MEMBERS NEWSLETTER

September 2017 - Q3
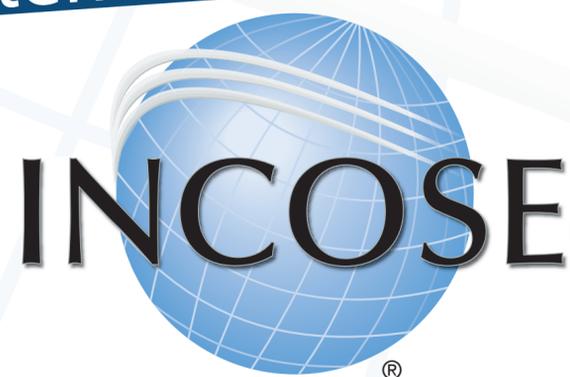
INCOSE

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President's Corner

Alan D. Harding, alan.harding@incose.org

I am writing this piece only a couple of weeks after returning home from INCOSE's 27th International Symposium in Adelaide, South Australia. This event, the premiere global systems engineering conference, returned to Australia for the first time since our symposium in Melbourne in 2001.

I would like to thank all our volunteers and staff who worked together to deliver such an enjoyable, distinctive, and successful symposium. I would particularly like to acknowledge Mark Wilson, our outgoing Associate Director for Events, who led the team and has for several years. Each international symposium has its own feel, and this one felt very integrated and international. I especially enjoyed meeting so many INCOSE members from Sector 3: Asia-Oceania.

Much has changed in INCOSE since we last visited Australia; we are a larger, more diverse, and more global organisation than the INCOSE that John Clouet led at that time. What remains the same is the passion, commitment, and good humour of INCOSE members.

The following is an interesting example of how things stay the same in INCOSE. In 2001, we recognised Kevin Forsberg and Hal Mooz as INCOSE pioneers for their trail-blazing efforts in project and system management – promoting the practical seamless integration of systems engineering and project management around the world. In 2017, we are highlighting the recent launch of "Integrating Project Management and Systems Engineering," created by INCOSE, MIT, and PMI, and available from the INCOSE Store.

Returning to Adelaide 2017, among a typically eclectic range of papers, round tables, panel sessions, and social events, I particularly enjoyed the diverse and excellent set of keynote speakers. As I will describe, they were fascinating, informed, challenged, and inspired.

- Air Vice Marshal Mel Hupfeld, Head of Force Design from the Australian Department of Defence was our opening keynote, explaining to us how Australia adopted a systematic and systemic approach to the development of military capability in his speech, "Force Design: Evolution not revolution."

- Moving from defense to transportation, Dr. Tomohiko Taniguchi, Professor at Keio University, gave us a wonderful keynote on "The Japanese Bullet Train 'Shinkansen' System: Its Genesis and Safety Assurance," marrying his personal recollections of the earliest trains and the systems thinking that ensured that the Shinkansen has a singularly good safety record.

- For our third keynote, we heard from Paul Nielsen, Director, and CEO of the Software Engineering Institute at Carnegie Mellon University. Paul spoke to us about the key challenge of establishing trust in autonomous systems of all kinds – vehicles, systems, algorithms, etc. It is certainly my view that, much as Paul explained, the cultural and societal challenges of accepting artificial intelligence across the whole of society and our world dwarf the technical challenges - especially when it may exceed human intelligence in the future.

- Our final keynote was a complete change. Bill Murtagh from the US National Oceanic and Atmospheric Administration (NOAA) talked to us about "Space Weather: Understanding and Mitigating Impacts on Our Interconnected and Interdependent Critical Infrastructure." Apart from all learning about space weather, Bill helped us understand the threats to our complex systems, and the warning and mitigation approaches that are taken. Clearly, this topic cuts across all our application domains and is not a well-understood topic.

I think you will agree that our 2017 keynotes reflect how wide our perspective in INCOSE has become and how, as systems engineers, we need broad awareness and understanding to complement the specialist knowledge that allows us to perform our various roles.

We uploaded all the keynotes on the INCOSE YouTube channel, and I encourage you to watch them and share them with other system engineers. You can also find the keynotes from IS2016 on YouTube, in a growing online collection from INCOSE. I hope you enjoy them and find them informative. *Editor's note: throughout this issue, we've sprinkled some photos of the INCOSE IS 2017 for you to enjoy!*

27 annual INCOSE international symposium
Adelaide, Australia
July 15 - 20, 2017

ENGINEERS AUSTRALIA
SESA

INCOSE President taking a break from official duties*
at the INCOSE IS 2017.

Notes from the Board

Rachel LeBlanc, marcom@incose.org

The 2017 INCOSE International Symposium (IS) was a big success! We welcomed over 600 attendees in Adelaide, Australia for nearly a week of meaningful knowledge transfer, technical discussions, and networking. If you were unable to attend the event, please see our YouTube channel to watch the Keynotes and Leadership Plenary (www.youtube.com/incoseyoutube). A huge thank you to the events team and all the volunteers who helped to make the IS so successful! In addition, a special thanks to Mark Wilson, outgoing Associate Director for Events, for his years of dedicated service to leading these international events.

Planning for upcoming international events are in full swing. The 2018 International Symposium in Washington, DC promises to be an attendance record breaker! We have posted the call for submissions on the IS 2018 website with a due date of November 10, 2017 (http://www.incose.org/symp2018).

The Board of Directors (BOD) has made the decision to move the 2019 International Workshop (IW) back to Torrance, CA. We are also exploring options for a stronger global presence for the workshop. This includes looking for a satellite location in the EMEA Sector for 2019 to complement the IW in Torrance and finding a location for a future IW to be held in EMEA.

Progress continues with the Chapter Governance and Finance Model (CGFM). The Board expects to receive a finalized proposal at the Quarter 4 BOD meeting, including a detailed rationale and financial justification for the model. Any changes to the existing model will be consistent with our values and principles and must allow us to achieve financial sustainability at central and local levels.

In addition to the existing efforts underway to improve the IT infrastructure, INCOSE will refresh the website by the end of 2017.

Budget planning began for 2018. Directors will reach out to their organizations during August-October to build plans and proposed budgets in preparation for the Quarter 4 BOD meeting.

Americas Sector Updates

Chicagoland Chapter

Randall Illiff, randall@eintllc.com

The INCOSE Chicagoland Chapter has a very busy fall. In addition to the normal monthly meetings (now available at six sites in the region), the chapter will host a fall tutorial, "3

Americas Sector Updates

Secrets to Successfully Managing Product Development Projects" on September 23rd, 2017, and support a worldwide Project Management-Systems Engineering (PM-SE) Integration virtual conference hosted by the Project Management International (PMI) on September 27th, 2017. The chapter plans to be active in the Great Lakes Regional Conference October 11-14, 2017, and will be staffing the INCOSE booth at the PMI Global Congress in Chicago, October 28-30, 2017.

Chapter leadership is committed to expanding professional and corporate outreach, and in addition to the events noted above, we will be leveraging release of the new PM-SE Integration book as a key tool in this effort. We are working to create reusable templates and best practices to share with other chapters, and welcome inquiries from any chapter that might benefit.

Further information is available here.

Los Angeles Chapter

Phyllis Marbach, prmarbach@gmail.com

The INCOSE-LA chapter had a busy previous quarter. Please see our newsletter at incose.org/los-angeles and select "Chapter News" to read the details. The next chapter speaker meeting is Tuesday, September 12, at The Aerospace Corporation in El Segundo. Kay Das will be presenting "Autonomous Vehicles and Systems Engineering." Saturday September 16, Northrop Grumman will host the Sixth Annual Mars Rover Science, Technology, Engineering, and Mathematics (STEM) outreach event for students of all ages in Redondo Beach. INCOSE will join other professional societies from across Southern California as well as the Jet Propulsion Laboratory speaker to introduce young people to the opportunities in STEM professions. Friday October 13 INCOSE-LA will remotely join the Systems Engineering Professional Development Day (SE-PDD) hosted online from the Great Lakes Regional Conference (GLRC) at Caltech, partaking in a full day of topics. On Saturday October 14, Caltech will also host a Systems Thinking Day. This event will include a Systems Thinking Tutorial, a roundtable, networking, lunch, and planning next steps, in how to "eEncourage systems thinking for wider community problems."

