



INCOSE UK

ASEC 2010

Annual Systems Engineering Conference

8th to 10th November 2010

Crowne Plaza Hotel, Heythrop Park Resort, Enstone, Chipping Norton, Oxfordshire

"Systems Engineering: Adding Value in Challenging Times"

We live in challenging times - budgets are shrinking, and customers are increasingly looking for value-for-money solutions, with the added complication of a perceived shortage of systems engineers across many industry sectors.

These are the challenges that Systems Engineering needs to address:

- driving down costs by effectively managing uncertainty on projects
- developing novel solutions that address the actual stakeholder problems
- promoting a systems approach as the cornerstone of good engineering practice

INCOSE UK invites you to attend ASEC 2010 and share your views on how the Systems Engineering community can move things forward.

For the latest information visit our conference web site: www.incoseonline.org.uk

Welcome to ASEC 2010

The 2010 INCOSE UK 3-day Annual Systems Engineering Conference (ASEC 2010) is a showcase of best practice in Systems Engineering and its benefits to the widest possible audience.

Our aim is to create the premium annual Systems Engineering conference in the UK, combining the very best features of previous INCOSE UK Spring and Autumn events and continuing to provide a unique opportunity for organisations and individuals to meet and share ideas.

ASEC 2010's new format offers a mixture of **keynote speakers** representing the challenges of our increasingly "Systems World", **paper presentations** giving an insight into some of the real world situations where INCOSE UK members are adding value, **invited speaker sessions** highlighting the best of the technical activities of INCOSE UK, **workshops** to allow smaller groups to look at a topic in detail and finally **tutorials** providing opportunities to learn more about Systems Engineering techniques and approaches.

This year's theme considers the value of Systems Engineering in 'Challenging Times'. The 'Value' of Systems Engineering in this context includes:

- Applying a Systems Approach to complex real world 'System of Systems' problems. Our first keynote speaker, **Professor Brian Collins** - *Chief Scientific Adviser,*

Department for Transport, will talk about the challenges of an integrated approach to ground transport, rail and infrastructure. We will also consider the challenges of dealing with System of Systems properties such as Safety and Resilience.

- How to get the most value out of Systems Engineering in engineering or service delivery organisations. Our second keynote speaker, **Peter Price** - *Director of Engineering and Technology (Civil Aerospace) at Rolls-Royce*, will talk about the role of Systems Engineering within his organisation. We will also have sessions on Systems Engineering skills, competencies and case studies from across the INCOSE community.
- Getting the most value from specific Systems Engineering activities. This will include the work of some of the INCOSE UK technical working groups, together with detailed workshops and tutorials. These will be complemented by an exhibition of Systems Engineering suppliers, tool vendors and specialist consultancies.

Please share your experiences to enrich our understanding and advance our profession. The event is also an excellent opportunity to network and discuss issues with key people and colleagues. As always, there will be a conference dinner with a distinguished after-dinner speaker, Professor Alan Smith of UCL. His theme is described later in this brochure.

A message about ASEC 2010 from the UK President



Most of us will have experienced firsthand spending constraints in the current economic climate. This is of major importance when one of the key messages of Systems Engineering is upfront investment in correct problem identification, definition and planning, to prevent the costs of having to correct errors. This investment can be difficult to achieve when money is tight. This year's event looks at demonstrating the value of Systems Engineering in these challenging times.

In this spirit of austerity, INCOSE UK has decided to arrange a single Annual Systems Engineering Conference (ASEC 2010) where contributors bring a wide range of experience applying Systems Engineering in different domains.

On behalf of INCOSE UK, I look forward to welcoming you all to this new annual conference, where you will have the opportunity to share experiences, network, and discuss/debate issues with fellow Systems Engineering professionals from a wide range of organisations. It is also an opportunity to enjoy catching up with existing acquaintances as well as making new friends from the UK's Systems Engineering community.

Finally, I would like to invite you to attend the INCOSE UK Annual General Meeting on the Monday evening after the day's events. This is your opportunity to find out from INCOSE UK's leadership team about the organisation, its activities, and to ask questions or provide feedback.

Dr Doug Cowper
INCOSE UK President

ASEC 2010 - Programme Overview

Please note: each morning there will be a plenary session in the Conference Theatre. Each afternoon you have a choice of **either** attending the Conference Theatre sessions, or selecting one of two parallel tutorials/workshops. These are **limited to a maximum of 30 delegates** each. Registration is open each day from 8:00 am. Detailed session descriptions will be found on the following pages.

