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President’s Corner

Welcome to the Spring edition of Preview. Since our Autumn edition much has happened for INCOSE UK and myself. In this edition I will reflect on our 20th anniversary, look ahead to a special ASEC14, and give you my immediate reflections on the INCOSE International Workshop.

We have launched our 20th Anniversary celebrations, which will run for the whole of 2014, with ASEC14 being one of the highlights. ePreview57 provided a great view of the earliest days of INCOSE UK, including a photograph of the attendees at our first meeting in September 1994, at Shrivenham. We would love to hear from any of you who were at that meeting – what your hopes and expectations were back then, and how you view systems engineering and INCOSE UK twenty years on. ePreview also gave you an idea of what we will be doing to make our 20th year special, please watch the website and your email for information on how you can get involved. In particular, if you have any ideas for opportunities please get in touch.

One special date for your diary is ASEC14 – our Annual Systems Engineering Conference – which we will hold at the RAF Museum, Cosford, in Shropshire on 18th and 19th November. We can promise you all of the usual ingredients of ASEC – a high calibre technical programme, two interesting and challenging keynotes, and an enthralling after dinner speaker. Our dinner will be in one of the hangers surrounded by historic aircraft, and during the two days there will be time to explore the museum’s other exhibits with include a TSR2 prototype, the cold war trio of Vulcan, Victor and Valiant, and many unique experimental and prototype aircraft.

In January I attended the INCOSE International Workshop in Torrance, California in my INCOSE UK, BAE Systems, and working group chair roles. During the week there I was also officially appointed President-Elect of INCOSE, a privilege and something that will significantly shape my next four years.

The incoming INCOSE President, David Long, set the theme for his presidency by talking about our current the age of systems challenges, and how we Systems engineers are linchpins in responding to these challenges. He believes that this is our opportunity to rise to these challenges. I believe this message resonates at the level of the individual systems engineer, systems engineering functions in our organisations, academia/research, and indeed for INCOSE UK. To be successful, we systems engineers must continue to improve our technical skills and our soft skills. Also we must continue to evolve the discipline of systems engineering, so that we have the processes and tools for the job. Within INCOSE UK we are active in many aspect of making this vision real, for example:

• Our own working groups (e.g. Architecture, Service Systems Engineering);
• Participation in international working groups (e.g. Competency, Systems of Systems);
• Through our strategic partnerships (e.g. with The IET, APM).

I look forward to seeing how our UK activities, linked within the wider global INCOSE and our strategic partners can continue to drive Systems Engineering forwards. There is no doubt, and much evidence, that INCOSE UK members continue to provide significant thought leadership, practical input and experience to the overall development and success of INCOSE and of systems engineering. Long may this remain the same!

Alan Harding
President INCOSE UK
president@incoseonline.org.uk

INCOSE UK Council Appointments

INCOSE UK announced its Council membership for the coming year at its Annual General Meeting (AGM) held on 12 November 2013, including election results and confirmation of the appointment of Officers.

The new appointments are:

- Technical Director: Prof Jon Holt
- Academic & Education Director: Prof Mike Wilkinson
- Communications Director: Robbie Forder
- Professional Development Director: Ian Presland
- Events Director: Ian Gibson
- Deputy Chair: Ivan Mactaggart
- Financial Director: Peter Lister

The AGM was an opportunity for Alan Harding (INCOSE UK President) and his fellow Council Members to thank Andrew Farncombe, the outgoing Technical Director, for leading the technical development of INCOSE UK and its Working Groups during the last eight years. The Council is looking forward to working with Jon Holt to develop further the technical work of the Chapter.

Last year Prof Kate Gill was elected as the Academic & Education Director. She has had to stand down due to an overseas posting earlier this year. Prof Mike Wilkinson has been appointed by the Council into the role for the remaining 2 years of the current term, in line with INCOSE UK’s articles of association.

Peter Lister has been re-elected as the INCOSE UK Finance Director. Peter has ensured INCOSE UK has been on a stable footing for the last 11 years and it is good to know he will continue to oversee the finances.

The remaining members of the INCOSE UK Council are:

- President: Alan Harding
- President-Elect: Richard Beasley
- Immediate Past-President: Prof Michael Wilkinson
- Communications Director: Robbie Forder
- Professional Development Director: Ian Presland
- Events Director: Ian Gibson
- UK Advisory Board Chair: Ivan Mactaggart
- Company Secretary: Emma Jane Taylor
Please allow me to introduce myself...

My name is Jon Holt and I have recently been elected as the Technical Director of INCOSE UK.

My first involvement with INCOSE was through presenting at the International Conference in Brighton in 1999. Since then I have been actively involved with INCOSE, have published extensively at events conferences and workshops and have won awards at both national and international levels.

I was the founder-director of Brass Bullet Ltd, a Systems Engineering consultancy and training company for over 12 years, until it was acquired in 2009 by Atego Systems, where I am currently the Global Head of Systems Engineering. I am also a Professor of Systems Engineering at the UK Defence Academy, where I am involved with teaching and research. With regards to other professional organisations, I am a Fellow of both the IET and the BCS and am a Chartered Engineer and Chartered IT Professional.

My main area of work is model-based systems engineering (MBSE) and I have published nine books in MBSE and its applications.

I have worked in many industries with a wide range of clients: including schools, industry, academia and government. I am passionate about all aspects of Systems Engineering and actively promote science and engineering to the general public through events such as science festivals, the IET Science Cabaret and other activities in my role as a STEM (Science, Technology, Engineering and Mathematics) Ambassador.

Somebody once said that a businessman is someone who seeks opportunities to do and improve business. As a practising Systems Engineer, I see the post of Technical Director for INCOSE UK as an excellent opportunity to improve and enhance both INCOSE UK and the discipline of Systems Engineering in general.

My vision is to build on the excellent work done by Andrew Farncombe during his sojourn and to enhance it in three ways: by promotion, engagement and dissemination.

Over the next few months it is my goal to engage with the working groups, local groups and special interest groups in order to provide a structure that can then be used as a basis for dissemination amongst the INCOSE members. I believe that these groups are essential to the success of INCOSE and by making them more visible and accessible, and by producing well-defined deliverables then these groups can add value to INCOSE membership generally.

I will also be working closely with Hazel Woodcock, who is the current editor for both the Z guides and the Omega guides, with a general review and revamp of these products.

I am grateful for the opportunity to work with INCOSE through my new role and am looking forward to the next three years.

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As you may know, the Academic Director role was until fairly recently occupied by Prof Kate Gill, who reluctantly had to step down because the role became incompatible with her day job (primarily as a result of being deployed to the USA). I temporarily took on some of her responsibilities within the UK Chapter as I was still acting as Immediate Past President. At around the time of last year’s ASEC I took on the role more permanently - regarding which, many thanks to the Council for asking me, and to my employer (Atkins) for being supportive.

