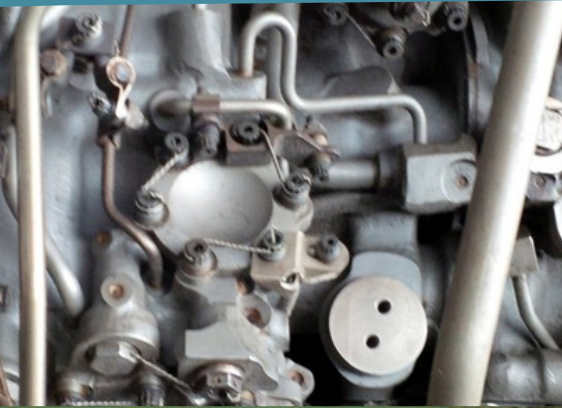


EPSRC Centre for Innovative Manufacturing

Through-life Engineering Services

4th International Conference On Through-life Engineering Services (TESConf 2015)



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CONFERENCE PROGRAMME ONLINE

The conference programme is available to download as a pdf from the conference website:

http://www.through-life-engineering-services.org/downloads/TESSConf_15_detailed_programme.pdf

CONFERENCE PROCEEDINGS ONLINE

The conference proceedings are available to access and to download papers as pdfs from the publisher's website:

<http://www.sciencedirect.com/science/journal/22128271/38>



The Fourth International Conference on Through-Life Engineering Services

3–4 November 2015
Vincent Building, Cranfield University

At a Glance

Monday 2nd November 2015						
17:30	19:00	Refreshments (CMDC bar)				
Tuesday 3rd November 2015						
		Auditorium	Room 2	Room 2	Room 3	Room 4
08:30	09:30	Registration				
09:30	09:50	Opening Session				
09:50	10:30	Keynote 1: Professor Jay Lee (University of Cincinnati, USA)				
10:30	11:10	Keynote 2: Professor Baldev Raj (National Institute of Advanced Studies, India)				
11:10	11:40	Coffee Break				
11:40	13:00		TES for Functional Product Development		Non-Destructive Testing for TES	Industrial Panel: Obsolescence Management
13:00	14:00	Lunch				
14:00	14:40	Keynote 3: Tjarko Bouman (Vanderlande Industries, NL)				
14:40	15:40	Strategies for TES				
15:40	16:10	Coffee Break				
16:10	17:50		Prognostics: Design, Implementation, and Lessons Learned	Towards self-repairing, zero-maintenance systems	Industrial Workshop: Non-Destructive Testing for TES	Standards Workshop: Writing Formal Standards – Master Class and Workshop
			Design for TES			
18:30		Bus for Dinner				



Wednesday 4th November 2015						
		Auditorium	Room 1	Room 2	Room 3	Room 4
09:00	10:40	Advanced ICT for TES				No Fault-Found
		Augmentral Reality TES	Product Lifecycle Design and Management			Industrial Workshop: No Fault Found
10:40	11:10	Coffee Break				
11:10	11:50	Keynote 4: Professor Gino Dini (University of Pisa, IT)				
11:50	12:30	Keynote 5: Dr Soundar Kumara (The Pennsylvania State University, USA)				
12:30	13:30	Lunch				
13:30	14:10	Keynote 5: Atsushi Yokoyama (East Japan Railway, JP)				
14:10	15:10	TES for Railway Industry	Maintenance Management	Human Factors in TES		
15:10	15:40	Closing and Award Presentation				
15:40	16:00	Refreshments and Networking				

Key



Plenary



Workshop



Parallel



Keynote Speaker Biographies



Dr Baldev Raj

Director of National Institute of Advanced Studies, Bangalore

Dr Baldev Raj has assumed responsibilities as the Director of the National Institute of Advanced Studies, Bangalore, one of India's leading multi-disciplinary institutions. A distinguished scientist and former Director of the Indira Gandhi Centre for Atomic Research in Kalapakkam, Dr Baldev Raj has helped advance several challenging technologies, especially those related to sodium cooled fast spectrum reactor with closed fuel cycle; a sustainable energy spectrum. He has also nurtured and grown excellent schools of global stature in nuclear materials and mechanics and nano science and technology. He has pursued his work in interdisciplinary domains of energy, cultural heritage, medical technologies, nano science and technology and education. He has been responsible for providing solutions to many unsolved challenges in Strategic, Security and Industry domains. He is known for overcoming the barriers of academic research and industry with acumens of leadership and experiences.



Professor Jay Lee

Ohio Eminent Scholar, L.W. Scott Alter Chair, and Distinguished Univ.

Professor Univ. of Cincinnati & Director, NSF Multi-Campus Industry/ University Cooperative Research Center on Intelligent Maintenance Systems (IMS) Univ. of Cincinnati, Univ. of Michigan, Missouri Univ. of S&T, Univ. of Texas-Austin www.imscenter.net

In today's competitive business environment, companies are facing challenges in dealing with big data issues for rapid decision making for improved productivity. Many manufacturing systems are not ready to manage big data due to the lack of smart analytics tools. Germany is leading a transformation toward 4th Generation Industrial Revolution (Industry 4.0) based on Cyber-Physical System (CPS)-enabled maintenance and service innovation. As more software and embedded intelligence are integrated in industrial products and systems, predictive technologies can further intertwine intelligent algorithms with electronics and tether-free intelligence to predict product performance degradation and autonomously manage and optimize product service needs. The presentation will address the trends of industrial transformation in big data environment as well as the readiness of smart predictive informatics tools to manage big data to achieve resilient product life cycle management. First, industry transformation including Germany Industry 4.0 and cyber-physical system will be introduced. Second, advanced prognostics technologies for smart product maintenance/service systems with case studies will be presented. In addition, research advances in designing cyber-physical model for smart product service systems

with many case studies will be discussed. Finally, dominant innovation® methodology for service innovation will be discussed.



Tjarko Bouman
Global Director Services, Vanderlande Industries

Tjarko Bouman is Global Director Services with Vanderlande Industries. In this role he is globally responsible for business and operational development of Services. He has a Master in Business Administration at the Erasmus University Rotterdam. He has 20 years of experience in customer services, project management and general management in an international environment and has worked for companies like Ricoh and FedEx.