Day 1: Monday, 8th November - Morning

09:00	Introduction to Day 1
09:10 – 10:00	Keynote Speaker: Professor Brian Collins – <i>Chief Scientific Adviser, Department for Transport</i>
10:00 – 10:40	Hillary Sillitto: <i>Ultra-Large-Scale Systems</i>
10:40 – 11:10	Coffee
11:10 – 11:50	Nic Plum and Chris Lowe: <i>Human Factors On The Right TRAK</i>
11:50 – 12:30	Merfyn Lloyd and Simon Masley: <i>Engineering Solutions to Complex Problems – Can Open Architectures Help?</i>
12:30	Lunch

Day 1: Monday, 8th November - Afternoon

	Conference Theatre		Tutorial		Tutorial
13:30–15:00	Colin Wood et al: <i>TRAK – An Architecture Framework for Rail</i>	OR	Stuart Burge: <i>How to Use Quality Function Deployment to Improve your Systems Engineering</i>	OR	Ian Presland: <i>Burden or Benefit? 10 Ways to a Better SEMP</i>
15:00–15:30	Coffee				
15:30–17:00	Professor John McDermid: <i>Systems of Systems Safety Engineering: Challenges and Strategies</i>				
17:30–18:30	INCOSE UK Annual General Meeting				
19:30	Conference Dinner with guest speaker: Professor Alan Smith (UCL): <i>Exploration of the Moon</i>				

Day 2 : Tuesday, 9th November - Morning

09:00	Introduction to Day 2
09:10 – 10:00	Keynote Speaker: Peter Price – <i>Director of Engineering and Technology, Civil Aerospace, Rolls-Royce</i>
10:00 – 10:40	Ian Presland and Andy Medwell: <i>A New Approach to Automated Process Tailoring</i>
10:40 – 11:10	Coffee
11:10 – 11:50	Paul Gibbons: <i>Introducing a Value Improvement Model for Repetitive Processes</i>
11:50 – 12:30	Adam Cannell and Nick Flynn: <i>The New Prestwick ATC Centre: Delivering through the Systems Approach</i>
12:30	Lunch

Day 2 : Tuesday, 9th November - Afternoon

	Conference Theatre		Tutorial		Workshop
13:30 – 15:00	Alan Smith et al: <i>SE and Project Management: Accommodate or Integrate?</i>	OR	Alan Knott et al: <i>SE Practices in the UK Rail Industry</i>	OR	Adrian Terry: <i>Developing Systems Thinking Potential as an Organisational 'Capability'</i>
15:00 – 15:30	Coffee				
15:30 – 17:00	An Update from the Capability Working Group				

Day 3 : Wednesday, 10th November - Morning

09:00	Introduction to Day 3
09:20 – 10:00	Professor Philip M'Pherson: <i>Peradventure Modelling – Systems Thinking returns to Systems Engineering</i>
10:00 – 10:40	Adrian Terry et al: <i>Systems Thinking Research – Grappling with Complex Real World Problems</i>
10:40 – 11:10	Coffee
11:10 – 11:50	Gary Smith and Dr Sotiris Missailidis: <i>Developing a New Understanding of Inflammation and Disease – Seeing Truth beyond Dogma with Systems Thinking</i>
11:50 – 12:30	Jon Holt et al: <i>The Great Escape – a Case Study of Systems Modelling for Safety-Critical Systems</i>
12:30	Lunch

Day 3 : Wednesday, 10th November - Afternoon

	Conference Theatre		Workshop		Tutorial
13:30 – 15:00	Bruce Elliott: <i>Improving the Practice of SE for In-Service Systems</i>	OR	Rick Adcock and Hillary Sillitto: <i>BKCASE</i>	OR	Keith Collyer and Hazel Woodcock: <i>Remember the Future - Creating a Clean Archaeological Record for In-Service Use</i>
15:00 – 15:30	Coffee				
15:30 – 17:00	Richard Beasley: <i>Keeping It Simple</i>				
17:00	Close				

Although INCOSE UK will make every effort to provide the programme as advertised, it may become necessary, for reasons beyond our control, to make changes to speakers and/or to the timing and content of the programme. INCOSE UK will not be liable for any costs incurred by delegates in relation to such changes.

09:10 - 10:00 : Keynote Speaker

Professor Brian Collins, *Chief Scientific Adviser, UK Department for Transport*

“Possible Approaches to the Complex Real World of ‘Systems of Systems’ Problems - the Case of Transport”



The development of a sustainable transport infrastructure, consisting of the modes of road, rail, aviation and shipping, together with the built and natural environments and users, presents an exquisitely ‘wicked’ problem to the systems thinker. The temptation to divide the infrastructure for purposes of analysis, investment and operation is nearly irresistible. This

results in a number of aspects of the properties of the real systems of systems being unknown until they either cause major disruption or failure. Furthermore, this traditional approach takes little account of imported dependencies upon or exported assumptions about other man-made infrastructure systems such as energy, water, and ICT. This talk will describe approaches that are being considered to address

such a wicked problem with a view to promoting more sustainable investment in transport infrastructure for the future.

Professor Brian Collins joined the Department for Business Enterprise and Regulatory Reform (BERR), now Business, Innovation and Skills (BIS) in May 2008 as its Chief Scientific Adviser (CSA). Professor Collins is also CSA at the Department for Transport. His role is to provide scientific and engineering advice to the Secretaries of State and Ministers, ensuring the use of sound scientific, engineering and technological evidence across the Departments. He is also Head of Profession for the Department’s scientists, engineers and technologists, and Professor of Information Systems at Cranfield University. Previously he has held senior positions at Clifford Chance, The Wellcome Trust, and was Chief Scientist and Director of Technology at GCHQ and Deputy Director of RSRE at Malvern. Professor Collins is a graduate of Oxford University, where he read Physics and also obtained his doctorate in astrophysics. He is a Fellow of the Royal Academy of Engineering, the Institute of Engineering and Technology, the Institute of Civil Engineers and the Institute of Physics.

