preview

the Newsletter of the International Council on Systems Engineering UK Chapter

Winter 2011

In This Issue:

President's Corner

As the new President on the Block I thought I should introduce myself and tell you a little bit about my first impressions and about some of the plans we are hatching for the coming year. So, by way of introduction, I have been involved in systems engineering consultancy ever since leaving the academic world (where I had a brief spell as a theoretical physicist) and have worked on a wide range of systems and system of systems problems. My work has been mainly undertaken in the Defence domain but I also have some experience of government, rail and space. Currently, I am seconded to Niteworks - a joint MOD/Industry construct that addresses systems problems for which no single company has sufficient expertise - and my employer is Atkins, the global design and engineering consultancy. I am very grateful to both Atkins and Niteworks for allowing me the time to take on the President role.

My first act as President, as part of the 'handover ceremony', was to thank Doug Cowper the outgoing President for his contribution - and to present him with a natty tie pin. Let me reiterate those thanks: Doug has done a fantastic job pushing the Chapter forward in difficult times. Thanks are also due to the other officers who stepped down at the same time, particularly Andrew Daw (who completed his stint as Immediate Past President and an additional temporary role as Professional Development Director). The solemn handover ceremony took place at the ASEC10 Conference - which I can honestly say was the best INCOSE Conference (UK or International) that I have ever attended. The quality of contributions - both from the platform and audience - was of the highest standard. I was particularly struck by the breadth of contributors from different domains and market segments, including the usual defence and aerospace, but also newer areas like medical and transport. This is very encouraging.

Counteracting the warm glow from the Conference was the unwelcome news from INCOSE Central about the membership fees rise. The UK Council was given only two days notice of the decision and we were therefore unable to make any representations on behalf of UK members. You should also be aware that the UK Chapter retains a very small proportion of your dues (only £20, even after the increase) - the rest goes to INCOSE Central. We are now looking hard at the INCOSE financial model and have initiated discussions with Central on how we might be able to deliver increased value to the UK membership. More on this in due course.

Finally, looking to the future, we are revisiting the Chapter strategy, focussing on delivering value to our different stakeholders. Plans are already well advanced in several areas, including: improving relationships with other professional bodies; a new engagement with academia; improved support for professional development; more targeted events, and; a new focus on influencing the wider world through our 'collective voice'. To me, this is shaping up to be a really exciting programme for the coming year - but I welcome any feedback you may have on priorities and interests. As you know, INCOSE is a volunteer organisation and we rely on enthusiastic and committed individuals (and understanding employers) for everything we do. If you have a burning issue and would like to get involved in doing something about it, please get in touch!

Dr Mike Wilkinson
President INCOSE UK

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INCOSE UK Annual General Meeting 2010

As usual, the Annual General Meeting of INCOSE UK was held at the end of the first day of the Conference. This particular AGM saw several changes to the Council, with Doug Cowper completing his term as President and moving to the Immediate Past Present role, Andrew Daw vacating that role to move on to life after presidency, and Mike Wilkinson taking over as President, with Alan Harding moving into the President Elect role from his previous role as UKAB Chair - commiserations to Mike Henshaw who also stood for this role. The posts of Finance Director and Technical Director were also up for election, but on this occasion there were no nominations for the roles, so the present incumbents, Peter Lister and Andrew Farncombe respectively, have agreed to remain in post. Finally, having been a gapped post since its creation earlier in 2010, the post of Professional Development Director has now been taken on by Ian Presland, who should bring a new focus to the role.

Outgoing President's Report

Doug's outgoing report featured a number of headlines, indicating the progress that has been made under his leadership. Firstly, he was pleased to report that individual membership does not seem to have been too adversely affected by the economic downturn, with UKAB membership continuing to increase every year. With UKAB membership increasing, it should be no surprise that INCOSE UK has also branched out into the wider engineering community, with EC[UK] affiliation in the pipeline, and growing relationships with the InstMC, IET, RAeS, and IEEE. He went on to highlight the improvements in organisational restructuring and improved process that have been brought in, including the rolling election system for Council members, and the use of on line voting. Moving on to the grass roots activities, Doug was keen to highlight the excellent work that has been done by the various working groups, leading to international recognition in some cases, and the continued thriving of the current local groups and interest groups. Finally, he was keen to stress how INCOSE UK contributes at the international level, with key involvement in EuSEC 2010 in Stockholm, strategic input into the INCOSE Transportation Workshop in Chicago, and the Chapter being awarded the Gold Circle Award last year for the 8th year.

Doug also provided a summary of where he felt we had got to against some of the strategic objectives that he set at the start of his tenure. As you would expect, many have been achieved, some have proved harder than expected, and some turned out to be less relevant than originally thought, but by and large INCOSE UK is now promoting itself better, offering a broader range of activities, improving its outreach with the wider community, and making better efforts to monitor its own effectiveness. Finally, Doug concluded with the news that he has been lobbying hard for a special 21st birthday present for INCOSE UK in 2015 - holding the INCOSE International Symposium. This would be both an honour for the Chapter and a real opportunity for the membership to attend a world class systems engineering conference on their doorstep.

Other reports

Peter Lister's Finance Director's Report was rather less positive. Due to a combination of exchange rate losses and lack of profit from events, INCOSE UK made a loss of £25k in 2009/10. This is by no means catastrophic, but as befits the general financial environment, there is a need to focus on profitability in 2010/11, which is likely to drive a move away from large three day events such as ASEC 2010, to other venues (probably a popular choice) and other event models. However, rest assured that INCOSE UK is still committed to delivering high quality events offering value for money.

Andrew Farncombe's Technical Director's report praised the excellent work that has been done by the working groups and interest groups,

highlighting the publication of the Competency Framework and Guidelines, and the In Service Systems WG report on extending the SE handbook as particular examples, and also highlighting the excellent work of the Architectures Working Group both in the UK, and in supporting international initiatives such as ISO42010. He also reported on the revitalisation of the "Z Guide" series, led by Hazel Woodcock, with four new guides published in 2010.

Ian Gibson's Communication Director's Report focussed on the behind the scenes work that goes on to provide benefits to members, including continuous improvements to the functionality of the website, publication of Preview, ePreview and the Annual Report, and engagement with the wider systems community. He also highlighted the continued good work of the current local groups, and the impending launch of the South Coast Local Group. Finally, he thanked the communications team, without whom none of this could happen (including this publication itself).

Rick Adcock's Events Director's Report described the evolution of the events strategy along three strands - a wider portfolio of events, a more professional approach to events management, and a change to the funding model. He went on to explain the three types of event that INCOSE UK will run in the future: the Annual Systems Engineering Conference in the autumn, some focussed technical events spread throughout the year, and a range of local group events which offer a free local event programme for all who want it. He then outlined the events planned for 2011, which can be found in the events section of this issue.