Atsushi Yokoyama
East Japan Railway Co., Research and Development Centre of JR East group, Technical Center, Director

April 1981: Employed by Japan National Railway (JNR: the predecessor of JR group)
February 1987- February 1989: Director (Taira Track Maintenance Section)
(April 1987: JNR was divided and privatized, and JR group were established)
June 2002- June 2005: Department Manager (Facility Department of Sendai Branch Office)

June 2005- June 2008: Deputy Manager (Facility Department of Head Office)

June 2008- September 2011: Director (Overseas Office of JR group in Paris)

September 2011-Present: Director (Technical Center).



Professor Gino Dini
Department of Civil and Industrial Engineering of the University of Pisa

Gino Dini is a full professor of manufacturing processes at the Department of Civil and Industrial Engineering of the University of Pisa. He is the author of more than 100 papers published in international conference proceedings and journals. His current interests and research areas include: machining process monitoring, assembly and disassembly processes, laser beam machining and Augmented Reality applications in industrial environments. He was awarded with the F.W. Taylor Medal for an innovative contribution given by his research

activity in the field of assembly process planning. Currently, he is a member of CIRP (International Academy for Production Engineering) and founding member of AITEM (Italian Association of Production Engineering).



Sounder Kumara

Allen E., and Allen, M., Pearce Professor of Industrial Engineering, Penn State, USA

Dr. Kumara is the Allen, E and Allen, M. Pearce Professor of Industrial Engineering at the Pennsylvania State University. He also holds joint appointments with Computer Science and Engineering, and an affiliate appointment with the School of Information Sciences and Technology.

His research focus is on building smart manufacturing and logistics systems, clustering in large scale networks and big data analytics. He is an elected fellow of Institute of Industrial Engineers (IIE), the International Academy of Production Engineering (CIRP), the American Association for the Advancement of Science (AAAS) and American Society of Mechanical Engineers (ASME).



List of attendees

John Pearce	Atkins Global
Phil Williams	Atkins Global
Gary Ford	Babcock International
Haydn Lewis	Babcock International
Mark Smith	Babcock International
Mark Parsons	Babcock International
Roger Fradley	Babcock International
Simon Bownes	Babcock International
Stephen Wilding	Babcock International
Charles Wallace	BAE Systems
Paul Thorley	BAE Systems
SalimAdda	BAE Systems
Simon Wright	BAE Systems
Karl Hribernik	BIBA - Bremer Institut für Produktion und Logistik
Stefan Wellsandt	BIBA - Bremer Institut für Produktion und Logistik
Jabeen Capon	BMT Reliability Consultants Ltd
Tel Winston	BMT Reliability Consultants Ltd
David Saul	BP
Ben Sheridan	BSI
Sarah Kelly	BSI
Steve Wilson	BSI
Lynn Mentipty	CILT
StephanieLatta	CILT
Thank-God Isaiah	Cranfield University
Zakwan Skaf	Cranfield University
Alfonso Cabañas,	Cranfield University
Rupert England	Cranfield University - CDS
Matthew Rowlings	Department of Electronics University of York
MakotoFujishima	DMG MORI CO., LTD
Hendrik Grosser	Fraunhofer IPK
Sebastian Adolphy	Fraunhofer IPK
Nils Klingbeil	Fraunhofer IPK
Abdelhakim Laghmouchi	Fraunhofer IPK
Paul Phillips	HS Marston Aerospace Limited
Jeremy Lovell	Intelligent Energy
Ian Blackman	International Institute of Obsolescence Management
Stuart Kelly	International Institute of Obsolescence Management
Erik Lejon	Luleå University of Technology
Håkan Lideskog	Luleå University of Technology
Magnus Karlberg	Luleå University of Technology
Michael Evans	Messier-Bugatti-Dowty
Richard Denning	MoD
Shan Wan	Nanjing University of Science and Technology
Vladimir Ulanskyi	National Aviation University, Kyiv - Ukraine
Marteb Busstra	NedTrain
Jack Appallius De Vos	NedTrain BV



Andy Doherty	Network Rail
Alistair Watson	Nikon Metrology
Andrew Ramsey	Nikon Metrology
Yuki Matsuyama	Osaka University
Ahmed Raza	Overseas Projects and Maintenance Abu Dhabi
John Lindstrom	ProcessIT Innovations R&D Centre, Luleå University of Technology
Andy Harrison	Rolls Royce
Tim Barden	Rolls Royce
Tom Hardy	Rolls Royce
Mario Wolf	Ruhr University
Alex Stallman	Safran Labinal Power Systems
Alan Purvis	TES - Durham University
Richard McWilliam	TES - Durham University
Alshammari Serhan	TES, Cranfield University
Andrew Starr	TES, Cranfield University
Andy Shaw	TES, Cranfield University
Chris Hockley	TES, Cranfield University
Daniel Gagar	TES, Cranfield University
Davood Sabaei	TES, Cranfield University
Duarte Polonia Rodrigues	TES, Cranfield University
Essam Shehab	TES, Cranfield University
John Erkoyuncu	TES, Cranfield University
Laura Lacey	TES, Cranfield University
Lawrence Tinsley	TES, Cranfield University
Leigh Kirkwood	TES, Cranfield University
Mark Jolly	TES, Cranfield University
Micheal Farnsworth	TES, Cranfield University
Paul Tasker	TES, Cranfield University
Pavan Addepalli	TES, Cranfield University
Piotr Sydor	TES, Cranfield University
Rajkumar Roy	TES, Cranfield University
Raúl González Muñoz	TES, Cranfield University
Stefano Tedeschi	TES, Cranfield University
Tabassom Sedighi	TES, Cranfield University
Windo Hutabarat	TES, Cranfield University
Yifan Zhao	TES, Cranfield University
Brian Humphreys	Thales UK
Andrew Gill	The Consulting Partnership
Darren McDonnell	Trinity College Dublin
Antoniomaria Di Ilio	University of L'Aquila
Yasushi Umeda	University of Tokyo
Wieger Tiddens	University of Twente

Detailed Programme

All the meeting rooms are in Vincent Building (B52A), unless otherwise specified.

