Congratulations to everyone, Members and Board alike, who helped make 2008 such a good year for INCOSE UK. Our efforts and standards have been recognised by our Chapter being given a Gold Circle Award for the sixth year running. The letter from the INCOSE Board to our President informing us of this is reproduced at page 7.

Registration Open for International Symposium

The symposium will be held concurrently with the APCOSE 2009 conference at Suntec Singapore International Convention & Exhibition Centre from 20 to 23 July 2009. The symposium will be opened by the Guest-of-Honour Mr TEO Chee Hean, Singapore’s Deputy Prime Minister and Minister for Defence.

For details and registration visit the symposium website: www.incose.org/symp2009/

SC 09 Best Presentation

We are delighted to announce the results of the INCOSE UK SC09 Best Presentation award.

The outcome was extremely close but the winners were: Paul Cooper and Phil Bartholomew of Mott MacDonald with their presentation: “Terminal 5 Rail Projects: An Untold Success Story”

More information and details of the also excellent runners-up can be found on page 4.

Hillary Sillitto becomes an INCOSE Fellow

UK Systems Engineering success and skills have been recognised again. Our nomination of Fellow of INCOSE for Hillary Sillitto has been accepted and he will receive the award at the IS in Singapore. Congratulations to Hillary on this well deserved recognition. We look forward to the benefit of his expertise and thinking in our discipline for many years to come.

Thanks also to those who contributed to the application with career details, letters of support and general advice on how to put the pack together.

Z Guides

You will notice some additional documents enclosed within this edition of Preview. Our Z Guides have been reissued and are well worth a look through. Changes include: new branding, a new chronological numbering scheme, and a new addition on Soft Systems Methodology.
I have been watching the news dissecting and analysing President Obama’s first 100 days in office. As we go to press with this issue of Preview, it is about 5 months since taking over as President of INCOSE UK and I wondered about my first 150 days in office. It is five months since I took over as President of INCOSE UK and a good time to review all that has happened during those one hundred and fifty days.

Firstly, the Spring Conference was a success with approximately 100 delegates attending each day. The technical content of the event was excellent and my thanks go out to all those involved in the event’s planning, organising and execution. The INCOSE UK Board, Secretariat, Events and Technical teams are now in the middle of planning the Autumn Assembly.

The International Workshop in San Francisco was very well supported by the UK with 17 of our members engaged in the various working groups and INCOSE management and leadership meetings. This was my first International Workshop and although I was unsure of what to expect, I came away from the event enthused and I was very impressed at the UK’s representation and level of international influence.

At this event the idea was floated to internationalise the In Service Systems working group which has done some outstanding work under the leadership of Bruce Elliott. The idea was supported by the INCOSE Technical Director, Dick Kitterman. Other highlights from the event included an award for the Requirements Working group lead by Jeremy Dick.

As part of INCOSE UK’s on going activities, being led by Andrew Daw, towards a systems professional status within the UK, a number of the Board participated in a workshop with Institute of Measurement and Control to draft a proposal for the Chartered Systems Professional designation to be presented to the Privy Council.

Since the Autumn Assembly last year, when Quintec joined the UKAB, we have two new corporate members. We are pleased to announce that Selex Systems Integration Ltd and Sul a Systems Ltd have joined the UKAB and we look forward to working with them. INCOSE UK appreciates the valuable support that the UKAB provides and we are pleased to see the UKAB expand.

The UK working groups continue to beaver away in the background with Phase 2 of the In Service Working Group about to get underway. Phase 3 of the Competency Working Group is making great progress and the inaugural meeting of the Capability Working Group is due soon – watch this space. The Rail Interest Group are busy organising a one day event in July, for more information please visit our website.

INCOSE UK’s outreach to other institutions continues with our support of the Royal Aeronautical Society Weapon Systems Group’s Boscombe Down event in 2010 titled “Weapon System Integrity vs Interoperability” and an open invitation to attend their committee meetings. INCOSE UK has supported the development of the Institute of Civil Engineers’ best practice guide which includes a chapter on Systems Engineering. My thanks to Derek Price for leading this initiative. Discussions have also taken place with the IET about how to make better use of the Memorandum of Understanding between our organisations.

The local groups continue to thrive with the Bristol and Scottish groups running a regular and comprehensive programme of events. This year has also seen the re-launch of the London group.

The Z Guides have been given a new format and the guide to Soft Systems has been added to the portfolio. My thanks to Hazel Woodcock, Brian Wilson and Emma Jane Taylor for this work.