Ian Presland's Professional Development Director's Report centred on the developments of the various professional qualifications that are available to members. Firstly, he described the interest in CSEP from the IET as an acknowledgement of depth of knowledge in Systems Engineering, and some intriguing possibilities to jointly promote and market CSEP within the UK. Secondly, he explained the progress made in making use of Engineering Council 'buddying' arrangements to allow INCOSE UK members to be awarded CEng status via a licensed institute without having to pay to join that institute. Finally, he provided an update on the sedate progress of the CSys designation which the InstMC are pursuing with the EC^{UK}.

Alan Harding's UKAB Chair's Report covered the aims of the UKAB to provide a forum to influence INCOSE UK activities within the wider SE community, and provided an update on the current UKAB membership and potential future members. He particularly highlighted the UK Systems Engineering survey, and the ongoing professionalisation agenda as examples where the UKAB and the INCOSE UK Council have cooperated to good effect.

Emma Jane Taylor's Company Secretary's Report covered the results of the election (reported at the start of this article), provided up to date figures for the individual and UKAB membership, and gave the new registered address for INCOSE UK.

Finally, Mike Wilkinson's Incoming President's Report raised some of the issues which he expects to dominate the next few years, including the drop in future discretionary spending, and the increased need for systems thinking and systems engineering to enable our stakeholders to achieve more with less. He went on to exhort the audience not to rest on their laurels but to take up the challenge of better understanding our stakeholders, focussing on delivering clear value and benefits from systems thinking/engineering activities, and spreading the word of what ST/SE can do.

INCOSE new dues information for 2011

INCOSE's leaders are proud that our organisation has been able to add more programmes and educational opportunities to the many benefits that were available when we were founded twenty years ago.

In addition to publishing *INSIGHT*, *eNote*, and *Systems Engineering*, we will begin sponsoring the publication of a new journal-*JET*, the Journal for Enterprise Transportation - in 2011. We continue to see significant growth in demand for the certification programme, and we aim to continue forming alliances with other organisations that will increase the opportunities for INCOSE members. We have also planned an aggressive Webinar schedule to offer continuing education and support to our members.

The Board of Directors is responsible for the financial position of the organisation, and always works to keep costs to members reasonable and competitive with other, similar organisations while supporting the activities of the organisation. It has become increasingly difficult for us to support the level of activities that are valued by our members at our current rate of dues. We have held off as long as possible, but it would prove unwise in the long run for INCOSE to continue without adapting to the changed economic climate.

Effective 1 January 2011, dues will increase in all membership categories as shown below so that we may maintain the quality of our programmes, initiatives, investments, working groups, and seminars.

Membership Category	Annual Dues (in USD)
Individual	135.00
Senior	75.00
Student	35.00
Corporate Advisory Board	3,750.00

For individual members, discounts will be applied for advance payment of dues such that annual dues will be USD 125/year for a 3-year advance payment and USD 115/year for a 5-year advance payment. Concurrently, to provide additional capital for chapter activities, we will be increasing by 50% the amount that is forwarded to chapters from individual members' dues.

The Board of Directors is aware that any increase in dues may cause some hardship for individual and corporate members, but the Board also has a fiduciary responsibility to our members to structure a sustainable financial model as INCOSE grows and matures. In the past few months, we have opened discussions on new avenues of revenue for the organisation that can help reduce the dependency on dues income alone. In every case, the goal is for INCOSE to increase its revenue in order to provide added value to the membership, meet existing costs and be able to continue to invest in its services.

The increased income from dues will allow us to restore to the 2011 budget some important funds that had previously been cut. These funds will allow Technical Operations to continue its work in developing products and contributing to a range of ISO standards. They will also support new investments to engage INCOSE's academic community and continue to develop our Youth Outreach initiative.

I am committed to helping INCOSE meet the cultural and practical challenges as we enter our third decade as the leading systems engineering organisation in the world. I hope that you will not only support this necessary dues increase, but also continue to help drive our global evolution in other ways through INCOSE's working groups, chapter activities, and initiatives.

Your Board of Directors exists to serve the needs of INCOSE members and to pursue the INCOSE Mission. You may contact us at any time with your suggestions, questions or concerns.

Yours sincerely,

Samantha F. Brown
INCOSE President

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Annual Systems Engineering Conference 2010

Systems Engineering: Adding Value in Challenging Times

From November 8th to the 10th, 2010 INCOSE UK introduced a new three day conference format. This first conference was held at the Crowne Plaza Hotel at Heythrop Park Resort in Enstone, Chipping Norton, Oxfordshire.

ASEC 2010: Day 1 – Morning session

Key Note Address: "Possible approaches to the complex real world of 'System of Systems' problems... the case of transport" – Professor Brian Collins: Chief Scientific Advisor, Department for Transport

Brian gave a fascinating insight into the way that systems thinking is being applied within the Transport domain, and how this thinking has been expanded to analyse the rest of the UK infrastructure, leading to the first ever presentation to the Treasury with "engineering" in the title. This was described as being very unusual as high level policy is generally dictated through economic arguments, rather than by more subjective issues. Brian took this further by asserting that "how we synthesise solutions is as important as how we analyse problems", going on to make the point that interoperability (even just at the level of deconfliction) is going to be key in the future with a need to think about the wider, bigger picture. He went on to make the point that in such messy, dare I say, wicked problems, there will be an increasing need to underpin decision making with probabilistic data rather than giving definitive answers. This is not expected to be comfortable for politicians.

The presentation was rounded off with a series of provocative statements. Firstly, a set of statements aimed at the Transport domain:

- How do we make further green house gas savings?

- How do we get people to reduce personal travel?

- How do we make logistics less energy consuming?

- What critical leapfrog innovations might be necessary or essential?

- Can we model, analyse and make useful predictions of any of this using current methods?

Secondly, a set of statements aimed at the wider community:

- Does trustworthy analytic evidence always lead to better decisions?

- Should we educate decision makers?

- How often do we review a decision making process?

- Will the complexity of policy decisions demand an unrealistic level of evidence gathering?

This was an excellent thought provoking presentation which led to a number of questions being asked, and an interesting set of further observations being made. Firstly, "getting from here to there" requires both a better understanding of what "here" and "there" really mean, and a further development of the current systems thinking toolset to work better at a higher level. Secondly, the key thing about transportation problems is that "people experience journeys", rather than transport systems being an end in themselves. Finally, given such a messy domain, Brian concluded with the observation that we need to be better able to distinguish between complicated problems that we can solve, and complex problems that we need to be able to accommodate and live with.