Day 1 – Monday, 2 November 2015

17:30–19:00 Refreshments (CMDC Bar: 10 minutes walking from Vincent)

Day 2 – Tuesday, 3 November 2015

08:30–09:30 Registration (Entrance Area)

09:30–11:10 Opening Session (Auditorium) Chair: Rajkumar Roy (Cranfield University)

09:30–09:50 *Opening Address* - Rajkumar Roy (Cranfield University)

09:50–10:30 **Keynote 1: Industrial Big Data Analytics and Cyber-Physical Systems for Future Maintenance & Service Innovation**
Jay Lee (University of Cincinnati, USA)

10:30–11:10 **Keynote 2: Life Cycle Management of Structural Components of Indian Nuclear Reactors and Reprocessing Plants**
Baldev Raj, P. Chellapandi, U. Kamachi Mudali (National Institute of Advanced Studies, Bangalore, IN)

11:10–11:40 Coffee Break (Foyer)

11:40–13:00 TES for Functional Product Development (Room 1) **Chair:** Magnus Karlberg (Luleå University of Technology, SE)

11:40–12:00 *Integrating Use Phase Information and Virtual Product Representation to Support Functional Products*
Erik Lejon, Peter Jeppsson (Luleå University of Technology, SE)

12:00–12:20 *Impact on Production Systems from Recent and Emerging Complex Business Models: Explicit and Tacit Knowledge Required*
John Lindström, Jerker Delsing, Thomas Gustafsson (Luleå University of Technology, SE)

12:20–12:40 *Aggregation of Solutions for Functional Product Life Cycle: Review of Results from the Faste Laboratory*
Daria Sas, Sofia Larsson, Andreas Dagman, Magnus Karlberg (Luleå University of Technology, SE)



- 12:40–13:00 *The Functional Products Technical Lifecycle and its Four Sub-Lifecycles*
John Lindström, Andreas Dagman, Magnus Karlberg Karlberg (Luleå University of Technology, SE)
- 11:40–12:40 Human Factors in TES (Room 2) Chair:** Sarah R. Fletcher (Cranfield University)
- 11:40–12:00 *Reducing Uncertainty in PHM by Accounting for Human Factors – A Case Study in the Biopharmaceutical Industry*
Darren McDonnell Nora Balfe (Trinity College Dublin, IR), Piero Baraldi (Politecnico di Milano, IT), Garret E. O’Donnell (Trinity College Dublin, IR)
- 12:00–12:20 *The Use of Job Aids for Visual Inspection in Manufacturing and Maintenance*
Rebecca L. Charles, Teegan L. Johnson, Sarah R. Fletcher (Cranfield University)
- 12:20–12:40 *Human Factors Engineering in System Design: A Roadmap for Improvement*
M. C. Leva, F. Naghdali, C. Ciarapica Alunni (Trinity College Dublin, IR)
- 11:40–13:00 Non-Destructive Testing for TES (Room 3) Chair:** Kirsten Tracht (University of Bremen, DE)
- 11:40–12:00 *Review of Non-Destructive Testing (NDT) Techniques and Their Applicability to Thick Walled Composites*
M.R. Jolly, A. Prabhakar, B. Sturzu, K. Hollstein, R. Singh, S. Thomas, P. Foote, A. Shaw (Cranfield University)
- 12:00–12:20 *Degradation Study of Heat Exchangers*
Sri Addepalli, David Eiroa, Suphansa Lieotrakool, Anne-Laure François, Juliette Guisset, David Rodríguez, Michele Kazarian, Julia Duda, Rajkumar Roy (Cranfield University), Paul Phillips (UTC Aerospace Systems, UK)
- 12:20–12:40 *The Use of Infrared Thermography for Maintenance Purposes in the Production Process of Components for Automotive Alternators*
Antonello D’Annibale, Antoniomaria Di Ilio (University of L’Aquila, IT), Michele Trozzi, Luigi Bonaventura (Denso Manufacturing Italia, IT)
- 12:40–13:00 *Degradation Assessment of Industrial Composites using Thermography*
Yifan Zhao, Jörn Mehnert, Wei Xu, Mosab Alrashed, Stephen Abineri, Rajkumar Roy (Cranfield University)
- 11:40–13:00 Industrial Panel: Obsolescence Management (Room 4) Chair:** Ian Blackman (International Institute of Obsolescence Management, UK)
- 11:40–12:00 *How Has Obsolescence Management Evolved So Far?*
Ian Blackman (International Institute of Obsolescence Management, UK)

- 12:00–12:20 *A Railway Industry Perspective*
Stuart Broadbent (ALSTOM, UK)
- 12:20–12:40 *An Oil and Gas perspective*
David Saul (The Society of Underwater Technology, UK)
- 12:40–13:00 *Next Steps for the Obsolescence Management Discipline*
Stuart Kelly (Through Life Support, UK)
- 13:00–14:00 Lunch** (Foyer)
- 14:00–14:40 Keynote 3** (Auditorium) **Chair:** Essam Shehab (Cranfield University)
How Condition Monitoring for Maintenance Optimization at Vanderlande Supports the Further Evolution of Service
Tjarko Bouman, Qiushi Zhu (Vanderlande Industries, NL)
- 14:40–15:40 Strategies for TES** (Auditorium) **Chair:** Essam Shehab (Cranfield University)
- 15:40–16:00 *Can Japanese Manufacturing Industry Provide Through-Life Engineering Services?*
Yasushi Umeda (The University of Tokyo, JP)
- 16:00–16:20 *Strategic Resilience for Through-Life Engineering Services*
Rupert England (Cranfield University)
- 16:20–16:40 *An Examination of Significant Issues in Naval Maintenance*
Gary Ford, Chris McMahon (University of Bristol, UK), Chris Rowley (Babcock International, UK)
- 14:40–15:40 TES for Gas Turbines** (Room 2) **Chair:** Ian Jennions (Cranfield University)
- 14:40–15:00 *Effect of Fouling, Thermal Barrier Coating Degradation and Film Cooling Holes Blockage on Gas Turbine Engine Creep Life*
Ebi A. Ogiriki (Cranfield University & Air Force Institute of Technology, NG), Yiguang G. Li, Theoklis Nikolaidis, ThankGod E. Isaiah (Cranfield University), Gowon Sule (Cranfield University & Air Force Institute of Technology, NG)
- 15:00–15:20 *Investigation and Assessment of Resource Consumption of Process Chains*
F. Klocke, R. Schmitt, K. Arntz, M. Grosse Böckmann (Fraunhofer IPT, Aachen, DE), A. Gasser, M. Alkhayat (Fraunhofer ILT, Aachen, DE), J. Kerkhoff, N. Klingbeil, T. Vollmer, M. Wegener (Fraunhofer IPT, Aachen, DE)



