President’s Corner
David Long, david.long@incose.org

It is hard to believe 2015 and INCOSE’s Silver Anniversary celebrations are drawing to a close. As we look back, there is a great deal worth celebrating. As we look forward, there are great challenges and opportunities on the horizon.

2015 has been a year marked by product launches—ISO/IEC/IEEE 15288, the 4th edition of the Systems Engineering Handbook, the 2nd edition of the Guide for Writing Requirements, and a new Project Managers Guide to SE Management. It is a year of notable progress in our publications—launching the new INSIGHT practitioner’s magazine, debuting this newsletter, and moving the Systems Engineering journal from four to six issues per year. It is a year of noteworthy events—the largest-ever International Workshop; the first-ever EMEA Workshop; impactful tours such as the Nordic and Air-Land-Sea systems engineering tour; countless regional, sector, and chapter events; and a 25th anniversary International Symposium that was spectacular from start to finish. We saw the launch of the new IT infrastructure and its evolution throughout the year, the beginning of what we hope is a stream of continuous improvement and evolution to better support INCOSE, its members, and its initiatives. 2015 was a year of innovation—the Institute for Technical Leadership, the Sigma Theta Mu honor society, Empowering Women as Leaders in Systems Engineering (EWLSE), and a few more we hope are yet to come. In addition, INCOSE’s working groups and chapters continued to advance the practice, serve our members, and move the systems engineering profession forward.

Over the past two years, I have had the honor of visiting sixteen countries spread over five continents. In addition to meeting with INCOSE chapters and participating in countless systems engineering—and engineering—events worldwide, I visited organizations in aerospace and defense, infrastructure, automotive, transportation, energy, IT, healthcare, medical devices, consumer products, and education. Regardless of where I have gone and whom I have spoken with, the systems engineering challenges highlighted in Systems Engineering Vision 2025 continue to resonate. These statements captured so clearly by Todd Bayer at Jet Propulsion Laboratory encapsulate the issues of today and the opportunities of tomorrow, opportunities that we must seize if systems engineering is going to deliver the requisite value in the years to come (see Figure 1, page 3).

As we begin the next twenty-five years, INCOSE has a solid foundation to build upon as we pursue Systems Engineering Vision 2025 and beyond. We must guard against looking only inward—to focus on just those who consider themselves systems engineers; to focus only... > CONTINUED ON PAGE 3
Note from the Editor
Lisa Hoverman, newsletter@incose.org

What a great 25th year for INCOSE! It has been an honor be a part of this organization, to work with, and interact with so many from across INCOSE in many forums – through your submissions to the e-Newsletter, to INSIGHT, to your submissions for naming the e-Newsletter, or in designing an icon for systems engineering, at the IS2015, and more. I thoroughly enjoy my interactions with each of you, your submissions, great insights, and love of INCOSE. It is phenomenal to see the growth and evolution of this organization. Following a US Holiday where we pause for a day to take time to reflect purposefully on the many things we have to be thankful for, I am extremely grateful for inclusion in, and work with, INCOSE. I learn much from each of you, daily, and enjoy the vibrancy of the INCOSE community. I look forward to year 26 with great anticipation.

In this issue, we have a fortifying farewell from outgoing President David Long for our President’s corner, interesting updates from the Technical Director, Academic News, a letter to members from The INCOSE Foundation, exciting chapter news, an update on our INCOSE Competitions (systems engineering icon and Members e-Newsletter Name), a fun pictorial ‘year 25 in review,’ and more!

We exist as an organization at a time where the systems of the world grow increasingly complex. In light of the recent terrible events that have affected our French and Los Angeles chapters profoundly, it becomes clear that a systems approach at all levels and approaches of life are in demand. We must prepare as an organization to meet these challenges. I know we will, and I look forward to being a part of that solution. As we look ever forward and towards integration, I wish all readers a beautiful December, and if you are celebrating, holiday(s). Below as always, I share our upcoming publication schedule.

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President’s Corner (continued from page 1)

Current Systems Engineering Practices and Challenges

Current systems engineering practice, based on well-defined processes and innovative analytic approaches, has demonstrated significant value to stakeholders, but in the future, the systems community must tackle many new fundamental interdisciplinary and integration-related challenges.

1. Mission complexity is growing faster than our ability to manage it . . . increasing mission risk from inadequate specifications and incomplete verification.

2. System design emerges from pieces, rather than from architecture . . . resulting in systems that are brittle, difficult to test, and complex and expensive to operate.

3. Knowledge and investment are lost at project life cycle phase boundaries . . . increasing development cost and risk of late discovery of design problems.

4. Knowledge and investment are lost between projects . . . increasing cost and risk; dampening the potential for true product lines.

5. Technical and programmatic sides of projects are poorly coupled . . . hampering effective project risk-based decision making.

6. Most major disasters such as Challenger and Columbia have resulted from failure to recognize and deal with risks. The Columbia Accident Investigation Board determined that the preferred approach is an “independent technical authority”.