"Ultra Large Scale Systems" – Hillary Sillitto: Thales

Hillary presented his views on how to approach what have been dubbed "ultra large scale systems". His key contention, based upon the outputs from a workshop held at St Andrews University in 2009, is that "traditional systems and software engineering methods are not sufficient, and may not even be appropriate" for use on ultra large scale systems. The full paper identifies 5 key issues, 10 principles and 5 practices which can be applied to these problems, but understandably these were not gone into in great deal during the presentation.

Linking in with some of Brian Collins's observation, Hillary explored the concept of "objective complexity" in relation to technical systems and socio-technical systems, asserting that whilst objective complexity can definitely be found in the former, it may not necessarily exist in the latter, pointing towards a conclusion that complexity in socio-technical systems may be more likely to be subjective rather than strictly objective.

He went on to explain the relevance of coupling in ultra large scale systems as it tends to result in power law behaviours being exhibited, leading towards an unexpectedly high prevalence of events with severe consequences. He suggested that measurement is key to identifying such power law behaviour, but that it needs to be both appropriate and relevant to be useful, and that uncertainty will always be inevitable in any complex system.

Building upon the theme from the first session, the key take home point from the question and answer session is that the real difficulty in dealing with ultra large scale systems is getting the split right between "that which can be solved" and "that which must be managed" and then acting quickly enough to take action before the world moves on.

"Human Factors - On the Right TRAK" – Chris Lowe: Liv Systems, Nic Plum: Eclectica Systems

Nic started off by introducing himself as an "accidental systems engineer", using an anecdote which probably has a feature length version that he'd be happy to give at the bar. His stated objective for the presentation was to explore the use of human factors and user-

centred-design in unusual places, principally in the rail industry. He characterised this industry as being very strong on silos of disciplines, with a big emphasis on interfaces and integration, but a systematic rather than systemic focus. Within this context architecture frameworks, such as TRAK, are definitely scary and new.

As a starting point, the question "does a framework have a user interface?" was posed. This was really aimed at encouraging the audience to think about how architectural frameworks present themselves to the people that have to make use of them, with a contention that "if you look after the people, the rest will fall into place".

Nic went on to explain the influences and dynamics behind the TRAK enterprise architecture framework and its stakeholders. He explained that simplicity has been the key driver behind the development of TRAK with the aims being:

- It needs to be easy to follow (both the metamodel and the views);

- Views need to fit on a page;

- The number of different views in the framework should be minimised;

- Aimed at the users, not the specifiers;

- All unnecessary choices that modellers could make should be removed, so that there is only one way of doing things wherever possible.

He also stated that the front end efforts to improve communication have led to some hard rules on colours, naming, and use of relationships, with an aim to be just fit for purpose with a metamodel that fits onto a single page (unlike other frameworks such as DODAF 2 where there are in the region of 250 elements).

Following on from Nic's quick overview of TRAK, Chris then went through an example of applying TRAK to a human factors problem. He explained that this initiative came about through a perception of a renewed interest in the whole-system approach within the human factors integration community, and a renewed appreciation within the systems engineering community that human factors is important and necessary. TRAK was seen as providing a potential common reference point for design efforts coming from both communities. He went on to say that existing approaches to adding human factors views to frameworks, such as the MODAF/NAF human views, were looked at as part of this work, but it was felt that they were both too domain specific, and too highly specialised away from the standard parts of MODAF, so it was seen as better to simplify the human factors aspects down to the point where they could be incorporated into TRAK at the ground level, so that humans are properly designed in from the start.

The particular example that was covered in the presentation, and accompanying paper, was an Automatic Traffic Regulation system, used to smooth the flow of traffic on the railways. As with all of the presentations, much more detail can be found in the paper, which can be downloaded from www.incoseonline.org.uk. The key point that Chris ended on was that TRAK was not only useful in its own right for developing the human factors solution, but that in particular it was very helpful for facilitating interactions with the systems engineering community.

Once again, this presentation raised a number of questions, which led to a number of observations. Firstly, to be of any use, architectural frameworks need to be used by all involved stakeholders. Secondly, that everybody thinks that their domain is somehow different, but that in practice letting people introduce their own domain language into a framework is unhelpful. It was seen as being far better to keen things clean and try to pull the specialists out of their own domain silos. Finally, whilst people can find it very comforting to put everything into the model, this is also often unhelpful, to TRAK comes with a "minimal process" to help make it obvious when to stop.

"Engineering solutions to complex problems – can Open Architectures help?" – Merfyn Lloyd and Simon Masley: Defence Equipment and Support, MOD

Fitting in with the theme of the day, one of Merfyn's first points was that people like to call everything "complex" when it's nearly always just complicated, or more likely a mixture of complicated aspects, with a few complex parts thrown in.

The main part of his presentation centred on the Generic Vehicle Architecture (GVA) initiative, which has been codified into Defence Standard 23-09. GVA sets out the open standards to be used on compliant platform systems, and is both mandated and policed to ensure that it is applied appropriately. The standard is based around dealing with 8 keys problems that have been found with UOR (Urgent Operational Requirement) vehicles in Afghanistan:

- Power;

- Space;

- Weight;

- Reliability;

- Maintenance;

- Agility to adaptation;

- Increasing training burden;

- Human Machine Integration.

The principles behind GVA are fully explained in the paper, but are based upon building on the past, building in future upgradeability, taking a whole platform view, involving industry, and ensuring that it is MoD owned and maintained. The expected benefits are an enhanced operational effectiveness at the front line, with reduced pan-DLOD cost. To get this up and running the open architecture vision has been widely socialised, backed up with "art-of-the-possible" prototyping using common vehicles, using generic interfaces rather than a generic design.

He went on to explain that the technical working groups were based upon engineers in jeans and t-shirts, with business development people in suits strictly banned – he commented that this may have been why it worked so well!

Key lessons that have come out of the GVA initiative so far are that it is essential to have a clear vision of what "good" looks like to drive the

work along and give it a sense of purpose, and that prototyping is absolutely fundamental. The final point that Merfyn made was that 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.

Yet again, this presentation led to many questions, with the following observations being made:

- VSI (Vectronics Standards Initiative) was used as a basis for the technical aspects;

- It was good to see a presentation that applies to commercial areas as well as defence;

- There are bound to be issues with design authority when third party elements are introduced downstream;

- Until UOR vehicles start becoming part of the core fleet it is unclear how the supporting processes will fit together;

- The Land Open Systems Architecture (LOSA) is doing similar work;

- US efforts to reduce stovepiping have been mostly focussed on C4I (Command, Control, Communications, Computers and Intelligence), rather than taking a holistic view;

- The Acquisition Operating Framework (AOF) will be expanded in due course to provide a common point of reference for commercial and industrial aspects associated with the UOR process.