10:00 - 12:30 : Plenary Session Presentations

<p>10:00</p>	<p>Ultra-Large-Scale Systems Hillary Sillitto: <i>Thales</i></p>	<p>Ultra-Large-Scale Systems (ULSS) are a major new challenge for systems and software engineering. Current engineering practice is ahead of the science – we are building systems we do not know how to characterise or analyse, and whose behaviour we cannot fully predict. ULSS are characterised by complexity, dominated by emergence, and exist in a state of constant reconfiguration and evolution – all of which make untenable a reductionist approach to engineering and a “closed system” approach to specification and certification.</p> <p>This paper recommends ten design principles and five design practices for ULSS, drawing on known Systems Engineering practice and an understanding of how complexity science is applied in other domains. The paper offers practitioners a strategy and a practical approach to deal with ULSS – or indeed any system that is larger scale and more complex than those they are accustomed to dealing with – and shows academics some possible routes to addressing the research challenges set out in the SEI (Software Engineering Institute) report on ULSS.</p> <p>We are delighted to say that a version of this paper was presented at the INCOSE International Symposium 2010 in Chicago and won a best paper award.</p>
<p>11:10</p>	<p>Human Factors - On the Right TRAK Chris Lowe: <i>Liv Systems</i> Nic Plum: <i>Eclectica Systems</i></p>	<p>This presentation is about applying a user-centred design (UCD) approach to unusual things: the design of a UK rail industry architectural framework called TRAK and its use for Human Factors work in a challenging Systems Engineering environment.</p> <p>This architectural framework, if it is to be usable, has to address a number of challenges. The framework needs to unite or integrate the different stakeholder viewpoints on the same underlying system or problem. The framework also needs to be usable by these different stakeholders.</p> <p>In applying UCD, the emphasis has been placed on consistency, simplicity and ease of use, and as a system it is essential that not only does it embed HF principles in its design but also that it should support the practical needs of Systems Engineering disciplines. For this reason, we will also describe how TRAK supports the needs of practitioners with reference to studies conducted within the Rail Industry.</p>
<p>11:50</p>	<p>Engineering Solutions to Complex Problems – Can Open Architectures Help? Merfyn Lloyd and Simon Masley: <i>Defence Equipment and Support, UK MOD</i></p>	<p>The answer to complex problems is not always a technical one in the sense of design and build but can be about setting the conditions in which the problems can be resolved. This was the approach taken by UK MOD’s Generic Vehicle Architecture (GVA) project which had to resolve a range of issues across a mixed fleet of operational vehicles in Afghanistan.</p> <p>The project took three views of the problem space: operational, acquisition and Systems Engineering. From this, eight factors were found which needed to be balanced through the Systems Engineering process. This was done by developing an open, scalable, modular common infrastructure for the Land domain of which the vehicles would be a part. From this a Defence Standard, rather than a design, was developed for vehicles defining the standards to be used to control the interfaces on the infrastructure allowing MOD to achieve the benefits it sought without constraining industry in delivering solutions.</p>

Programme : Monday, 8th November - Afternoon

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13:30 - 17:00 : Parallel Tutorials

How to Use Quality Function Deployment to Improve your Systems Engineering

Stuart Burge: *Partner, Burge Hughes Walsh*

Quality Function Deployment (QFD) presents a prima facie case for being an extremely powerful Systems Engineering tool. In essence it can help an organisation:

- translate vague "customer" requirements into clear, precise measurable system design requirements;
- identify acceptance and qualification criteria;
- accurately flow-down requirements;
- determine sub-system requirements;
- manage requirements;
- and much more.

Based upon a sequence of matrix charts, QFD provides a logical and systematic methodology for capturing and organising the requirements translations necessary for effective and efficient new system introduction. Despite being able to address many of the concerns of the Systems Engineer, QFD has received little or no attention from the Systems Engineering community.

The purpose of this tutorial is to demonstrate the power of QFD and show why it should be a key tool in every System Engineer's tool box. The specific objectives are to:

- Describe the basic principles of QFD and its benefits;
- Explain how QFD often fails in practice;
- Introduce a systems approach to QFD;
- Practise QFD through a simple case study;
- Introduce participants to System Function Deployment.

The tutorial is specifically aimed at those individuals who are involved in analysing and interpreting requirements, writing sub-system requirements and the validation and verification thereof.

Burden or Benefit -10 Ways to a better SEMP

Ian Presland: *Thales Training and Consultancy*
www.thales-trainingconsultancy.com

Is the System Engineering Management Plan (SEMP) a Cinderella or just an ugly sister in the Systems Engineering world?

For some, the SEMP is best kept out of sight, beavering away in the background, like the fairytale housemaid. For others it is a truly ugly sister, totally undesirable to get involved with and a pain which needs to be avoided at all times!

Perhaps the answer is that it is closer to Cinders, but only because you have the power to be fairy godmother, to shape the SEMP correctly, so that it can be the Belle of the Ball, loved by all.

This tutorial covers, through a combination of presentation and discussion of delegate experiences, key areas that cause issues in understanding, generation, maintenance and wider acceptance of the SEMP. This includes its overall value, its intended audience and its place as a process definition tool. The tutorial also looks at the document in relation to project cost and size estimation and how to encourage its use on a day-to-day basis. Tips are provided which it is hoped will mean delegates leave convinced that the SEMP does indeed have real benefit to their organisation.