Figure 1. Systems Engineering Vision 2025, June 2015. As Adapted from Todd Bayer, Jet Propulsion Laboratory.

on those domains that use our processes, methods, tools, and terminology; to optimize our practice in isolation of the greater context within which we serve. Instead, we must look outward. We must be inclusive, recognizing that only the smallest minority who practice systems engineering consider themselves systems engineers. We must serve and connect all those domains that currently leverage systems practices (whatever terms they may use) as well as emerging domains from which INCOSE can learn and to which we can bring value. Most importantly, as we seek to improve and advance systems engineering, we must do so in the context of the greater enterprise and the greater lifecycle. We do not optimize a system by optimizing individual components. Therefore, we must ensure that we not only improve our practice but also advance our interactions with others, most notably with project management, test and evaluation, and software engineering.

Though the challenges ahead are grand and INCOSE’s vision is often audacious, I am optimistic as I look forward – optimistic for both INCOSE and the profession we serve. There is a great sense of energy that permeates INCOSE and tremendous momentum. As I noted in my April 2015 President’s Corner, I believe our paradoxical mindset is key, blending long-range thinking and near-term tactics, directed initiatives and organic contributions. The principles formally captured by the Board of Directors – Impact, Partnership, Holism, Differentiation, and Volunteers – allow us to naturally align across so many dimensions rather than manage, freeing our volunteers to bring their intellect, experience, and passion to the opportunities ahead. That volunteer spirit, that great passion, is INCOSE’s greatest asset, one that has served us well for the last twenty-five years and one that properly supported, will continue to serve INCOSE well into the future.

There is no doubt that it is a challenging time to be a systems engineer – a time of transformation of our practice, a time of shrinking budgets and schedules, a time of ever-more challenging problems. However, it truly is a great time to be a systems engineer – a time in which we are transforming our practice to address the problems of today and tomorrow, an era in which the great challenges are systems challenges, a time in which systems practitioners can – and must – be the linchpin in delivering the capabilities and value our customers demand. Moreover, it is a wonderful time to be part of INCOSE – an organization with an important mission, an organization defined by passionate volunteers making a difference locally and globally.

As my term draws to a close and we prepare to install the 2016 Board of Directors at the International Workshop, let me simply say “thank you” for the opportunity to serve over the last two years. Systems engineering is the profession I choose, and INCOSE is the professional body I love. I count myself blessed for the opportunity to connect with, learn from, and serve alongside so many wonderful individuals from around the world. It has truly been a pleasure, and I look forward to continuing to support INCOSE in the exciting journey that lies ahead.
Institute of Electrical and Electronics Engineers (IEEE) held its first International Symposium on Systems Engineering (IEEE ISSE) in Rome, Italy, 28-30 September 2015. The INCOSE Italy chapter, after consultation with INCOSE central, took the initiative to participate in the event presenting a special session entitled “Research at INCOSE Italy,” organized by its academic members. The main motivation was to showcase the strong links with the Italian research community in the field. The organizers of the symposium were excited about the session.

After this introduction, Prof. E. Brusa, presented the first paper. The paper discussed the integration of functional and physical simulations for electro-mechanical systems design, with examples coming from the steel industry and mechatronic devices.

Then M. Filippi introduced service systems engineering and the importance of dependability engineering in the development of complex engineered systems delivered as a service, especially when many years of system operation are expected or required.

The following paper focused on software support to systems engineering. C. Kavka presented the collaboration between University of Trieste and ESTECO describing a prototype of Business Process Model and Notation (BPMN) process representation and execution with “human in the loop,” automating processes actively supervised by human experts.

The last presentation of the session, delivered by Prof. A. Garro, focused on the modeling of systems properties that deal with formally expressing constraints and requirements that influence and determine the structure and behavior of a system, showing also a brief summary of the activities done in the framework of the MOdel-DRIven physical systems Operation (MODRIO) European Union-funded research project.

The INCOSE 4th edition of the Systems Engineering Handbook, and other INCOSE publications were made available for consultation in the room of the special session.

Enrico Mancin added to the participation of the members of INCOSE’s Italy chapter to the symposium. Enrico presented a co-authored paper about the activities performed in the Single European Sky Air Traffic Management (ATM) Research project, in collaboration with the Italian National Aviation Agency (ENAV).

Outstanding contributions from other relevant INCOSE members included the chairing of the special session on the Theoretical Foundations of Systems Engineering (THEFOSE) by INCOSE Ambassador Omar...
Hammami (who was also author of two presentations), and a presentation from INCOSE Associate Director for Education Rick Adcock, relating the results of an academic forum meeting held in May 2015, which explored ways of understanding, promoting, and enhancing the value of systems engineering knowledge in the education of all engineers.

Finally, of remarkable interest, was a panel specifically dedicated to the current state and the future of the Systems Engineering Body of Knowledge, presented by senior lecturer Rick Adcock, this time in his role as SEBoK Editor-in-Chief.

Overall, the participation in the IEEE event provided a good example of the open attitude towards cooperation that characterizes INCOSE. Here is the list of papers that can be obtained from the IEEE repository.

