## OPENING OF CONFERENCE

### PLENARY SESSION

**The National Digital Twin**

**KEYNOTE SPEAKER:** Mark Enzer, Mott MacDonald

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### 1A - OPTIMISATION

**Using Optimisation in the Design of the RWUAS Air Vehicle Structure**

**INVITED PRESENTER:** Gordon Mackenzie, Leonardo Helicopters

**Rapid Stochastic Broadband Acoustics on GPUs**

**Mark Allan, Zenotech Ltd**

**Automated Shape Optimization Technology Coupled with Upfront CFD**

**Sean Horgan, 80/20 Engineering Ltd**

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### 1B - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

**Torsional Stiffness Simulation of Metallic Disc Membrane Couplings Considering Pre-Stretch and Post-Buckling Behaviour**

**Murat Islam, John Crane UK Ltd.**

**The Development of Machine Learning Tools to Automate and Improve on the Identification of Invasive Non-native Species and Help Keep Boots off Ballast**

**Sam Ahdab, Mott MacDonald**

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### 1C - COMPUTATIONAL TRIBOLOGY 1

**Recent Developments in Modelling Techniques to Study Surface Interactions in Tribology**

**INVITED PRESENTER:** Daniele Dini, Imperial College London

**Optimization of Piston-Cylinder Liner Conjunction Micro-Geometry for Enhanced Tribo-Dynamic Performance**

**Stephen Bewsher, AVL List GmbH**

**Utilising Computational Tribology to Realise Multi-Scale Behaviour of Thin Solid Films**

**Robin Hildyard, Loughborough University**

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### 1D - INTRODUCTION TO THE ESSENTIALS OF SPDM

**This short taster training course will include an introduction to SPDM based on 20 years of production experience for engineers currently not using an SPDM solution. It will cover SPDM project successes, the core technology of SDM and SPDM, the different classes of solutions available, how SPDM fits with other engineering systems and the value obtainable from SPDM, including functional Digital Twins.**

**Mark Norris, the SDM Consultancy**

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### 1E - CRACKING THE CRUSH TUBE:

**A NONLINEAR LARGE DEFORMATION PROBLEM**

**The NAFEMS Computational Structural Mechanics Working Group**

The Computational Structural Mechanics Working Group invites you to learn about the many ways of modelling a crush tube. A challenge problem, available from the NAFEMS website, has been posed and this session will act as a forum for respondents to discuss their solution and why they made the choices that led to it. A summary of all received submissions will also be presented.
## DAY 1 - AFTERNOON SESSION

### PLENARY SESSION

**Saving the Russian Mir Space Station: The Role of Computerised Simulation**  
**KEYNOTE PRESENTER:** Michael Foale CBE, British-American Astrophysicist & Former NASA Astronaut

### REFRESHMENT BREAK

### 2A - COMPOSITES

**European Materials Modelling Council**  
**INVITED PRESENTER:** Gerhard Goldbeck, Goldbeck Consulting

- Deep-learning Based Distortion Prediction in Composites Processing  
  Shuang Yan, University of Nottingham

- Supporting Innovative Composite Technologies  
  Andrew Main, MSC software UK Ltd

- Multiscale Modelling of Random and Hybrid Discontinuous Tow Based Composites  
  Rizwan Choudhury, University of Derby

### 2B - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

- Development of a Real-time Engine Temperature Monitoring System, Using AI Based on Accurate and Validated Thermal Simulation Data  
  Andrew MacLean, Maya HTT UK Ltd

- Increase CAE Productivity Levels Utilizing Machine Learning  
  Signe Stenseth, Open IT

- Machine Learning for Satellite Mission Planning Using Weather Data  
  Christos Constantiou, The Centre for Modelling & Simulation (CFMS)

- Artificially Intelligent Segmentation of a Shock Absorber X-ray CT Scan and Beyond  
  Emmanuela Baksiova, BETA CAE Systems UK Ltd

### 2C - SHEET METAL FORMABILITY – MATERIAL PROPERTIES, FAILURE AND SIMULATION

This workshop is intended to assist all those involved in the design of sheet metal components to identify the key material properties and potential failure modes during manufacture. The session will demonstrate how CAE methods can be used to simulate the manufacturing method in order to identify any potential problems with the process and establish if part design changes are required.

**WORKSHOP TOPICS – PART 1:**
- Introduction to sheet metal forming processes
- Characterisation of sheet metal material properties for use in simulation
- Definition of process failure simulations

### 2D - OPEN DISCUSSION

**VERIFICATION AND VALIDATION, SPECIFICALLY FOCUSSING ON CODE VERIFICATION**
- Recap – what is verification and validation (based around the NAFEMS/ASME V&V diagram)
- SGMWG/CFDWG
- Code verification (current practice, best practice)
- SGMWG/CFDWG
- Discussion

### 2E - UNCERTAINTY QUANTIFICATION 1

- Stochastic Topology Optimization For Robust And Reusable Designs  
  Johannes Neumann, Rafinex SARL

- Dealing with Uncertainty with Confidence  
  Edoardo Patelli, University of Strathclyde