I have always been an advocate for the Academic Director role. My own career started out in academic circles - I did a first degree in Physics, then a PhD and post-doctoral appointment in theoretical physics. During that period I discovered what hard work it is being an academic, not least the constant pressure to publish. Having spent a long period since then in different technical consultancy and business management roles, I am now a Technical Director in Atkins - currently seconded to the Technical Director role in Niteworks (a MOD/Industry partnership involving over 100 different companies). Continuing the academic theme, I serve as a Visiting Professor at Loughborough University, associated with the Engineering System of Systems (ESoS) Group.

I have been heavily involved in INCOSE activities since about the middle of the last decade, under various guises, including a variety of leadership roles, and participation in conferences and working groups. As well as my current roles on the UK Council, I am one of the co-chairs of the UK Architecture Working Group (AWG) and am also a co-chair of the International AWG.

Having now spent a couple of months consulting with some of our academic colleagues and industry colleagues with a link to academia, my aspirations for the Academic Director role are starting to clarify. These are the areas in which I would like to see us make some significant progress in the coming year:

**Systems Engineering Research.** I would like INCOSE UK to: understand the extant UK research strategy and current programme focus; develop a view on collaborative research priorities, informed by industry; engage with funding bodies to promote views on priorities.

**Linking Academia and Industry.** I would like INCOSE UK to: identify the community of potential academic/industry collaborators; capture case study and reference material for sharing by an appropriate mechanism; facilitate collaborative paper writing; facilitate industrial input to education/training.

**Student Members.** I would like INCOSE UK to: survey student members to establish a viewpoint baseline; develop proposals for increasing the value of student membership; explore mature student needs; develop new engagement models/activities.

**Schools.** I would like INCOSE UK to: understand the role of Systems Thinking in education, the national curriculum and specific Systems Engineering courses; survey what other professional bodies are doing; develop some standard education material; identify INCOSE members willing to brief to schools; solicit input for ASEC, Preview or other communications channels.

If any of this sounds like something you would like to contribute to then please drop me an email or give me a call - I am in the process of setting up a group to take this agenda forward.

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Prof Jon Holt
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Prof Mike Wilkinson
academic-director@incoseonline.org.uk
INCOSE International Workshop 2014 – Summary Report

Alan Harding

This is a summary of key points that I identified at the International Council on Systems Engineering (INCOSE) International Workshop (IW) in January 2014. I attended in various roles - as President-Elect of INCOSE, BAE Systems’ representative on INCOSE’s Corporate Advisory Board, as President of INCOSE UK, and as the co-chair of the Systems of Systems Working Group (SOSWG).

Overall Themes

David Long, our incoming President, reviewed the current healthy status of INCOSE and acknowledged the contribution of our predecessors. In particular David noted outgoing President John Thomas’s emphasis on:

- The systems engineer as a multidisciplinary leader;
- The need to increase INCOSE’s influence on worldwide systems issues
- The need for additional resources to support the volunteer-led thought leadership of our organization

David’s second key point, which will frame his period of presidency, was the vital “T-shaped” nature of a systems engineer and his hope that INCOSE matures its place in the education ecosystem and fills a gap with the notion of an “INCOSE University” providing:

- For Systems Practitioners: In-depth professional development on systems concepts, tools, and techniques
- For Engineers: Awareness of systems concepts & approaches
- For Senior Management: Understanding of the value of SE
- For the Greater World: Awareness of systems

David’s final point was to highlight how the great challenges of our time are systems challenges – and that we as systems engineers are vital going forwards whether we want that role or not. He called on us to embrace the challenge, all the responsibility, and all the opportunity that goes with it.

In my first remarks as President-Elect of INCOSE I highlighted the importance of an integrated INCOSE – with all of its components working well together. Like any organisation INCOSE needs to evolve, and during the IW we had excellent discussions on our stakeholders and what they value, future membership models, and industry engagement via the Corporate Advisory Board. All of this evolution will be towards a global and diverse INCOSE.

INCOSE Overall Statistics

Overall excellent growth in members for INCOSE – both individual and corporate. Also, we have two new Chapters in EMEA (Europe, Middle East and Africa) – Denmark and Poland. The greatest growth is in EMEA, and Asia-Pacific sector continues to struggle. The CAB continues to grow and diversify, and the Academic Council subset of the CAB also is growing.

<table>
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<th>Jan 2013</th>
<th>Jan 2014</th>
<th>Annual Change</th>
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<tr>
<td>Overall Members</td>
<td>8344</td>
<td>9422</td>
<td>+13%</td>
</tr>
<tr>
<td>Sector 1 – Americas</td>
<td>5114</td>
<td>5469</td>
<td>+7%</td>
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<tr>
<td>Sector 2 – EMEA</td>
<td>2544</td>
<td>3321</td>
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<tr>
<td>Sector 3 – Asia-Pacific</td>
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<td>95</td>
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</tr>
<tr>
<td>SEP</td>
<td>1425</td>
<td>1854</td>
<td>+30%</td>
</tr>
</tbody>
</table>

INCOSE Membership by Sector

- Sector 1 – Americas
- Sector 2 – EMEA
- Sector 3 – Asia-Oceania
SE Professionalism and Leadership

INCOSE continues to highlight the need for effective systems engineering leaders skilled in technical disciplines and leadership/influencing skills:

- We announced the first winner of the David Wright INCOSE Leadership Award – Tina Srivastava from Raytheon/MIT and a member of the New England Chapter. Over a two year period this award includes mentoring, attendance at international events and support for a leadership project between INCOSE and another professional organisation.

- The number of Certified Systems Engineering Processionals (CSEP) continues to grow, passing 1854 in December 2014. The UK figure is now 32 SEP's.

Corporate Advisory Board (CAB)

The 5 top ranking areas set as CAB needs are as follows. These will be developed and action plans created to ensure that they are reflected in coordinated activity across INCOSE:

1. SE Professional development
2. Agile/Expedited methods
3. Effective Trade Studies
4. Product-lines, re-use
5. Better Value proposal for INCOSE and Systems Engineering

The CAB had two key sessions of relevance during IW:

1. A session on good practice in how to gain maximum benefit from CAB membership – based on experience from Lockheed Martin. This material will be interesting to CAB and UKAB organisations alike.