Integration of Heterogenous Functional-Vs-Physical Simulation within the Industrial System Design Activity
Eugenio Brusa, Davide Ferretto, and Ambra Calà

The “systems engineering” approach is currently changing the design and development of industrial products manufactured through a direct processing of materials. Its influence upon the machine and system design activity is herein analyzed, by focusing on the integration of functional and physical models. Assessing a suitable tool to predict the system performance through a heterogeneous simulation is a main goal of the research activity. As an example of application a flywheel system for the kinetic energy storage is used to describe some typical features of this technical domain.

A Service Systems Engineering Framework with Application to Performance Based Logistics
Massimiliano Filippi (Selex-ES, Italy); Andrea D’Ambrogio (University of Rome TorVergata, Italy); Marco Lisi (European Space Agency, The Netherlands)

Although systems engineering is becoming progressively the leading discipline in the development of engineered systems, most of the functions performed by a system are “delivered” as services. This leads to what is referred to as service systems engineering (SSE), which has its basis in systems engineering and, for specific types of services, represents the driving discipline to design successful systems capable of delivering effective services. In the defence market, the acquisition of defence and weapon systems is facing, in the last decades, a continuous budget contraction for both the acquisition and the support of the delivered systems. The main scope of support services, as an instance of SSE, is to define, deliver, and assess the proper blend of services to ensure optimal system performance at an affordable lifecycle cost. This paper introduces a model for the definition, implementation and continuous assessment of operational availability, in order to ensure that the required performance is met in a cost-effective way throughout the system lifecycle. The amount, distribution, and continuous readiness of the logistic resources required to meet the target availability is the primary scope of what is referred to as performance based logistics, which this paper addresses by introducing a SSE framework to tailor, design, deliver, and monitor logistic resources.

Leveraging the BPMN Standard to Govern Engineering Processes in a Collaborative Environment
Dario Campagna, Stefano Costanzo, Carlos Kavka, Carlo Poloni, and Alessandro Turco

We propose using the BPMN standard to manage engineering design workflow complexity. In particular we show how it is possible to combine manual and automated activities in an easy graphical collaborative tool. The BPMN standard (certified by Object Management Group (OMG)) couples an expressive graphical representation with a rigorous XML encoding of processes and the interactions among them. In this paper we present an analysis of the applicability of the BPMN standard to engineering processes together with prototype implementation of a collaborative web-based environment. Complex engineering scenarios involving automated simulation tasks depending on human-based decisions are fully implemented with a few proposed specific extensions (allowed by the BPMN specification). Our prototype mimics a software as a service (SaaS) platform and constitutes an extreme collaboration environment where users can model their processes, share them with co-workers and launch and monitor their executions. The central role is played by the “user task,” through which it is possible to model collaborative decision making sessions integrated in the engineering processes.

Modeling of System Properties: Research Challenges and Promising Solutions
Alfredo Garro and Andrea Tundis

Modeling systems properties deals with formally expressing constraints and requirements that influence and determine the structure and behavior of a system. Systems property models enable the verification of systems properties through real or simulated
experiments so as to support their evaluation during systems design and their monitoring during systems operation. However, several research challenges should be addressed to effectively handle systems properties, ranging from conceptual properties representation to tracing and verification. This paper aims at discussing these main challenges and presenting some promising solutions by focusing on those resulting from recent systems engineering research efforts.

A System Engineering Data Management Framework in a Large Scale Project in the ATM Domain

Luigi Mazzucchelli, and Enrico Mancin

SESAR (Single European Sky ATM Research) is the technological pillar of the Single European Sky. It aims to improve ATM performance by modernizing and harmonizing ATM systems through the definition, development, validation, and deployment of innovative technological and operational solutions. These innovative solutions constitute what is known as the SESAR concept of operations. The SESAR programme constitutes one of the biggest projects of projects worldwide in the ATM domain. The Work Package 3 “verification and validation infrastructure” is one of the major work-packages in the programme incorporating ten different sub-projects, including all the major European Air Service Navigation providers (ANSPs), all the major manufacturing industries of the domain (ground and airborne) and managed by ENAV S.p.A. By taking an optimized approach across the lifecycle and throughout all levels of systems development from the highest system level to subsystem and component levels, development programs are more likely to meet cost and schedule targets. This means taking and implementing a holistic viewpoint supported by robust and yet simple data management framework. In this respect, the paper introduces a systems engineering data management framework (SE-DMF) that is able to secure key main objectives: Development and maintenance of processes; methods and tools for requirements management and requirement quality assurance; design, implementation, maintenance, and operation of suitable tools to support requirements management activities in a large scale collaborative environment.

AFIS-EMEA Workshop

Jean-Claude Roussel, jean-claude.roussel@airbus.co

The AFIS-EMEA Workshop took place in Paris on 7–9 October 2015. This first international systems engineering workshop of the EMEA sector was a great success with around 200 delegates coming from 10 countries. The workshop covered 12 technical sessions directly linked with the INCOSE working groups, linking to related work to be done at the International Workshop 2016. This successful event will be followed by others in EMEA.