ASEC 2010: Day 1 – Afternoon session

Conference Theatre Session: "TRAK – an architecture framework for rail" – Colin Wood: London Underground Capital Programmes Directorate, Nic Plum: Eclectica Systems, Andy Pryor: SEA

This conference session provided an in-depth explanation of the development of the TRAK framework, followed by two cases studies showing how TRAK was used to support the London Underground SSR Upgrade, and to develop a Railway Functional Architecture.

Nic kicked things off by describing the maturation of TRAK from its early days as a set of Visio diagrams, to its current form as a UML metamodel and profile available as a plugin for the Sparx Systems Enterprise Architect tool. The process of getting there followed a logical sequence of defining the metamodel, then developing the profile, then moving on to create custom toolbars, searches, diagrams, context sensitive searches and other features that will make TRAK more usable.

This part of the session concluded with a set of observations that will be of use to anybody else attempting to undertake a similar activity:

- Constraints can be hard to enforce, especially as you need to develop the ability to predict "wrong behaviour" by end users, who have a habit of finding new ways to break things.

- All tools have quirks, and each one is different.

- A repository based tool is essential. Whilst objects on diagrams are easy to see, it is the relationships between them that are key.

- There is only a small group of people doing this sort of thing, so although support is available, you have to go out and find it.

In the next part of the session, Colin shared his experiences of developing system architectures for the Sub-Surface Railway Upgrade, a project intended to provide 191 new air-cooled trains, with a new signalling system and modernised train depots, power systems and track. Initially this was described as a somewhat chaotic approach with the team spending 24 months "reverse systems architecting" drawing diagrams in Visio. Not surprisingly, this led to strikingly different styles of diagrams, with no shared underlying taxonomies or data models. However, this was by no means wasted effort as many of the layout diagrams proved useful and fed into the development of TRAK and its underlying metamodel, and provided some of the intellectual groundwork for the adoption of the new ISO 42010 standard within the organisation.

He went on to show some examples of TRAK views that were developed to support the SSR Upgrade Project, and made the often overlooked point that architectural repositories don't manage themselves – they need to be regularly reviewed and maintained so that they don't get messed up. Finally, he went on to talk about where the architecture efforts were going next. The initial quick wins were seen to be uniting different business areas and integrating with London Underground project lifecycles. Interesting opportunities to share best practice with Transport for London, and the New York City Transport authority were also touched upon, with potential to exploit this work on future deep tube upgrades and redefine business processes to better understand what they should stop doing in the future.

The major issues that emerged during the project were the need to manage stakeholder expectations and misconceptions, and the need to strike a balance between fast output and maintaining a good and accurate model. Positives that were observed included low cost, good support to the systems engineering processes, good integration with requirements, ease of learning, buy-in from sponsors, and a perception that a TRAK based architectural repository adds value.

In the final part of this session, Andy Pryor explained how TRAK was used to support the definition of a Railway Functional Architecture. The decision to use TRAK was based upon a number of factors:

- There was no modelling standard within UK Rail;

- TRAK has a small and easy to understand metamodel in comparison to other frameworks such as MODAF;

- There is a growing community of users;

- It is well documented;

- Good tool support was available.

Initially, a strawman model was developed to support consultations with the steering group and with domain experts, through a series of review workshops. This was then further developed leading to a relatively complete "Concept Perspective" and a "Solution Perspective" that has some limited areas of depth to show proof of principle. Once again Andy showed some examples of the TRAK views used to support this process, and once more they looked easy to follow and easy to use. The model itself is intended for release among the wider community, subject to issues with maintenance and availability being resolved.

He rounded up by touching on some of the issues and benefits that were encountered during the project. Key issues included managing the evolution of the meta-model, maintaining the split between the concept and solution boundaries, developing an effective review process, and knowing when to stop. Key benefits included good

alignment with project objectives, an easily understood architecture framework, and the development of an active user forum.

This conference session was initially summarised by the fourth panellist, Brian Hepworth, but was opened out afterwards to the floor, leading to a number of observations. Firstly, the Department for Transport have been directly sponsoring TRAK, with them being highly supportive of this session at ASEC 2010. Secondly, the team were able to make good use of friends in high places, allowing them to take an "act first, ask for permission later" approach rather than getting bogged down in red tape. Finally, in response to an inquiry from the floor, it was explained that the meta-model has no explicit definition for information exchanges and services as it was deemed unnecessary.

Conference Theatre Session: "Systems of Systems Safety Engineering: Challenges and Strategies" – Professor John McDermid: University of York

John started off this final session of the day by defining the terminology that he planned to use to talk about systems, systems of systems (SoS), platforms, and the concepts of "open SoS" and "closed SoS". These definitions seemed highly appropriate for use in support of safety analysis, and could easily be applied within the wider community, leaving aside any ongoing arguments about whether a "system of systems" is a valid concept! For the purposes of this talk, John defined a platform as being the highest level of engineered item, with a system of systems being a set of interacting platforms, each with both common and competing goals, but with the set of platforms being members of the SoS, rather than designed in elements. A "closed SoS" would have fixed membership with controlled changes, whereas an "open SoS" would have dynamic membership with change based upon rule based behaviour rather than direct control. It is these "open SoS" that John was particularly interested in covering during the session.

Having defined the terminology he wished to use, John went on to describe a number of system of systems accidents. The first one was an accident at Überlingen where a Boeing 757 and a Tupolev 154 crashed into each other following the overruling of the onboard collision avoidance system by air traffic control in Zurich. A mixture of failures in the ground segment communication and warning systems, allied to different rules in use by each airline about the precedence of air traffic control over the collision avoidance system led to an otherwise avoidable accident.

The next example covered the shooting down of two US Army Black Hawk helicopters within the 1994 Iraqi no-fly-zone by two US Air Force F-15 fighter aircraft. In this case, a mixture of incompatible equipment (no shared radio nets and different IFF systems) and poor procedure (lack of briefing to the F-15 pilots, and lack of correct visual identification) led to another accident that should not have happened.

The last example covered an accident that didn't happen but could have, where a UK reservist harrier pilot operating in support of US operations in Afghanistan refused to follow orders to attack a man with a donkey on the basis of a mismatch between the doctrine used by each force – the US approach being to prosecute targets that are believed to pose a threat, whereas the UK approach being that it is a war crime to prosecute a target that does not pose a threat. In this example, the interoperating rules of the SoS broke down due to differing expectations, but in a way that probably saved lives.

John went on to explain the challenges of analysing such situations from a safety perspective, starting off by looking at how classical safety analysis techniques can be used, and what the limitations are. The first technique was hazard analysis, where a hazard was defined as "a condition that threatens the safety of personnel or the platform", with a hazard having both one or more causes, and one or more resultant accidents. To use this in a SoS context, this definition was extended to be "a condition of a subset of the SoS that threatens the safety of personnel or a system in the SoS". Within a SoS, the mitigation of SoS hazards has to include actions by other systems, as well as, or possibly instead of, actions by the affected system.