The chapter has October and November speaker meetings at The Aerospace Corporation on the second Tuesday of each month and a holiday party on December 9 at the Del Rey Yacht Club. We are planning more tutorials on topics such as systems security engineering and model based systems engineering. We are participating in the planning of a Western States Regional Conference (WSRC) in the fall of 2018 in Seattle. Long-term plans are to host the WSRC in LA in 2019. Please check our web site at www.incose.org/los-angeles for more information about 2017 upcoming events and tutorials. Links to our registration pages are included in the detailed event web pages. We are looking for more volunteers to help with one of these events or to help in STEM outreach events. Please contact prmarbach@gmail.com about volunteer opportunities or to run for an officer position.

San Diego Chapter

Randall Illiff, randall@eintllc.com

2017 INCOSE San Diego
Mini-Conference & Call for Papers!

When: Saturday, November 4, 2017 8:00 AM to 4:30 PM

Location: UCSD Extension University City, 6256 Greenwich Dr. San Diego, CA 92122

Pricing: Early bird price (until Oct 28) is $50 INCOSE Members / $60 Non-INCOSE Members / $25 Students. After Oct 28 and at the door, the price is $60 INCOSE Members / $70 Non-INCOSE Members / $35 Students.

Join us for a day of stimulating thought and discussion with fellow professional systems engineers, system engineers in law, and big data scientists. The conference centers on the crucial role of system engineering in practice and more topics as follows:

- Systems of Systems System Engineering
- Systems Engineering Interoperability Best Practices
- Agility & Incremental Commitment Spiral Model
- Science of Laws in System Engineering
- Big Data Visualization of Molecular Structure
- Big Data Analytics Visualizations of Uncertainties
- and MORE

To present at the Mini-Conference: please send an abstract with a minimum of two paragraphs fully describing the topic to: Mini-Conference POC: James C S Meng, Ph.D., mengjc@ucsd.edu.

This year, we are also partnering with The Science of Laws Institute on Lawmaking with Systems Engineering Methodologies: How systems engineering tools and techniques can be applied to the creation and optimization of the laws of government. To present at this track will require a paper. For details, see the following: https://sdincose.org/call-for-abstracts-4th-annual-science-of-laws-conference/

Additional related topics are still in development and welcome. The preliminary agenda is on the registration page; a more detailed agenda with topics and presenters will be available by the end of September 2017. All interested parties are welcome and encouraged to attend. Broad participation is good for all attendees and presenters.

Refreshments: The registration fee includes a continental breakfast as well as a lunch of sandwiches and drinks. Please state vegetarian preferences with your registration. Catering orders close on October 30, 2017 at 4:00 PM. We will purchase a few extra lunches, but if you register after October 30, 2017 there is a possibility that you may not have a lunch.

To register and see the preliminary schedule, please see https://sdincose.org/rsvpmaker/2017-incose-san-diego-mini-conference-2017-11-04/

North Star Chapter

Angela D Robinson, adrobins@msn.com

Meet and Greet with Chris Unger from the
Healthcare Working Group

Chris was a guest speaker at the Medtronic Systems Engineering Symposium: Engineering Systems of Systems. While he was in the Twin Cities, we organized a meet-and-greet, inviting systems engineers who work in the medical device industry.

Chris sends his remarks to those in attendance and we would like to share some of the conversation below.

"Thanks to everyone who could make it to the meet-and-greet on the evening of August 31st. I learned a lot, and I appreciated the conversation.

For now, I think I have persuaded Kousha, Anthony, John, and Brian to consider volunteering to help the Healthcare Working Group set priorities by participating in a user advisor board which we will confirm once we firm up the expectations and operations."

The discussion also confirmed that the potential topic list for the 4th Annual INCOSE Conference Systems Engineering in Healthcare is interesting. Chris will go through the feedback to see if we can trim some topics and if the UAB can help define the next level down which is what aspects would be especially interesting to see in the conference.

Chris also shared that people also mentioned that they were not aware of the Healthcare domain SEBoK extension. The top 2 articles are at:

- http://sebokwiki.org/wiki/Overview_of_the_Healthcare_Sector
- http://sebokwiki.org/wiki/Healthcare_Systems_Engineering

Finally he states: "There are three more articles at the lower level (healthcare delivery, lean in healthcare, and systems biology). We are hoping to plan a few more, but we do not have the right authors lined up. I am very happy to consider more detailed articles sponsored by the Healthcare Working Group, but the SEBoK editorial board will not validate them until other application domains catch up to us."

INCOSE CSEPs Celebrating Certification
at the INCOSE IS 2017!

Sector Updates

Americas

Kendra Kreutz, kendrakreutz@gmail.com

Register now for INCOSE Great Lakes Regional Conference

GLRC11 - October 11-14, 2017 in Minnesota

The participating chapters of the INCOSE Great Lakes Region invite you to join them for their annual conference hosted by the North Star Chapter of Minnesota, October 11-14, 2017 in the Twin Cities.

Our keynote speaker this year is INCOSE President-Elect Garry Roedler. INCOSE Past President David Long will be giving the Sigma Theta Mu lecture.

The program also includes:

- 3 additional featured and invited speakers

- 29 technical presentations

- 3 panel sessions

- 5 tutorials (including a free tutorial by our Platinum Plus sponsor, No Magic)

- Full-day systems literacy workshop

- STEM demonstrations

- Sponsors and exhibitors showcasing products and services

Take the INCOSE CSEP/ASEP Exam on Saturday, 14 October, FREE for GLRC11 attendees!

Register now! Early registration ends on September 17, 2017. Meet us in Minneapolis for the full event – or – the portions of the Friday program that will be broadcast to nine satellite sites around the country as part of the GLRC11 Systems Engineering Professional Development Day (SE PDD). Find your nearest satellite here.

Follow conference information on the GLRC11 website.

More member fun at the INCOSE IS 2017!

Asia-Oceania

Australia - Systems Engineering Society of Australia (SESA) Chapter

Ramakrishnan Raman, ramakrishnan.raman@hotmail.co.uk

SESA was proud to host the 27th INCOSE International Symposium in Adelaide. It was a rare treat for Australian systems engineers to participate with the larger INCOSE parent in this premier event. We trust that all our international guests not only enjoyed the symposium, but also got to taste some of the delights of our lovely country. The International Symposium, 2017 was a shot in the arm for systems engineering in Australia, and a real boost for SESA with membership numbers increasing by ~50%. In fact, the response by SESA members was such that they could not all fit in the group photo, where we proudly displayed our Gold Chapter Circle award.

SESA Members cannot fit in the photo where they commemorate their INCOSE Gold Chapter Circle Award.

The profession is now becoming aware of the value that the Tech Ops program within INCOSE brings to the systems engineering discipline, and the wealth of product that it generates. This helped bootstrap interest in the Australian Systems Engineering Workshop (ASEW) October 30-31, 2017 in Brisbane. This is SESA's local equivalent of the INCOSE International Workshop, and establishes linkages with many INCOSE working groups.

SESA held its General meeting on June 29, 2017. At this meeting, SESA elected and welcomed three new members to the SESA Management Committee. We thanked the retiring members for their service over many years.

Bill Parkins, who has served for many years as SESA Secretary and led our international engagement in the Asia Oceania Sector, stepped up to the challenge and accepted the nomination as SESA President Elect.

With the engagement of staff within Engineers Australia to perform secretariat and finance functions, Mark Eggler moved into the combined role of Secretary/Treasurer to direct and

monitor the performance of that contract.

The election of Rainer Ignetic and Chris Browne as Government and Academic representatives respectively boosted our ambassadorial team.

SESA recycled our retiring past president by appointing Quoc Do to the committee to pursue the Tomorrow's Systems Engineers objective. Quoc will use his experience as alumni of the Technical Leadership Program to chair an Awards & Integrated Mentoring (AIM) committee to assist new systems engineers to develop their careers.

SESA has created active Regional Branches in most States of Australia which will propel the organization into 2018. SESA will convene the annual strategy meeting with ASEW to embrace the opportunities created.