This tutorial was originally delivered at the INCOSE International Symposium in Utrecht in 2008.

13:30 - 15:00 : Conference Theatre Session

TRAK - An Architecture Framework for Rail

Colin Wood: *London Underground Capital Programmes Directorate*

Nic Plum: *Eclctica Systems*

Andy Pryor: *SEA*

Systems Engineering extols, amongst other things, the virtues of having greater control and awareness of interfaces, sometimes called Interface Management. Systems Architecting is the activity of choice for delivering managed interfaces. Systems architecting of complex systems within and across different contractual boundaries requires a common architectural description language – aka an architecture framework.

While other sectors have been applying architecture frameworks for years, the rail sector has largely ignored them, perhaps thinking that they are over-complicated, another bureaucratic layer and just too difficult to roll-out successfully. It may have a point...

... but TRAK is different. It is easy for small, medium and large enterprises alike to get to grips with. It was developed by rail professionals for rail professionals. It is system-centric and has just enough to get the job done. Its open source means anyone can download it freely from the internet and start producing productive systems architecture diagrams straightaway. What is more, they are re-usable and shareable with partners.

This lively 60 minute joint presentation will explain TRAK and explore three case studies:

- An implementation of TRAK using Sparx Systems Enterprise Architect;
- Applying TRAK to interface management for the London Underground Sub-Surface Railway Upgrade;
- Applying TRAK to developing a functional architecture model of the UK railway.

15:30 - 17:00 : Conference Theatre Session

Systems of Systems Safety Engineering: Challenges and Strategies

Professor John McDermid: *University of York*

In many arenas, especially defence, there is a growing trend to deploy Systems of Systems (SoS) – collections of interacting systems, operating under different authorities. The use of SoS poses many challenges from a safety engineering perspective, including: How can hazards be identified? How can a safety case be produced (or do we need multiple safety cases)? How can safety be controlled when the composition of the SoS changes?

These are difficult problems, not least because some of the classical approaches of safety engineering, eg the focus on failure, are no longer sufficient. However, there are some emerging strategies, eg use of simulation to assess hazardous scenarios, use of a network of interdependent safety and assurance cases, and dynamic assessment of risk.

The session will set out some of the key problems and outline some emerging problems in order to stimulate discussion.

09:10 - 10:00 : Keynote Speaker

Peter Price, *Director of Engineering and Technology, Civil Aerospace, Rolls-Royce*
 “Systems Challenges in the Development of Aero Gas Turbines”



A high level of technology is needed to enable the aero gas turbine engine meet its technical requirements. On top of this, the engine is made up of a great number of complex parts that have to be carefully integrated. One of the growing challenges is the expectation from the customer of a fully mature product at entry into service. Peter will describe the scope of these

challenges, and describe the need for Systems Engineering skills in Rolls-Royce to help with successful and effective development of gas turbine engines. He will present the corresponding challenge to the Systems Engineering

community for approaches and methods that can be effectively integrated into the successful engineering at Rolls-Royce.

Peter was appointed Director of Engineering and Technology for Rolls-Royce Civil Aerospace based in Derby, UK in 2005. His previous position was Director of Engineering for Rolls-Royce Defence Aerospace. He joined Rolls-Royce in 1980 as a graduate trainee and has held a number of positions covering combustion engineering, technology capability and demonstration, new product development, in-service engine programmes and business programme management. Peter gained a Bachelor of Science degree in Aeronautics and Astronautics from Southampton University. He received the Royal Academy of Engineering Silver Medal in 2005 for his contribution to vertical lift propulsion developments and was elected a Fellow of the Royal Academy of Engineering in 2008. He is also a Chartered Engineer, Fellow of the Royal Aeronautical Society and Chair of Governors at the John Cabot Academy in Bristol, UK.

10:00 - 12:30 : Plenary Session Presentations

<p>10:00</p>	<p><i>Bringing Savile Row to your Systems Engineering Wardrobe: A New Approach to Automated Process Tailoring</i> Ian Presland: <i>Thales Training and Consultancy</i> (www.thales-trainingconsultancy.com) Andy Medwell: <i>Purple Secure Systems</i> (www.purplesecure.com)</p>	<p>Many organisations are attempting to capture Systems Engineering ‘best practice’ by converging diverse processes into canonical standards. This is challenging, especially where the business delivers a diverse range of systems; best practice for one class of development may be entirely inappropriate for another.</p> <p>In deploying engineering process, best practice must inevitably be tailored to the needs and scale of each specific programme and the challenge for process architects is to devise a mechanism that takes the expertise and effort out of process tailoring.</p> <p>Within Thales, we have been addressing this issue. A tool has been developed and trialed that performs automated tailoring of best Systems Engineering practice based upon programme characteristics.</p> <p>This presentation summarises the concepts behind the tool and demonstrates how these have eased the problems of process convergence, optimisation and evidence gathering.</p>
<p>11:10</p>	<p><i>Introducing a Value Improvement Model for Repetitive Processes</i> Paul Gibbons: <i>Gatwick Airport and the Systems Centre, University of Bristol</i></p>	<p>Building on the Lean and Six Sigma conceptual frameworks, this presentation will introduce a conceptual model for improving value in repetitive processes taking a Systems Engineering perspective. The objective is to stimulate sustainable competitive advantage by applying a value improvement model for delivering better effectiveness and efficiency of resource bundles, providing a service to repetitive processes.</p>
<p>11:50</p>	<p><i>The New Prestwick Air Traffic Control Centre: Delivering through the Systems Approach</i> Adam Cannell and Nick Flynn: <i>NATS</i></p>	<p>This presentation will focus on the New Prestwick Centre (NPC) project, comparing and contrasting it with previous NATS projects. We will show that by adopting a systems approach and by applying consistent processes, in spite of all the challenges encountered, the project was delivered on time and to budget.</p> <p>One of the key challenges was transitioning 29 major systems to purpose-built world class facilities while continuing to maintain full capacity and service levels on a 24/7 basis.</p> <p>The project would not have succeeded without the use of disciplined system integration techniques proving that they are vital in managing complex projects where there are tightly-coupled interdependencies between separate systems, their processes and the people who operate and manage them.</p>