PMI Global Congress

Tina P. Srivastava, tinaps@alum.mit.edu

INCOSE Board of Directors (BoD) Secretary Dr. Tina P. Srivastava presented at the Project Management Institute (PMI) Global Congress in Orlando, US-FL, held 11-13 October 2015 as part of our INCOSE Alliance with PMI. INCOSE also hosted a booth through the INCOSE Orlando chapter. Randy Iliff (bb7) and Tina co-led an interactive session on systems engineering and project management (building off of the one held at the INCOSE International Symposium 2015 (IS2015) in Seattle, and feeding into a session for the upcoming IS2016 in Edinburgh) entitled Take the Project Management “Puzzle” Gaming Challenge. This session engaged participants based on the following: “All projects are challenging, but projects

Figure 1. Tina and Randy presenting at PMI Global Congress
with developmental objectives are much more likely to encounter cost, schedule, and technical issues.” This interactive gaming learning activity – to date experienced by over 5,000 participants worldwide – left attendees with a much richer understanding of how to master the “development difference.” Not only did over 100 people attend the session, several people approached the co-leads afterwards expressing positive feedback and a strong interest in participating in the Alliance activities and contributing to systems engineering/project management working papers.

Tina was also an invited panelist on the Fireside Chat | Women in Project Management session, which had a great turnout. The session covered “What is it like to be a woman in project management, a profession predominantly made up of males?” Led by Tina, several successful women shared their real-life experiences in the world of project management in a casual atmosphere. Following the discussion attendees enjoyed a meet and greet with keynote Stacy Allison, the first American woman to summit Mt. Everest, and owner of Stacy Allison General Contracting.

Upcoming! CSD&M Asia 2016
2nd Asia-Pacific Conference on Complex Systems Design & Management

When: February 24-26, 2016 – Singapore University of Technology & Design (Singapore)
Main Theme of the Keynote Presentations: “Smart Nations: Sustaining and Designing”
Website with program: www.csdm-asia.net
Contact: contact@csdm-asia.net
Registration opened: http://www.2016.csdm-asia.net/Registration-.html

Register Now for the Major Conference on Complex Systems & Smart Nations!
- Solo or Group registration with discount – For INCOSE members who wish to attend there is a 30% discount on registration fee and conference dinner fee. Please let your chapter members know, as this information may not be visible on the registration site. In order to get the discount, the INCOSE members must enter this promotion code cesames30 at the time of registering.
- 1-day or 3-day Pass
- Online payment or bank transfer
- Information: http://www.2016.csdm-asia.net/Registration-.html

Our Speakers
The Conference committees propose a rich program with high-profile speakers and a variety of activities. Our guests will share with you societal and industrial challenges as well as scientific and methodological state of the art on the theme: “Smart Nations - Sustaining and Designing” and “Technology & Policy” at this 2nd edition CSD&M Asia. We’re honored to present, below in alphabetical order of last names, a first list of our speakers who will share their experiences. Further Details: http://www.2016.csdm-asia.net/Program-.html.
- Michael Batty, Professor, University College London – UK
- Theresa Brown, Sandia National Laboratories – US
- Richard De Neufville, Professor, MIT – US
- Alan D. Harding, Head of Systems Engineering, Defence Information at BAE Systems/President-Elect, INCOSE-UK
- Soon Poh Heah, Assistant CEO Engineering & Operations Group, JTC Corporation – SG
- Jimmy Khoo, Managing Director, Singapore District Cooling at Singapore Power Ltd – SG

Figure 2. Women in Project Management Featured Panelists and Keynote: Stacy Allison, Amanda Braun, Tina Srivastava, and Donna Richey Winkleman
In Practice
Designing complex industrial systems and public service infrastructures systems is a fundamental strategic challenge for academia, industries, and governments. A new discipline, centered on systems architecture & engineering emerged in the academic environment. This discipline intends to develop scientific fundamentals, design methods, and engineering tools that allow engineers to manage the increasing complexity of the technical systems they design and implement. This field is at the interface between industry, academia, and government, and requires its practitioners to understand the industrial and governmental concrete contexts as well as to master a strong theoretical background. The ambition of the CSD&M Asia conference is to be the Asia-Pacific meeting of reference for the industrial, academic, and governmental communities working in the design and management of complex industrial systems or public infrastructure systems.

More than 450 participants from government agencies, academia, and industry, 12 international keynote speakers, and more than 30 select teams will present their research and professional feedback. There will be 1 Tools Session to share the latest technological news, 1 or 2 tutorials on “big data,” 2 panels and 1 open session by Surbana Jurong with outstanding experts. Finally, there is a conference gala dinner sponsored by SembCorp at the famous Fullerton Hotel in Singapore.