- 15:20–15:40 *Life Analysis of Industrial Gas Turbines Used as a Back-Up to Renewable Energy Sources*
Thank-God Isaiah, Siddig Dabbashi, Dawid Bosak, Suresh Sampath, Giuseppina Di Lorenzo, Pericles Pilidis (Cranfield University)
- 14:40–15:20 **Acoustic Emission for TES (Room 3) Chair:** Pavan Addepalli (Cranfield University)
- 14:40–15:00 *Application of Acoustic Emission in Diagnostic of Bearing Faults within a Helicopter Gearbox*
Faris Elasha (Coventry University, UK), Matthew Greaves (Cranfield University), David Mba (London South Bank University, UK), Abdulmajid Addali (Cranfield University)
- 15:00–15:20 *Automated Shot Counter System for Through-life Support of Target Rifles*
D. Gagar, C. Hockley, P. Foote (Cranfield University)
- 14:40–17:50 **Standards Workshop: Writing Formal Standards – Master-Class and Workshop (Room 4) Chair:** Paul Tasker (Cranfield), Ben Sheridan (British Standards Institute) Facilitation: Sarah Kelly & TBA (British Standards Institute)
Many academics miss the opportunity of ensuring their applications' development is enshrined in formal Standards. Formal Standards publicise best practice and drive innovation. As a relatively new area of interest, TES academics and practitioners will benefit greatly by accelerating the development of formal Standards in the field. This workshop and master-class aims to brief academics and practitioners with some key tools and techniques for developing formal Standards from their work.
Outline Agenda:
 1. What are formal Standards, how do they promote innovation
 2. BSI and BSI committees
 3. Writing formal Standards (BS 0)
 4. Workshop: identifying candidates Facilitated
 5. No Faults Found – a case study
 6. Discussion
- 15:40–16:10 **Coffee Break (Foyer)**
- 16:10–16:50 **Prognostics – Design, Implementation, and Lessons Learned (Room 1) Chair:** Zakwan Skaf (Cranfield University)
- 16:10–16:30 *The Adoption of Prognostic Technologies in Maintenance Decision Making: A Multiple Case Study*
W.W. Tiddens (University of Twente & Netherlands Defence Academy, NL), A.J.J. Braaksma (University of Twente, NL), T. Tinga (University of Twente & Netherlands Defence Academy, NL)



- 16:30–16:50 A Simple State-Based Prognostic Model for Filter Clogging
Zakwan Skaf, Omer F. Eker, Ian K. Jennions (Cranfield University)
- 16:50–17:50 Design for TES (Room 1) Chair:** Samir Khan (Coventry University, UK)
- 16:50–17:10 *Development of a Research Vehicle Platform to Improve Productivity and Value-Extraction in Forestry*
Håkan Lideskog, Magnus Karlberg (Luleå University of Technology, SE), Urban Bergsten (Swedish University of Agricultural Sciences, SE)
- 17:10–17:30 *Fact-Based Design for Leisure Boats: The HighSea-Experiment Setup*
Stefan Wellsandt Moritz von Stietenrona, Karl Hribernik (University of Bremen, DE), Bjørnar Henriksen, Carl Christian Røstad (SINTEF, NO), Klaus-Dieter Thoben (University of Bremen, DE)
- 17:30–17:50 *An Integrated Aerospace Requirement Setting and Risk Analysis Tool for Life Cycle Cost Reduction and System Design Improvement*
L. Ruiz Estébanez, E. Shehab, P. Sydor, T. Mackley, P. John (Cranfield University), A. Harrison (Rolls-Royce, UK)
- 16:10–17:50 Towards Self-Repairing, Zero-Maintenance Systems (Room 2) Chair:** Ashutosh Tiwari (Cranfield University)
- 16:10–16:30 *Social-Insect-Inspired Networking for Autonomous Load Optimisation*
Matthew Rowlings, Andy Tyrrell, Martin Trefzer (University of York, UK)
- 16:30–16:50 *Experimental Validation of a Resilient Electronic Logic Design with Autonomous Fault Discrimination/Masking*
Richard McWilliam*, Philipp Schiefer, Alan Purvis (Durham University, UK)
- 16:50–17:10 *Modelling, Simulation and Analysis of a Self-Healing Energy Harvester*
Michael Farnsworth, Ashutosh Tiwari (Cranfield University)
- 17:10–17:30 *Modelling Electronic Circuit Failures using a Xilinx FPGA System*
Thomas E. Carney, Richard P. McWilliam, Alan Purvis (Durham University, UK)
- 17:30–17:50 *FlightGear as a Tool for Real Time Fault-Injection, Detection and Self-Repair*
Alan Purvis, Ben Morris, Richard McWilliam (Durham University, UK)



16:10–17:50 Industrial Workshop: Non-Destructive Testing for TES (Room 3) Chair:
Pavan Addepalli (Cranfield University)
On-Wing Aero-Engine Inspection : NDT on the Flightline
Tim Barden (Rolls-Royce, UK)
Radiographic CT Scanning for the Purpose of NDT as Part of the Focus on Emerging Technology in NDT Andrew Ramsey (Nikon Metrology, UK)
NDT Requirements for Advanced Thermal Management Components
Paul Phillips (HS Marston Aerospace Ltd, UK)

18:30 Bus Transfer to Dinner

Wednesday 4 November 2015

09:00–10:00 Advanced ICT for TES (Auditorium) Chair: Nikolaos Tapoglou (Cranfield University)