Classical systems safety works by analysing causes within the system boundary, and considering interactions across the system boundary. This approach could work for Closed SoS where boundaries can be controlled and managed, but is much more problematic for Open SoS with ad hoc membership, autonomous systems, flexible rules, and dynamic boundaries. To analyse every possible configuration would confound traditional methods, which in any case are geared towards proving that a product is safe at the point of delivery, rather than geared to providing assurance for a system of systems undergoing constant change, where the concept of a "system boundary" may not even apply.

Having exposed some of the issues with applying hazard analysis to SoS, John went on to look at Functional Failure Analysis and Functional Hazard Analysis. These techniques are easy enough to do but suffer from the usual problem of top down functional analysis of being weak at dealing with the emergent hazards that could occur in a SoS. Finally, he went on to explore the use of HAZOP [Hazard and Operability Analysis]. This technique is based upon flow modelling and focuses on deviation from intended behaviour, and has been shown to work well in chemical process modelling. Once again, this technique looks less suited to ad hoc SoS situations in the defence world, but its change of focus to deviation from expected norms was seen as being worthy of further investigation.

So, having explored the limitations of current techniques, John went on to present a strategy for SoS safety analysis based upon building upon the classical techniques, but focussing on flows and dynamic issues, and linking to a safety case driven approach. He also explained an agent based simulation approach specifically geared towards exposing hidden and emergent hazards called SimHAZAN [Simulation-based Hazard Analysis]. This technique uses a recursive data mining method to reduce the number of runs required by several orders of magnitude down to thousands, rather than millions, and uses automated exploration of interactions between individual instances. The downside of course is the upfront effort required to define the models to be analysed in the first place.

Finally, John left us with a few conclusions and observations. The good news is that System of Systems safety is now recognised as a serious issue, there are some good starting points within the existing techniques, and links are being forged with enterprise architecture techniques to support the definition of the SoS under investigation. The challenges are primarily the sheer scale, complexity and dynamics of change when dealing with SoS, the organisational issues to be resolved when managing hazards in a SoS environment, and finally the problems of trading between projects to mitigate SoS hazards early enough to make a difference.

This interesting session provoked several questions from the audience, leading to the following additional observations:

- Failure is often due to organisational issues, not due to system design issues, and in fact it is often at the organisational level that many SoS problems can be solved.

- System of Systems terminology is not necessarily helpful, but cannot be avoided.

- There needs to be some mapping between the detailed models used to design systems, and the abstract models used to analyse the SoS interactions, but aspirations to do this in a detailed joined up fashion are likely to be far too complicated to be realistic. The connection needs to be understood, but the separation of concerns needs to be maintained.

Day one concluded with the AGM, details of which can be found elsewhere.

ASEC 2010: Day 2

Key Note Speaker Peter Price – Director of Engineering & Technology, Rolls Royce

An interesting presentation which generated the following questions:

Q. How interchangeable are the engines on the same airline?

A. Rolls Royce are moving more towards "plug and play", however, it is generally not as simple as that.

Q. How does Rolls Royce get Systems Engineering training to stick and applied in the work place?

A. Rolls Royce incentivises engineers to use what they have learned.

Q. Given the differences between the civil and defence markets which one did Peter prefer to work in?

A. In the past innovation was driven by the military market. However, that has now changed due to the competitiveness of the civil market and the programme timescales. Military trends to be more transformational steps rather revolutionary. Peter has enjoyed working in both.

A New Approach to Automated Process Tailoring – Ian Presland (Thales)

Ian presented an interesting presentation on tailoring, its benefits, its costs and the challenges. He described the tailoring function and tool and the results of a pilot evaluation. His address generated the following questions:

Q. What do they mean by process refactoring?

A. Splitting down the process into parts that are atomic that can then be reused.

Q. Was the tool entirely text based?

A. Yes, however, there was a graphical element. As it was a pilot with limiting funding, the tool was based on Excel which has the advantage that everyone has Excel on their desk top. However it stretched Excel to its limit.

Q. If you start with full process it can be difficult in leaving out steps and to what depth you go to in each step, can the presenter comment on their experience of this?

A. Yes some of this was built into the process. They did consider going from a blank sheet rather than the approach they did take in removing surplus process steps.

Q. The presenter mentioned trying to avoid subjectivity, however, the removal of subjectivity would add risk by doing so.

A. Accept what the question is referring to. There will always be some subjectivity in this approach as there is judgement on the characteristics of the project. The advantage is getting people to discuss this.

Q. Given the process is aimed at managing risk and is used to automatically generate the SEMP, could it be used to automatically generate other management artefacts?

A. Yes there is a relationship within the tool that can be used.

Q. How long did it take and how long to roll out?

A. One year for the pilot. Rollout depends on take up. It was supported by Thales management and it took 6 months to a year to get it to a point where they were confident with it.

Q. How do you support pull through from the process from Bid to Execution?

A. The tool is designed to capture the information entered during the bid phase. This information can then be carried forward to the development phase.

The New Prestwick ATC Centre Delivering Through a Systems Approach – Nick Flynn (NATS)

How many people have heard of the transition to the ATC Centre at Swanwick? Most of you?

How many have heard of the new ATC at Prestwick? Not many - Exactly!

Nick presented a very good positive case study of using a systems approach to deliver the new ATC at Prestwick whilst at the same time avoiding the bad headlines that Swanwick generated.

ASEC 2010: Day 3 – Morning session

Systems Engineering Survey - Presented by Steve Dawes (GCHQ)

Presentation of the Systems Engineering Survey conducted by INCOSE UK and GCHQ. These results will be published on the INCOSE UK website. The key conclusion is that Systems Engineers appreciate the need to have a balance of soft skills combined with technical competencies. This balance is needed to keep Systems Engineers motivated, able to operate across the broad range of challenges they face and remain appropriately rewarded.

The following questions were raised from the audience:

Q. How were the conclusions drawn regarding the balance of soft skills as it was not obvious from the graphs presented?

A. More comprehensive data contained within an Excel Spreadsheet is where the conclusion is drawn from. This required an aggregation of the technical competencies to make the comparison.

Q. What are the next steps as a result of this survey?

A. This survey provides useful information to managers looking to recruit Systems Engineers and INCOSE UK in terms of Systems Engineers' demographics and perceptions. The work may also feed into the SEASON report.

Q. The fact that 90% of Systems Engineers were men was queried.

A. The fact was supported by only one or two women were in the audience.

Q. This led to a general comment/question about whether Systems Engineering is missing or not addressing a large amount of female engineers.

A. It was pointed out that this was an issue generally for engineering that the other institutions have been trying to address. However, this may be something for INCOSE UK to take a look at.

Q. Given that there were two distinct groups of respondents (low level and high level), would the conclusions be the same for each group?