INCOSE Systems Engineering Handbook V4.0 Free Training Webinars
John Clark, john.clark@incose.org

The INCOSE Training Working Group and the INCOSE Chapter Hampton Roads Area are presenting INCOSE 4th edition of the Systems Engineering Handbook free training webinars for all INCOSE members, employees of INCOSE corporate advisory board (CAB) organizations, and employees and students of INCOSE Academic Council organizations. This weekly series began on Thursday 8 October 2015, will run through March 2016, and starts at 12:00 pm, US Eastern Standard Time. Click on https://connect.incose.org/Library/Tutorials/training/SitePages/Home.aspx, log-in to Connect using your INCOSE username and password, scroll to SE Handbook V4.0 Tutorial, click on Tutorial ID: 01_October 2015, the Tutorial Session you want, and download the files. Tutorial Session: 00_Shared Documents contains the latest schedule and the READ ME file to access the webinar or telecom. All sessions are recorded for later download. Other tutorials past recorded sessions include: SE Fundamentals (Tutorial ID: 02_October 2014), SE Handbook v3.2.2 (Tutorial ID: 02_October 2014), and Leadership Skills (Tutorial ID: 01 thru 04).

The SE Handbook V4.0 tutorial also provides tips and personal help in systems engineering. A certificate of completion is provided on request. The tutorial consists of weekly 60-minute sessions. There is no need to register, just join in. Reading of the applicable >> continued on next page
It has been an eventful year for The INCOSE Foundation. Early on, our Board made a decision to celebrate INCOSE’s 25th Anniversary year, now nearing its end, by offering 25 grants to INCOSE chapters to help them advance the art and practice of systems engineering or to strengthen their chapter through a general operating grant. Requests came from across the world – ES, PL, TN, UK, and US giving us a chance to see the exciting work across INCOSE and the deep interest in growing chapter activities. Ultimately, the INCOSE Foundation awarded 18 grants. Here are some highlights:

- An event produced by the chapter in ES to disseminate systems engineering principles to construction and infrastructure companies;

- To foster innovative systems thinking through a series of seminars oriented toward the application of systems engineering principles in the life sciences, and issues of community or societal impact; to provide a model for seminar development and delivery that could be leveraged by other INCOSE chapters and in varying application domains. The initial seminars are being produced by the Space Coast chapter;

- The Technical Director of the UK chapter is an engineer and a magician invited to perform at the Cardiff Science Festival in 2015. The solo show, called “What’s The Difference,” covers the importance of computers and mathematics on the world of engineering, with an emphasis on systems engineering. A large part of the show involves audience participation, either with audience members on stage or getting the whole audience to join in with the magical effects. The INCOSE Foundation grant covered INCOSE-branded calculators for the audience to play along with some of the number games and provided them with a souvenir that they will not soon forget.

- Support for 25 student members through the Association for Unmanned Vehicle Systems International (AUVSI) Student Unmanned Air Systems (SUAS) four-day competition event. The SUAS competition aims at stimulating and fostering interest in unmanned air systems, technologies and careers and focuses on engaging students in a challenging mission. It requires the design, integration, and demonstration of a system capable of conducting air operations, which includes autonomous flight, navigation of a specified course, and use of onboard payload sensors. The INCOSE Southern Maryland chapter donates toward the cost of conducting the event and, with this grant, had additional funds to support INCOSE student memberships for participants.

We celebrate these results and provide a full report on activities in the next INCOSE Foundation Annual Report.

This is the time of year when we ask you to support the work of your colleagues around the world with your contribution to the INCOSE Foundation. Our Board of Directors remains committed to supporting the advancement of the art and practice of systems engineering with your help. Please give as generously as you can to our general fund or to a specific scholarship.

Finally, as many of you know, I am now serving in the role of Chair and CEO as Bill Ewald continues to recover from a stroke he suffered in May. We are pleased to report that he continues to improve from what was a serious event. He retains his zeal for The INCOSE Foundation. If you would like to make a gift in his honor, note that with your gift and we will gladly report it to him.

For information about scholarships and to make a donation, please visit: http://www.incose.org/about/Foundation/FoundationDonate

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INCOSE SYSTEMS ENGINEERING HANDBOOK V4.0 FREE TRAINING WEBINARS (CONTINUED FROM PAGE 9)

Sections of the INCOSE 4th edition of the Systems Engineering Handbook before each session is strongly recommended. Course materials include the shared documents, tutorial slides, questions, and audio and video recordings for download and use at your convenience. Most slides contain speaker notes in the PowerPoint Notes view.

Questions? Contact john.clark@incose.org.
Academic News From the Academic Council of INCOSE

Thomas F. Gannon, tgannon@wpi.edu

Sigma Theta Mu Founded at the INCOSE 2015 International Symposium

One of the signs that a discipline is maturing is that an honor society emerges to recognize outstanding undergraduate and graduate students engaged in its study. Numerous fields, ranging from business to mechanical engineering, boast at least one honor society whose purpose is to recognize academic achievement.

As part of the celebration of INCOSE’s 25th anniversary, INCOSE founded Sigma Theta Mu, the international professional systems honor society. Its purpose is to recognize and promote high scholastic, scientific, and professional attainment in the study and practice of systems, systems-related engineering, or systems engineering. Students in the top fifth of their class enrolled in eligible degree programs are eligible for membership.

Sigma Theta Mu is currently in the process of chartering its founding chapters and will induct its first members early next year. If you have interest in starting a chapter at your university, please send an e-mail to president@sigmathetamu.org.