India Chapter

Purohit Geetika, PurohitGeetika@JohnDeere.com

Local Circle Events

The INCOSE India Chapter continued to engage with the members in the local circle events. Here are some of the highlights of these events.

Pune

The India Chapter conducted another local circle event on July 11th, 2017 in Pune, hosted by John Deere. 30 engineers representing various engineering organizations like KPIT, Eaton, Intercax, and John Deere attended the event. Mr. Mark Eggler of Eggler Technology Training delivered a talk on "The Use of Advanced Model Based Systems Engineering Techniques in the Design of New Generation Armoured Fighting Vehicles." It was another learning and networking opportunity for Pune circle members in this year.

India Chapter – Pune Circle Event

India Chapter – Workshop in NITIE, Mumbai

Mumbai

The India Chapter reached out to academia and conducted a workshop on systems engineering in the National Institute of Industrial Engineering (NITIE) in Mumbai on August 9, 2017. Over 50 students attended the event. It included an introduction to systems engineering, a couple of industry case studies, a systems simulation game, and India Chapter updates presented by India Chapter Committee members Nikhil Joshi, Stueti Gupta, and Geetika Purohit. This was the first engagement of the INCOSE India Chapter with NITIE, and it opened doors for future engagements.

Bangalore

Bangalore conducted another local circle event on August 11, 2017. The event included an informal interactive session on the Purdue Systems Collaboratory by Dr. Robert Kenley of Purdue University. The attendees also engaged in focused discussions on the application of systems thinking to manufacturing plant design and system-of-systems.

India Chapter – Bangalore Circle Event

INCOSE

11th Annual INCOSE
Great Lakes Regional Conference

SUPERIOR SYSTEM SOLUTIONS FOR TODAY'S COMPLEX ENVIRONMENTS

11 - 14 October 2017 | Twin Cities, Minnesota

GLRC 11

Attend GLRC11 at an SE PDD Site – 13 Oct 2017!

Initiating the second decade of successful Systems Engineering (SE) conferences in the Great Lakes region, GLRC11 will have featured presentations from SE thought leaders and papers from SE practitioners and academia on important SE topics.

Building upon last year's conference, GLRC11 again features an INCOSE **Systems Engineering Professional Development Day (SE PDD)**. The SE PDD is a virtual extension of the conference, with featured sessions broadcast from the host site in Minnesota exclusively to several satellite sites on **Friday the 13th of October**. The objective is to create mini-satellite conferences that give a portion of the GLRC experience without having to travel, thus expanding the impact and value of the conference to the entire region.

## This Year's SE PDD Program will Feature:

Sigma Theta Mu Lecture by David Long, Vitech and INCOSE Past President
8 Technical Presentations
Networking with local systems engineering professionals

Where can I Participate?

Hosted by INCOSE Chapters, we currently have nine satellite SE PDD sites across the USA:

- Cascade Chapter at PNNL in Richland, WA
- Chicagoland Chapter at IBM in Schaumburg, IL
- Cleveland-NO Chapter at Reliability First in Cleveland, OH
- CoA Chapter at IPFW in Fort Wayne, IN
- CoA Chapter at IUPUI in Indianapolis, IN
- CoA Chapter at Purdue in West Lafayette, IN
- Finger Lakes Chapter at SRC in Syracuse, NY
- LA Chapter at Caltech in Pasadena, CA
- Michigan Chapter at ESD in Detroit, MI

If you are not able to join us in Minnesota, go to the GLRC11 website to register for an SE PDD site near you!
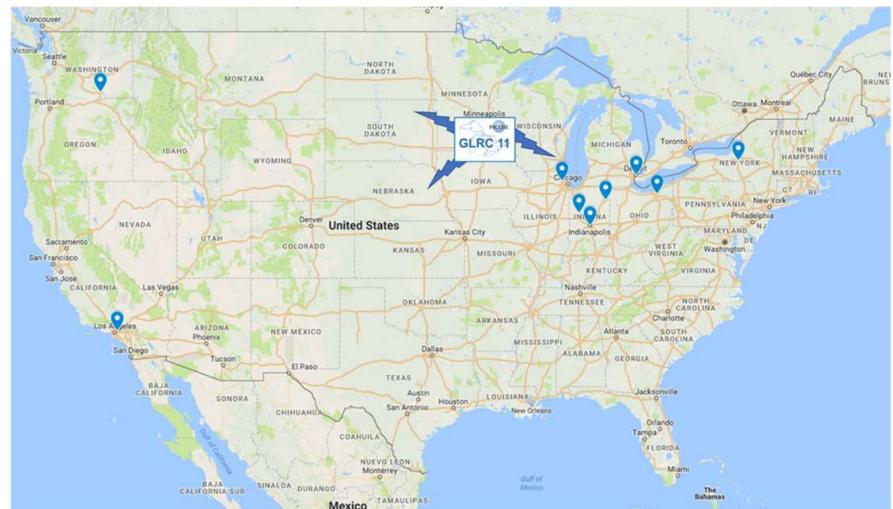
Important GLRC11 SE PDD Dates

7 August 2017	Early Registration Begins
17 September 2017	Early Registration Ends
13 October 2017	GLRC11 SE PDD Live Virtual Broadcasts of Technical and Plenary Sessions to Satellite Sites

For questions and comments, please contact the GLRC11 Satellite Sites Co-chair:
Gary Houchin-Miller: gary.houchin-miller@jci.com.

www.incose.org/glrc11

Rev Date: 5 August 2017

Asia-Oceania Sector Updates

EMEA

Singapore Chapter

Yew-Seng Yip, yipys@alumni.nus.edu.sg

MOU with NTUC

INCOSE Singapore Chapter signed a Memorandum of Understanding (MoU) with NTUC on April 28, 2017 for the Chapter to be a U Associate Partner of NTUC (National Trade Union Congress), and for NTUC to be a strategic partner of the chapter. Both parties will collaborate to promote the practice of systems engineering and to engage its practitioners. NTUC is the sole national trade union center in Singapore. U Associate is a key B2B program designed to engage and support our working people through professional guilds and communities. Through this MoU, the Singapore Chapter hopes to extend its outreach to more industries and employers to expand the opportunities for system engineers.

Talk by Richard Beasley on "Industry 4.0" on July 25, 2017

MoU signing with NTUC

The Singapore Institute of Technology (SIT) hosted this event with about 20-30 attendees including INCOSE members, NTUC representatives, academia, and students. Professor Quek Tong Boon was in attendance. Boon is currently the Chief Scientific Advisor to the Singapore Ministry of Trade and Industry and the Chief Executive of the National Robotics Program as well as Advisor to the Science and Engineering Council (SERC) at A*STAR. He was the Chief Defense Scientist of Singapore's Ministry of Defense (MINDEF).

EMEA

South Africa Chapter

Alisa Farr, alisa@letter27.co.za

INCOSE SA Conference 2017

Navigating an Unsettled Future

"Trying to predict the future is like trying to drive down a country road at night with no lights while looking out the back window. The best way to predict the future is to create it."

-Peter Drucker

The thirteenth INCOSE South Africa (SA) Conference 2017 will be on Wednesday through Friday, October 11-13, 2017 at the CSIR Convention Centre in Pretoria, South Africa. In addition, on Thursday morning, October 12, there will be a Systems Engineering Professional examination session.

SA representation at the INCOSE IS 2017

Tutorials on offer include:

- "System Dynamics" by a team from Research, Development, and Testing at Eskom

- "A Systems Approach to Meeting Stakeholders' Future Rail Service Needs" by Tim Burleigh.

- "The Psychodynamics of Socio-Technical Systems—From Systems Engineering to Systems Leadership" by Dr. Jean Cooper

- "The Essence of Transformational Leadership in a Technology Business" by Dr. Dietmar Winzker

- "Design, Marketing, and Engineering—Art or Science?" by Dr. Dietmar Winzker

The Keynotes on offer, that have been finalized, are, in no particular order:

- "The reason I want to go to Mars is simple—The allure of the unknown is far more powerful than the comfort of the known" by Dr. Adriana Marais (SAP Africa)

- "Big Data or Big Hype?" by Professor Mike Inggs (University of Cape Town)

- "Circles in a Forest—Some Thoughts on the Application of System Dynamics to Biological and Environmental Phenomena" by Dr. David Rubin (University of the Witwatersrands)

- "Behold, the line in the sand: Our creations mustn't be deadly creatures" by Dr. Thompson Chengeta (University of Johannesburg)

- "Half the World, Half a Chance—Women in Science" by Teresa Oakley-Smith (Diversi-T)

- "What Makes Us Human? Perspectives from South African Palaeoanthropology" by Dr. Ashley Kruger, Evolutionary Studies Institute, University of the Witwatersrand)

For registration, sponsorship, or more information, visit our conference website, http://www.incosesaconference.co.za.