Programme : Tuesday, 9th November - Afternoon

13:30 - 17:00 : Parallel Tutorial and Workshop

Systems Engineering Practices in the UK Rail Industry

Alan Knott: *Parsons Brinckerhoff*
Duncan Kemp: *Department for Transport*
Brian Halliday: *Network Rail*
Kuldeep Gharatya: *London Underground*
Jon Elphick: *Atkins*

The UK Rail industry has introduced some very strong, robust engineering practices over the last century or so. Many of these 'good practices' have been developed by systems thinkers and have at their heart some sound Systems Engineering principles (albeit they were not labelled as such at the time). However, over time, this has led to discipline-based silos of 'traditional' engineering which have become resistant to the introduction of new concepts, such as those offered by advanced Systems Engineering practices used by more technologically driven industries. But this is changing...

Thanks to the efforts of a hardy group of committed Systems Engineers, the UK Rail industry is starting to adopt the methods that have been proven in other industries and which are delivering real benefit to the designers, constructors, operators and maintainers of the infrastructure and rolling stock that forms our railway system network.

Come and learn from the leaders in their fields how UK Government policy makers, engineers and operators are transforming our railway industry using a variety of adopted, adapted and newly developed innovative Systems Engineering practices. The content will be of interest to both new and experienced Systems Engineering practitioners, especially those from other industries and those looking for new challenges.

Developing Systems Thinking Potential as an Organisational 'Capability'

Adrian Terry: *Achievement Advance Ltd and Visiting Fellow at Bristol University's 'Systems Centre'*

Emerging work from the Systems Centre at Bristol University indicates the nature of the boundary between systems thinking and non-systems thinking engineers and project managers in organisations. Two perspectives are becoming apparent. These perspectives drive the two 'world views' apart leading to conflict, slowing project progress, reducing creativity and diminishing the overall value to their organisation.

Understanding these world-views yields insights into:

- How to get the best from 'systems thinkers' in a 'traditional engineering environment'?
- What tools and techniques might be used to 'bridge the gap'?
- What type of work environments systems thinkers may find most effective and how it may differ?
- How to harness the strengths of both populations to advantage?

This workshop will explore these preliminary findings and, more importantly, provide insights, approaches, tools and techniques to help manage at the boundary.

Participants will get an opportunity to participate in the 'VIEW® Problem-solving Style Psychometric', which has been used to gather this early evidence, and will receive individual reports of their approach to handling problems, dealing with change and making decisions.

They will leave with a clearer understanding of how they can tackle problems and manage change, with ideas on how to harness the different perspectives to deliver more robust and creative responses to complex challenges.

13:30 - 15:00 : Conference Theatre Session

Systems Engineering and Project Management: Accommodate or Integrate?

Alan Smith: *University College London*
Heather Rolls: *Ultra Electronics*
David Venn: *QinetiQ*
Les Oliver: *MBDA*

One of the problems facing Systems Engineering today is how to effectively implement practice in organisational structures based on a traditional hierarchy combined with a project portfolio. But is this a new problem? If not, why hasn't it been solved already? Many organisations still treat Systems Engineering and Project Management as different and separate activities. In this session we look at this issue, explore the principles of a Systems Engineering approach and a more traditional Project Management approach and investigate how they can be conceived of as a single integrated activity.

15:30 - 17:00 : Conference Theatre Session

An Update from the Capability Working Group

Led by members of the Capability Working Group (CWG)

Since the first meeting of the CWG in September 2009, a small team has been working to understand the variety of views of what the terms Capability and Capability Engineering mean in different contexts. Using some of the techniques of Soft Systems Methodology, this sub-group has explored a number of World Views (Weltanschauungen) and their relationships both to Jack Ring's Value Cycle in particular and to Systems Engineering in general, the results of which have been captured in a White Paper. This session will present the workshop findings with the objective of bringing a wider audience up to speed with the work so far.

It will invite comments on the World Views presented, test the assertion that they represent a sufficiently full set to provide a reliable reference for future work, and seek wider views as to how the CWG should build on the work to date for the benefit of the membership at large.

Attending this session will bring you up to date with the latest thinking on this very current topic, and you should be prepared to join in what promises to be a lively debate!