Sigma Theta Mu’s Founding Board members are: Michael J. Vinarcik, ESEP-Acq, President and Founder; C. Robert Kenley, Ph.D., Secretary and Founder; Art Pyster, Ph.D., Treasurer and Founder

INCOSE Institute for Technical Leadership Worldwide Webinar Held on October 30

The INCOSE Institute for Technical Leadership conducted a successful worldwide webinar on Friday, 30 October 2015. This was the second Institute-wide event, following the inaugural workshop conducted at the 2015 International Symposium in July. Over a period of two hours, the webinar addressed systems engineering leadership models being developed by each of the participant teams, observations of uncertainty and complexity made by participants as part of their inter-session assignments, with how they responded to them, and plans for obtaining 360-degree feedback during the coming quarter. The next Institute-wide event will be the second in-person workshop that will be held on Friday, 29 January 2016, the day before the opening of the International Workshop 2016.

New Student Division Established at Kennesaw State University

The INCOSE Atlanta chapter sponsored a new student division at Kennesaw State University. Student participation in the INCOSE western regional conference next year is also under development.

US DoD STEM to Participate in 2016 USA Science and Engineering Festival

Submitted by Zach Hawkins, US DoD STEM Development Program Office

As the US Department of Defense (DoD) looks to maintain its technological edge now and in the future, it is vital the DoD communicate and expose our preeminent technology, along with our elite and innovative scientists and engineers, to the next generation of science, technology, engineering, and math (STEM) talent.

In concert with that effort, the DoD will again be a premier sponsor at next year’s USA Science and Engineering Festival in Washington, US-D.C. (15-17 April 2016). The expo provides the DoD with the opportunity to engage a broad audience of over 350,000 that includes students, parents, educators, industry, academia, and job seekers. Participation in the expo will allow for unique exposure to the best the DoD has to offer in the world of science and technology.

In addition to booth space, the DoD will sponsor the event’s main stage—a central hub where elite guest speakers and videos will be played during the three-day event. With the DoD’s sponsorship, videos will be submitted by Defense organizations and played between events on the main stage. This effort follows a successful 2014 event that featured more than 325,000 attendees, 750 exhibits, and 3,000 hands-on activities. For more information, please visit the event’s website at http://www.usasciencefestival.org/.

ABET Workshop on Enhancing Systems Engineering Education will be Featured at the INCOSE 2016 International Symposium

Dr. Michael Milligan is the Accreditation Board for Engineering and Technology (ABET) Executive Director and CEO. He will give three presentations at the 2016 International Symposium in Edinburgh. He will talk to the INCOSE Board of Directors, the Academic News From the Academic Council of INCOSE
From the Technical Director
Paul Schreinemakers, schreinemakers@me.com

I am very pleased to invite you to join us in Los Angeles, US-CA for the Annual International Workshop 2016 (IW2016), to be held from Saturday, January 30 Tuesday, February 2, 2016 at the Torrance Marriott Hotel.

The workshop enables INCOSE members of ~45 working groups (WGs), the chapters, leadership and administrative committees to come together to advance the progress on the products and activities of INCOSE. Whether you are already a member committed to one or more of these entities, or you are just curious to discover what is happening in our organization, IW2016 is an excellent opportunity for sharing and networking with friends and colleagues. These meetings are our premier forum for the exchange of ideas and for helping to move both INCOSE and systems engineering forward. The following topics are just a few examples of the activities going on during IW2016. For a full overview and detailed schedule of all the activities and meetings, please refer to the INCOSE IW2016 website:


The greatest opportunity to find out what is happening throughout INCOSE is during the Opening Plenary on Saturday morning, 30 January 2016. The opening plenary provides an overview of INCOSE’s current activities and initiatives, and includes the installation of newly elected officers and directors.

Working Group meetings: Most of the WGs of INCOSE meet throughout the 4 days from Saturday–Tuesday. Some WGs meet and work over several days, while others schedule their activity within one day. There are two kinds of WG meetings:

- **Working sessions**, where the focus is on improving and completing WG products. Working sessions are ideal for contributing with and learning from the real experts in the field. Attendees planning to attend working sessions are encouraged to contact the relevant session leaders before the event to facilitate planning.

- **Outreach sessions**, where the focus is on disseminating the current state of the art to IW2016 attendees with no or little previous exposure to the working groups. Attending an outreach session is also the ideal opportunity to influence the future direction of a WG and perhaps the entry point for deeper WG involvement.

To inform you better of the activities and products each WG will be working on during the Workshop, all WGs are encouraged to share their plans for the workshop activities. You are welcome to visit the WGs to find out more details about their current activities, and they always welcome new participants and contributors. Please visit our website where you will find all useful information and charters for our active WGs at: http://www.incose.org/ChaptersGroups/WorkingGroups.