EMEA Sector Updates

Greatest Young Systems Engineer of the Year (GYSEOY) Challenge

The INCOSE South Africa chapter initiated the annual GYSEOY challenge in 2015. Companies and organisations can enter teams of their young and/or aspiring systems engineers to develop skill and knowledge in the application of systems engineering.

The final review process of the challenge culminates in the announcement of the winning team at the annual INCOSE SA conference. Here, the winning team and all the participating teams present their research, process, and solution proposal.

The participants review a problem statement presented as a narrative. From there, they embark on research and requirements elicitation. These are presented at a requirements review halfway through the challenge calendar. The teams must then assess and adapt their working and thinking strategies to deliver a successful, competitive, and tailored systems engineering process and solution.

The 2017 problem statement tells the story of a young woman from Macassar South Africa, Aamilah Slamet, with the ambition to provide nutritional and affordable food to her community. She hopes to develop a nutrition value chain using modern technology that could rival the economies of scale of large existing agricultural production systems and their supply chains.

The teams must assist Aamilah in the design of this system and also in garnering the interest of angel investors. Given the rising food prices in South Africa, that are leaving an increasing amount of families in a troubled situation, the problem that these young engineers need to address has tangible real-world significance.

The participants also receive training in systems engineering from Ad Sparrius (Ad Sparrius Systems Engineering and Management), and the use of software modelling tools in model based systems engineering from Cobus Scannell (Letter27).

2017 teams are: Denel Dynamics, Reutech Radar systems, SKA South Africa Gauteng, SKA South Africa Western Cape, Armscor, Transnet

Wisest Systems Engineering Mentor of the Year (WiSEMOY) Challenge

INCOSE SA initiated the WiSEMOY challenge in 2016 to recognize the mentors that made an outstanding contribution to the profession through the growth development of their prodigies. The challenge is open to mentor-mentee couplets from across the systems engineering community, and not restricted to just INCOSE members. The mentee, mentor, or others may submit nominations. A WiSEOY candidate profile includes the following:

- Mentors in leadership (preferably high-level) roles. The mentor, particularly, should have the reputation of an excellent leader of technical teams or organisations

- Mentors who lead by example. They show rather than tell and can practise in contemporary industrial contexts

- Mentor-mentee couplets working on practical programs/projects, particularly projects wherein new intellectual capital arises and wherein real progress is demonstrated

- Mentors of courage; mentors prepared to take risks and who, sometimes, face failure, but who – despite this threat – overcome difficulties and abate risks

- Mentor-mentee couplets, who dare across the boundaries of technical disciplines and who are able to take the bird's eye view. Clearly interface management, problem solving, and systems integration are at a premium

The winner of the WiSEMOY award is announced at the INCOSE SA annual conference.

Model Based Systems Engineering Working group

INCOSE SA is in the process of developing a model based systems engineering (MBSE) working group to research and address the specific needs of industry in South Africa as well as the challenges to model based systems engineering and its practitioners in South African systems.

MBSE is generally applied in the international environment in large projects with sizeable resources. The tools, processes, and modelling languages applicable for these organisations and their projects may not be suitable to more frugal ventures in the South African environment.

The purpose of the South African MBSE Initiative is to build on the work of the INCOSE international MBSE working groups to establish a MBSE process and method suited for the local environment. The SA MBSE Initiative align the high-level goals with the international MBSE goals to include the following:

- Engage INCOSE stakeholders to assess the current state of practice of MBSE

- Build a broad community that promotes and advances MBSE in South Africa

- Advance, customize, and mature the MBSE practice for the South African environment

- Get authoritative information on MBSE out to practitioners and the broader community

- Clarification on the application of MBSE processes, methods, modelling languages, and tools

The South African MBSE Initiative will be formally launched at the INCOSE South African conference.

United Kingdom (UK) Chapter

Ivan Mactaggart, president@incoseonline.org.uk

Engineering Council Renews INCOSE UK's Affiliate Status

The Engineering Council reviewed the UK Chapter's third Professional Affiliate Status earlier this summer. The Engineering Council conducts a review every five years to ensure that Professional Affiliates are complying with the high standards laid down by the Engineering Council.

This review was the first opportunity for the Engineering Council to review the new systems, which INCOSE UK and the Society of Environmental Engineers implemented to enable INCOSE UK members to become professionally registered through their home institute.

Ian Presland, the Professional Development Director, explains, "It is always nerve-racking when we as individuals or as an organisation are assessed, but on this particular occasion, we the INCOSE UK Council were a little on edge, as we recognise the ability to offer Professional Development to our members as a key role of the Society. We are therefore delighted that the Engineering Council have renewed our Professional Affiliates Status."

INCOSE UK President, Ivan Mactaggart, stated, "Our volunteers, Secretariat and the INCOSE UK Council have worked hard to transition to our new registration arrangement, and to put systems in place to assist our members throughout the registration process, and to enable their continuous Professional Development using the mycareerpath® tool, which has been developed by the Engineering Council. Recognition from the Engineering Council that INCOSE UK is complying with the regulatory requirements for the engineering profession is a significant accomplishment and consistent with our aim and vison."

Engineering Council CEO Alasdair Coates said, "The Engineering Council's vision is to maintain society's confidence and trust in the engineering profession. We achieve this through working with partners across the professional engineering community and are pleased to see INCOSE UK maintaining those standards expected of a Professional Affiliate."

INCOSE UK Establishes Early Careers Forum

The UK Chapter is looking for ways to better engage with the newer members of the systems engineering world. Along with the UK Advisory Board, the council decided to hold a workshop for young professionals to gain insight into how new systems engineers would like to be further involved in INCOSE UK, and what they would like to see in the future for systems engineering. This proved to be successful, and many good suggestions came from the workshop.

Those present on the day of the workshop elected Omer Elroubi as their spokesperson and invited him to attend the next council meeting to report on the workshop's findings. After listening to the feedback from the workshop, the council agreed that they should create an Early Careers Forum and the council offered Omer the position of interim chair.

Omer will sit on the council and have the chance to give a voice to those who just started a career in systems engineering. His main task is to develop the terms of reference (TOR) for the Forum alongside the INCOSE UK President-Elect, Kirsty Akroyd-Wallis, and the INCOSE UK Secretariat. They will present the TORs to the council at the meeting in September for endorsement.

We will hold the Forum's inaugural meeting at our Annual Systems Engineering Conference (ASEC) in November, where we will brief our members on the Forum TORs and ask to elect members to the committee roles. The sole criteria for the Forum Committee is that an individual must be a member of INCOSE UK and within the first five years of their Systems Engineering career. We are very enthusiastic about this development within INCOSE UK and we are sure that the Forum will prove to be an excellent addition to the organisation.

Annual Systems Engineering Conference

21 - 22 November 2017
The Slate Building,
University of Warwick

Academic News

From The Academic Council of INCOSE

Thomas F. Gannon, tgannon@wpi.edu

Assistant Director for Academic Communications

Activities with the American Society of Engineering Education (ASEE) Activities Sponsored by the INCOSE Academic Council

Alice F. Squires, alice.squires@wsu.edu

The annual ASEE 2017 Conference's INCOSE Academic Council sponsored events were well represented and attended making the event a strong success. For the panel on "Perspectives on System Engineering's Critical Role in Transforming Engineering Education Around the Globe," the team (moderator Alice Squires and speakers Ariela Sofer, Tom McDermott, Radu Babiceanu and Satinderpaul Devgan) had an audience of about twenty feisty attendees. The main highlight of this event was the multiple perspectives offered and reflected both in the panel presentations and the question and answer session. The audience emphasized interest in the topic and the need for collaboration going forward.