Finally, as our membership continues to grow (it is currently heading towards 800 members), it appears that INCOSE UK continues to flourish despite the current economic climate and this is down to the dedication and hard work of all our members now and over the last 15 years. Thank you and keep up the good work.

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**Event Report: INCOSE UK Spring Conference 2009**

The UK chapter of INCOSE held its annual Spring Conference between 30 March and 1st April 2009 at the East Midlands Conference Centre (EMCC) in Nottingham. Although this year’s event was somewhat marred by the effect of the “Credit Crunch”, the 120 or so people who did attend over the 3 days enjoyed a lively and varied mixture of tutorials, papers and exhibits.

**The Application of Systems Engineering**

The theme of the UK Spring Conference 2009 was “The Application of Systems Engineering”. This broad theme was chosen to complement the more research focused theme of the Conference for Systems Engineering Research (CSER), which is being held at Loughborough University in the UK this year (see [http://cserr.lboro.ac.uk/](http://cserr.lboro.ac.uk/)). We received over 50 presentation submissions for this year’s event. After much deliberation by the review team, 17 presentations were chosen, arranged in 7 sessions covering Enterprise Architecture; Systems Engineering and Related Disciplines; Capability Management; Systems Engineering Lifecycle Processes and Systems Engineering Case Studies.

For a full list of presentations and tutorials, including details of all presenters see: [http://www.incoseonline.org.uk](http://www.incoseonline.org.uk).

The interesting thing about this year’s event is that we had around half of our presenters from traditional defence and aerospace, and the other half from other sectors, in particular Rail and Infrastructure. As usual, we asked delegates at the event to vote for the best presentation and the results are announced on page 4 of this newsletter. Three presentations scored consistently highly, and all three of these have been recognised for their contribution to the event.
The number of case studies presented was particularly well received. Many of the real success stories coming from the use of tried and tested Systems Engineering approaches in the rail and infrastructure sectors. The most topical of these was presented by Paul Cooper and Phil Bartheolomew (Mott MacDonald), and described the “Untold Success Story” of the Heathrow Terminal 5 Rail link.

Dr Jon Holt (Brass Bullet) attempted to de-mystify Enterprise Architecture for us. This presentation looked at the role of Systems Engineering alongside IT and management disciplines in helping to change the way in which complex enterprises are run. This session was complemented by one at the end of Tuesday led by Samantha Brown (INCOSE President Elect) and Professor Patrick Godfrey of the University of Bristol summarising the work currently being done by INCOSE and the UK chapter, to promote professional recognition of Systems Engineers.

Feedback from Delegates
One minor grumble in the event feedback was about the jargon and assumptions in some of the defence focused presentations. It does seem that Systems Engineering has become so firmly embedded into defence culture that those of us involved in it have got out of the habit of explaining basic terminology and concepts. We will be considering parallel sessions on defence and non-defence topics in future and will endeavour to make sure that we remind speakers in open sessions to take extra care with jargon. One defence paper which did not fall into this trap was presented by Jonathan Cook, Merfyn Lloyd and Simon Masley of UK MoD. This looked at how Systems Engineering principles can be applied even when we are delivering urgent operational solutions direct to the front line in very tight timescales.

The first day of the event featured smaller tutorials offered by INCOSE members; topics included System Thinking, Creative Problem Solving; Systems Engineering Competencies; System Assurance and ULM/SySM. Feedback from the tutorials was very positive. Most of those who attended one of these sessions found it a high quality and good value way of finding out more about detailed Systems Engineering topics.

UKAB
Monday also gave us an opportunity for a joint meeting of UK INCOSE Board and our UK Industrial Advisory Board (UKAB). UKAB member organisations support INCOSE in the UK both financially and with advice and guidance on what direction the UK chapter should be taking. We are extremely grateful for all of the support we get from this group, which allows the UK chapter to offer a number of additional benefits alongside those of normal INCOSE membership.

EMCC as a Venue
The venue for this year’s event was something of a departure for us. Firstly, it was slightly further north than we have been in recent years. Those of you who were able to attend the conference did not find the 2-3 hour journey for London or Bristol too difficult, although the addition of a major road closure and diversion around Nottingham did add to the adventure for some of us.