09:00 - 12:30 : Plenary Session Presentations

09:20	<p>Peradventure Modelling: Systems Thinking returns to Systems Engineering Professor Philip M'Pherson</p>	<p>INCOSE UK has been rediscovering the importance of Systems Thinking (ST) to the philosophy and practice of Systems Engineering (SE) – (see 'Z Guides' Z6 and Z7). This paper is in sympathetic support, but it extends the usual SE lifecycle framework into an integrated multi-level model that brings ST to each phase and level. It reveals the complexity entailed for system design, support, procurement and management. The procedure is called Peradventure Modelling (PraM), because "Peradventure" connotes the excitement and uncertainties of an original holistic future-system survey. PraM is a bit like data fusion except that some "sensors" are trained onto the future!</p> <p>PraM is a progressive development from original ST and SE thinking. It is System Survey-orientated and embodies a loopy lifecycle with nine levels (Value, Context, Requirements, Resources, Architecture, LC Support, Risk, Monitoring, and Evaluation). The matrix cells survey all the interacting intellectual, technical and managerial problems entailed by the delivery of the desired future-system. The Survey has to identify the 'right' future-system, as well as flag the integrated managerial system for its through-delivery.</p>
10:00	<p>Systems Thinking Research - Principles to Grapple with Complex Real World Problems Adrian Terry, Mike Yearworth, Professor Patrick Godfrey, Gordon Edwards: Systems Centre, University of Bristol</p>	<p>We recognise that systems research is of necessity needs-driven and that this presents certain challenges in framing a research agenda for Systems Engineering. These challenges can be characterised along three main dimensions i) the need for practical principles that guide systems thinking pedagogy such that we can be effective in delivering needs-driven research; ii) the potential for conflict between industry needs-driven research and traditional academic processes; and iii) the need for rigour in systems research methodology. In this paper we primarily focus on the first of these challenges.</p> <p>A unifying framework for systems thinking research has been developed based on the following seven principles: purposefulness, balance of breadth and depth, harnessing diversity, clarifying boundaries, building confidence and momentum for change, communicating in the language of stakeholders and stimulating further learning. These principles will be used to underpin the further development and teaching of practically oriented systems research methodologies so enabling problems associated with complex real-world systems to be addressed.</p>
11:10	<p>Developing a New Understanding of Inflammation and Disease – Seeing Truth beyond Dogma with Systems Thinking Gary Smith: Perses Biosystems Dr Sotiris Missailidis: Open University</p>	<p>Systems Thinking can be used to discover simple solutions when faced with complex problems. The main theme discussed here is that this way of working can and should be applied to biological systems and medicine.</p> <p>Current wisdom is that when a person becomes ill, inflammation around the infected area helps it kill the invader. In some disease conditions, however, it is thought that the immune system malfunctions and instead of attacking invaders, by mistake it starts to destroy healthy tissue. Systems Thinking suggests that this failure mode (known as chronic inflammation) is actively promoted by invaders in order to outwit the immune system. The model discussed in this presentation is able to explain more correctly the aetiology of disease (ie the explanation of cause) and as a result make far-reaching predictions for treatment.</p> <p>The presentation will be given by a systems engineer and a medical researcher.</p>
11:50	<p>The Great Escape – a Case Study of Systems Modelling for Safety-Critical Systems Jon Holt, Simon Perry, Mike Brownword and Matthew Hause: Atego</p>	<p>The benefits of systems modelling are many and varied and are often quoted by tool vendors and consultants as the answer to life's biggest problems. There is no doubt that effective systems modelling is an essential part of any Systems Engineering toolbox, especially when failure of the system will endanger life or the environment. When it comes to such safety-critical systems, how much confidence can we have in these modelling techniques? How comfortable would you be if your life depended on a model of the system? This paper demonstrates the confidence that it is possible to have in a systems model by making the systems modeller part of the system itself.</p> <p>The paper describes an example application of a safety-critical system based on a classic escapology system, as performed by Harry Houdini. The system was completely modelled from the requirements, through scenarios, design, test and final implementation. As the ultimate validation of the model and demonstration of confidence in the model, one of the authors then performed this death-defying stunt.</p>

Programme : Wednesday, 10th November - Afternoon

13:30 - 17:00 : Parallel Workshop and Tutorial

Overview of BKCASE (Body of Knowledge and Curriculum Architecture for SE)

Workshop Chair

Rick Adcock: *Cranfield University*

Facilitators

Hillary Sillitto: *Thales*

David Wright: *Cranfield University*

The BKCASE project is an attempt to produce a guide to the Systems Engineering Body of Knowledge (SEBoK).

The approach is to bring together an international team of authors to create the initial structure and content, and then to engage as wide a community as possible to review and populate the SEBoK.

The workshop will start with an overview of the current state of the BKCASE project, provided by the two UK members of the BKCASE team, including a discussion of the BKCASE approach and challenges.

This will be followed by facilitated group work, in which key elements of the early BKCASE draft products will be reviewed and discussed. To assist in this, delegates registering for the workshop will be sent the draft outputs and asked to come along with suggestions of which topics should be discussed.

Finally, we will bring together the key outputs of the day. These will be summarised and fed back to the BKCASE team.