Art Pyster's lecture, "Spice Up Every Engineer's Education with A Pinch of Systems Engineering," a plenary event at the conference shared with about eight other distinguished speakers each in their own 'conference room (online participants)' had over 50 attendees who continued to show high interest in the idea of integrating systems engineering concepts into the very foundation of engineering curriculum. Art demonstrated how this could easily be done when developing new undergraduate engineering programs. The audience of tenure-seeking faculty presented one key challenge - how they can possibly 'do it all' with the high-demand from many different areas for added content in addition to research and service requirements. This article author suggests that we need to demonstrate how to change the perspective of systems engineering from something being added to the curriculum, to systems engineering as a foundational core of engineering curriculum. My experience is that this is already the case in certain university programs, especially those noted by

empirical observation, developed by faculty entering academia with industry experience.

On the final afternoon of the conference, about 25 participants across the two previously mentioned events (panel and lecture), attended the INCOSE sponsored workshop "Integrating Systems Engineering: Foundations for First Year Students and Best Practices for the Capstone Experience" delivered by faculty (Mario Simoni (Rose-Hulman), Bill Fortney (NC State), Fred Looft (WPI), Federica Robinson-Bryant (ERAU), and Alice Squires (WSU)). It was so well received, folks were interested in continuing the workshop past the ending time. Feedback from the workshop included comments that the workshop was excellent, fun, and engaging with great presentations. Participants liked the enthusiasm of the presenters, and there were one or more requests for a workshop at the Capstone Design Conference next year in Rochester, New York, June 4-6 (http://www.capstoneconf.org) that Fred Looft supports. Bill Fortney summed up the experience he noted from teaming with other faculty to deliver guidance to engineering educators: "This highlights the need to teach faculty the thinking associated with the systems perspective along with teaching them "tools." If they capture the vision of the systems perspective and how it complements their existing technical skills, they will figure out how to adapt the tools to their unique situations."

INCOSE Marketing and Communications Director Rachel LeBlanc hosted an INCOSE Booth at the ASEE conference with some support from INCOSE members, and found that librarians that support engineering education have a strong desire and ability to bring Wiley sponsored publications, such as the INCOSE handbook, the INCOSE conference proceedings, and more, into the universities. There was also

an interest in INCOSE-sponsored systems engineering certifications from academia such that INCOSE already plans to have a booth at the annual ASEE conference next year in Salt Lake City, Utah, June 24-27, 2018, for the second year in a row. Plans are in place to have staff attend to support systems engineering certification.

As a member of the American Society of Engineering Education (ASEE) Corporate Member Council (CMC), INCOSE also supported industry day on Tuesday, and Alice Squires served as a panel member for "Closing the Gap: Industry Perspectives on Undergraduate Preparation for Practice," presenting "Bridging the Gap Between Engineering Education and Practice with Systems Savvy Engineers." An estimated 40-50 participants attended the panel and feedback included "Many thanks – that was a good session!" and "This is the first really new thing that I've learned here [at the ASEE conference]." Continuing her work on the CMC board as INCOSE's representative to ASEE, Alice is leading a Special Interest Group (SIG) focused on bringing a systems perspective to all engineers to help them deal with the growing complexity of systems and foresee the far-reaching consequences of design decisions in society, both now and in the future. To this end, Alice is seeking input from the broader engineering community on priorities for the potential set of initiatives that a SIG could pursue. She is asking for your opinion and guidance; please rank the initiatives being considered (provides the "Most Value", "High Value", "Medium Value", "Little to No Value") and optionally add an initiative of your own (with a brief description), by completing this one-page survey: https://www.surveymonkey.com/r/ASEEandINCOSEsurvey. Initiatives of potential value are listed below and defined in more detail in the survey:

- Hold Workshop Series with Industry Participants

- Develop and Distribute Comprehensive Survey to Engineering Community

- Offer Educational Seminars on Systems Engineering

- Set up Infrastructure to Support Collaboration on Capstone Experiences

- Develop and Host an Annual Sustainable Systems Focused Global Challenge Competition

Once you complete and submit the survey, you will see the results collected to date for the primary question. Please submit your responses by the end of September 2017, thank you!

The work INCOSE supported through ASEE is successful in moving INCOSE towards achieving its strategic goal in Education: "INCOSE curricular recommendations are widely adopted around the world, raising the quality of engineering education" that discussions are underway for INCOSE joining the International Federation of Engineering Education Societies (IFEES) as a bronze member to further influence engineering education around the world!

Please send any questions or comments related to ASEE and related activities to alice.squires@wsu.edu.

Significant Changes to Engineering Criteria Approved by the Engineering Accreditation Commission of ABET

David Olwell, EAC Commissioner

The Engineering Accreditation Commission (EAC) of ABET approved significant changes to the engineering criteria this summer. Those changes move to the ABET Board of Directors for further approval. If they receive final approval, they would be effective for the 2019-2020-accreditation cycle. The changes are of significant interest to the systems engineering community. They represent the first major revision to the engineering criteria in twenty years.

The EAC added a definition section. Here are two new key terms:

- Engineering Design – Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process, in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs, to identify a high-quality solution under the given circumstances. For illustrative purposes only, examples of possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.

- Complex Engineering Problems - Complex

engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.

The EAC streamlined the previous a-k student outcomes from Criterion 3 and renumbered the outcomes (the numbers are jumbled below to realign with the CAC criteria). I have highlighted some key terms from my point of view. The 1-7 outcomes are now:

Criterion 3: Student Outcomes

The program must document student outcomes that support the program educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

(6) An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.

(3) An ability to communicate effectively with a range of audiences.

(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

The EAC also amended the curricular requirements in Criterion 5. Note that the EAC reduced the credit hour requirements slightly.

The curriculum requirements specify subject areas appropriate to engineering, but do not prescribe specific courses. The program curriculum must provide adequate content for each area, consistent with the student outcomes and program educational objectives to ensure that students are prepared to enter the practice of

engineering. The curriculum must include:

a. A minimum of 30 semester credit hours (or equivalent) of a combination of college-level mathematics and basic sciences with experimental experience appropriate to the program.

b. A minimum of 45 semester (or equivalent) credit hours of engineering topics appropriate to the program, consisting of engineering and computer sciences and engineering design, and utilizing modern engineering tools.

c. A broad education component that complements the technical content of the curriculum and is consistent with the program educational objectives.

d. A culminating major engineering design experience that 1) incorporates appropriate engineering standards and multiple constraints,

e. and 2) is based on the knowledge and skills acquired in earlier course work.

The EAC also approved program criteria for cybersecurity engineering and similarly named programs. INCOSE was one of the three lead societies in this effort, and Dick Fairley led the INCOSE effort.

These program criteria apply to engineering programs that include "security," "cybersecurity," "computer security," "cyber operations," "information assurance," "information security," or similar modifiers in their titles. The new criteria are:

1. Curriculum

The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

The curriculum must

- Include probability, statistics, and cryptographic topics including applications appropriate to the program.

- Include discrete math and specialized math appropriate to the program, such as abstract algebra, information theory, number theory, complexity theory, finite fields.

- Include engineering topics necessary to analyze and design complex devices, software, and systems containing hardware, software, and human components.

- Provide both breadth and depth across the range of engineering and computer science topics necessary for the:

1. Application of security principles and practices to the design, implementation, and operations of the physical, software, and human components of the system as appropriate to the program

2. Application of protective technologies and forensic techniques

3. Analyzing and evaluation of components and systems with respect to security and to maintaining operations in the presence of risks and threats

4. Consideration of legal, regulatory, privacy, ethics, and human behavior topics as appropriate to the program

2. Faculty

The program must demonstrate that faculty members teaching core engineering topics understand methods of engineering design, engineering problem solving, and engineering practice with specific relevance to security.

We did not make significant progress on developing program criteria for systems engineering. However, the proposed changes to the general criteria, in my opinion, represent a significant advance for the entire engineering community to adopt a systems perspective more fully, especially in engineering design.