2. An extended session on Tailoring and Scaling SE including the following material:
   - Introduction to SE Scaling and Tailoring, Dave Walden
   - Technical Operations – introduction presentation on scaling and tailoring SE
   - Industry Outreach Board – presentation including material from a panel at IS13 “When one size doesn’t fit all – how important is good tailoring?”
   - JoAnn Lane at USC: “Lean, Agile, and Kanban Methods: Providing “More” Faster”
New and Upcoming Technical Products

SE Vision 2025
INCOSE SE Vision 2025 is now one final confirmatory review from issue and will give a basis from which to inspire and guide, and to engage with other stakeholders from a leadership position.

BKCASE
The BKCASE project has now handed over the SE Body of Knowledge and the Graduate Reference Curriculum for SE (GRCSE) to an Editorial Board. Rick Adcock (Cranfield) is now Editor-in-Chief of SEBOK.

BKCASE is led by:
- The International Council on Systems Engineering (INCOSE)
- The Institute of Electrical and Electronics Engineers Computer Society (IEEE-CS)
- The Systems Engineering Research Centre (SERC).

Working Groups
The illustrations below show the latest organisation and leadership of the technical working groups. Changes are shown in Blue.

47 Working Groups
Initiatives: Standards, MBSE
Project: BKCASE SEBoK
Current Technical Organisation Structure

- 47 Working Groups regrouped in five clusters:
  - Knowledge enabler: 14 WG
  - Process enabler: 16 WG
  - Industry Domain: 6 WG
  - Technology Domain: 3 WG
  - Government Domain: 6 WG
  - Links with Academia: 1 WG
  - MBSE: 1 WG

- Two major initiatives: MBSE, Standards
- Support to Projects: BKCASE, SE Vision 2025
- Webinars: Handover from CAB in 2011, WG Webinars
  
  Per 2013 Jim Armstrong is AD for WG Integration (Assistance needed)

- Agile Systems and SE Working Group website is here, and a significant set of background information on Agile is available from here.

- Model Based Systems Engineering (MBSE) Working Group is very active, wiki here. The next MBSE challenge is to establish model-based approaches into the mainstream of systems engineering. Bill Miller (Technical Director) showed the following illustration which indicates the intended path.

- Competency Working Group – is working with the NDIA (US National Defense Industry Association) to develop a Role-Based Competency Framework that will extend the existing INCOSE SE Competency Framework into a generic, configurable tool. One key feature will be to align/link with competency models in adjacent disciplines (e.g. PM, Leadership) to ensure completeness and credibility. This will include:
  - Generic SE roles
  - Typical SE activities per role
  - Classes of SE competency

- Systems of Systems Working Group (SOSWG) continues to be active. Its current tasks are a survey of SOS methods, development of a SOS Primer, and some work on case studies. The SOSWG Webinar series continues monthly. At IW the SOSWG received a collaboration award for the Pain Points survey completed in 2013.

Forward Planning – INCOSE Diary Dates

- INCOSE International Symposium, Henderson NV, 27th June -3rd July 2014
- INCOSE EMEA Sector Conference, Cape Town SA, 27-30 October 2014
- IW15 Torrance LA, 26th-28th January 2015
- IS15 Bellevue, Washington State, USA,
ASEC 2013 Report

Ian Gibson, Events Director INCOSE UK

Back in November 2013, the INCOSE UK Annual Systems Engineering Conference returned to Heythrop Park near Chipping Norton, following a gap of a couple of years since our previous visit to this venue. It is pleasing to report that the “teething troubles” that we encountered last time with the hotel side of things seem to have been resolved (on a personal note I was glad to see that my shower drained down the plughole rather than backing up and running out of the door!). The conference facilities themselves remain first class, with an excellent auditorium and high quality breakout rooms, making this an attractive venue that is well suited to the requirements for our Annual Conference (and after all, where would we be as Systems Engineers if we didn’t have requirements!).

The main auditorium at Heythrop Park

Of course, for the Events Team the story started back in March 2012 when we started the search for suitable venues. A welcome side effect of increased attendance at ASEC for the past few years is a need to look for larger venues with better facilities, not to mention making sure that we have some choices of different locations across the country (whilst also being aware of the geographical centres of mass of the UK membership).

Looking ahead to this year’s conference, by the time this edition of Preview comes out the Events Team will have already met up to thrash out the conference theme, determine the programme structure and started identifying keynote speakers and tutorial presenters. Luckily we get to have Christmas off to recharge between conference cycles.

In terms of numbers, ASEC 2013 was one of our best ever attended conferences, with over 150 attendees each day, and 6 exhibitors. We also had two innovations in the programme – breakout sessions for two of the newly formed working groups: the SE/PM Joint Working Group with the Association for Project Management (APM), and the Service Systems Engineering Working Group; and a Student Poster competition.

The breakout sessions were intended to provide a forum for both briefing delegates about the activities of these recently formed working groups, and getting involved in influencing their future direction, and feedback from the events indicates that both needs seem to have been successfully met.

Sadly the level of entries for the Student Poster competition fell significantly below expectations, but we would like to thank Colin Walsh (Cranfield University) and Thomas Walworth (University of Bristol) for putting in entries, and we hope that they enjoyed their complimentary attendance at the event. However, there was sufficient interest expressed in the Student Poster concept for us to consider running something similar next year, so look out for a Call for Posters and please pass it on to any Systems Engineers that you know who are on postgraduate or undergraduate courses during 2014.

Best Paper

As always, the presentations are assessed during the conference by those delegates who were present in the main theatre sessions. The top three presentations were:

1. “Quantification of SE value” - Paul Davies (Network Rail)
2. “Creation of MBSE models that advance the understanding of the system of interest” – Rob Behan and Fran Thom, presented by Richard Beasley (all from Rolls-Royce)
3. “The application of SE to deliver Technical Assurance on complex system programmes” – Doug Cowper (Cleave Systems) and Ian Gallagher (Altran)

In addition to our well-deserved admiration, all of the presenters and authors have also received a certificate and a small prize.

We would also like to thank all of our other presenters, and all of those who responded to the Call for Presentations, but didn’t make the final cut. As a technical conference, ASEC is dependent upon having a supply of interesting and relevant contributions, and we would encourage all INCOSE UK members to consider submitting a presentation. Finally, we would like to thank Duncan Kemp and Rhiann Evans for agreeing to present their paper “Steampunk System of Systems Engineering: A case study of successful System of Systems Engineering in 19th Century Britain”, following a late change to the programme.

Some of the highlights

Kuldeep Gharatya’s keynote speech on the opening day of the conference was a highlight for many delegates, providing an inspirational vision of how Systems Engineers could, and should, be moving into leadership roles within their organisations to ensure that the complex technological engineering challenges of the future can be met.

Kuldeep Gharatya after his keynote speech

At the other end of the first day, Peter Eyre’s entertaining after-dinner speech about the development of the new Shannon Class lifeboat as an in-house RNLI solution was very well received, even if some of the footage of trials in extreme sea conditions might have put some delegates off their dinner. Peter certainly enjoyed the experience and has expressed his gratitude for being invited to tell us...
about how his idea turned into reality.