Remember the Future - Creating a Clean Archaeological Record for In-Service Use

Keith Collyer and Hazel Woodcock: *IBM*

In 1986, David Parnas published a classic paper "A Rational Design Process - How and Why to Fake It". This was probably the first to discuss the relationship between what a process is supposed to be, what people actually do and, most importantly, how they should document what they have done. In this tutorial we will examine the lessons of this paper and what, if anything, we have learnt since its publication nearly a quarter of a century ago.

There is a wide variety of approaches to process definition, which we can broadly place on a range from low to high ceremony. The extreme of low ceremony is no process, moving through degrees of discipline to the high ceremony end, where nothing is done without it being approved and signed off by multiple reviewers. We will discuss where various lifecycles fit into this approach, with a perspective on what really happens. If your process is Agile, do you really not want to document anything? If your process is Waterfall, do you really do all of one stage before you move to the next? We will discuss why these stereotypes are wrong and how the low and high ceremony ends of the range are closer than their proponents think - or will admit to.

In this tutorial, you will gain an understanding of what development processes are all about, the relationship between what the process says you should do and what you really do, and how to make sure that what you create is meaningful and useful to those who come after you.

13:30 - 15:00 : Conference Theatre Session

Improving the Practice of Systems Engineering for In-Service Systems

Bruce Elliott: *Arbutus Technical Consulting*

Here's an odd thing: while most of the guidance about Systems Engineering is concerned with realising new systems, a significant number of systems engineers are concerned with sustaining systems that are already in service. The experience of these practitioners is that, while the principles underpinning Systems Engineering remain the same across the lifecycle, some of the guidance needs adjustment to suit the in-service phase.

The UK Chapter recognised this anomaly and set up a working group in 2008 to tackle it. The UK working group issued supplementary guidance on In-Service Systems Engineering earlier this year and the work is now being taken forward by an international working group.

Bruce was co-chair of the UK working group and is co-chair of the international working group. He will explain the 'W' lifecycle and the four in-service perspectives that underpin the guidance and summarise the main pieces of advice in it. He will describe ongoing work and suggest where it may lead. In an interactive session at the end there will be an opportunity for delegates to influence this important work.

15:30 - 17:00 : Conference Theatre Session

Keeping It Simple

Richard Beasley: *Rolls-Royce*

Ian Gibson: *Sula Systems*

Terry Winnington: *University of the West of England*

Back in March 2010, a one day event was held in Bristol exploring a variety of "Simple systems techniques that work", applying them to the problem of saving the earth from an asteroid impact. The choice of techniques was deliberately constrained to things that you do fairly quickly using a pen and a piece of paper (although some of the techniques did literally stretch the idea of a piece of paper to new limits), and covered Stakeholder Identification and Balancing Conflicting Requirements, N² Charts, Six Honest Serving Men (Who, What, Where, When, Why and How) and Quality Function Deployment (QFD).

Did we manage to save the earth? Not really, given the time available, but then that was never the real aim! What we did gain from the event was some useful insights into when, how and why to apply the various techniques, an appreciation of how the delegates got on with getting to grips with the systems thinking concepts in the space of a single day, and some thoughts on how the techniques could be used to provide a way into a more rigorous and formal Systems Engineering process, which we intend to open up to general discussion from the floor.

We certainly enjoyed running the event, and are confident that you will enjoy hearing about the lessons that we learnt from doing it, and joining in the debate on how simple systems techniques can be successfully applied to complex systems problems.

Conference After Dinner Speaker: Professor Alan Smith (UCL)

"Exploration of the Moon – how things have changed in 50 years"

Monday, 8th November 2010



Next year sees the 50th Anniversary of the first man in space and so it is perhaps a good time to look back at the US and USSR space programmes - the space race - from a Systems Engineering and Systems Engineering management perspective. If we were living then with what we know now, would we have made the same decisions that led to a man on the Moon in 1969?

On 25th May 1961 Kennedy made his famous statement to Congress: "I believe this nation should commit itself to achieving the goal, before the decade is out, of landing a man on the Moon and returning him safely to the Earth." At that time the US lunar programme was a shambles with seven out-and-out failures from eight launches and the nearest thing to a success, Pioneer 4, missed the Moon by such a large margin that it was unable to detect it! The USSR was doing a little better (five failures from eight launches) and consistently ticking the 'firsts' boxes (eg first impact onto Moon, first image of far side, ...). Political imperative and a can-do attitude definitely overruled any sense of technology readiness, yet the programme was a success and the 'giant leap for mankind' turned out to be a giant leapfrog over the USSR for the NASA space programme.

But is it really as simple as that? Of course not.

About INCOSE

The International Council on Systems Engineering (INCOSE) is a not-for-profit membership organisation founded to develop and disseminate the interdisciplinary principles and practices that enable the realisation of successful systems. INCOSE has grown significantly since its formation in 1990.

Today, there are over six thousand members representing a broad spectrum – from student to senior practitioner, from technical engineer to programme and corporate management, from science and engineering to business development. Members work together to advance their technical knowledge, exchange ideas with colleagues, and collaborate to advance Systems Engineering.



Professor Alan Smith, BSc, PhD, FRAS, FAPM

We are delighted to have Alan Smith address this topic for us.

