fixed Wing Aircraft&lt;br&gt;David John Wills, CEO, RAW-air, Austria</td>
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<tr>
<td>19.00</td>
<td>(P.3) A Three-Dimensional Finite Element-Based Damage Model for Composite Structures Under Crush Loading&lt;br&gt;Professor Brian Falzon, Royal Academy of Engineering - Bombardier Chair in Aerospace Composites, Queen’s University Belfast, UK</td>
</tr>
</tbody>
</table>
PROGRAMME – WEDNESDAY 8 OCTOBER (CONTINUED)

17.30  (O.4) Modelling and Simulation for Advanced Materials Systems Design
Robert Harwood, Aerospace and Defence Industry Director, Ansys, USA
End of day 2

18.15  (P.4) Next Generation Methods for Aerospace Structures
Delphine Zinck, A&D Test to Performance Industry Solution Experience Senior Manager, Dassault Systemes, France

18.30  CONFERENCE BANQUET
Titanic Belfast Museum

Drinks reception & tours of the museum
Dinner
After dinner talk:
Aspects of Aircraft and Aerospace Manufacturing in Northern Ireland
Guy Warner, Author, UK
Coach 1 to depart for Queen’s University Belfast
Coach 2 to depart for Queen’s University Belfast

PROGRAMME – THURSDAY 9 OCTOBER 2014

08.30  Registration & Refreshments

09.00  Announcements

09.15  Keynote: Composites in Aerospace: A Multi-Physics Modelling Approach
Professor Constantinos Soutis, Director of the Aerospace Research Institute, The University of Manchester, UK

ROOM 1  SESSION Q – MANUFACTURING (PART 1)

10.00  (Q.1) Design and Flight Tests of a Civil Unmanned Aerial Vehicle for Maritime Patrol: The Use of 3D-Printed Structural Components
Mario Ferraro, UAV Designer, University of Southampton, UK

10.30  (Q.2) Automated Methods for Aircraft Design Integrated with Manufacturing
Roisin McConnell, PhD Student, Queen’s University Belfast, UK

11.00  Networking Refreshment Break

SESSION S – MANUFACTURING (PART 2)

11.30  (S.1) Investigation of Production Process Variations on Occurrence of Delamination During Hole Drilling in Composite Laminates
Jacob Thorup Filipowicz, Stress Engineer, Terma A/S, Denmark

12.00  (S.2) Investigation of Aircraft Panel Deformations during Riveting Process
Dr Adrian Murphy, Director of Research, Queen’s University Belfast, UK

12.30  (S.3) Achieving Desired Thermomechanical Coupled Field in Functionally Graded Hollow Cylinders by Material Tailoring
Dr Guojun Nie, Professor, Tongji University, China

13.00  Closing Comments

13.10  Networking Lunch

13.40  TECHNICAL TOURS

All tours are free to attend and open to all conference delegates. Coaches will be provided to transport you to the site of the visit and back to Queen’s University Belfast afterwards. Places are limited and will be given out on a first come first serve basis, so make sure you book your place when registering for the conference. Please note that booking is essential and delegates can only attend one technical tour.

<table>
<thead>
<tr>
<th>Northern Ireland Advanced Composites and Engineering Centre (NIACE)</th>
<th>Thales Land and Air Systems</th>
<th>Bombardier Aerospace</th>
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<tbody>
<tr>
<td>15 places available</td>
<td>10 places available - open to European Nationals only</td>
<td>15 places available</td>
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<tr>
<td>13.40 Coaches to depart from conference venue for NIACE site</td>
<td>Coaches to depart from conference venue for Thales site</td>
<td>Coaches to depart from conference venue for Bombardier Aerospace site</td>
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<tr>
<td>14.00 Tour to begin</td>
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<tr>
<td>15.00 Coach to depart for Queen’s University Belfast</td>
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<td>15.20 Arrive back at University</td>
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CONFERENCE NETWORKING EVENTS

MONDAY 6 OCTOBER 2014
Pre-Registration Networking Evening - The Crown Liquor Saloon, 46 Great Victoria Street, Belfast, BT2 7BA
18.00 - Meet in pub

Join us at this traditional Northern Irish pub, owned by the National Trust, for a drink on the eve of the conference. This will be a fantastic opportunity to meet other delegates, speakers and members of the Conference Organising Committee, whilst experiencing traditional Belfast culture. This event is open to all and free to attend, although delegates will have to buy their own drinks. Pre-registration is appreciated but not essential.