Peter Eyre standing next to an RNLI Shannon Class lifeboat

Pascal Foix’s keynote speech at the start of the second day took a different approach, focussing more on the technical possibilities of joined up model based systems engineering processes and toolsets. Given Pascal’s role as Vice President for Systems at Thales, it was pleasing to see his vision of the future in this area, and it will be interesting to see how close it ends up to reality.

Pascal Foix presenting his thoughts on Model Based Systems Engineering

Some awards

Earlier in the year there were a number of INCOSE awards made to UK members, including Long Service Awards for Andrew Farncombe and Peter Lister. Both have been stalwarts of INCOSE UK since its inception, and eagle-eyed readers of the first ePreview of this year will have seen them both on the photograph from the first INCOSE UK meeting.

Andrew and Peter being presented with their awards by Alan Harding, INCOSE UK President

Peter has served as President in the past before his current role as Finance Director, and Andrew has just stepped down this year after a long spell as the Technical Director, during which he has played a significant part in the development of the INCOSE UK Working Groups, and in the development of the Annual Systems Engineering Conference into its current format.

Andrew has handed the Technical Director baton on to Jon Holt (from Atego), who is no doubt hoping that a long tenure in the role is not a compulsory element.

We were also pleased to recognise the second cohort of Chartered Engineer and Incorporated Engineer Professional Registrations through the buddyng scheme with the IET. This initiative gives members a route to CEng without having to join another institution, which is sure to prove popular in the long term.

Some of areas for improvement

It is very gratifying to report that having gone through the feedback forms, there were no major complaints, and many favourable comments on the organisation of the conference and the venue facilities.

However, there were some comments on the location of Heythrop Park, and the difficulties of getting there – some of which were down to unexpected roadworks on the nearby roads, and some adverse weather conditions. This is unfortunate, but does rather seem to go hand-in-hand with the venue being based upon a countryside retreat in Oxfordshire.

Heythrop Park – lovely in the sun, not necessarily so easy to find in Autumnal fog

One recurrent theme over the last few years has been a plea from some delegates for an overall improvement in the style and content of presentations. Whilst recognising that INCOSE UK is a volunteer organisation, and that the presenters are often very busy people, it has been noted that not everyone can present "off the cuff", and that not all presentations end with a set of succinct "so what?" points that delegates can take away with them. In an effort to improve on this situation, we are considering running a "soft skills for systems engineers" course which would include elements on presenting ideas and influencing stakeholders.

Some views from the Delegates

James Towers, Object Flow

Since I found ASEC 2012 both useful and enjoyable I was keen to attend ASEC 2013 from a personal perspective, however I was also there in my capacity as the chair of the Model Based Systems Engineering Working Group presenting a paper and generally supporting the aims of the group.

What was the most interesting thing that you learnt at ASEC 2013? During conversations I realised there are some aspects of MBSE which polarise opinion in the community, and they're not the aspects I expected!
What was the most useful thing that you found out at ASEC 2013 that you expect to be able to take back to your day-to-day work? Some of the content from Paul Davies presentation on “Quantification of Systems Engineering value” has certainly influenced my thinking.

What was your favourite presentation, and why? It’s always difficult to narrow it down to one thing, but the presentation by Michael Emes from UCL on Risk was interesting as it overlaps with one of the pieces of work I’m doing at the moment, so I suspect I will be going back to it several times.

What was the best bit of the whole event? It’s always good to meet new people and chat with likeminded professionals.

What do you personally get out of attending these events? I always come away with more questions than answers, and an expanded list of professional development objectives, but that’s a good thing, right???

Would you recommend INCOSE UK events to colleagues? Absolutely, you get to meet some very insightful people particularly from outside of your own domain(s).

Selina Taylor, HMG

Why did you decide to attend ASEC 2013? There were two main reasons. Firstly, it’s a good opportunity to look at Systems Engineering across a range of sectors, and secondly, I am attending as my organisation’s UKAB representative.

What was the most interesting thing that you learnt at ASEC 2013? Aside from the helium tube demonstration, the Systems Thinking tutorial did what it said on the tin – it made me think about Systems Thinking!

What was the most useful thing that you found out at ASEC 2013 that you expect to be able to take back to your day-to-day work? The tools outlined in the Systems Thinking tutorial will definitely be applicable to the day job.

What was your favourite presentation, and why? The London Underground presentation – very entertaining, highlighted the problems of complexity well, and was thought provoking too. It also made really good use of mixed media to illustrate the points.

What was the best bit of the whole event? The ability to network and to have engaging, intelligent discussions about Systems Engineering.

What do you personally get out of attending these events? Personally, I gain exposure to different ideas and different sectors. I also find the networking important.

Would you recommend INCOSE UK events to colleagues? Yes, it’s a good way of getting a broad range of exposure in a relatively short period.

Richard Smith, Retired

Why did you decide to attend ASEC 2013? To see how Systems Engineering is developing and supporting activities outside of Defence (especially National scale and Enterprise Systems), and to meet former colleagues.

What was the most interesting thing that you learnt at ASEC 2013? That there is a useful and practical understanding of MBSE – at least at Rolls-Royce...

What was your favourite presentation, and why? Paul Davies – as usual he seems to have dug out some very useful, timely and persuasive material.

What was the best bit of the whole event? “Networking”.

Delegates enjoying a networking opportunity during the coffee break

Finally, some "thank-you"s

As always, we would like to thank or keynote speakers for sharing their visions, our after-dinner speaker for being entertaining and informative, our presenters for sharing their thoughts, and our tutorial givers for passing on their knowledge and experience. Special thanks go to Andrew Farncombe for all of his hard work over the years in running the INCOSE UK conferences (including organising the panel of judges for the technical programme, who also deserve thanks for critically assessing every 3 page abstract that was submitted). As ever, we would like to thank Dot-The-Eye for doing such a good job of organising the administration and running of the event, and finally, we would like to thank all of the conference delegates for coming along and joining in, making sure that it remains an enjoyable, educational and worthwhile event for all concerned.

Articles from our Members

In our continuing series we present an article submitted by Steve Fisher that looks to provide information of interest to systems engineers on the Postal Systems domain.
An Introduction to Royal Mail Information Systems

Stephen Fisher

INCOSE UK reports that the ‘flavour’ of systems engineering most prevalent in the UK has developed into an open and inclusive practice that facilitates the application of systems thinking and systems engineering principles in domains outside of the traditional domains of defence and aerospace. In recent years the membership of INCOSE UK has widened significantly from its roots, expanding to include domains such as transportation - particularly rail - energy, civil engineering, space, medicine, and security. For more information, visit www.incoseonline.org.uk.