Alan was awarded a PhD at Leicester University in 1978 working in the area of X-ray observation of Supernova Remnants. He then went on to act as an instrument scientist for the Medium Energy X-ray Experiment which flew on-board the European Space Agency mission EXOSAT. In 1984 he joined the European Space Agency in the Netherlands where he worked both as an astronomer and as project scientist/project manager for Russian and Italian space projects. In 1990 he joined University College London's (UCL's) Mullard Space Science Laboratory, initially as Head of Detector Physics but later to become Programme Manager and eventually Director and Head of Department (2005). In 1998 he was made a Professor of Detector Physics. While at UCL he has been Director of their Centre for Advanced Instrumentation Systems (1995-2005), a Co-Director of the Smart Optics Faraday Partnership (2002-2005) and is presently founding Director of the Centre for Systems Engineering (1998-present) and Vice-Dean for Enterprise in the Mathematical and Physics Sciences Faculty.

In the UK, membership numbers have grown steadily, with 50 at our inaugural event in September 1994 in Shrivenham, and rising from 350+ members in 2003 to over 700 members in 2010. A key goal for INCOSE UK is to achieve a steady and sustained increase in the number of members, further broadening the base of the membership to include new industrial domains. If you undertake tasks which are characterised by the interaction of multiple conflicting factors across multiple technical and business domains, often exhibiting less than obvious behaviour, then you are either doing, or need to be doing, Systems Engineering, and INCOSE UK exists to help you.

Registration and Event Prices

Registration

The event registration will be managed for INCOSE UK by **Dot The Eye Ltd**. To register for the event, visit our online registration facility at: www.incoseonline.org.uk. Here you can register for the event (including accommodation) and pay by card through a secure payment facility with Lloyds TSB Cardnet via SagePay. Options to pay by cheque or company order are also available.

If you are unable to take advantage of our online registration facilities, please contact **Dot The Eye Ltd** either by email at: enquiries@incoseonline.org.uk or by telephone: 01460 298217 or fax: 0845 280 5304.

Prices

	1 Day	2 Days	3 Days
Member Rate	£300	£500	£700
Student Rate	£150	£250	£350

These prices are for INCOSE UK members. Non-members are welcome, but you will be charged an **additional £72** that will give you the benefits of INCOSE membership for one calendar year. Student membership for non-members is an **additional £20**.

All prices quoted here are **inclusive of VAT (@ 17.5%)**, lunch and morning and afternoon coffee.

Accommodation

Overnight accommodation (dinner, bed and breakfast) at the event venue is available at **£117.50 per night** and must be booked with the event registration. Accommodation is charged at cost so there are no discounts or concessions.

Non-residents who wish to attend the Monday evening Dinner will be charged an additional **£35.00**.



Venue and Travel Information

The venue for ASEC 2010 will be the Crowne Plaza Hotel, Heythrop Park Resort, Enstone, Chipping Norton, Oxfordshire, OX7 5UE (postal purposes only) or OX7 5UF (SatNav).

The completely rebuilt conference area retains the tiered lecture theatre but adds new meeting and tutorial rooms, plus a ballroom for exhibition space and the traditional INCOSE banquet. The £50 million development includes 197 newly refurbished bedrooms that meet the Crowne Plaza's high standards of bedroom accommodation.

Directions

SatNav users: Please enter '**The Drive, Church Enstone**' into your SatNav.

Alternatively, you can enter the postcode: **OX7 5UF**. Do not enter the post code used for postal purposes shown above (OX7 5UE), **since this does not work for SatNav!**

From the M40 Northbound: Leave the motorway at Junction 8 (signposted Oxford) and join the A40. Continue along this dual carriageway and at the first roundabout take the third exit and continue North along the A40. Continue straight across the next roundabout and at the next roundabout turn right onto the A44 (signposted Woodstock, Evesham).

Continue along this road (passing under the A34 and through Woodstock) for approximately 12 miles to the village of Enstone. After passing a petrol station on the left, continue through the village for 1/2 mile. At the bottom of the hill turn right at the Harrow Public House into "The Drive" to the crossroads and the entrance to Heythrop Park will be seen immediately facing you.

From the South: Leave the motorway at Junction 11 (signposted Banbury) and continue towards Banbury. After crossing over the next two roundabouts, at the third roundabout take the first exit left onto the A361 to Chipping Norton. Continue through a series of traffic lights and straight across the next roundabout (Banbury Cross).

After a short distance turn right at the traffic lights (signposted A361 Bloxham) and continue along the A361, passing through the villages of Bloxham and South Newington, for approximately 11 miles. Do not take the first road signposted to Heythrop Park but continue to the roundabout (next to the Little Chef) take the first exit onto the A3400 (signposted Enstone, Woodstock (A44)).

Continue along this road (which after 1 mile becomes the A44) for 4 miles to the village of Enstone, and fork left onto the B4030. Continue along this road for about 250 yards and the entrance to Heythrop Park will be seen set back off the road on the left hand side.

Registration now open - please book early

Please use the online facility at: www.incoseonline.org.uk to register and pay for your attendance.

INCOSE UK is supported by the following organisations that make up the UK Advisory Board (UKAB). The UKAB advises the Chapter Board on aims and strategy, and co-ordinates working group activities with the Technical Director.