Secondly, the EMCC is a purpose built conference centre, offering additional facilities which we could not find in our more traditional hotel based venues. The feedback on the venue itself and in particular the main lecture theatre was very positive. Having tried this style of venue over our last two events, most of you seem to agree that the effort of finding a venue with a decent sized lecture theatre and professional standard AV is worth while. Moving to this style of venue does generally mean we cannot guarantee hotel accommodation on site. At this venue we had a mixture of “cheap and cheerful” student accommodation and local hotels. Most of the delegates who stayed in the student rooms where happy to have the option of a cheap room.

Some of you were obviously surprised by exactly what “basic student accommodation” means.

The biggest complaint was that those of you who arrived on Sunday or Monday evening did not have anywhere to meet for a drink or for dinner. This was caused by a mix-up between the event organisers and the venue over exactly what would be open on campus during the event. We apologise to anyone who struggled for something to do on those evenings, or anyone who found the accommodation even more basic than expected.

Booking and Information
The online booking system for events has been running for some time and seems to be working well. A number of you commented on how good the service from Dot-the Eye (DTE), our conference organisers, was. One small issue was the early availability of joining instructions. We will make sure that we improve the availability of joining instructions, and include clearer information about onsite accommodation in future. We will also pay much closer attention to the other facilities available at non-hotel venues.

Exhibitors
We had planned a larger exhibit area for this year’s event, but this was also affected by the difficult financial circumstances. Although some of the more kind hearted amongst you were concerned about what value the exhibitors got out of the event, they themselves seemed very happy and are all keen to support us in the future. Some of you suggested we should get the exhibitors more involved in the event itself, and we will certainly look into this.

In Summary
So, in summary, most of the feedback was positive about the event organisation and administration: the venue, facilities and food and the varied selection of papers and tutorials. The food at the banquet was good and the after dinner speaker was interesting (even if his tales of Arctic Exploration made some of us feel a bit inadequate).

On the negative side, some of you found the basic accommodation too basic and we need to put more work into the joining instructions. Those of you in non-defence sectors found some of the defence presentations hard to follow.

Some of the feedback which just made us smile includes:

- **What was best?** “my tutorial”; “no parallel streams so I did not have to think about which session to go to”; “not too many people”.
- **What was worst?** “I hate presenting”; “early breakfast”; “appalling (road) diversions and lack of signs at midnight on Monday”.

A majority of those who replied said the event offered good value for money, with a couple of people comparing it favourably to other similar events run by other organisations. Others of you were not so sure, and were looking for something more directly focused on their specific need to justify attending in these difficult times. This along with all the feedback will be considered when we look at events for the next 12 months.

I would like to thank everyone who presented at or attended the event, and for all of our sponsors and exhibitors. In particular thank you to all of the volunteers and our friends at DTE and EMCC for making this one of the most smooth running and efficient INCOSE events I have been involved in. We hope to see you all at an INCOSE UK event soon.
Event Report: Spring Conference 2009 Best Presentation Award

by Andrew Farncombe

We are delighted to announce the results of the INCOSE UK SC09 Best Presentation award.

The outcome was extremely close but the winners were:

**Paul Cooper and Phil Bartholomew** of Mott MacDonald with their presentation: "Terminal 5 Rail Projects: An Untold Success Story"

This won by a nose over: Jon Holt of Brass Bullet with his "Enterprise Architecture: Systems Engineering in the mist". Jon is to be doubly congratulated since he was the winner of the last Spring Conference Best Paper award at SC07.

This in turn just beat: Jonathan Cook, Simon Masley and Merfyn Lloyd of UK MoD with "Systems Engineering in Fast-Track Military Vehicle Acquisition".

The spread of these three presentations illustrate the richness of Systems Engineering as practised in the UK:

- The application of Systems Engineering outside the 'traditional' domains of defence and aerospace
- Pushing the boundaries of 'conventional' Systems Engineering to include changes to the whole enterprise
- Applying systems principles in a pragmatic and flexible way to situations where a quick response to operational needs is imperative.

Very many congratulations to Paul and Phil and to the runners up.

A copy of all papers is available for members from the incoseonline.org.uk website.

Event Report: Spring Conference 2009 Impressions

by Peter Lister

The Nottingham University campus looked splendid in the late afternoon sunshine on Sunday. I was soon transported back to undergraduate days as I settled into my billet for the duration of SC09. There always seems to be more to talk about than you expect.

The meeting with the UKAB stuck pretty well to the brief and remained at a strategic level without too many descents into the weeds. We concluded the day with a convivial visit to a nearby Italian restaurant.