This article aims to further expand the available domain knowledge by providing information of interest on systems engineering within the Postal Systems domain. Provided is an overview of mail processing and the major programmes that deliver the mail processing capabilities within the UK. Finally, an overview of the systems engineering approach adopted to deliver these capabilities is discussed.

Introduction

The areas of systems engineering that receive the most exposure tend to be in the domains of aerospace, defence and railways. This article attempts to broaden the domains that systems engineers are exposed to by providing an overview of systems in the domain of postal automation.

This article provides an overview of the Royal Mail System, how mail is processed and some of the major programmes that are delivering the mail processing capabilities within the UK. It is hoped that this will be of particular interest to the engineering community.

The Mail Processing System

Overview

The Royal Mail System provides a nationally integrated capability to support the handling of mail pieces. The System incorporates and integrates the substantial legacy investment that has been made in mail handling equipment, personnel and management infrastructure. The system is required to operate ‘24/7’ and deliver a high service level availability.

The mail processing system is distributed throughout the UK and currently consists of 52 mail centres, a central Control Centre, a backup disaster recovery control centre, four manual data entry centres (MDEC) and an Open Systems Laboratory to support test and development work. The distributed mail centres are connected via a secure, private wide area network (WAN) and incorporates, locally, private LANs. The system is intentionally designed such that each mail centre can continue to operate if the WAN is lost.

Mail System Topology

The mail centres act as the local reception point for mail in their region. Received mail is processed at different times of the day depending on the mail centre, the class of the mail and whether it is a letterbox collection or bulk business mail.

Architecture

Received mail undergoes a two stage sort. First, Mail enters the ‘system’ at an outward mail centre where each mail piece is processed through a mail processing machine (MPM) which reads address information and sorts and tags the mail. Once this tagging and sorting of the mail is complete, mail pieces are transported to the mail centre that serves their destination – the inward mail centre. (Local sorted mail remains at the local outward mail centre). At the inward mail centre, MPMs perform a secondary sort to the level of individual delivery walks or points.

On the initial mail sort, each mail piece is fed into a Mail Processing Machine (MPM) which uniquely tags each mail piece, scans it and sends an image of it to the local area processing cluster. Auto-recognition software, using Optical Character Recognition (OCR) type technology, is used to interpret the mail piece address. Not all mail items can be automatically read by the system, so the images from these mail pieces are sent to a Manual data Entry Centre where multiple ‘keyers’ are tasked with manually reading and entering address information from the captured images. Manual address resolution can happen in real-time (within seconds) or in slow time as the mail is transported between outward and inward mail centres. In this way, almost all
mail items can be given an address result by the System. The **address resolution** process allows a routing code to be applied to each mail piece to enable the system to correctly carry out a final sort of the mail at the destination, or **inward**, mail centre.

**Workflow Manager** – Provides processing flow control, within the Local Area Processing Cluster, for all activities from image collection, through address resolution and associated routing and tagging of mail items.

**External Interfaces** – A set of ‘middleware’ interfaces provides the connectivity between the processing system and each, individual MPM.

**Tag Management** - A distributed tag management system is used to maintain and manage information associated with each tagged mail piece as it is processed through the mail system. A ‘tag’ barcode is printed on the mail piece by the MPM that uniquely identifies the mail piece, the tagging mail centre and MPM and time stamp data. This, along with all of the attributes which have been determined about the mail piece, is stored in a tag database at the local processing site. The tag ID provides the link between electronic information flows and physical mail piece flows and also provides the basis for post-processing analysis. The mail piece images and associated tags provide the primary operational inputs into the System.

**Address Resolution** - The MPM takes a video scan of each mail piece to obtain an image, this is processed by the Mail System to determine the routing of each tagged mail piece (address resolution) and to characterise the mail piece attributes such as stamps and other indicia. For the majority of mail pieces, address and non-address attribute resolution is accomplished by automated techniques. Automatic address resolution uses direct processing of the image data to identify characters and/or words on the mail piece. This information is used to select the most probable address from a reference address database (**RADB**). The initial RADB is derived from the postcode address file (**PAF**) produced by Royal Mail and other reliable sources of address information (e.g. the Electoral Register).

**Route Codes** - If the MPM is able to interpret the address then a ‘routing’ barcode is also printed by the MPM on the mail piece that identifies its address parameters. Dependent on the address resolution achieved, the routing barcode may be built up incrementally by different points in the processing chain. The depth of address resolution used for sorting the mail is controlled by a Sort Plan which is unique to each Mail Centre and MPM. For an **outward** sort the resolution will be, at least, to inward Mail Centre level. For an **inward** sort the resolution will be, at least, to walk level and ultimately to the specific delivery point for the mail piece. This information is reflected in the Route Code applied to the mail piece.

**Fluorescent Tag and Route Codes are applied to mail pieces by the mail centre**

**Manual Data Entry** - In the event that an address is not automatically interpreted then manual data entry is invoked. This can be real-time or non-real-time. In real time the mail enters a physical delay line that gives an operator approximately 11 seconds to read the address and enter it into the system. In non-real-time, the mail is held at the Mail Centre and its image is sent to a manual data entry centre where a human operator is tasked with interpreting the image in a defined time period. Once interpreted the information is returned to the holding mail centre where the mail is re-fed through an MPM and the tag ID used to associate the mail piece with the supplied routing information from the MDEC. The routing barcode can then be printed on the mail piece and it then continues to be processed in the normal manner. Royal Mail has centralised MDEC work in four locations, remote from the individual mail centres, and accessed across the private WAN of the Mail System.

**Control Centre** - System-wide management and control of the System is carried out by the Royal Mail Control Centre which is networked to all the mail centres and monitors and reports on performance of the major components of the system.

The control centre provides functions such as performance and network management, security services, software distribution and a 24/7 help desk. In addition, the reference address database is managed and distributed from the control centre. The control centre uses a number of specialist tools that
include Tivoli and Remedy for software management and fault handling, respectively. The management information enables the ongoing operation of the system and provides the data for analysis of the system and the mail pipeline.

**Mail Processing Machines** - The initial processing of collected mail is carried out by a collection of mail processing machines (MPM) located at the mail centres. Royal Mail currently operates over 500 MPMs of various types which include specialist machines for sorting letters and large letters (Flats).

Example MPM Types currently in use include:

- IMP - Integrated Mail Processor
- ILSM - Intelligent Letter Sorting Machine
- FSM - Flats Sorting Machine
- MTT - Mail Transport Sorter
- CSS - Compact Sequence Sorter

Any one mail centre could have a combination of any of these machines.