09:00–09:20 *Towards Software Performance Monitoring: An Approach for the Aerospace Industry*
Raúl González Muñoz , Essam Shehab (Cranfield University), Martin Weinitzke (Airbus Operations, DE), Rachel Bence, Chris Fowler (Airbus Operations, UK), Paul Baguley (Cranfield University)

09:20–09:40 *Security Aspects in Cloud Based Condition Monitoring of Machine Tools*
Stefano Tedeschi, Jörn Mehnen, Nikolaos Tapoglou, Roy Rajkumar (Cranfield University)

09:40–10:00 *Condition Monitoring in the Cloud*
E. Uhlmann (TU Berlin, DE & Franhofer IPK Berlin, DE), A. Laghmouchi, E. Hohwieler, C. Geisert (Franhofer IPK Berlin, DE)

10:00–10:40 Augmented Reality for TES (Auditorium) Chair: Nikolaos Tapoglou (Cranfield University)

10:00–10:20 *Secure Access Augmented Reality Solution for Mobile Maintenance Support Utilizing Condition-Oriented Work Instructions*
Matthias Neges, Mario Wolf, Michael Abramovici (Ruhr-Universität Bochum, DE)

10:20–10:40 *A 3D Immersive Discrete Event Simulator for Enabling Prototyping of Factory Layouts*
John Oyekan, Windo Hutabarat, Christopher Turner, Ashutosh Tiwari (Cranfield University), Neha Prajapat, Nadir Ince, Xiao-Peng Gan (Alstom Power, UK), Tony Waller (Lanner Group Limited, UK)

09:40–10:40 Product Lifecycle Design and Management (Room 1) Chair: Jörn Mehnen (Cranfield University)



- 09:40–10:00 *Method for Automated Structuring of Product Data and its Applications for Automated Structuring of Product Data and its Applications*
Sebastian Adolphy, Hendrik Grosser, Lucas Kirsch (Fraunhofer IPK Berlin, DE), Rainer Stark (Fraunhofer IPK Berlin, DE & TU Berlin, DE)
- 10:00–10:20 *Simulating Life Cycles of Individual Products for Life Cycle Design*
Yuki Matsuyama, Shinichi Fukushige (Osaka University, JP), Yasushi Umeda (The University of Tokyo, JP)
- 10:20–10:40 *Web-Based Process Planning for Machine Tool Maintenance and Services*
Shan Wan (Nanjing University of Science and Technology, CN), James Gao (University of Greenwich, UK), Dongbo Li, Yifei Tong, Fei He (Nanjing University of Science and Technology, CN)
- 09:00–09:40 No-Fault-Found (Room 4) Chair:** Piotr Sydor (Cranfield University)
- 09:00–09:20 *Minimizing Total Lifecycle Expected Costs of Digital Avionics’ Maintenance*
Raza Ahmed (Department of the President’s Affairs, Overseas Projects and Maintenance, Abu Dhabi, AE), Vladimir Ulansky (National Aviation University, UA)
- 09:20–09:40 *Probabilistic Machine Learning Could Eliminate No Fault Found*
Rodrigo E. Teixeira, Kari E. Morris, F. Christian Sautter (UAH Research Institute, US)
- 09:40–10:40 Industrial Workshop: No-Fault-Found (Room 4) Chair:** Tom Hardy (Rolls-Royce, UK) Piotr Sydor and Rohit Kavade (Cranfield University) will present NFF Benchmarking followed by an interactive NFF assessment with those attending.
- 10:40–11:10 Coffee Break** (Foyer)
- 11:10–11:50 Keynote 4 (Auditorium) Chair:** Tetsuo Tomiyama (Cranfield University)
Application of Augmented Reality Techniques in Through-life Engineering Services
G. Dini, M. Dalle Mura (University of Pisa, IT)
- 11:50–12:30 Keynote 5 (Auditorium) Chair:** Tetsuo Tomiyama (Cranfield University)
Service Computing for Through-Life Engineering
Soundar Kumara (The Pennsylvania State University, US)
- 12:30–13:30 Lunch** (Foyer)
- 13:30–14:10 Keynote 6 (Auditorium) Chair:** Andrew Starr (Cranfield University)
Innovative Changes for Maintenance of Railway by Using ICT–To Achieve “Smart Maintenance”
Atsushi Yokoyama (East Japan Railway, JP)



- 14:10–15:10** **TES for Railway Industry** (Auditorium) **Chair:** Andrew Starr (Cranfield University)
- 14:10–14:30 *Uncertainty of Net Present Value Calculations and the Impact on Applying Integrated Maintenance Approaches to the UK Rail Industry*
L. Kirkwood, E. Shehab, P. Baguley, A. Starr (Cranfield University)
- 14:30–14:50 *Creating Value by Integrating Logistic Trains Services and Maintenance Activities*
Marten Busstra (NedTrain, NL), Leo van Dongen (NedTrain, NL & University of Twente, NL)
- 14:50–15:10 *Performance Centered Maintenance as a Core Policy in Strategic Maintenance Control*
Jack I. Apallius de Vos (NedTrain, NL), Leo A.M. van Dongen (NedTrain, NL & University of Twente, NL)
- 14:10–15:10** **Maintenance Management** (Room 1) **Chair:** John Erkoyuncu (Cranfield University)
- 14:10–14:30 *Maintenance Requirements in Aerospace Systems*
Samir Khan (Coventry University, UK)
- 14:30–14:50 *Positioning of Spare Part Contracts in the Servitisation Process*
Davood Sabaei, John Erkoyuncu, Rajkumar Roy (Cranfield University)
- 14:50–15:10 *A Conceptual Framework to Assess the Impact of Training on Equipment Cost and Availability in the Military Context*
Duarte Rodrigues, John Erkoyuncu, Andrew Starr (Cranfield University), Steve Wilding, Alan Dibble, Martin Laity (Babcock International, UK), Richard Owen (Cranfield University)
- 15:10–15:40** **Closing & Award Presentation** (Auditorium) **Chair:** Rajkumar Roy (Cranfield University)
- 15:40–16:00** **Refreshments and Networking** (Foyer)
- 16:00** **Lab Visits**

Conference Dinner

Tuesday 3rd November 2015: Dinner at the Woburn Sculpture Gallery

Woburn Abbey, comprising Woburn Park and its buildings which include the Sculpture Gallery, was originally founded as a Cistercian abbey in 1145. Taken from its monastic residents by Henry VIII and given to John Russell, 1st Earl of Bedford, in 1547, it became the seat of the Russell family and the Dukes of Bedford. The Abbey was largely rebuilt starting in 1744 by the architects Henry Flitcroft and Henry Holland for the 4th Duke.