On Tuesday, equipped with the conference badge and bag (both sporting the new INCOSE UK logo), I staked out my place on the banking seat in the main conference theatre. It really is a superb facility and fully kitted out with AV and lighting equipment. While making use of the free Wi-Fi to check my e-mails, I got nabbed by Andrew Farncombe to be a microphone monitor for questions at the end of each presentation. Trotting up and down the steps every 40 minutes is a great way to alleviate post lunch dozitis, and probably helped a little to burn off some of the calories delivered by the excellent catering.

With Dot-The-Eye staffing the registration desk I was able to sit through all of the presentations for a change. The presentation standard was generally high, though as ever on a personal scale some were more interesting than others. As you will see from the article about the best paper award, choosing the best was the equivalent of a photo finish, so it would seem that many felt the same.

We deliberately booked a larger venue than in previous years after the sell-out situation at SC07. However, along with the entire banking community, we had not anticipated the recession when we booked the EMCC over 12 months ago. The numbers were still respectable, but there was plenty of room (especially for the last session on Wednesday...) and it was a shame that the 200 plus that we could have catered for was not achieved.

On the Tuesday evening we had the traditional event dinner. The proceedings were enlivened by an after dinner speaker for the first time in recent years. Alan Chambers regaled us with the story of his unsupported expedition to the North Pole. His approach to minimising the weight that the team had to pull was central to the success of the venture and was an object lesson on how to focus on the objective and strip out anything that is not needed. Mind you, cutting off the ferules on your bootlaces was probably more of a psychological boost than a practical benefit.

Overall a great venue, good service, top-notch presentations, but just a little disappointing that more of us were unable to take part. Hopefully things will have improved on the economic front in time for the next event.
The SEASON report highlights a long-standing issue regarding the diversity of views on systems engineering and a lack of a coherent and generally recognised academic structure for the subject. The recent INCOSE UK professionalisation workshops and conference sessions, and engagement with the InstMC, have highlighted the need to recognise “systems” activity outside the traditional engineering context. This think-piece sets out a possible framework to cover these two issues.

Structure
We propose and define three distinct strands of practice: a domain independent “systems practice”; “engineering” as defined by UK SPEC; and “systems engineering”, which is “systems practice” applied within the domain of engineering.

We define them as follows:

**Engineering**: solving engineering problems using technology (this is a summary of the definition of what a professional engineer does, from UK SPEC).

**Systems Practice**: solving system problems using system techniques (this definition is created by direct analogy with the “engineering” definition above).

**Systems Engineering**: applying systems practice to solve complex engineering problems particularly those with complex constraints and a diverse range of technologies and human interactions (this is a new definition of systems engineering framed to be compatible with the UK SPEC definition of Engineering and our new thinking on systems practice).

These three definitions are linked; Systems Engineering is the intersection of systems practice with engineering.

**Systems Practice**
Systems Practice is not limited to Engineering but may apply to any of the 3 Stupple and 5 Hitchins levels of system and to the extended levels shown in the Sillitto/Godfrey Framework (see Figure 1).

It has three core components:

**Understanding systems**: including notions of system structure, control and behaviour, an understanding of complexity and an ability to explain complex system behaviour, the concept of emergent properties, and interactions of a system with its environment.

**Solving system problems**: this has four core components and three supporting processes, and is based on the notion that a system problem represents dissatisfaction with the current situation and the solution is to change the current situation to achieve some desirable future state.

The four core components are:

- “understand the problem”,
- “architect the change”,
- “deliver the change” and
- “deliver the benefit”.

The three support processes are:

- “plan and manage the change project”,
- “understand and manage risks and potential for unintended consequences” and
- “visualise and model the solution in its environment”.

**Developing system solutions**: applying the problem solving approach recursively at different levels and in different domains to develop the components of the change project. When the components of the change project involve engineering projects, this activity becomes identical to traditional systems engineering.

**Systems Practice for Precedented & Unprecedented Problems**
Systems practice applied to a well-bounded domain results in well-established “recipes” that are found effective in dealing with certain classes of problem: for example naval architecture or the design of aircraft, trains, cars or sensor systems. In this case people often see Systems Engineering or Systems Practice as predominantly a process and management activity.

Systems practice is also and uniquely effective, however, in solving unprecedented problems and ones that cut across established domains. Systems Engineering has demonstrated the capability both to produce unprecedented solutions to unique problems (the Apollo program, ICBMs...), and to provide better and more dependable solutions to known “hard problems” such as the design of aircraft, complex infrastructure systems, and complex sensors – anything involving the integration of multiple technologies and disciplines, or where established assumptions break down in the face of escalating complexity.