**MBSE Workshop:** There is no explicit model-based systems engineering (MBSE) workshop at the IW2016. Weekend days will have a strong focus on MBSE activities. However, where relevant, WGs will harmonize their dissemination meetings, such that there will be a coherent MBSE thread throughout the entire workshop. There is the opportunity to attend the IW for the weekend only, but as of 2016, the MBSE content spans the entire workshop.

**Projects & Initiatives:** Major projects and initiatives undergo review from the project leadership and the key participants, to understand any impacts to INCOSE in both the near-term and mid-term and to establish the necessary plans. The projects and initiatives include MBSE and Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE).

**Town-Hall meetings:** Two plenary town-hall meetings are scheduled. On Sunday, the audience receives an update on the BKCASE project and on Monday, the audience learns about the status of two of our 5-year objectives: Transformation and Impactful Products. Both town-hall meetings occur first thing in the morning as live broadcasts like an INCOSE Webinar.

**INCOSE Foundation Soiree:** As the name indicates, this event takes place in the evening - on Saturday, 30 January. The Corporate Advisory Board once again hosts the Soiree to benefit the INCOSE Foundation, thereby advancing the development of systems engineering and
INCOSE Competitions Update

Alan Harding, alan.d.harding@baesystems.com; and
Rachel LeBlanc, rbowers@wpi.edu

THE SEARCH FOR AN ICON FOR SYSTEMS ENGINEERING
– Alan Harding

Our search for a systems engineering icon goes on. Thank you to everyone who submitted entries for the competition. This is a tough challenge, and while you provided some interesting ideas, we have not yet found our winner. We believe it is important enough to continue the search, and so we are re-opening the process for entries from 1st Jan – 31st March 2016. After judging, we hope to announce a winner at our International Symposium in July 2016.

We do have some additional guidance for entries, based on looking at all the entries so far:

1. The icon must be recognisable as “the essence” of systems engineering
2. The icon should not represent specific industries/systems
3. There should be no lettering or text on the icon
4. The icon must be explainable to the layperson, leading into a conversation about the essence of systems engineering

So, please take some time to work on some more, or make changes to a previous submission, send them in to info@incose.org, by 31 March 2016, and good luck!

THE NAMING OF THE INCOSE E-NEWSLETTER
– Rachel LeBlanc

Thank you to all who have submitted potential names for our newsletter. We appreciate your enthusiasm and we enjoyed reading your clever submissions! We decided to put this search on hold as we reevaluate our marketing and communications strategy. We want to make sure we are effectively representing the mission and value of INCOSE. In order to do that, we will be taking a holistic look at our current positioning and determining the steps necessary to build a cohesive strategy that will help move INCOSE forward. We appreciate your patience and welcome your continued input throughout this process.
Our focus at Squoring Technologies encompasses monitoring and decision-making, based on measurement information gathered from enterprise tools.

Working with sectors such as aerospace, automotive or energy has helped us appreciate how projects deal with increasingly complex and numerous data. Engineers achieve efficient project monitoring based on this raw data in three phases (depicted in Figure 1):

- **Data Collection**: raw data coming from third party tools are aggregated into a unified format
- **Model application**: adherence to in-house, industrial or international standards is evaluated
- **Dashboard creation**: a role-based approach helps users access information relevant to them

The best approach can address data coming from heterogeneous (or even competing) sources, and can manipulate objects coming from the whole spectrum of a project’s ecosystem (requirements, design objects, models, source code, issues). Details of an object depend on their nature, which makes for a more efficient understanding, while still keeping an eye on the big picture.

- **Support scalability, adaptability and deal with systems complexity**
  The best approach can address data coming from heterogeneous (or even competing) sources, and can manipulate objects coming from the whole spectrum of a project’s ecosystem (requirements, design objects, models, source code, issues). Details of an object depend on their nature, which makes for a more efficient understanding, while still keeping an eye on the big picture.

- **Measure adherence to standards**
  Previous work focused on the source code area produced models based on industry standards (HIS, MISRA, ISO/IEC 9126). Newer products should deliver a full implementation of ISO/IEC 15288.

- **Provide collaborative project management**
  Data restitution based on a role-based tool, allows users of any origin to manage and share projects as team members. Moreover, dashboards are relevant to each user role, and offer an unambiguous point of view for the user. At the same time, it ensures consistency, by providing the same view to users sharing the same role.

- **Integrate the systems engineering tool to the enterprise environment**
  This is a crucial feature, as the degree of integration of any tool in an existing infrastructure can result in its adoption or refusal. Integration features allow engineers to embed the tool into simple scripts, as well as integrate it with continuous integration systems.

All these features comprise a workable and adaptable solution, addressing the depth of systems engineering and expectations of project management.
25 @ 25 – Lena Johansson

Interviewed by Sandy Young, sandy@jwalcher.com

Name: Lena Johansson
Title: Global Expert Requirements Management
Organization: Tetra Pak
Place of Birth: Varberg, Sweden
Current Residence: Limhamn, Sweden
Domain: Food processing and packaging
Years in systems engineering: 4 years
Year joined INCOSE: 2015
Role in INCOSE: Tetra Pak Representative, Corporate Advisory Board

What has been your most fun and/or challenging systems engineering requirements management project?
I have an expert role within systems engineering, specializing in requirements management. The most fun and challenging project was when our team developed an internal training called “Systems Engineering for Non-Systems Engineers.” Trying to explain systems engineering, its benefits and how it is performed, to an audience outside of the systems engineering community is truly challenging and forces you to focus on what is really the core within systems engineering.