A camera or scanner on each MPM takes an image of the mail piece as it is fed into the machine. Some MPMs have multiple scanners that enable images to be taken of the front and back of mail pieces. These images are transferred to the local area processing cluster (LAPC) for address resolution. Mail pieces are sorted by the MPM dependent on the results of the address resolution. The MPM prints a unique ‘tag-id’ on each item (in the form of a barcode) so that the system can track the item. The address resolution process enables the MPMs to also print a ‘Routing code’ on each mail piece.

Some MPMs also have the independent capability to process customer barcodes (CBC) without redress to the main processing systems.

**Royal Mail Programmes**

For over 15 years Royal Mail’s information Systems have evolved through the implementation of a number of major programmes. These have provided incremental capability improvements to management and customers built on the foundation of tried and tested legacy systems.

**Address Interpretation**

The initial cornerstone for Royal Mail’s information systems was set by the Address Interpretation (AI) programme. AI provided highly available “business critical” services that were able to process 48 million items per day with Christmas peaks of 80 million and was able to automatically assign 92% of mail items.

The AI System provided a nationally integrated capability to support the handling of automated letters and package mail and services in support of business development opportunities. The AI System made use of the substantial legacy investment in mail handling equipment, personnel and management infrastructure. The legacy capabilities were extended by improving automatic attribute recognition, adding networking between independent mail centres (MCs), centralising manual data entry (MDE) operations, and adding centralised management of the automated mail streams. The AI System continues to provide the basic foundation for the current mail processing systems.

**MEARS**

In 2010 Royal Mail awarded the contract for the Mail Piece Events and Attribute Resolution System (MEARS) which replaced the existing Address Interpretation (AI) system.

MEARS provides a high availability mission critical system that provides the Sortation Decisions for all Royal Mail’s Letters and Flats machines and networks 52 Mail Centres and four MDEC’s into a single National Operational Control Centre.

MEARS supports a 24/7 Operational Service Desk and has achieved high Service Level Availability in support of national mail processing targets.

**Mailmark**

In 2013 Royal Mail awarded the contract for the Enterprise Intelligent Barcode (EIB) programme which is aimed to initially enter service in 2014. EIB represents a major strategic investment in the letters market and will help the Royal Mail track and charge for bulk (commercial) mailings. Royal Mail will market the EIB programme and services under the Mailmark™ name [Ref. http://www.royalmail.com/mailmark].

Currently, the Royal Mail processes 70 million pieces of mail a day and tracking every piece is critical in terms of revenue protection. With Mailmark™, each letter will be imprinted with a barcode that will include information such as point of origin and destination address. The letters are then sorted using recognition technology, which allows each item to be tracked and reconciled against a shipping manifest. Mailmark™ will give Royal Mail the ability to monitor, measure and compare what mail has actually been processed with what mail should have been processed.

Mailmark™ will be integrated into the Mail piece Events & Attributes Resolution System (MEARS) programme, which continues to modernise Royal Mail’s address interpretation system and sorting infrastructure.

Under Mailmark™ a number of new barcodes will be introduced to support the enhanced capability. These consist of:

- Four types of four-state barcodes (4SB):
- Three types of Complex Mail Data Mark (CMDM) barcodes:

A Mailmark™ 4State Barcode (4SB) is a height-modulated barcode that encodes mail piece information into the vertical bars of the barcode, where each bar can have one of four states realised as either an Descender, Ascender, Full bar or central Track.

The Complex Mail Data Mark (CMDM) is a Data Matrix two dimensional barcode. This barcode encodes mail piece information within the data matrix.
Versions of these types of barcodes are already in use by Royal Mail. However, the new Mailmark™ barcode versions will provide enhanced capability to specifically support mail piece tracking and management.

The architecture for Mailmark™ represents a capability uplift to the existing MEARS system architecture.

MEARS already tracks and publishes events and attributes for every automatically sorted mail piece, this capability will be enhanced to read Mailmark™ barcodes and provide tracking for every Mailmark™ item processed at the mail centre.

The Mailmark™ Architecture

The Mailmark™ customer will submit an item manifest into the system which will identify every piece of their barcoded Mailmark™ mail submitted to the mail centre. As mail is processed through the mail centre and the barcodes are read the system will provide a comparison of what has been declared in the manifest against what has actually been processed. Reports will be provided to stakeholders (RM, Customers) showing progress of mail pieces through the system and any discrepancies between declared mail and actual processed mail. The financial systems will use the gathered system data to generate, correct and distribute invoices and enable Royal Mail to protect its revenue.

Systems Engineering

The Royal Mail systems are developed and operated under a service based strategy and as such the framework followed is that provided by ITIL (IT Infrastructure Library) in conjunction with TOGAF (The Open Group Architectural Framework). ITIL provides a framework of Best Practice guidance for IT Service Management and governance. It also provides a focus on the continual measurement and improvement of the quality of IT services delivered, from both a business and a customer perspective.

The ITIL framework is documented in five core books which cover each stage of the service lifecycle, from the initial definition and analysis of business requirements in Service Strategy and Service Design, through migration into the live environment within Service Transition, to live operation and improvement in Service Operation and Continual Service Improvement.

The ITIL Lifecycle

The ITIL lifecycle is consistent with the Systems Engineering lifecycle and requires similar development artefacts and processes. As such, operating under an ITIL framework has not presented any major challenges for systems engineers on Royal mail programmes.
SE Tools Used

There are two primary engineering support tools used for design and maintenance of the Royal Mail systems, these are:

- Enterprise Architect (EA) tool from Sparx Systems used for System Design and Requirements Management;
- Hewlett Packard Quality Centre (HP-QC) tool used for Verification and Validation.

Enterprise Architect is a UML-based tool that is used for System Design and Development activities and supports the development of a TOGAF Model. The EA tool supports capture, management and maintenance of the system design with traceability back to the requirements baseline as well as configuration management and version control.

HP Quality Centre provides capability to enable test and release management, test execution and defect tracking. Requirements management is supported and provides the basis for all testing as well as full traceability from requirement to test and vice-versa.

SE Challenges

The major design drivers for the Royal Mail systems is to provide highly open and flexible solutions that are fully integrated with the current system and which supports transition and continued support to legacy and new external systems.

**Modelling** - building a comprehensive design model has proved to be essential to effectively managing the impact of change on legacy systems. A comprehensive model based approach allows changes to be identified and managed.

**Integrated toolsets** - are essential if, for example, requirements are going to be effectively tracked and managed from conception through to delivery and sign off.

Meeting these objectives provided a number of challenges, not all technical. For example, the Royal Mail systems undergo a regular series of upgrades to the underlying software covering new version uplifts, security patches and bug fixes. These have to be tested and integrated into the live system in a controlled way. Delivering new capabilities and systems into this environment provides challenges to the integration and test strategy, on top of this 24/7 operation adds additional complexity. To meet this challenge, a well defined and agreed test strategy that makes allowances for a dynamic infrastructure and live environment has had to be developed.