The caveat is that at the current state of knowledge and practice, outcomes are not assured. Appropriate application of systems practice reduces the risk of a poor outcome in complex situations, but success
still depends on skill, knowledge and intuition as well as process and method.

Open Versus Closed Systems Thinking

Most engineering process views, including the well-known systems engineering "Vee-diagram" in its conventional form, take a "closed system" view, starting from a defined requirement.

Effective systems practitioners flex between "open system" and "closed system" thinking. They use open systems thinking to understand the system problem to be solved, and visualise how "their" system will interact with other systems and the environment to contribute to the solution – to make sure they "build (or buy) the right system". They use closed system thinking to establish the boundary of the solution system, partition it into logical and relatively independent parts with compatible boundaries, and work within the defined boundaries to develop the parts of the solution and deliver against the agreed contract – to "build the system right".

Many people seem to have a strong preference for one mode or the other and may become deeply uncomfortable when required to work in the other. Both are necessary for success.

Summary and Conclusions

The definition of systems engineering above is consistent with current accepted definitions, is complementary to "traditional engineering", and is a skill that all engineers need to have to a greater or lesser extent.

The wider concept of systems practice recognises that the systems engineering approach and principles can be applied outside the boundaries of engineering, and removes the need to stretch the definition of "Systems Engineering" far outside the recognised boundaries of engineering to include this wider stakeholder community.

Their preference for open or closed systems thinking will determine the roles and lifecycle phases in which individual systems practitioners are most effective.

This contribution is intended to further the Systems Engineering professionalisation debate.
April 17, 2009

Dr Doug Cowper
Cleave Systems Ltd.
Greet 5 The Chesils
Nr Winchcombe Glos GL54 SNW
UNITED KINGDOM

Dear Doug:

On behalf of the International Council on Systems Engineering (INCOSE), we are pleased to recognize the United Kingdom Chapter as a Gold Circle Award Chapter based upon its contributions and accomplishments in 2008. The Gold Circle Award recognizes chapters reaching the highest goals and standards established by our organization.

For many, chapters provide the primary day-to-day interface with INCOSE. Chapters organize technical and social programs, communicate key information about our organization and discipline, support technical activities, and enhance the member experience by facilitating an open, inviting environment where members receive valued products and services that enhance their careers. In fulfilling this mission, the United Kingdom Chapter leaders and members have committed significant time and energy to further the goals of our organization.

To honor these efforts and achievements, this Gold Circle Award will be presented at the 2009 INCOSE International Symposium in Singapore. In doing so, INCOSE recognizes and celebrates the contributions and achievements of the United Kingdom Chapter, its leaders, and its sponsors.

High quality, vibrant chapters are essential in INCOSE’s drive to enrich, educate, and enlighten the INCOSE membership while improving recognition of INCOSE and the systems engineering profession. The Member Board and INCOSE extend heartfelt thanks and appreciation to the United Kingdom Chapter for its contributions towards attaining these goals.

Congratulations,

Jonette Stecklein
Member Board Chair
Local Groups & Working Groups

INCOSE UK Scottish Local Group

The Scottish Local Group formed in 2008 and had its first meeting in September last year at the Institute for Systems Level Integration in Livingston, between Edinburgh and Glasgow. Over 20 people attended, and speakers included Andrew Daw, Ian Sommerville, and the local group committee members Hillary Sillitto, Gerry Watt (also Chief Executive of Electronics Scotland), Hermine Schnetler, Malcolm Currie and Mark Begbie. At the drinks reception afterwards there was a lot of networking, and much discussion on the concept of “time to value” that Ian Sommerville highlighted in his talk.

The next event was a TRIZ workshop on 21 Oct. About 12 people attended, feedback was good, and we are co-hosting another one with ImechE this summer.

Just short of 20 people attended one or both of our half-day sessions on 2nd December, the morning on Systems Engineering Professionalisation and the afternoon on Lean. Both were well received, the morning session summarising the Autumn Assembly session the previous week, and the afternoon illustrating a number of interesting applications of lean thinking to business interactions through the supply chain. Kenny McLean of Thales provided the perspective of “a big company looking down”, Phil Rees of the ATC described work with a previous employer from the point of view of “a small company looking up”, and Hugh Boyd described the experience of Plexus applying lean, six-sigma and 5S principles to deliver quality products on time against fluctuating demand, using quite complex modelling techniques and metrics to allow them to “plan to forecast, execute to actual consumption”.