Awards at the ISEF

Dorothy McKinney, dorothy.mckinney@computer.org

INCOSE Continues Tradition of Awarding Prizes at the ISEF

Every year since 2009, INCOSE has sent a team of judges to the International Science and Engineering Fair. This year, the team of INCOSE judges was: Dorothy McKinney (INCOSE Fellow), lead; Bill Mackey (INCOSE Fellow); Bill Chown (INCOSE CIO); Shazad Contractor (INCOSE SFBA Chapter member); Phyllis Marbach (INCOSE LA Chapter President); and INCOSE LA chapter members Nazanin Sharifi, Mark TenEyck, Karen Miller, David Neal, Warren Scheinen and Dhanajay Kulkarni. From a field of over 1600 high school student projects from over 100 countries around the world, in 2017 the INCOSE judges selected ten Honorable Mentions and two winners:

- Best overall systems-engineered project

- Best systems-engineered prosthetics project

Bill Mackey (INCOSE Fellow) and Nazanin Sharifi (INCOSE LA Chapter member) presented the prizes, as you can see in the picture on the next page.

"A Fully-Integrated and Self-Contained Lab-On-A-Chip Device for Sample Preparation, RNA Amplification, and Detection for Disease Diagnostics" won the first prize for the best overall systems-engineered project. This very impressive project was successful in improving RNA analysis by replacing the tedious and error-prone manual biological sample preparation (which uses pipettes to do RNA separation and amplification) and detection (which is susceptible to cross-contamination) with a fully-integrated and low-cost microfluidic device that performs sample-to-answer RNA analysis. To develop the RNA-analysis on a chip, Benjamin Liu:

Awards at the ISEF

- Optimized components he initially developed last year, which included:

  - an acoustic micromixing process to enhance RNA capturing efficiencies

  - inexpensive wax microvalves for gating the microchannels

  - electrochemical micropumps

- Developed a two-compartment-based reagent-storing blister that could provide onboard reagent storage and act as a pump, valve, and mixer

- Demonstrated a fully integrated and self-contained microfluidic cartridge as well as a battery-powered hand-held instrument that consists of integrated circuitry to regulate heating, electrical, and an optical sensor for sample-to-answer biological analysis of RNA-based infectious diseases (e.g., Chlamydia Trachomatis and Mycoplasma Genitalium)

Left to right: Syamantak Payra, winner INCOSE prosthetics prize, from Friendswood, Texas; Nazanin Sharifi, INCOSE LA Chapter; Bill Mackey, INCOSE Washington DC Chapter; Benjamin Liu, winner INCOSE 1st prize, from Arcadia, California

Personal Observations of Dorothy McKinney:

Benjamin did an impressive job of analyzing the essential aspects of RNA analysis, identifying areas where much improved automated processes could replace existing manual processes, and doing trade studies and design of all the individual elements needed to implement his vision of an improved diagnostic device. Through thorough testing, he showed not only how well his system worked as designed, but also showed impressive results at diagnosing real disease from RNA samples.

The project entitled, "A Smart Bionic Leg Brace: An Electromechanically Actuated Active-Assist Wearable Orthotic Device for Comprehensive Restoration of Gait Characteristics Across Everyday Mobility Scenarios" won the prize for the best systems-engineered prosthetics. Illnesses and injuries like multiple sclerosis, stroke, and poliomyelitis can cause a loss of leg strength, necessitating the use of a Knee-Ankle-Foot Orthosis (KAFO), or leg brace that locks the knee joint to prevent leg collapse. However, an immobilized knee causes abnormal walking gait, which leads to hip//back pain, chronic fatigue, and joint/muscle damage. Approximately over 100 million patients around the world could benefit from a bionic leg brace that substitutes for lost muscle functionality and assists the user by actively bending the leg during walking.

In this project, Syamantak Payra developed a versatile smart bionic leg brace that can restore natural walking gait across the entire body in different everyday mobility scenarios. By redesigning hardware and optimizing retrofit mechanics, Payra achieved maximum force, speed, and range of motion. To facilitate ease of use, he integrated voice-control functionality into a smartwatch/smartphone app. Additionally, Payra developed advanced algorithms for the brace to assist in sitting/standing, ascending/descending stairs/ramps, entering/exiting vehicles, and to intelligently adapt to the user's walking speed and gait over any terrain.

To evaluate the bionic brace and assess algorithm robustness, he formulated and executed extensive data-collection and analysis methodology. Payra collected walking gait data was from eight sensors across the body, analyzed, and statistically modeled. This smart bionic brace provides unparalleled performance – all eight walking gait characteristics evaluated improved across the tested mobility scenarios, including significant reductions in gait pathologies – at only 2.6% of the cost of the most expensive, yet less functional KAFOs available today.

Personal Observations of
William Mackey:

It was clear from the interview session that Syamantak thoroughly researched the need with potential stakeholders including his grandfather. He went to retirement homes and conducted surveys to develop the need and requirements for a bionic leg brace. He went through several generations of development on the bionic leg brace system. After he developed the bionic leg brace system, he thoroughly tested the system using actual persons. He showed a video to demonstrate both a typical poorly walking subject and the same subject with his smart bionic leg brace. Syamantak's skills extended to not only good systems engineering, but also to good business practices. My own mobility challenges attest to the value of his smart bionic leg brace.

Awards at the ISEF

Honorable Mention -- Battery System Optimization and Development of a Novel Rapid-Response Bioelectronics Device

Rahul Lall, of Auburn High School in Auburn, Alabama, designed and developed a miniaturized real-time biometric monitoring system on a flexible substrate that can be integrated into wearable fabric. The motivation for his project was the unexpected death of his grandfather; had this monitor been available for his grandfather to wear, they could have called for medical help that might have saved his grandfather from death. In current medical practice, human body monitoring on a continual basis is often only possible in highly monitored hospital environments such as Intensive Care Units (ICU). Constrained to the bed, the patient is often monitored through sensors connected through wire harnesses to medical equipment. However, if it were possible to miniaturize the systems required for acquiring, storing, and utilizing this biometric information, the hospital could provide this level of intensive care to several patients in need of continuous, real-time monitoring outside of hospital settings. Doctors could use such a system, if miniaturized, to monitor many patients with life threatening conditions including arrhythmia, myocardial infarction, seizures, and aneurisms, in addition to monitoring the geriatric population.

Honorable Mention -- Safe with Me Now: A Novel System to Prevent Vehicular Hyperthermia in Children

Jessica Yu of West Linn High School in West Linn, Oregon was one of several students who addressed the problem of the safety of children left in hot cars. A Mayo clinic report, that said that over 700 children have died from vehicular hypothermia in the past 20 years, and 28% of these were in a car without any adult knowing they were in the car, strongly affected her. Jessica surveyed the products currently on the market in the U.S., and concluded that none of them can detect a child who climbs into a car without an adult's knowledge and does not sit in a child safety seat. In addition, existing products depend on the driver noticing an alert and being close enough to the vehicle to get the alert signal. The system she designed and built recognizes the presence of a child without any adult in the car (whether the child is in a car seat or not), and alerts bystanders as well as the driver if hypothermia threatens. The cost of production of her design is under $100.

Honorable Mention – SafeSeat

Andrew Barbaro, of Carroll High School, Dayton OH, developed a functionally enhanced child carrier using readily available hardware at an affordable price point. Andrew demonstrated excellent skills in and implementation of sub-system isolation, problem definition, requirements, detailed design, logic-control, technological integration, simulation testing, refinement, operational validation, and reliability testing.

He used Raspberry Pi 3 to control GPS, thermal, weight, and tension sensors, using Python programming. The 'SafeSeat' monitors a child's presence and status, by weight and safety buckle lock, monitors ambient and car temperature. It sufficiently lowers the car windows for appropriate ventilation, when temperature rises more than 8 °C or exceeds 100 °F. Additionally, the 'SafeSeat' is equipped with audible alarm for public attention, automatic geo-location texting to parents/guardians, and calling 911 with text to speech capabilities relaying the hazardous situation with prerecorded message and present location.

Our observation was that this system was ready for productization and has the potential to save lives and hardships. Andrew, like all his colleagues in the huge projects hall, was very articulate. He easily explained his project quickly and concisely in a very cheerful manner. The future of engineering is in good hands. Andrew hopes to commercially sell these enhancements as a kit

with an app and hopes to exhibit pioneering vision so that car manufacturers will include these features as standard, using his Android or iOS apps. Andrew's analysis showed that all the necessary hardware purchased was affordable; he completed all the programming with guidance from his teachers supplemented by YouTube tutorials.