We will be organising coaches to take you to the conference dinner from the recommended hotels. Details of this transport will be announced at the conference. If in any doubt please ask at the registration desk.

If you have booked a hotel outside Cranfield, please let us know the details of your accommodation so that we can if possible arrange transport for you to the dinner or otherwise advise how to get there.

For accompanying guests costs, please contact Mrs Lauren Dalzell on

Tel: +44 1234 750111 x 4031

Email: lauren.dalzell@cranfield.ac.uk

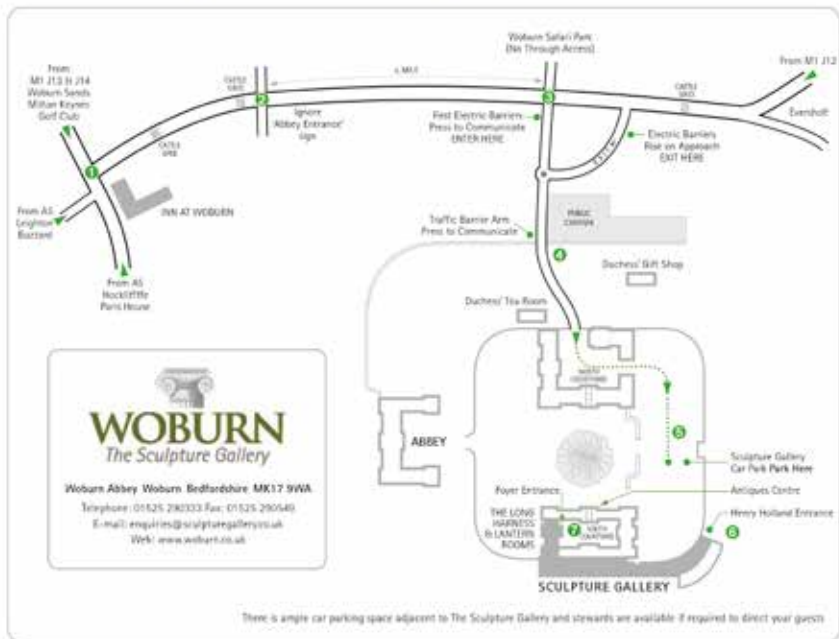
Dress code for Dinner: *"smart casual"*

Woburn Sculpture Gallery
Woburn Abbey
Woburn
Bedfordshire
MK17 9WA



The Sculpture Gallery

Location and Access



Directions from Woburn village

- 1 From Woburn village, at the junction by the Inns at Woburn, turn towards Woburn Abbey.
- 2 Cross over two cattle grids, ignore the Abbey visitor entrance on right.
- 3 Carry on to the top of the hill and turn right at the entrance with electric barriers. Ignore 'Delivery Vehicles Only' sign. To the right of the barriers is an intercom button, press to communicate.
- 4 Once through the barriers continue down the access road, past the main car park on your left and drive through the opening arch in the wall ahead, through the barrier, over small a cattlegrid.
- 5 Continue past the Duchesses' Tea Room on your right. Drive into the North Courtyard and on through the only accessible archway to your left and park in the gravel parking area to your right.
- 6 The Henry Holland corridor is located at the far end of The Sculpture Gallery car park or walk onto the roundabout with the large cedar tree and into the courtyard with the Antiques Centre.
- 7 The Foyer Entrance is through the archway and immediately ahead to your right.

By Road

Woburn Abbey is ideally situated being just 4 miles west of the M1 between junctions 12 and 13, giving easy access from most areas of the country.

Milton Keynes, Leighton Buzzard, Bedford, Cranfield	20 miles
Watford, Northampton, Aylesbury	45 miles
London, Oxford, Cambridge, Rugby	1 hour
Leicester, Coventry	1 hour 15 mins
Birmingham, Nottingham, Reading	1 hour 30 mins
Sheffield, Stoke, Swindon	2 hours
Leeds, Manchester, Bristol	2 hour 15 mins

By Rail

Stetchley and Milton Keynes to Euston	50 minutes
Fitzwick to Kingstons	1 hour
Fitzwick station direct to and from Gatwick	1 hour 40 mins

By Air

Eaton Airport	35 mins
Heathrow	1 hour 30 mins
Stansted	1 hour 30 mins
Gatwick	2 hours
Birmingham Airport	1 hour 30 mins

On-Campus Shopping

Costcutter: Grocer, off-licence, video rental, newsagent. Open Monday to Friday 08.00 to 19.00. Saturday 08.30 to 16.00. Sunday 10.00 to 13.00.

Post Office Counter (in Costcutter): All Post Office service except car road tax. Open Monday to Thursday 09.00 to 17.00. Friday 09.00 to 16.30. It is closed on Saturday and Sunday. Post is collected from the red pillar box outside the shop Monday to Friday at 10.45 and 17.30, Saturday at 10.15, and Sunday at 11.15.

Santander Bank: College Road, Cranfield University. Open Monday, Tuesday, Thursday, and Friday 10.00 to 18.00. Wednesday 10.00 to 17.00. Cash Point (24 hours) accepts NATWEST cards, MasterCard, Visa, Cirrus, EuroCard, and others. Telephone 0845 6013366

Boys to Men: Hairdressers open Monday to Friday from 08.45 to 17.45 and Saturday from 08.30 to 13.15.

CSA Shop (Building 114): Sells stationery, clothing, snacks, and Cranfield memorabilia. Open Monday to Friday 08.30 to 18.00.