Other challenges that have to be addressed by the system include handling the large increase in mail volumes during the Christmas period and the wide variations in addressing and handwriting. Valentine's Day also presents extra challenges with a larger number of red envelopes being used which can present address recognition issues. The risks in these areas are mitigated by appropriate system sizing upfront during system design and bringing on-line extra processing facilities and additional manual data entry staff at the appropriate times. In addition, MPM camera and address reading OCR technology assist in minimising the impact.

### Acronyms/Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>4SB</td>
<td>Four State Barcode</td>
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<tr>
<td>AI</td>
<td>Address Interpretation</td>
</tr>
<tr>
<td>CMDM</td>
<td>Complex Mail Data Mark</td>
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<tr>
<td>CSS</td>
<td>Compact Sequence Sorter</td>
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<td>EA</td>
<td>Enterprise Architect</td>
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<tr>
<td>EIB</td>
<td>Enterprise Intelligent Barcode</td>
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<tr>
<td>FSM</td>
<td>Flats Sorting Machine</td>
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<tr>
<td>ILSM</td>
<td>Intelligent Letter Sorting Machine</td>
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<tr>
<td>IMP</td>
<td>Integrated Mail Processor</td>
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<td>ITIL</td>
<td>IT Infrastructure Library</td>
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<td>LAN</td>
<td>Local Area Network</td>
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<td>LAPC</td>
<td>Local Area Processing Cluster</td>
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<td>MDEC</td>
<td>Manual Date Entry Centre</td>
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<td>MEARS</td>
<td>Mail Piece Events and Attributes Resolution System</td>
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<tr>
<td>MPM</td>
<td>Mail Processing Machine</td>
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<tr>
<td>MTT</td>
<td>Mail Transport Sorter</td>
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<tr>
<td>OCR</td>
<td>Optical Character Recognition</td>
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<tr>
<td>TOGAF</td>
<td>The Open Group Architectural Framework</td>
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<td>WAN</td>
<td>Wide Area Network</td>
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Acknowledgements

Many thanks to my colleagues who provided the references and subject matter expertise to enable me to compile this article.

Steve Fisher
Lockheed Martin
www.lockheedmartin.co.uk

It is the intention to encourage members of the UK Advisory board, INCOSE Working Groups and individual Members to submit articles for future editions of Preview. To contribute an article contact Robbie Forder at: communications-director@incoseonline.org.uk

It should be noted that all published articles represent the views of their Authors and not necessarily those of INCOSE.
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Wow! INCOSE has been going for twenty years. Congratulations and thank you to all who have made this organisation what it is today.

A lot of good advice and best practice has been pulled together and published over the years. There is now even a pathway to becoming a chartered engineer in systems engineering, which was unthinkable twenty years ago. Such has been the energy and enthusiasm of members that you would think that all remained to be done was to dot the “i”s and cross the “t”s.

But is this really the case?

Well, let’s look at something a lot of people are familiar with - cars. Back in 1994 I owned a Saab 900, which had been put on the road in 1990. The body was built of metal. It had what was then considered a lovely car heating system with air vents strategically placed to give maximum comfort and control knobs you turned for temperature and how much air you blew through the car. The vents had deflectors that you could manually adjust. The fuel to the turbo engine was controlled with what I can only describe as a gadget, which meant the turbo engines had become very much less troublesome to maintain. There was also a radio with traditional turnable knobs. You could adjust the position of the wing mirrors from inside the car, something I found useful when reversing into a tight parking space. Of course it had the rear window heater, very useful in winter. Naturally, being a Saab it had front seat warmers, a must for the Scandinavian winters.

Last year I bought a brand new Volvo. Where do I start with the differences? The body is made of acrylic. The dashboard has two screens, one for the driving controls and the other for controlling all the extras. The driving controls advise you things like if you’re in the wrong gear, what miles per gallon you are getting from the car at that instant and distance to tank empty if you keep up your current driving style. The control of the extras includes linking into your phone, accessing the radio or other loaded music, choosing the colour of the interior lighting or the type of control screen you want to see, switching off certain controls to make driving on icy roads easier and goodness knows what else I haven’t discovered yet. The car has sensors all round. It warns you if you’re getting too close to objects in front or at the back, making nasty beeping noises. The windscreen as well as the rear window has a heater. Just switch it on and within a minute or two the ice that was covering the windscreen slides down onto the bonnet. And of course it has the front seat warmers... Hmm... luxury. There’s no dipstick to check the oil level – that now comes as part of the service! There’s the automatic parking capability, cruise control, speed limiters... I could go on... It’s one heck of a sophisticated complicated machine.

What’s brought about this massive change?

Well, smaller and smarter computers for one thing. Then there’s better measuring, both in terms of accuracy and reliability. And of course the continuing trend of miniaturisation has reached the level where subsystems can be packed tightly onto cars. Putting these trends together has led to bit-by-bit enhancements to car designs, a sort of bottom up systems engineering.

These trends don’t just affect cars. They are universal in the development of machines, ranging from big ones on the manufacturing floor doing horrendously complicated jobs to the coffee maker at home. They have been with us for the past two decades and much more, and are likely to continue for at least another two decades and probably for a lot longer than that. But it has all led to many more bits being assembled into a single system. Which is why more systems engineers were needed. Yes, there were some engineers who were naturally talented at putting together systems, but there were a limited number of them. Hence the desperate need for an institute, like INCOSE, to step up to the mark to teach and train more.

So far we’ve managed to keep control of our designs, knowing which bit affects what part in given ways, using tried and tested techniques such as architecture frameworks, user and system requirements, waterfall diagram processes. But will these tools be adequate in the face of the onslaught of more “gizmo cosmetics” on top of the basics?

Some very complicated projects have already decided to choose their main subsystems based on where the interfaces are the least complex. The standard N2 diagrams have helped a lot on dealing with this issue. De-complexing interfaces works to a limited extent. However, this is not easy to do and is likely will prove inadequate in the not too distant future.

What about using these new super-duper computers to do the systems engineering modelling for us? This relies on getting the modelling right. I know a lot of people think this should be relatively easy, but I’ve seen so many pitfalls triggered (e.g. not fully checking theory assumptions were applicable or failing to ensure all the necessary aspects are included in the model) that I doubt this will prove to be a long-term solution. Yes the models will become more accurate in their modelling as their errors are found and removed, and are reused time and time again. But as systems become more complex, even these fast assessing means will start to fail.

So what’s left?