A. Essentially, yes. Both groups provided a similar set of conclusions.

Peradventure Modelling – Systems Thinking Returns to Systems Engineering – Presented by Prof. Phillip M'Pherson

Insightful presentation on "Thinking", "Holistic Thinking" and "Systems Thinking" and proposed a Peradventure Framework for structured thinking.

The presentation raised the following question from the audience:

Q. Is there a way of relating system value to the positive emergent behaviour of the system as there is an issue with trying to determine system value from just the sum of the parts?

A. It is possible if you can model the emergent behaviour of the system and then break the system behaviour into parts enabling you to use value calculus to analyse these behavioural parts.

Systems Thinking Research – Presented by Dr Mike Yearworth (Bristol University)

Presentation on systems thinking research and how to guide systems thinking in research programmes. The presentation used the EngD programme from Bristol University and identified how they try to resolve the conflicts between the needs of the industrial project and the academic rigor required by the University. A model of how academic and industry might relate on research programmes was also presented.

The following questions were raised from the audience:

Q. How do you deal with the difference between the industrial and academic "pulls"?

A. The EngD candidate still needs to satisfy the requirements of a PhD type of viva despite trying to achieve the objectives set by their employer. This is achieved by ensuring the academic rigor throughout the project discussed towards the end of the presentation.

Q. How soon do you see the change towards the new model (academia and industry)?

A. As a community, this is where we can help. We need to lobby the Higher Education Funding Council for England (HEFCE) to ensure there is a balance between academic and industrial peer review. At the moment it is biased towards academic peer review.

Q. At the peer review stage for proposals, should it be the Engineering and Physical Science Research Council (EPSRC) who conduct the review or should it include other research councils (e.g. ESRC) given the multi-disciplinary nature of Systems Engineering research.

A. It is difficult to be an engineer on the ESRC review team. Bristol currently uses the University's faculties and departments that align with the ESRC, however, this is a bit of a fudge.

Developing a New Understanding of Inflammation and Disease – Gary Smith (EADS) & Dr Sortiris Missallidis (Open University)

Very interesting paper on systemic diseases like cancer and using systems biology to understand some of the ways cancer progresses and ways it may be tackled. The presentation also proposed that a systems approach can reveal a better understanding and modelling of diseases.

The following questions were raised from the audience:

Q. Does the systems approach allow you to target the areas to apply reductionism to?

A. Yes.

Q. Based on a member of the audience's experience, the person has 2 consultants who are addressing two but related conditions. However, the 2 consultants cannot cross consult as it costs more regardless of whether it might be more effective. Apparently they used to be able to cross consult.

A. Current medical practice is based on reductionism which drives funding and stove piping of disciplines. There are some moves to try and get more of a systems approach into the profession.

Q. Have you used any formal modelling techniques on this work?

A. No not yet. This work is all part-time as they have had trouble getting funding to support the work.

The Great Escape – A Case Study of Systems modelling For Safety Critical Systems – Presented by Dr Jon Holt (Artego)

Presentation of a case study of using systems modelling in a safety critical application, the case study in question is the modelling of a Harry Houdini "escaping from a straight jacket whilst dangling upside down from a crane" stunt. The presentation included a video clip of Jon Holt performing the stunt.

Q. The presentation showed how Jon and his colleagues modelled the solution. Did they also model the solution discovery process?

A. Yes.

Q. As part of the safety risk assessment did the team model some of human factors aspects, for example how long you could hang upside down before it started to degrade the performance of the individual attempting the escape?

A. Yes.

Q. Did you obtain health and safety clearance for the stunt?

A. No.

Q. Given the case study was of a safety critical nature, did the team get an emergent safety property from the model?

A. The team used heuristics in conjunction with the model to make the go/no go decisions.

Q. If the same exercise was repeated using a more traditional approach, do you think it would come up with the same answer?

A. Quite possibly. Jon would be happy to lend the straight jacket to anyone wishing to run a comparative exercise.

Q. Where there any issues with using the UML tools in this safety/time critical example?

A. The team treated the UML tools as tools and that the team were the masters of the tool and not the other way round. There were things that could not be modelled using UML, e.g. confidence.

ASEC 2010: Day 3 – Afternoon session

Improving the Practice of SE for In-Service Systems - Presented by Bruce Elliott (Arbutus)

Presentation of the INCOSE In-Service Systems Working Group activities including the motivation for the work, the UK led phase, the International phase and the way forward. Bruce enquired how many of the audience have been working on in-service systems within the last year and about 2/3 of the audience responded that they had.

After running through the case study examples used by the In-Service Working Group to identify the gaps in the INCOSE handbook Bruce posed the following questions to the audience:

- Do you agree that these are gaps?
- Do you buy the four perspectives?
- Do you see any other gaps not addressed by the working group?

A member of the audience pointed out that they see a lot of the issues highlighted by in-service systems work early on in a product development lifecycle when trying to use legacy common components.

The audience generally agreed with the gaps presented. A comment was made about improving information flows between old and new systems and the four perspectives.

There was a suggestion to increase the guidance on transition to operation to include insertion. If insertion is addressed in in-service systems it would also help with new systems.

In some cases it can be easier to work on in-service systems than new systems as there is access to current in-service data, and access to real operators and users rather than trying to gather information from various sources. This example highlighted that the difficulties between new and in-service systems are in different places.

Bruce asked the audience to provide him with any further sources of good practice (personal experience, standards and guidance, etc.).

Bruce provided an overview of the International Working Group threads:

- Take the UK work and improve it.
- Recommend how the guidance should be integrated with other SE guidance.
- Recommend methods for knowledge transfer (e.g. the SE body of knowledge work in the BKCASE project).

A brief discussion followed on the principles of SE and how you might hang the guidance under these principles. A number of SE principles were identified: the Royal Academy of Engineering document – making systems that work, the 8 pragmatic principles from the INCOSE SE working group (1993).

Other points raised included:

It helps to think about in-service issues when designing new systems.

Within MoD they are moving towards continuous evolution using discrete projects. This will require applying in-service considerations to the enterprise. The MoD has tried to develop some principles to support this, for example, Through-Life Management (TLM) and cross Defence Lines of Development (DLoDs).

A question of clarification on the terminology used on the slides between lifecycle stages and lifecycle processes. Bruce clarified that you identify the lifecycle stages and the use the appropriate processes within each stage and that this is not very clear within the INCOSE SE handbook.

There was a discussion around the problems that the initial systems development V lifecycle provides for any subsequent developments and that these should also be mindful that there might be further development at a later date. It was suggested that a better model would be the Barry Bohem's spiral model as it nicely embodies the in-service systems work. Perhaps the strap line for the working group should be "boldly going beyond the V".

Is there any interest from other non-INCOSE groups into this work, for example, the Institute of Asset Management ? Good idea, however, the working group needs to pace itself.