Our next meeting is the System Architecture session at Thales Glasgow on 2nd June, where Mike Wilkinson will provide a wider perspective and other speakers will be Hillary Sillitto, Alistair Blair (also of Thales) and Alex Duffy from Strathclyde University.

We plan to move on to holding meetings to a regular quarterly “drumbeat”. Malcolm Currie is organising the next one on SE in non-traditional industries, and the one after that will be on the need for soft skills in systems engineering.

We would like to thank all our speakers, the committee members and their employers, for their efforts and enthusiasm in getting this local group up and running, the sister institutions (notably Electronics Scotland, the IoP and IET) which have publicised our events and encouraged their members to participate, and all the people both INCOSE members and from sister institutions who have contributed to the meetings.

Hermine Schnetler of the UK ATC is now the group chair, and Graeme Morrice of Selex-Galileo recently joined the committee. As always, we would warmly welcome new faces on the committee and at our events.

Happy Sillitto (ex-chair) and Hermine Schnetler (Chair)
Scottish Local Group

Railway Interest Group (RIG)

The Rail Interest Group is organising a day-long workshop on rail systems engineering in London on Tuesday 7th July with speakers from the UK and the Netherlands.

For more details, see www.incoseonline.org.uk

Bruce Elliott

In Service Systems Working Group (ISSWG)

The current phase of work is now under way after a well-attended kick-off meeting at Bristol on 29th April. The group is working towards a target of delivering guidance on overcoming the particular challenges of SE on in-service systems in early 2009.

Bruce Elliott

Systems Engineering Competencies Working Group (SECWG)

Phase 3 of the SECWG has been active since July 2008 and we are now in the final stages. The objective for phase 3 has been to update the Systems Engineering Competencies Framework and Guide to Competency Evaluation documents using feedback obtained from several sources:

- Organisations that have implemented the competencies
- Bristol Local Group meeting
- INCOSE Autumn Assembly workshop in 2007
- Comments from individuals.

A guiding principle for update was to keep significant structural changes to a minimum because many organisations have tailored the existing competencies for their own use. As a result the current list of competencies has not been altered but the content of each has been reviewed and amended to incorporate feedback. The SECWG is currently collating the updates for final review over the Summer, with the aim of publishing the updates in the early Autumn.

Sandra Hudson
Chair Phase 3 SE Competencies WG
The observant amongst you will have noticed a new A1 class locomotive steaming its way along the British rails - Tornado. It took 18 years of public donations and volunteer work to build Tornado. All to keep our knowledge and capability for building and running steam engines alive!

A sad indictment of our societal knowledge when you consider we have had the ability to build steam engines for nearly two thousand years.

Yes, I did write: 'nearly two thousand years'...

Hero of Alexandria (c. 100AD) wrote about a 'ball which spins round on a pivot when a cauldron is boiled'. The design is simple. Pressure builds up in a cauldron that is closed by a bung at the top. An L-shaped pipe is inserted into this bung and steam allowed to pass through it into a sphere connected to the other end of this pipe. From the sphere, the steam escapes at various points, but mainly through bent tubes. If these tubes are placed in the right configuration, steam is forced out in a direction to make the sphere revolve. The principle is that of jet propulsion. So why didn't the Romans develop steam power and create their own industrial revolution, and thereby probably kept their empire in existence longer?

Whilst this design is workable it could have never been used as a practical power source. Inadequate heat transfer from the burning fuel to the cauldron would have kept the efficiency low. Whilst Hero could have used a worm gear to gear the high speed of the outlet steam tubes, it would be with significant friction loss. The worst problem was the sleeve joint where the L-shaped pipe was joined to the sphere. Here a compromise has to be reached between a loose joint that leaks steam and lowers pressure, and a tight one that wastes energy in friction. At the end of the day this machine could have only delivered a tenth of horsepower... not much good other than as an entertainment device!

And yet, when you look at Hero's other written work, he had all the necessary components to build a useful steam energy that would be useful... things like making metal cylinders and pistons to fit them, and valve mechanisms. He just never put them together in the right configuration.

Just think of where we would be today had the Romans built a useful steam engine!

The first steam engine to be invented in England was to help pump water out of coal mines. It was invented in 1698 by Savery and had very limited efficiency: like Hero's steam cauldron it wasted a lot of fuel. Also it could not pump water from the deep mines. However 1709 saw an improvement in this steam engine when Newcomen improved the efficiency with the use of piston and cylinders.