- Model Reduction and Uncertainty Quantification for Weld Simulations on Ferritic Materials  
  Jefri Draup, EDF Energy R&D

- Uncertainty in Simulation and Test  
  Jack Reijmers, Nevesbu

### 3A - ELECTROMAGNETICS

- Motor Design Optimisation Including Electromagnetic Performance and Mechanical Stress  
  Tamara Monti, Dassault Systemes UK Ltd

- 3D Electromagnetic Eddy-Current Problems within the Finite Element Framework of Computing Platform Fenics  
  Nunzio Palumbo, Relis Royce plc

### 3B - INFRASTRUCTURE

- Innovation Through Simulation in Built Environment  
  Ganga Kasi, Sir Robert McAlpine Ltd

- Innovative Techniques for Bridge Assessment  
  Ricardo Teixeira, Mott MacDonald

### 3C - SHEET METAL FORMABILITY – MATERIAL PROPERTIES, FAILURE AND SIMULATION

**WORKSHOP TOPICS – PART 2:**
- Discussion of the different materials used in sheet metal forming
- Description of how materials are tested to establish the required material parameters
- Application of simulation with an example using the Forming Limit Test

### 3D - FROM GRAINS TO PROPERTIES

**CALCULATING BULK SCALE BEHAVIOUR FROM MICROSTRUCTURES**
- Computational Structural Mechanics Working Group

- Modern engineering uses material design to obtain advantageous properties for challenging applications. This material design is underpinned by advanced simulation methods that use knowledge of the microstructure of the materials to predict the bulk-scale material response. This session will focus on one such technique, crystal plasticity finite element analysis, and will serve as an introduction to what it does and how it can be used.

### 3E - UNCERTAINTY QUANTIFICATION 2

- Effective Quadratures: Empowering Engineers with Open Source Computational Methodologies  
  Pranay Seshadri, The Alan Turing Institute

- Supporting the Design of Composite Components using Multi-physics Simulations  
  Olivia Stodieck, Daptablade Ltd.

END OF DAY 1
**DAY 2 - MORNING SESSION**

**PLENARY SESSION**

**Climate Change – How Can Climate Models Help us to Respond?**
KEYNOTE SPEAKER: Vicky Pope, Met Office

**Innovation through Engineering Simulation - A Rolls-Royce Perspective**
INVITED PRESENTER: Akin Keskin, Rolls Royce

**SHORT BREAK**

**4A - ADDITIVE MANUFACTURING**

Rapid 3D Inspection of AM Components Using CT: From Defect Detection to Thermal Performance Simulation
Celia Butler, Synopsys

Structural Simulation of Components with Defects - A Workflow from Computed Tomography to Finite Element Simulation
Beate Lauterbach, Volume Graphics GmbH

**REFRESHMENT BREAK**

**4B - CFD 1**

High-Fidelity CFD the Automotive and Motorsport Sectors in The Cloud
INVITED PRESENTER:
Neil Ashton, Amazon Web Services

Neeraj Cherukunnath, Rolls Royce Plc

**4C - COMPUTATIONAL TRIBOLOGY 2**

Multi-body Based Multi-physics Approaches to Simulate Modern Powertrain Tribodynamic Challenges
INVITED PRESENTER:
Günter Offner, Loughborough University & AVL List GmbH

Tribodynamic Modelling of High-speed Rolling Element Bearings Using Experimentally Obtained Boundary Conditions
Harry Questa, Loughborough University

**5A - MANUFACTURING PROCESS**

Finite Element Simulation of the Braiding Process
Melodie Cueto Carrion, National Composites Centre

Understanding the Manufacturing Cost Drivers of Tolerances
Amanda Bligh, aPriori Technologies

Understanding Powder Behaviour in an Additive Manufacturing Process by Using DEM
Marina Sousani, DEM Solutions Ltd

Manufacturing Process Chain Model in Composites Manufacturing
Melodie Cueto Carrion, National Composites Centre

**5B - CFD 2**

Using Fluid Dynamics for Simulating Exterior Ballistics Phenomena
Véronique de Brie, Royal Military Academy

Employing Advanced CFD to Predict Oil Distribution, Churning Losses and Gearbox Cooling
David Percival, EnginSoft UK Limited

Numerical and Experimental Evaluation of Tile Stoves Mode of Operation
Florian Schüssler, ACAM Engineering GmbH

Increasing Product Reliability with Reduced Order Models
John Parry, Mentor Graphics Corp.

**5C - WHAT ARE THE CHANCES OF THE SHIP SNAPPING? CONSIDERATIONS WHEN USING PROBABILISTIC ANALYSIS**

In the April 2019 issue of NAFEMS BENCHMARK magazine, two challenge problems are presented. The first one consists of two normal distributions, producing an analytical (theoretical) solution. The second one contains several distributions (normal, uniform and lognormal), and therefore an exact solution is not available. At the NAFEMS World Congress 2019 these problems were discussed and a few solutions were presented. In this special session at the UK Conference, these solutions and additional ones will be deliberated in combination with the theoretical background and the pitfalls of these methods.

**LUNCH**