Bruce enquired if anyone from the audience would like to become involved?

Keeping It Simple - Presented by Richard Beasley (Rolls Royce), Ian Gibson (Sula Systems), and Dr Terry Winnington (University of the West of England)

This session was a walkthrough of the Bristol Local Group one day event held in March that explored the following various simple techniques:

- Multiple Stakeholder (widening the boundary or interest)
- N^2 Charts (exploring within the system boundary)
- Quality Function Deployment (QFD) (a convergent tool)
- Kipling's Six Honest Men (used to probe the problem and solutions)

The benefits and issues of each tool were presented and explored.

A question was raised about how the workshop used the QFD to derive functions when there was not much time to form a solution architecture on which to base the QFD. The workshop used verbs from the case study brief to populate the "what" part of the tool and constraints and "hows" to populate the how part of the tool. There was an important point raised about the use of a time constrained and simple problem to demonstrate the QFD tool in that it did not start to highlight some of the limitations of the tool.

A point raised at the event that was discussed further was how to connect the simple models/tools used for getting started in systems thinking to the detail of the formal and more complex systems engineering models and tools. It was suggested that one would use the simple tools to elicit a wider stakeholder input that can be used to generate the more specialist detailed and complex modelling required by subject matter experts to work the solution. For example, the output from these simple techniques can be used to guide your modelling, i.e. where to target your effort. It was suggested that after using the simple tools, stop and then write a statement of requirement to capture where you have got to. It was also suggested that the interpretation of the information from the simple tools was down to the skill of the systems engineer.

The session also discussed the need for systems engineers to know more about visualisation techniques to communicate complex concepts.

ASEC 2010

Best presentation award

We are delighted to announce the results of the INCOSE UK ASEC 2010 Best Presentation award.

The outcome was extremely close but in first place were:

Nick Flynn and Simon Clothier of NATS with their presentation:

"Prestwick Air Traffic Control Centre - Delivering through the Systems Approach"

This won by a whisker over Gary Smith of Perses Biosystems and Dr Sotiris Missailidis of The Open University with their "Developing a New Understanding of Inflammation and Disease - Seeing Truth beyond Dogma with Systems Thinking".

In third place was Professor Philip M'Pherson with "Peradventure Modelling: Systems Thinking returns to Systems Engineering".

I hope you will agree that these presentations illustrate the richness of Systems Engineering as practised in the UK:

Very many congratulations to Nick and Simon and to the runners up.

Andrew Farncombe
INCOSE UK Technical Director

From the corner ...

A friend of mine pointed out that whenever you want to do something new, at least one politician will always appear to say it can't be done. Systems engineering projects are no different. History is littered with examples.

Even England's most famous engineer, Isambard Kingdom Brunel had his 'no-politician', namely Dionysius Lardner. Their first skirmish concerned the speed at which broad-gauge steam engines could travel. After carrying out experiments using the *North Star,* Lardner came to the conclusion that at 41 mph, the engine could only haul 16 tons and would have excessive fuel consumption. Lardner attributed this to excessive air resistance. When Brunel, with his assistant, Daniel Gooch came to examine the problem, they found the *North Star's* blast pipe orifice was misaligned. The problem was soon fixed and they could haul nearly three time's Lardner's load with a third of the fuel.

Lardner and Brunel also clashed swords over *Box Tunnel*, on the London to Bristol railway line near Bath. The tunnel had a 1 in 100 gradient. Lardner pointed out that if the brakes on a train were to fail, then the train would accelerate to 120 mph, at which speed the passengers would suffocate. Brunel pointed out that Lardner had forgotten to take into account air resistance and friction, which when all said and done was a rather basic error. The *Box Tunnel* is still being using to this day as a railway tunnel.

Then came the argument over the *SS Great Britain*. Lardner declared at a meeting of the British Association for the Advancement of Science that the ship would run out of coal after 2,080 miles, well short of the required 3,500 miles for a Liverpool to New York crossing. What Lardner did not understand was that the coal carrying capacity increases as a cube of its dimensions while the water resistance against the engines increased as a square of dimensions. This meant that larger ships would be more fuel-efficient and could therefore carry sufficient coal to cross the Atlantic. *SS Great Britain* proved Brunel's point by arriving in New York with 200 tons of coal to spare.

For those who are interested in the *SS Great Britain*, it has been restored to its former glory and can be now visited in Bristol.

In a sense Brunel was lucky with having Lardner as his 'no-politician', as he was able to study what Lardner was saying, work out where he had gone wrong and present his argument to those who had an interest in the project. It is much more difficult to deal with a 'no-politician' when he is a person in an acknowledged position of authority and, instead of interacting with the project, remains apparently uninterested or silent about it.

This is exactly what happened to John Couch Adams. By September 1845, he had predicted the existence and position of a new planet, which was later to become known as Neptune. It was the first time such an astronomical discovery had been made by mathematics rather than observation.

Adams let James Challis, Director of the Cambridge Observatory know of his discovery and a month later left the Astronomer Royal, George Airy a manuscript describing work. Airy responded to Adams by asking some questions of clarification. Adams did not respond to these queries, for reasons we will never truly know, though the suspicion is that Adams found these queries trivial. So Adams's work remained unpublished.

Unknown to all three of them, Urbain Le Verrier had independently come to the same conclusion. He published his work in November 1845 in France. Airy read Le Verrier's paper and from then onwards did his best to establish British priority to Neptune's discovery. It was too late. Johann Galle at the Berlin Observatory at Le Verrier's request and using his predictions discovered Neptune on 23rd September 1846.

Charles Parsons also had to fight against the silence of 'the establishment'. He brought out his reaction steam turbine in 1884. He was to make its improvement and application his chief concern for the rest of his life. Parsons realised his steam turbine had direct application to marine propulsion and electricity generation as they both needed high efficiency and steady loads.

One of the main problems was the vane profiles for the turbines. They were completely new and very complex shapes to manufacture to fine tolerances. Despite this, he produced his first prototype in 1885, giving 4 kW. It was a small but significant start. By 1892 Parsons reached a respectable 100 kW. But the market and buyers were nowhere to be found.

As his engines were now powerful enough to power small boats, he decided to build a turbine-powered steamboat. So *Turbinia* came into being. Disappointingly, she could only do a maximum of 20 knots. The problem was not with the turbine, but with the high rotational speeds of the propellers producing cavitation i.e. the power was going into making bubbles instead of pushing the boat. This was a totally new phenomenon they had to overcome.

The solution was to operate at lower revolutions per minute with three more turbines and propellers. The trials off the northeast coast of England produced 34.5 knots, about 4 knots more than the fastest destroyers afloat. But nobody wanted to listen.