It was during the course of trying to repair a Newcomen engine in 1763 that James Watt worked out the principles of how to improve its efficiency. But it took until 1776 for Watt to build the first satisfactory engine incorporating a separate condensing cylinder to reduce the cooling time of the steam engine's cycle. The immediate obvious improvement was that Watt's engine used only a quarter of the fuel needed by a Newcomen engine.

This first engine was supplied to an ironmaker, Wilkinson, who used it to force blast through his furnaces to improve the quality of the iron. This allowed him to come up with a way of improve the boring accuracy for cylinders, which in turn improved the reliability of Watt’s steam engines.

From there Watt developed and in 1781 patented a method for using his engine to turn a wheel. Thus the coming of steam locomotives, steamships and factory machines was heralded.

Steam engines continued to be a major player in our lives until oil took over. But in that time we learned a lot about how to engineer and use steam power. The only way we can keep such a wealth of knowledge is by building and using these machines. Writing about it, whether it is in books or on a computer just does not give you the instinctive insight as to how to use things.

Which brings us back to Tornado... let's hope it lives up to its expectations and name speed-wise!

O. B. Server
**News from the UK Advisory Board (UKAB)**

**Sula and Selex Join UKAB**
The Sula Systems Ltd and Selex Systems Integration Ltd Memoranda of Understanding have recently been signed, making Sula and Selex the latest members of the UKAB.

From Sula signing the MoU that formalises their arrangement are, pictured left to right: Ian Gibson (Communications Director of INCOSE UK and also a Sula employee), Doug Cowper (President of INCOSE UK) and Chris Lamb (Sula representative to the UKAB).

UKAB always welcomes your comments and suggestions, so if your organisation is a UKAB member, then contact your representative or for non-UKAB members, you can forward your comments to me or to Ady James (UKAB Secretary).

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Project Performance International delivers leading-edge project performance training and consultancy worldwide.

Our training can assist your organisation to reduce costs, meet schedules, and exceed stakeholder expectations.

Systems Engineering
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www.ppi-int.com/training/systems-engineering-course.php

A world renowned short course in Systems Engineering, that has been presented to over 4,500 professionals on six continents. Relevant to beginners and seasoned veterans alike, offering a structured approach from cradle to the grave. This course, taken by most of the world’s leading technology companies, teaches principles, and demonstrably effective methods for meeting stakeholder needs and maximizing value delivery from engineering.

Who Should Attend?

- Project Directors
- Project Advisers
- Project Managers
- Engineering Managers
- Anyone who develops non-trivial solutions to non-trivial problems, regardless of job title

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<td>26 - 30 Apr. 2010</td>
<td>EUR 2,075</td>
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<td>P006-399</td>
<td>Pretoria, Sth. Africa</td>
<td>10 - 14 May 2010</td>
<td>AUD 2,700</td>
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<td>P006-400</td>
<td>Helsinki, Finland</td>
<td>31 May - 4 Jun. 2010</td>
<td>EUR 2,075</td>
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<td>P006-409</td>
<td>Munich, Germany</td>
<td>20 - 24 Sept. 2010</td>
<td>EUR 2,075</td>
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<td>P006-413</td>
<td>London, UK</td>
<td>1 - 5 Nov. 2010</td>
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<td>P006-414</td>
<td>Cape Town, Sth. Africa</td>
<td>8 - 12 Nov. 2010</td>
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<td>P006-416</td>
<td>Amsterdam, Holland</td>
<td>29 Nov - 3 Dec. 2010</td>
<td>EUR 2,075</td>
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</table>

Requirements Analysis & Specification Writing

www.ppi-int.com/training/requirements-analysis-specification-writing-course.php

Provides effective, actionable methods for dealing immediately and comprehensively with the single most frequent source of project problems – inadequate requirements. A demonstrably effective and efficient methodology for capturing and validating requirements is followed by the principles of organizing requirements into requirements specifications. We then turn to techniques for writing individual requirements, and writing them well. Real-world examples are used extensively, generating group discussion and group working to assist in understanding.