The Café Bookshop: A café and a bookshop selling hot and cold drinks, homemade cakes and snacks and books. Open Monday to Friday: 08:30 to 18.00.

Wharley End Garage and Shop: Petrol station and car care. Stocks groceries, milk, sandwiches, sweets, and car accessories. Open Monday to Friday 07.30 to 19.00, Saturday 08.30 to 17.30, and Sunday 09.00 to 17.00.

Cinemas and Theatres

Cineworld: Xscape, Marlborough Gate, Central Milton Keynes. Website www.cineworld.co.uk
A new entertainment complex featuring a 16 screen cinema, a ski slope, health complex, family leisure centre, shops and restaurants. Information and booking, telephone 01908-685000.

ODEON: Milton Keynes Stadium is situated on Stadium Way next to the MK Dons Stadium. Website: www.odn.co.uk. The cinema has 11 screens including an IMAX and two Dolby Atmos. It's offers include a VIP Gallery experience, premier seats, Metropolitan style Costa, Ben and Jerry's and SNOG. It is located in between seven restaurants, TGI Fridays, Prezzo, Frankie & Benny's, Pizza Express, Chimichanga, Bella Italia and Nandos.

Milton Keynes Theatre and Gallery: Midsummer Boulevard, Central Milton Keynes. 01908-606090. www.mkweb.co.uk/mktheatre. A new theatre and gallery for Milton Keynes offering a wide range of entertainment: musicals, ballet, opera, plays, contemporary and traditional exhibitions.



Food and Refreshments on Campus

Mitchell Hall

Self-service restaurant open seven days a week serving beverages and snacks throughout the day with meals at set times. Monday to Friday: Breakfast 07.30 to 09.30, Lunch 12.00 to 13.45, Dinner 17.15 to 19.30 (7.15 pm on Friday). Weekends: Breakfast 07.30 to 10.00, Brunch 11.00 to 13.45, Dinner 17.15 to 19.15.

Mitchell Hall Bar & Bistro

The bar is open lunchtimes and evenings Monday to Friday. The Bistro serves sandwiches and ploughman's lunches Monday to Friday 12.00 to 14.00. Bar is also open Monday to Friday 17.30 to 23.00.

Stafford Cripps

Self-service restaurant open Monday to Friday from 10.00 to 14.30, serving coffee, tea, and snacks. Lunch 12.00 to 13.45.

College Arms

Lively bar serving morning coffee, bar snacks and specialty pizzas lunchtimes Monday to Friday and every evening including weekends. Open from 11.00 to 23.00.

Cranfield Students Association (Building 114)

Student café and bar serving hot and cold food, drinks and snacks from 08:30 to 23:00 Monday to Friday with slightly more limited hours at weekends.

Chinese Uncle Lim's

Located in the Social Club, Uncle Lim's is a Chinese Food restaurant and takeaway. Open Tuesday - Friday 5pm-10:30pm. Saturday 12-2pm & 5pm-10:30pm. Sunday 5pm-10:30pm. Closed Monday.

Public Houses

Astwood: The Old Swan, Tel: 01234-391351, 17th Century thatched public house. Good food at reasonable value. Play area outside.

Cranfield: Cross Keys, Tel: 01234-750213, The Swan, Tel: 01234-750332. Traditional pub games: skittles, darts and pool.

How to find us

Cranfield campus is located almost midway between the towns of Bedford and Milton Keynes and is conveniently situated between junctions 13 and 14 of the M1.

Car Travel – Post Code MK43 0AL

From London and the South

Take the M1 north to junction 13. At the roundabout, take the 4th exit signposted A507 in the direction of Bedford. At the second roundabout, take the second exit signposted to Cranfield, Hulcote and Salford. Continue along this road to Salford and turn right at T-junction, signposted Cranfield. Follow this road to the end and go straight across the first roundabout, right at the second, then left at the third. With the petrol station on your left go straight over the mini-roundabout, and the entrance to the University is the first road on your right - signposted 'Main Reception'.

From Birmingham and the North

M1 south to junction 14. Take A509 in direction of Wellingborough, then immediately first right, proceed through Moulsoe, then turn left following signposts.

From Bedford and the East

A428 then A422 west, exiting left into Astwood (7m), then left again following signposts. Or A421 south-west towards M1/Kempston/Milton Keynes, taking exit towards Cranfield/Marston Moretaine, then follow signposts towards Cranfield and then Cranfield University.

From Oxford and the West

Follow A34, then A421, to Bicester, Buckingham and Milton Keynes. In Milton Keynes follow signs to M1 North (junction 14). Take A509 in direction of Wellingborough, then immediately first right, proceed through Moulsoe, then turn left following signposts.

Parking Advice

Vehicle Permits are required for all vehicles parking on the Cranfield campus. Visitor Vehicle Permits can either be issued to visitors prior to their arrival or created on the day at the main reception.

Rail travel

From London St Pancras to Bedford. A bus service is available from Bedford to Cranfield University (see 'Bus Travel').

London Euston to Milton Keynes Central. Frequent, fast services. A bus service is available from Milton Keynes station to Cranfield University (see 'Bus Travel').



Air travel

London Luton

Our nearest public airport is London Luton which is situated just off Junction 10 of the M1.

From here you can catch a train direct from Luton Airport Parkway station to Bedford Station (A shuttle bus service is available from the terminal building to the Luton Airport Parkway Station).

On arriving at Bedford Station we recommend you take a taxi to the campus (see 'Taxi Information').

You can reserve a cab direct from the Luton Airport to the campus, approx. 25 minute drive. (see 'Taxi Information').

Other surrounding airports

There are good airport links from several airports around Cranfield. These include:

- London Heathrow
- London Stansted
- London Gatwick
- City Airport
- Birmingham Airport

There is information about travel from these airports to Cranfield via Milton Keynes and Bedford on their websites.

Please use the campus postcode 'MK43 0AL' as destination for the travel planner.

Cranfield Airport

Private, executive air travel is also an option to Cranfield campus via Cranfield Airport.

National Express

National Express runs coaches from several major UK airports to nearby towns.