If you could work as a systems engineer in any industry (not your own), what would it be? Why?
I would work in the healthcare or medical device industry, since it would be an opportunity to contribute to the well being of others.

You’ve spoken about agile methods in mechanical product development and its implications for systems engineering. Please summarize?
I presented findings from a pilot project that applies an agile method called “Scrum” in our traditional stage-gate product development process. We have seen two main benefits thus far: increased work efficiency and improved employee motivation. Here, the role of the systems engineer is different due to the iterative and incremental way of working. We focus more on risk analysis using failure modes and effects analysis (FMEA), requirements prioritization, and verification and validation planning as we try to verify our systems as early as possible.

Where do you see INCOSE and systems engineering going in the next 25 years?
I expect systems in general to become more complex and more software intense. As a consequence, I think systems engineers will need to utilize model-based systems engineering, view software as a competitive advantage, and apply methodologies for agile development.

Year 25 in review – a fun pictorial

President David Long introduces INCOSE principles
Strategy session pre-IS2016
Name: Ginny Lentz
Title: Systems and Programs Technologist (retired)
Organization: IBM Federal Systems Division, Lockheed Martin and United Technologies Corporation
Place of Birth: LaPorte, Indiana, USA
Current Residence: Cary, North Carolina, USA
Domain: Defense, Aerospace, Transportation
Studied in college: Mathematics
Year joined INCOSE: 1991
Roles in INCOSE: Founder, Nominations and Elections Committee, Past President (1996), 1st Chair Corporate Advisory Board, 1st Chair Events Committee, Co-Chair of the first Academic Workshop
Years in systems engineering: 45 years

Why did you become a systems engineer?
There was a job to be done, and I did it. Later we called it systems engineering. It was challenging, and we were building unprecedented, computer-based systems so there was always something new to learn. I was frequently in the middle of a triangle between the program manager, the customer, and the chief engineer. The best part is that systems engineering is all about making things useful.

What project or accomplishment are you most proud of in your systems engineer career?
I consider GPS (Global Positioning System) to be my legacy system. As the systems engineering manager on the Control Segment, I chaired the system-wide Interface Control Working Group. GPS is a system with many unintended civilian applications, and I love collecting stories from all kinds of users.

How has INCOSE changed since you were president in 1996?
The global breadth is the same. More countries are involved now and with increasing memberships. In 1996 we felt that if commercial programs knew about systems engineering, they would adopt it as is...that's about the time I left defense and aerospace for more commercial organizations to get a dose of reality. We are still trying to understand that new reality and its many variations. The good news is that processes are codified, we have the Systems Engineering Handbook, the evolving Systems Engineering Body of Knowledge (SEBoK), we are certifying systems engineers, and we are moving to model-based systems engineering (MBSE).

Describe the ideal INCOSE board candidate.
A leader with broad spectrum systems engineering experience. One who represents typical systems engineers on current programs and brings their needs to INCOSE. A curious and intuitive person who is comfortable with ambiguity, and confrontation. A lifelong learner and one who can get quickly to the bottom line of any discussion and work with the others to resolve items for the common good. A good connector...a catalyst for change...One who is sufficiently self-assured to not let their ego get in the way of getting the board of directors' job done.
This December, in the 25th year of INCOSE, marks the fourth issue of the new *INSIGHT* in cooperation with John Wiley & Sons publisher as a magazine for systems engineering practitioners. *INSIGHT*’s mission is to provide informative articles on advancing the state of the practice of systems engineering. The intent is to accelerate the dissemination of knowledge to close the gap between the state of practice and the state of the art as captured in *Systems Engineering*, the Journal of INCOSE, also published by Wiley.

The focus of the December issue of *INSIGHT* is the French chapter of INCOSE, Association Française d’Ingénierie Système (AFIS) Doctoral Symposium: Advancing Systems Analysis and Modeling in French Universities. The theme papers in the December issue promote research contributions for interdisciplinary and collaborative engineering based on models. Articles from theme editor Hervé Panetto and authors address the following topics:

1. Theme Editorial
2. Improving Human-Machine Interaction Requirements for Maintenance Enabling Systems Specification
4. Design Process for Complex Systems Engineering Based on Interface Model
5. A Design Methodology and Representation Formalism for Changeable Systems – Application to Manufacturing Systems
6. A Method for Formalizing Requirements Interoperation in Complex Systems Engineering
7. A Tooled Approach for Designing Executable and Verifiable Modeling Languages
8. ScOLA, A Scenario Oriented Modeling Language for Railway Systems

In addition, we are pleased to include a separate paper “Realizing the Potential of Connected Fitness Technologies: A Case for Systems Engineering Involvement” and a book review “Systems Thinking Made Simple: New Hope for Solving Wicked Problems.”