Back of the envelope sums? Yes this is a good tried and tested method of the past, but it’s not for the complexity and potential for the detrimental ripple effects in this safety consciousness age.

Anything else we could try?

Gut feel? Put it together and hope for the best?

Um... err... I think INCOSE has still got a lot of work to do, don’t you?

O. B. Server

News from the UK Advisory Board (UKAB)

During the last 12 months the UKAB has concentrated effort on the professionalisation of systems engineering in the UK. This has seen many of the UKAB organisations support their systems engineers in gaining professional registration as Chartered or Incorporated Engineers. As we move forward in 2014 the UKAB has endorsed the INCOSE UK Strategy and is currently supporting the development of the operations plan including the exploration by the INCOSE UK Professional Development Director, Ian Pressland into providing a route to CSEP acquisition. This we see as another significant milestone in demonstrating the value of systems engineering and employing systems engineers to solve complex problems.

Those who have looked at the UKAB pages on our website will know the UKAB provides the UK Council with a robust mechanism for testing its thoughts and a Joint Workshop held after ASEC13 established that we need to do more in communicating with our various stakeholders. This activity has led to the establishment of a small team which will support the Communications Director and leverage our various communications opportunities. Another issue of significant importance
is the development of systems engineering capability within our organisations. After an exploratory workshop last year I am looking forward to a joint workshop between the INCOSE UK Council and the UKAB to consider how INCOSE UK can support organisations in the development of their systems engineering capability.

At the AGM and the last issue of Preview I presented four strategic development opportunities that were identified by The INCOSE UK President and myself as a key part of developing Systems Engineering in the UK. We have been working with one of the UK’s leading brand names from one of these sectors and I hope we may be seeing them represented in the UKAB shortly.

In parting; it is almost two years since I took up the role of Chair and it is now time to look to the future. I have in accordance with the UKAB Terms of Reference called for nominations for candidates to stand as the UKAB Chair from 1st September 2014. The election will be held shortly and I look forward to announcing a new UKAB Chair in April.

Ivan Mactaggart
UKAB Chair
ukab-chair@incoseonline.org.uk

UKAB Members
INCOSE Events Calendar

This calendar is a summary of events at the time of going to press. For the latest, up-to-date information please visit the Events page at the UK INCOSE website: www.incoseonline.org.uk

Dates for your diary

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<thead>
<tr>
<th>Date/Time</th>
<th>Organisation &amp; Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 April 2014</td>
<td>Railway Interest Group</td>
<td>Crossrail 2 - History and transport planning case: Are we talking the same language - planners and engineers?</td>
</tr>
<tr>
<td>17:00 for 17:30</td>
<td>Parsons Brinckerhoff’s offices, 6 Devonshire Sq, London EC2M 4YE</td>
<td>Richard is Modelling Manager at TfL. He will be talking about how TfL decide which places to connect and how and the extensive modelling undertaken to provide decision support. The talk will look at the challenge in the context of real case study.</td>
</tr>
<tr>
<td>13 May 2014</td>
<td>Railway Interest Group</td>
<td>The Atkins/UCL MSc in Rail Integrated Design Management: Developing the Skills to Deliver Multi-discipline Design Solutions</td>
</tr>
<tr>
<td>17:00 for 17:30</td>
<td>UCL’s Roberts Building in Torrington Place, London, WC1E 7JE.</td>
<td>Bob will describe the integrated programme and its syllabus, reflect on the experience with it to date and suggest lessons that can be drawn for teaching system-related skills in the rail sector.</td>
</tr>
<tr>
<td>11 June 2014</td>
<td>UK Chapter</td>
<td>2014 Tutorial Day</td>
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<tr>
<td>Full Day</td>
<td></td>
<td>INCOSE UK tutorial days provide an excellent opportunity to extend or reinforce your Systems Engineering skills by learning from acknowledged experts. The day focuses on subjects that are of practical use in an SE environment by covering topics that are established SE processes and techniques to add to your SE ‘tool-box’. To view the Tutorials visit <a href="http://www.incoseonline.org.uk">http://www.incoseonline.org.uk</a>.</td>
</tr>
<tr>
<td>24 June 2014</td>
<td>Railway Interest Group</td>
<td>HS2 Systems Architecture</td>
</tr>
<tr>
<td>17:00 for 17:30</td>
<td>Mott MacDonald’s offices in 10 Fleet Place, London EC4M 7RB</td>
<td>Eddie will describe how a systems architecture is being constructed and used on the HS2 project to identify all high level interfaces and to align activities concerned with RAM, safety, requirements, commissioning and overall systems demonstration and assurance.</td>
</tr>
<tr>
<td>27 June 2014</td>
<td>INCOSE Central</td>
<td>INCOSE International Symposium</td>
</tr>
<tr>
<td>03 July 2014</td>
<td>Henderson, NV, USA</td>
<td>For more information visit <a href="http://www.incose.org/symp2014/?page=welcome">http://www.incose.org/symp2014/?page=welcome</a>.</td>
</tr>
<tr>
<td>Full Days</td>
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<tr>
<td>27 October 2014</td>
<td>INCOSE EMEA</td>
<td>INCOSE EMEA Sector Conference</td>
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<tr>
<td>30 October 2014</td>
<td>Cape Town, South Africa</td>
<td>The EMEASEC is the continuation of the biennial European Systems Engineering conferences (EuSEC). The name of this ninth conference has changed from EuSEC to EMEASEC in order to better represent the geographical and cultural scope of the EMEA Sector of INCOSE. For more information <a href="http://incose-emea.org/">http://incose-emea.org/</a>.</td>
</tr>
<tr>
<td>Full Days</td>
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<tr>
<td>18 November 2014</td>
<td>INCOSE UK</td>
<td>Annual General Meeting</td>
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<td></td>
<td>Royal Air force Museum Cosford</td>
<td>The Annual General Meeting of INCOSE UK Ltd</td>
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<tr>
<td>18 to 19 November 2014</td>
<td>UK Chapter</td>
<td>Annual Systems Engineering Conference 2014 (ASEC2014)</td>
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<tr>
<td>Full Days</td>
<td>Royal Air force Museum Cosford</td>
<td>“Systems Engineering then and now - celebrating 20 years of INCOSE UK”</td>
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<td></td>
<td></td>
<td>This year marks the 20th anniversary of the formation of INCOSE UK. This year’s ASEC, therefore, promises to be an extra special event. For more information visit <a href="http://www.incoseonline.org.uk">http://www.incoseonline.org.uk</a></td>
</tr>
<tr>
<td>24 to 27 January 2015</td>
<td>INCOSE</td>
<td>International Workshop</td>
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<td></td>
<td>Torrance CA</td>
<td>Mark your Calendar for IW 2015!</td>
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