Taxi Information

These taxis are 'Private Hire' and have flat a rate on certain routes: for example, approximately £10 between the Cranfield campus and Milton Keynes Central Railway station, £32.50 between Cranfield and London Luton Airport, and £65 between Cranfield and London Heathrow Airport. If you require taxi transportation from airports to Cranfield, it is recommended to book a cab well in advance through these numbers 'Private Hire' taxis are normally cheaper than 'Black Cabs' and will require telephone bookings.

Milton Keynes Taxi Firms

Skyline
01908 222111

Speedline
01908 260260

Raffles
01908 222222

Milton Keynes Taxis
01908 980006

Approximate prices for a taxi from the following airports are:

- Luton Airport £30*
- Heathrow Terminals 1, 2 & 3 £60*
- Heathrow Terminals 4 & 5 £65*
- Stansted Airport £70*
- Gatwick Airport £90*
- Docklands London City £70*
- Birmingham Airport £65*
- East Midlands Airport £70*

*Please note: drop off/pick up and waiting charges may apply.

Bedford Taxi Firms

AGS	Anglia Cars	24-7 Cars
01234 218888	01234 320032	01234 511247

Bus Travel

Please note that different companies refer to the University in different ways. The main bus stop is named either as 'Cranfield University' or 'Wharley End' (Cranfield), Cranfield University main gate'.

Buses to and from Bedford Bus Station (Bedford Railway Station is 10 minute-walk):

Cranfield Connect (Uno) - Route C1 & C10 (C11 weekends only)
Stagecoach - Route 53

Buses to and from Milton Keynes Central Station via Milton Keynes Coachway:

Cranfield Connect - Route C1 & C10 (C11 weekends only)

If you have off-campus accommodation, these buses might have nearby stops.

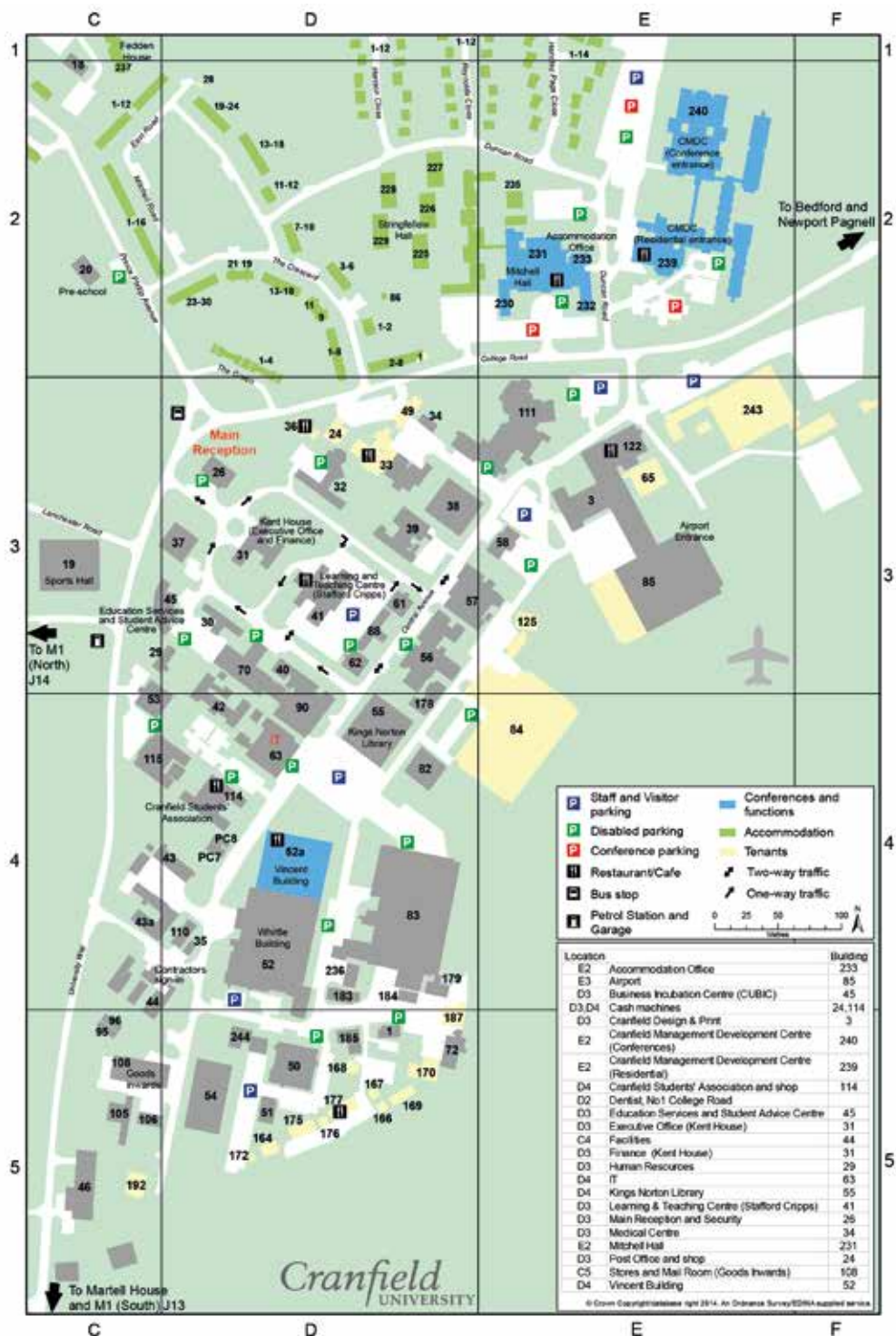
If you should have enquiries regarding the above bus services (including time tables and fares), please contact the relevant company direct via their website www.unobus.info and www.stagecoachbus.com

National Express

From London St Pancras to Bedford. (Take a taxi to Cranfield University).

London Euston to Milton Keynes Central. Frequent, fast services. (Take a taxi or a bus to Cranfield University).







Conference Pack Contents

- Conference Programme
- Call for Papers for TESConf 2016
- Summer School 2016
- Local wifi login details
- Pen



Emergency Contact:

Andy Shaw or Lauren Dalzell

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www.through-life-engineering-services.org/TESSConf/

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Industry Partners



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