Honorable Mention – Mark EBED047 Eco-Phone: A Future Safe Phone with Visible Light and Infrared Communication

Mohammed Sharief of St. Aloysius Pre-University College, Mangalore, New Delhi, India addressed the potential problem that RF waves from cell phones can cause to human health. All mobile phones use Radio-Frequency (RF) waves for wireless communication and they generate different levels of RF radiation depending on their model, make, and exposure to RF radiation measured as SAR (Specific Absorption Rate). The FCC limit for public exposure from cellular telephones is an SAR level of 1.6 watts per kilogram (1.6 W/kg), however most devices do not practically comply with this regulation. The Eco-Phone that Mohammed designed is a novel product that alleviates this safety hazard by using alternative means of wireless communication, using Visible Light and InfraRed Spectrum for uplink/downlink data transmission while the GSM module of the phone is mounted onto a cellular gateway. He designed his product specifically for the indoors where people spend much of their time; indoor locations are often the places where signal reception is poor causing mobile phones to work harder and thus produce higher SAR rates. His design uses a visible light/infrared gateway base station mounted on the ceiling, which spreads the signal throughout the house much like a wifi router, to protect users from the RF wave data stream. The testing he did showed conclusively that his phone unit put out no harmful radiation, and handled both voice and data transmission on the phone very effectively at high bandwidth.

Honorable Mention -- MyHealth: A Novel Wearable Solution for Early Detection and Monitoring of Parkinson's Disease and a Transformation from Subjective to Quantifiable Testing

It was interesting and encouraging to find that many of the finalists we met got the ideas for their projects after observing a relative with a problem. Thus, Surabhi Mundada of Olympia High School, Olympia WA learned that "Early detection and monitoring of Parkinson's … allows slowing of the disease's progression through earlier treatment. However, current techniques for detection of the disease are subject to user and clinician inaccuracies and are tedious. To address these issues, [she] engineered … MyHealth [to] quantitatively detect and monitor Parkinson's symptoms such as tremors, gait impairments, bradykinesia, and muscle rigidities. Patients wear an armband with in-built sensors. He developed program algorithms to read and process sensor data [from a glove also worn by the patient] to detect, monitor and store the symptoms. [The system was] tested using simulated and Parkinson's patients' data." The result was a very well-engineered system applied to a prevalent biomedical problem. Unfortunately, delightful as she was, it did not take long to see from her exhibit that Ms. Mundada's project was a top contender and so we had to move on. So many exhibits, so little time.

Honorable Mention -- Temporal Amplification of Photoplethysmographic and Biometric Signals Hidden in Video Streams for Contactless Monitoring of Cardiovascular Health and Identity Authentication

Eshika Saxena of Interlake High School, Bellevue, Washington presented a project that addressed the issues of the rising cost of health care with a solution that allowed physicians to remotely monitor two of a patient's vital signs (body temperature and pulse rate) and provide some verification of the patient's identity by using their finger prints. This project recognized that the ubiquity and the speed of the Internet were now sufficiently developed to make this telemedicine project a successful and practical approach. The project used a standard web cam or smart phone to produce a video output which was subject to various computational techniques to provide outputs that were diagnostically useful to a physician. The project allowed the monitoring of body temperature by monitoring the changes in facial color on the patient's forehead and respiration rate by the rising and falling of the patient's abdomen. The innovative algorithms developed by Eshika relied "on computation, rather than optics, to selectively magnify hidden signals in ordinary videos" to present "previously invisible information." As a bonus, the algorithms also conveyed finger print information to the doctor to help identify the patient. This is the second year in which Eshika received an INCOSE honorable mention at the ISEF – in 2016, she focused her project on identifying contaminants in human food.

Honorable Mention -- AzureWare: A Novel Approach for Quantifying Tremors and Progression of Parkinson's Disease through an Android App and Bluetooth Low Energy Technology

Koushik Sridhar of Ardrey Kell High School in Raleigh, North Carolina identified the need to measure the progression of Parkinson's disease so a patient can know when they should go back to their doctor and ask for a possible alteration in the type or amount of medication they get. The tremors caused by Parkinson's disease reduce the quality of a patient's life by making it very hard to accomplish everyday tasks. Today, although there are medications which control the symptoms, there is no device doctors and patients can use on an on-going basis to check on the progression of the disease. Koushik designed and developed a glove, instrumented with an accelerometer, and algorithms implemented in an Android app which gives patients, doctors, and caregivers valuable information about the severity of tremors as well as the progression of Parkinson's disease.

Honorable Mention -- Engineered Environmental Containment: Using Lemna minor L. to Reduce Nitrate Levels in Aquatic Environments

Aaron Wills of Central Lee High School in Donnellson, Iowa tackled the problem of decreasing the negative impact on nitrogen fertilizers on the environment. In the American Midwest, nitrogen fertilizers are in extensive use, allowing farmers to improve yields significantly. However, run-off leaches into many major water systems. When nitrate levels in water systems rise too high, it can cause an algae bloom, which can lead to dead zones which suffocates aquatic life. The Gulf of Mexico provides an example of how nitrogen fertilizer runoff can adversely affect marine life.

Aaron designed and constructed a low-cost containment system using environmentally friendly materials including PVC pipe and Lemna minor to metabolize the nitrates. The tested system functioned in two different pond systems for a total of seven weeks, and succeeded in reducing nitrate levels from 4.9 mg to /L to a hardly detectable 0.1 mg/L. In the process, the system maintained healthy levels of pH and dissolved oxygen, and saw a noticeable decline in phosphate levels.

Honorable Mention -- Drone Defense System: Detection, Tracking, Classification and Targeting of Flight Objects in 3D and Real Time

Tassilo Schwarz of the JOHANNES-HEIDENHAIN-GYMNASIUM in TRAUNREUT chose to address the problem of drones entering inappropriate areas. In January 2015, undetected by radar, a quadcopter entered the airspace of one of the highest security locations in the world, the U.S. White House. The hobbyist drone succeeds in flying at a low altitude over the famous garden outside the Oval Office; it later crashed and was found on the South Lawn. However, the Secret Service did not bring down the drone, which they did not even detect. Instead, a technical defect caused the crash. Many drones are invisible to conventional radar.

The problem Tassilo tackled was to develop a low costs system to detect flying objects in real time, classify them into drones/non-drones, determine their position and speed in space, point a tool (e.g. laser) mounted onto a pan-tilt unit at the drone and pass data on the detection to a responsible law enforcement/

security agency. He did several trade studies, examining technologies which could be used for detection, tracking, and 3-D position determination. He selected visual detection as the preferred approach, and designed and implemented a system using multiple cameras to detect and track targets. He developed object identification algorithms, tracking algorithms, and separate 3-D tracking algorithms for each camera. He ran experiments to characterize errors, ad improved his algorithms based on this information. His improved system was capable of distinguishing drones from all birds that do not have stationary flight capability (specifically hummingbirds and falcons), and in tracking drones both in daylight and at night at 60 frames per second (more than real time).

Honorable Mention -- Braille Reading and Training System

One of the more immediately useful projects we visited at the Intel International Science and Engineering Fair, LA was Maggie Ford's Braille Reading and Training System. According to the young woman from Mississippi School for Mathematics and Science, Columbus MS, "Braille books are extremely hard to find… very bulky and heavy." The purpose of Maggie's project was "to design and construct a refreshable single cell Braille device which can be used by to read books in Braille or help them to learn the Braille alphabet." As we saw for ourselves, the project was a success. A laptop computer could read letters from a text file and relay them to a console that could produce the appropriate Braille representations, both physically and visually. Maggie could enter my name into a file and immediately produce the Braille equivalent. Did you know that "ch" is a single symbol in Braille? Maggie told us that she is now working on a four-finger pad version based on feedback from actual Braille users. Based on this project, the MyHealth project reviewed above, and the many other projects we saw hosted by young women from around the world, the fear that there will not be many women in engineering in the years ahead appears to be unfounded.