To find out more about the pub please visit www.nicholsonpubs.co.uk/thecrownliquorsaloonbelfast

TUESDAY 7 OCTOBER 2014
Evening Drinks Reception - The Great Hall, Queen’s University Belfast
18.15 - Drinks reception begins

The first evening of the conference will feature a drinks reception to be held in Queen’s University’s Great Hall. Experience the Hall’s magnificent wood panelled walls and the University’s portrait collection whilst reflecting on the first day’s proceedings and networking with your peers. This event is free to attend but registration is appreciated. The venue is a short walk from the conference venue.

To find out more about the University please visit www.queenseventus.com/sites/Eventus/Venues

WEDNESDAY 8 OCTOBER 2014
Conference Banquet - Titanic Belfast Museum, 1 Olympic Way, Queen’s Road, Titanic Quarter, Belfast, BT3 9EP
18.15 - Coaches to leave conference venue for Titanic Belfast Museum
18.30 - Drinks reception & tours of the museum
20.00 - Dinner
22.00 - Coach 1 to depart for Queen’s University Belfast
22.30 - Coach 2 to depart for Queen’s University Belfast

All conference attendees are invited to a conference banquet which will take place in the brand new Titanic Belfast Museum, home to nine galleries which explore the story of the Titanic and the shipyard where she was built. The evening will begin with a drinks reception and opportunity to explore the museum. A three course meal will then be served and followed by an after dinner talk given by Guy Warner, a local author and aviation enthusiast, looking at ‘Aspects of Aircraft and Aerospace Manufacturing in Northern Ireland’.

This event is open to all and free to attend, but registration is essential. Coaches will be provided to take delegates to the Museum and then return them to the conference venue at the end of the evening.

To find out more about the Titanic Belfast Museum please visit www.titanicbelfast.com

THURSDAY 9 OCTOBER 2014
Technical Tours
13.40 - Coaches to depart from conference venue to technical tour sites
14.00 - Tours to begin
15.00 - Tours to finish & coaches to return to conference venue
15.20 - Coaches to arrive back at conference venue

These tours have kindly been arranged by local businesses and will visit the Thales Land and Air Systems, Northern Ireland Advanced Composites and Engineering Centre (NIACE) and Bombardier Aerospace sites in Belfast. Places are limited for each tour so booking is essential. Coaches will be provided for all three tours and will return to the conference venue afterwards. Please note that the Thales Land and Air Systems visit is open to European Nationals only and ID will need to be presented in advance of the tour.

To find out more about all three companies please visit the following websites:
www.thalesgroup.com
www.niace-centre.org.uk
www.belfast.aero.bombardier.com

FRIDAY 10 OCTOBER 2014
Sightseeing Tour to Giants Causeway and Bushmills Distillery
08.30 - Coaches to depart from conference venue
14.30 - Coaches to arrive back at conference venue

On Friday morning a short sightseeing tour will take place for conference delegates and their friends and family. Coaches will depart from the conference venue and visit the world famous Giant’s Causeway, where you will have time to take in the sights and have a look around the visitor centre. The tour will also visit the Bushmills Distillery, where you will be able to go on a guided tour of the distillery and try some Bushmills Irish Whiskey.

Registration for this tour is essential, so make sure you book your place when registering for the conference. If friends and family would like to come with you please contact the Conference and Events Department to book their place on the sightseeing tour. Tickets for this tour cost £25 + VAT each and include entry into the Giants Causeway Visitors Centre and Bushmills Distillery, but does not include refreshments or lunch. Children must be over the age of 8 and under 18’s must be accompanied by a parent or guardian.

To find out more about the Giants Causeway and Bushmills Distillery, visit:
www.nationaltrust.org.uk/giants-causeway
www.bushmills.com

To find out more information on any of these networking events and register, please visit our website or contact the RAeS Conference and Events Department on +44 (0)20 7670 4345 or conference@aerosociety.com

FOR MORE INFORMATION AND TO REGISTER www.aerosociety.com/4ASD
SPONSORSHIP AND EXHIBITION OPPORTUNITIES

We have a range of sponsorship and exhibition opportunities available at this conference and its associated networking events, which will enable you to promote your company to a relevant audience, reinforce your company’s brand and network with key individuals working in your industry. Sponsorship opportunities include:

- Lead sponsorship of the conference
- Exhibition packages
- Delegate insert packages
- Website advertising packages
- Sponsorship of the conference proceedings
- Sponsorship of refreshment breaks and lunches
- Sponsorship of the drinks reception on Tuesday 7 October
- Sponsorship of the conference banquet on Wednesday 8 October

To find out more information, view the full packages and register your interest, please contact the RAeS Conference and Events Department on +44 (0)20 7670 4345 or conference@aerosociety.com

CONFERENCE ORGANISING COMMITTEE

INTERNATIONAL ORGANISING COMMITTEE

Chairman: Professor Alan Morris, Royal Aeronautical Society, UK
- Paul Arendsen, NLR, Netherlands
- Professor Horst Baier, Institute of Lightweight Structures, Germany
- Professor Chiara Bisagni, Politecnico di Milano, Italy
- Professor Carlos Cesnik, The University of Michigan, USA
- Professor Jonathan Cooper, University of Bristol, UK
- Professor Zafer Gurdal, Skoltech, Russia
- Dr Kota Harinarayana, India
- Professor Andy Keane, University of Southampton, UK
- Yiu-Wing Mai, University of Sydney, Australia
- Professor Joaquim Martins, The University of Michigan, USA
- Dr Malcolm Nash, Royal Aeronautical Society, UK
- Professor Constantinos Soutis, University of Manchester, UK
- Dr Martin Spieck, DLR - Deutsches Zentrum für Luft- und Raumfahrt, Germany
- Professor Afzal Suleman, University of Victoria, CA
- Professor Michel van Tooren, University of South Carolina, USA
- Professor Vassili Toropov, Queen Mary College, University of London, UK
- Professor Rade Vignevic, Cranfield University, UK
- Professor Paul Weaver, University of Bristol, UK
- Professor Karen Willcox, MIT, USA
- Professor Zheng Zhong, Tongji University, Shanghai, China

LOCAL ORGANISING COMMITTEE

Chairman: Dr Adrian Murphy, Queen’s University Belfast, UK
- Prof Brian Falzon, Queen’s University Belfast, UK
- Dr Damian Quinn, Queen’s University Belfast, UK
- Dr Trevor Robinson, Queen’s University Belfast, UK
- Dr Danielle Soban, Queen’s University Belfast, UK
BOOKING FORM

REGISTRATION FORM:
Registration and secure payment can be made on-line at www.aerosociety.com/events. Alternatively, complete one registration form per person (photocopies may be used) and return with payment to: Conference & Events Department, Royal Aeronautical Society, No.4 Hamilton Place, London, W1J 7BQ, UK

TITLE:  FIRST NAME:  SURNAME:
POSITION:
ORGANISATION:
ADDRESS:
TEL NO:  FAX NO:
EMAIL:  RAeS MEMBERSHIP NO:

REGISTRATION FEES: (includes refreshments, lunch, access to proceedings and entry to networking events)

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<th>Fee £</th>
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<td>(inc. Armed Forces)</td>
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<td>Speaker (Early Bird)**</td>
<td>400.00</td>
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<td>270.00</td>
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*RAeS Corporate Partners are entitled to the special offer of five places for £2220 + VAT.
**The Early Bird discount rate expires on Friday 29 August 2014.
RAeS Student Affiliate Members may attend free of charge subject to availability.
Co-authors may register using the RAeS Member rate.
Members of Composites UK are entitled to a 10% discount on the Non-Member and RAeS Member rates. Contact the Conference and Events Department to book on using this discount.

CREDIT CARDS:
The RAeS can accept payment on the following payment cards
Visa  Mastercard  Amex  Maestro
Switch Issue Number:
Name on card: ____________________________________________________________
Expiry Date: Month   Year
Card Number: ____________
Please include your CVC security code: ____________
These are the last 3 digits on the signature panel on the back of the card or 4 digits printed on the front of the Amex card

METHODS OF PAYMENT:
All payments should be made in Sterling (UK£).
Online: Registration and secure payment can be made online at www.aerosociety.com/conference
Cheque: Should be made payable to the RAeS and enclosed with this registration form. Please add £15 if your cheque is not drawn on a UK bank to cover bank charges/currency exchange rates.
Bank Transfer: Payments can be made by bank transfer into Account No. 01564641, Sort Code 40 05 22, HSBC Bank plc, Mayfair Branch, 18a Curzon Street, London W1J 7LA, UK. Please indicate on the registration form if you have paid your fees direct.

SIGNATURE: X