As it so happened, Parsons was in luck. There was a grand naval review off Spithead on 26th June 1897 to mark Queen Victoria's Diamond Jubilee. There were 165 ships flying the White Ensign, 38,000 officers and men, the Prince of Wales, Prince Henry of Prussia (the Kaiser's brother) and Queen Victoria present. Just as the review began, *Tubinia* dashed out from her position and into the passing review. Her sudden and dramatic appearance made spectators shout in amazement. The authorities, on the other hand, sent out a picket boat to stop *Turbinia*. You've guessed it – *Turbinia* was too fast, and to add insult to injury, the wash behind her almost sank the picket boat. Before any disciplinary action could be taken, Prince Henry of Prussia sent Parsons his congratulations and asked for a return.

Turbinia can be seen at the Discovery Museum in Newcastle-upon-Tyne.

So how can systems engineers deal with the 'no-politicians'?

I think Charles Parsons had part of the answer when he said: "If you believe in a principle, never damage it with poor impression. You must go all the way."

Another part of the answer is to have the wherewithal to demonstrate that principle. Brunel was lucky enough to be well respected in his profession (his father was an engineer with a good reputation), Parsons had the private means to develop his turbine engines, but Adams was unlucky enough to have neither of these. But once they had been proved so spectacularly right, they were seriously listened to thereafter.
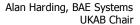
O. B. Server

News from the UK Advisory Board (UKAB)

The UKAB provides a forum for UK Systems Engineering organisations (within industry, government and academia) to influence the activities that INCOSE UK undertakes, and the systems engineering best practice that INCOSE UK promotes.

For more information about UKAB Membership please contact the INCOSE UK Secretariat.

Welcome to Parkway Engineering, a new UKAB member

Alan Harding, BAE Systems
UKAB Chair

UKAB Members

Advertisement

INCOSE Events Calendar

Please note that the one day events for 2011 will be announced shortly. For updates, more information and registration visit the INCOSE UK website at www.incoseonline.org.uk

Date/Time	Organisation & Location	Description
7 February 2011 All Day	**Capability Working Group** BAWA in Filton	**CWG Workshop** We have booked at room at the BAWA in Filton to hold a one day workshop on the 7th February 2011. If you are interested in taking part please make a note in your diary and await full details of the event which will be published later (early January). There will be no charge for attendance but registration will be required to fix the numbers and because there are only 30 places available. The agenda has still to be finalised, but the purpose will be to discuss developments so far and agree an action plan for the working group. Those of you who attended the CWG session at ASEC10 will be aware that there was a lively debate around the paper produced by the Perspectives Analysis sub-group. This workshop will be used to continue this debate and reach some common understanding before considering how to use the insight gained to move forward. Two activities have already been proposed; to develop a Z Guide and to start some work on an ontology. The aim will be to launch these and / or any other activities identified at the workshop by setting up additional sub-groups. You will find it helpful to read (or re-read) the white paper produced by the Perspectives Analysis sub-group before the workshop. It can be found on the INCOSE UK website under Groups > Capability Working Group > Other Documents (you will have to be logged in to view the file). Any other relevant information will be posted in the Working Group area.
22 March 2011 19:00 for 19:30	**South Coast Local Group** NATS Corporate and Technical Centre 4000 Parkway, Whiteley, Fareham, Hants PO15 7FL (off Junction 9 of the M27).	**First Meeting of the South Coast Local Group** This new group of INCOSE UK is being set up on the South Coast, aiming to cover the Southampton and Portsmouth areas of Hampshire and extending into Dorset and Sussex. The area has a lot of organisations involved in systems engineering and universities involved in teaching and research. The group will provide a meeting place for systems engineers to share ideas, concerns and knowledge, on a regular basis at a convenient local location. The meeting will consist of a short introduction to INCOSE, the UK Chapter and Local Group, a talk on 'Emergent Properties: the good, the bad and the ugly', from George McConnell of Selex, and a chance for everyone to discuss the way forward and contribute to the group. Further meetings are planned for May, September and November. To get on the mailing list email: john.davies3@btinternet.com.
30 March 2011 18:30	**Bristol Local Group** Knowledge Exchange Suite, Merchant Venturers Building, University of Bristol, Woodlands Road, Bristol, BS8 1UB	**Systems Research Showcase** Once again, this event will provide a chance to see some of the latest postgraduate research in the systems arena being conducted in the south west. This event will take place at the University of Bristol.
18 May 2011 18:30	**Bristol Local Group** Room 1N05, Frenchay Campus, UWE, Bristol	**What an EngD in Systems did for me...** Ever wondered what an EngD in Systems involves, and how the research is exploited back into the SE community? This event will feature some of the first cohort of the EngD students from the Bristol Systems Centre sharing their findings and explaining the journey that they went on to get there.
20 June – 23 June 2011 All Day	**INCOSE International** Denver, Colorado USA	**21st Annual International Symposium** For full details visit the https://www.incose.org/symp2011/
13 July 2011 18:30	**Bristol Local Group** Room 1N05, Frenchay Campus, UWE, Bristol	**The Final Step - Getting Systems Into Service (in association with the APM)** Why does the final part of getting a system into service often follow a more protracted path than expected? This event will look at this important part of the lifecycle from both a systems and a project management perspective to examine some of the pitfalls and issues that can occur, and some of the approaches that are used to mitigate against them.

Date/Time	Organisation & Location	Description
9 and 10 November All Day	**Scarman Training and Conference Centre** Warwick	**Annual Systems Engineering Conference 2011**

Opportunities

Purple Secure Systems are currently looking for experienced **systems engineers** with a sound working knowledge of defence and government industry processes and standards. You would also need to be able to undertake a wide range of analyses and assessments in a project or programme environment.

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- Use Cases

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And finally ...

If you have an event you would like publicised in Preview, or wish to contribute an article, please contact the Preview Editor, Stephen Fisher by email at Steve.fisher@incose.org

Not an INCOSE Member?

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How do I join?

Fill in the on-line application at www.incoseonline.org.uk

What does it cost?

Full members pay £95 per annum (reducing to £90 if paying for a full year by direct debit). Students pay £35 per annum.

Membership subscriptions are eligible for tax relief. The UK Chapter has been approved by the Board of Inland Revenue under Section 201 Income and Corporation Taxes Act 1988.

What are the benefits?

- A UK and World-wide Forum for Systems Engineering
- UK and International Interest Groups, Working Groups and Conferences
- A chance to influence the way Systems Engineering develops
- The opportunity to network and learn from other Systems Engineers

Preview is the Quarterly Newsletter of the **UK Chapter** of **INCOSE**, the International Council on Systems Engineering. All INCOSE UK members receive a copy of **Preview**, in addition to the regular e-mail bulletin **ePreview**. INCOSE UK Members may also download the quarterly Systems Engineering Journal, and INSIGHT, the INCOSE Newsletter