Advanced Composites Centre for Innovation and Science

5th ANNUAL CONFERENCE

7th September 2012

www.bris.ac.uk/composites
Programme

Introduction and update on ACCIS activities
Prof Michael Wisnom, Director

**Industrial Doctorate Centre in Composites Manufacture**
Prof Ivana Partridge, Professor of Composites Processing

**Design of Z-pinned Laminates: Methods and Challenge**
Dr Giuliano Allegri, Lecturer in Aerospace Structures

**Viscoelastic properties of nanocomposites**
Dr Jacopo Ciambella, Lecturer in Composites Engineering

**Ferromagnetic microwire enabled multifunctional composites**
Prof Huaxin Peng, Professor of Aerospace Materials

**Bio-inspired material and structural adaptivity in future advanced composites**
Dr Richard Trask, Lecturer in Multifunctional Materials

**Crack Arrest and Self-Healing in Composite Structures (CRASHCOMPS)**
Prof Ian Bond, Professor of Aerospace Materials

**One minute presentations by ACCIS researchers**
Dr Richard Trask, Lecturer in Multifunctional Materials

12.30-14.00 Lunch, posters, lab tours
Advanced Composites Centre for Innovation and Science

- Established in 2007
- Brings together composites research across University
- Based in Engineering, linked to Science and Medicine
- Focus for collaboration between academia and industry
- ACCIS Vision:
  A world leading centre for composites education and research, combining cutting edge fundamental science with strong industrial links for exploitation and technology transfer

Modelling of carbon nanotube structure

Undercarriage stay
DTC Design, Build, Test
Academic Staff

• 16 core ACCIS staff in Engineering

• Huaxin Peng promoted August 2012 to Professor of Aerospace Materials Visiting Professor at Harbin Institute of Technology

• Over 40 academic staff across the University with an interest in composites

Prof. Peng
New Appointments

- Two appointments this year:
  - Prof. Ivana Partridge
    Professor of Composites Processing
    Starting October 1st
  - Dr. Jacopo Ciambella
    Lecturer in Composites Engineering in conjunction with the ACCIS Doctoral Training Centre, February 2012
    In Civil Engineering Department

Ivana Partridge

Jacopo Ciambella
New Staff and Researchers

• Sacha White
  ACCIS Administrator
  Replacing Katie Drury (on maternity leave)

• Post-doctoral researchers including:
  - **Dr Anna Chatzimichali**, Research Associate in EPSRC Centre for Innovative Manufacturing
  - **Dr Mehdi Yasaee**, Research Assistant in Experimental Characterisation, Rolls-Royce UTC
  - **Dr Galal Mohamed**, Research Assistant in Analysis of Composites, Rolls-Royce UTC
  - **Dr Jin Geng**, Research Assistant on Damage Visualisation project with GKN
  - **Meisam Jalalvand**, Research Assistant on High Performance Ductile Composites Technology programme grant

• 20 new PhD students starting next month
ACCIS Research Themes

- Multifunctional Composites and Novel Microstructures
  - Embedded fibres for sensing, self healing

- Design, Analysis and Failure
  - Predicting damage at notches

- Intelligent Structures
  - Morphing aerofoil

- Composites Processing and Characterisation
  - Fibre waviness in curved composite
Major Projects

- New Industrial Doctorate Centre in Composites Manufacture led by Prof. Ivana Partridge

- Part of EPSRC Centre for Innovative Manufacturing in Composites led by Nottingham in collaboration with Bristol, Cranfield and Manchester

- HiPerDuCT Programme Grant with Imperial College on High Performance Ductile Composites Technology starting to produce interesting results
Research Highlights

- Unified framework for delamination fatigue - Giuliano Allegri
  Prediction of S-N curves from Paris plots and vice-versa

- Measurement of shear modulus and friction of Graphene - Fabrizio Scarpa
  Paper in *Nano Letters*, 2012
Industrial Partnerships

- Rolls-Royce Composites University Technology Partnership launched in March 2012
  - Bristol Composites UTC
  - TU Dresden Lightweight Structures UTC
- Bristol UTC extended to 2016
- Ongoing partnerships with Vestas, Airbus, Agusta Westland
ACCIS Doctoral Training Centre

- 4th Cohort starting shortly
- 13 new students brings total to 48
- Alex Brinkmeyer and Neil Buckney finalists in AIAA student paper competition at SDM conference (158 entrants)
- Michael Elkington patent on novel shark tooth joint concept
- Already a number of journal papers
- Call for PhD projects shortly
- 1st DTC conference held in April to showcase research
- Next one on Tuesday 16 April 2013
New ACCIS PhDs

- **Matthew Kay** - The Development and Impact Performance of a Self-Healing Carbon Fibre Reinforced Polymer Material
- **Christopher Norris** - Self-Healing Composites via a Bioinspired Vasculature
- **Robert Malkin** - Damage Tolerant Hierarchical Composite Structures
- **Marcus Walls-Bruck** - Shape Adaptive Self Fixing Structures Using Shape Memory Alloy Actuation
- **Mehdi Yasaee** - Interlaminar Crack Arrest in Composites

Graduation, July 2012
New Projects

- **Innovative Wind Conversion Systems for Offshore Applications (InnWind)** – Paul Weaver (EU FP7)
- **New Inter-Scale Techniques For Damage Analysis of Novel Composite Architectures (InterCom)** – Dmitry Ivanov (EU FP7)
- **Sustainable manufacture of composites**, - Kevin Potter (EPSRC / G8) with the universities of Southern California, McGill and Munich
- **Bio-inspired Highly Ordered Hierarchical Architecture by Innovative Manufacture** Richard Trask, Bruce Drinkwater, Wuge Briscoe (dstl)
- **Dyneema Netshape Armour by Additive Layer Manufacture** – Richard Trask (dstl, EADS)
JAXA Collaboration

- Dr. Shin-Ichi Takeda here as visiting researcher
- Scaling effects in notched composites in tension
- Comparison of large scale structural tests and small coupons
- Overall FE analysis
- Detailed damage modelling
National Composites Centre Links

- Further ACCIS researchers have joined NCC staff, others are involved in projects
- Monthly ACCIS-NCC seminars
- Dissemination events at NCC on ACCIS research, e.g. ABBSTRACT2 project with Airbus, GKN, Bath University
- Academic sandpit held to solicit ideas at appropriate TRL level to feed into NCC core programme
Future Opportunities

- Academic and industrial collaborations, secondments
- Major new research programmes through TSB, MoD, EPSRC and FP7 initiatives
- Exciting opportunities for blue skies PhDs and initial studies via DTC or undergraduate projects
- Projects in EngD centre in composites manufacture
- Knowledge Transfer Partnerships
- Collaborations through the National Composites Centre