<table>
<thead>
<tr>
<th>CODE</th>
<th>LOCATION</th>
<th>DATES</th>
<th>PRICE</th>
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<tr>
<td>P007-256</td>
<td>Cape Town, Sth. Africa</td>
<td>22 - 26 June 2009</td>
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<td>P007-255</td>
<td>Amsterdam, Holland</td>
<td>21 - 25 Sept. 2009</td>
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<td>Amsterdam, Holland</td>
<td>18 - 22 Jan. 2010</td>
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<td>P007-263</td>
<td>Amsterdam, Holland</td>
<td>6 - 10 Sept. 2010</td>
<td>EUR 2,075</td>
</tr>
</tbody>
</table>

“The best thing was the ability of the presenter to teach what could be dry material in a fun way”

Visit PPI at Booth B04 at INCOSE’s 2009 International Symposium in Singapore

Project Performance International
PO Box 2385, Ringwood North
Victoria, 3134, Australia

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Fax: +61 3 9876 2664
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# Events

## Planned Events

The INCOSE UK events calendar is shown below, for updates, more information and registration visit the INCOSE UK website at [www.incoseonline.org.uk](http://www.incoseonline.org.uk).

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Organisation &amp; Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/06/2009 - 11/06/2009 1700H for 1730H</td>
<td>Railway Interest Group Atkins’ offices at Euston Tower 126 Euston Road London NW1 3AT</td>
<td>Towards Visualisations of Configuration Management One of the principal areas of concern for managing large programmes is the management of risk associated with change. The central issue is one of communication. This presentation proposes better methods of communicating change. An illustration of this is shown using the Victoria Line Upgrade project, where a visualisation of the configuration has improved communication. Areas of success are highlighted and a number of improvement areas identified.</td>
</tr>
<tr>
<td>16/06/2009 - 16/06/2009 18:00 - 19:30</td>
<td>London Local Group Council Room, UCL</td>
<td>Strategic Risk Management The London Local Group is organising a multi-perspective panel discussion on the subject of Strategic Risk Management. Panelist will bring views from Defence, Business, Space and Rail.</td>
</tr>
<tr>
<td>18/06/2009 - 18/06/2009 08:30</td>
<td>INCOSE Associates Rooftop Gallery, Royal Observatory, Blackford Hill, Edinburgh</td>
<td>TRIZ - Rapid Innovative Problem Solving - Institution of Mechanical Engineers IMechE are running a TRIZ Rapid Innovative Problem Solving event on Thursday 18 June 2009 in the Royal Observatory Blackford Hill Edinburgh. INCOSE UK Members are invited to attend the event at the IMechE Member rate.</td>
</tr>
<tr>
<td>07/07/2009 - 07/07/2009 09:00 - 16:00</td>
<td>UK Chapter London Underground, 55 Broadway, London Organised by the Railway Interest Group (RIG)</td>
<td>INCOSE UK Rail Systems Engineering Workshop After a successful series of evening presentations, the RIG is now organising a day-long workshop to explore in more detail three difficult questions that rail organisations face in increasing their take-up of systems engineering: 1. How should we apply systems engineering principles in the rail environment? 2. How do we find enough rail systems people? 3. How do we write systems engineering into contracts?</td>
</tr>
<tr>
<td>15/07/2009 - 15/07/2009 18:30</td>
<td>Bristol Local Group Room 1N05 on the University of the West of England (UWE), Frenchay Campus, Bristol</td>
<td>“Open Forum” Over to you – an opportunity to air your ideas in public. We can’t promise a prize for the best contributor, but we can be fairly sure of an enthusiastic and enquiring audience.</td>
</tr>
<tr>
<td>29/09/2009 - 29/09/2009 14:00 - 17:30</td>
<td>Scottish Local Group UK ATC</td>
<td>Practical examples of Systems Engineering application in non-traditional industries</td>
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<tr>
<td>26/10/2009 – 27/10/2009</td>
<td>INCOSE UK</td>
<td>Autumn Assembly</td>
</tr>
<tr>
<td>01/12/2009 - 01/12/2009 14:00 - 17:30</td>
<td>Scottish Local Group University of Edinburgh Business School</td>
<td>How to manage and deal with the human behavioural aspects in your role as Systems Engineer to ensure success In collaboration with Edinburgh University</td>
</tr>
<tr>
<td>25/02/2010 - 25/02/2010 All Day</td>
<td>INCOSE Associates MoD Boscombe Down, Salisbury SP4 0JF</td>
<td>Royal Aeronautical Society’s Weapon System Integrity vs Interoperability Conference Abstracts of 200 - 500 words typed and double spaced on A4 paper should be submitted by Friday 3rd July 2009</td>
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**Rick Adcock**  Events Director, INCOSE UK.  [r.d.adcock@incose.org](mailto:r.d.adcock@incose.org)