SESA was a great host for INCOSE IS 2017! A sincere Thank You to all involved, both pictured and not!

Submissions for papers, panels & tutorials – Key Dates

Submission deadline	10th November 2017
Notification of acceptance	16th February 2018
Final Manuscript	30th March 2018

28th Annual INCOSE international symposium
Washington, DC, USA
July 7 - 12, 2018

INCOSE Foundation

Len Troncale, lrtroncale@cpp.edu

INCOSE Foundation Grants to SSWG & NSWG

The Foundation, in its first round of grants to stimulate systems engineering research, awarded $1,500 to one of several Systems Science Working Group's (SSWG)10-year ongoing projects for initial design and population of a public database on Systems Processes Theory (SPT). This research database will be available to all systems engineers for deeper understanding and use of natural science evidence for systems engineering applications, but will also be available to the international population of systems thinkers, systems scientists, and designers from all fields that address systems problems.

The Foundation also awarded $750 to a project of the Natural Systems Working Group (NSWG). At the INCOSE International Workshop, 2017 in January, a joint session of the NSWG and the SSWG focused on critiquing a new field emerging from Systems Processes Theory (SPT), Systems Pathology. It quickly became clear that there were many antecedents to Systems Pathology in systems engineering, and that a vigorous and rigorous general Systems Pathology could improve the systems engineering praxis. At that joint session, the groups announced a new International Society for Systems Pathology (ISSP), and this second grant will help fund its official initiation (just as corporate funds once seeded the foundation of INCOSE itself). Any INCOSE members interested in joining the new ISSP as founding members need only contact this author.

One unique feature of these grants is that they will be deposited in a fund for work/study students such that every dollar of the grant will not only help students in need, but also be multiplied by a factor of four and matched by two grants totaling $3,170 from the Wilson Trust & Troncale Funds for student work on closely related and synergetic projects. Thus, the total value of funding, when joined by volunteer supervision by this author, will result in a total of 1.5 person-years of work on developing the above described products. This indicates the value of the INCOSE Foundation in stimulating development of our field.

EWLSE Update

Alice Squires, ewlse@incose.org

EWLSE "Down Under" at INCOSE IS 2017

At the INCOSE IS 2017 in Australia, Empowering Women as Leaders in Systems Engineering (EWLSE) sponsored an informal networking event on Sunday (after the day's sessions), a technical session panel, and two EWLSE members presented technical papers on research related to women in systems engineering. This was EWLSE's first time scheduling an informal networking event (no other agenda) to provide the opportunity for EWLSE members and their colleagues to informally network, and many who attended the event formed dinner groups for the evening.

On Wednesday, Regina Griego kicked off the EWLSE panel on "Systems Engineering Leadership: Navigational Instruments and Guides" recommending that in order to address what may seem to be a murky path to gain greater competency and leadership as a Systems Engineer, leadership development and technical competency development need to go hand in hand. This type of deliberate competency development will provide the clear opportunities for advancement and support that predict job and career satisfaction and help retain people in the organization. Lauren Stolzar discussed how the roles that people are assigned drive leadership development in systems engineering. 'New' opportunities that stretch people will promote learning and the skills, whereas repeatedly putting people in the same role or in too many simultaneous roles will either stop or slow the learning and skill development process. Current leaders need to be cognizant of human nature and the importance of roles in developing each person's inherent leadership skills. Bill Parkins provided an Australian perspective. He compared Elements of Competency for the Chartered Credential CPEng that signifies competent, ethical engineering practice in Australia -Personal commitment, Obligation to community, Value in the workplace, and Technical proficiency - to the INCOSE functional areas of expertise reviewed as part of the CSEP (Certified Systems Engineer Practitioner) certification process. The Chartered Australian Systems Engineer (CASE) provides pathways to reduce time and cost of achieving both CPEng in Systems Engineering and the INCOSE CSEP. Heidi Hahn addressed building systems engineering leaders in a non-systems engineering culture. Heidi's talked about how the Los Alamos National Laboratory Future Female Leaders in Engineering (FFLIE) project focused on building a sense of belonging and emphasizing soft skills - such as mission and business analysis, stakeholder engagement and analysis, human-centered design, and technical writing and presentation skills - to prepare the program participants to flourish as technical leaders once they join the workforce. Suja Joseph-Malherbe joined the panel in presenting to an attentive audience of men and women who followed up the panel's presentation with an extensive discussion on leadership styles, among other topics. Bill Parkins, resident from Australia, rounds out the panel summary by adding the following, that for him: "…so many colleagues from Australia made the event successful… I quite enjoyed the experience and intend to encourage women into leadership roles in SESA, the INCOSE Australia Chapter."

Heidi Hahn presented a paper on "An Innovative Program to Further the Careers of Women as Leaders in Engineering" which addressed an initiative of the Los Alamos National Laboratory (LANL) to create a pipeline of female engineers to fill needs for a diverse mid-career workforce. The paper went into more detail on the points

EWLSE Update

Heidi shared as part of the EWLSE panel (described previously). On behalf of authors Erika Palmer and Benedicte S Wilson, Cecilia Haskins presented "Keeping women in systems engineering: gender dynamics in the field". The paper developed systems dynamics based causal loops to show the push-pull relationship of how women are attracted to and repelled from engineering careers. The model addresses a gap in research as to why the representation of women in engineering and systems engineering is very low despite many K-12 initiatives encouraging young women to enter engineering fields. The results show that the success of the K-12 initiatives does not continue into the university, followed by a high attrition rate in part impacted by an unwelcome work environment for women. EWLSE strongly encourages papers that share research on gender and diversity related topics in systems engineering for INCOSE IS 2018.

Speaking of the next symposium, are you interested in attending, speaking during, or co-sponsoring an INCOSE / EWLSE sponsored weekend workshop on July 7 and 8 during 'tutorial weekend' prior to the main INCOSE IS conference events in Washington, DC in 2018? EWLSE plans to hold an open leadership workshop that features national and international government, industry, and academia leaders as keynote speakers and panel members during the morning sessions, with hands-on workshop sessions each afternoon on topics such as "Embracing a Spectrum of Engineering Leadership Styles" and "Recognizing and Addressing Unconscious Bias." Send your requests and ideas on topics you would like to learn more about, speakers you would like to hear from, and interests in co-sponsoring this workshop event to: ewlse@incose.org.

Interested in joining EWLSE? We welcome you! To become a member of EWLSE please log into your account on incose.org, go to Profile Home and add "Empowering Women" to your Committees/ Working Groups. Finally, if you are interested in being matched to a systems engineering mentor, please start by emailing ewlse@incose.org.

Vision 2025

Paul Schreinemakers, schreinemakers@me.com

Netherlands Version of Vision 2025 Published

Last June, the Netherlands Chapter published its version of INCOSE's Vision 2025 in the form of a PowerPoint presentation. This is the story behind how we came to setup this country-specific version of the vision. I hope that it will encourage other chapters to initiate a similar activity.

As the Netherlands Chapter had its 20th anniversary in 2016 and INCOSE published their Vision 2025 only 2 years before, we came up with the idea to do an analysis of the applicability of the vision to the Netherlands chapter. Since this was the Chapter's 20th anniversary, we also wanted to extend the horizon of the Netherlands vision another 20 years from now, to roughly 2035. To meet this challenge, we setup a group of eight experienced systems engineers, from academia, defense, rail/road infrastructure, and the space industry. This included Heinz Stoewer, one of the authors of the original Vision 2025. The complete list of names can be found in the presentation.

During a series of monthly meetings, we analyzed all three chapters of the original INCOSE 2025 Vision. In between

meetings, the team members worked on specific tasks and reported the outcome before or at the next team meeting. During the first meeting, Heinz explained the thinking behind the original vision and answered questions that team members had. This gave us good and common understanding of the Systems Engineering Vision 2025.

Chapter 1; The global context for systems engineering. After thorough analysis, we concluded that this global context does not really differ for the Netherlands. So, we decided that chapter 1 remained the same for the Dutch chapter.

Chapter 2; The current state of systems engineering. This chapter definitely led to changes. With a very strong representation of systems engineering in the rail, road, and waterway infrastructure domain, and a domain-specific guideline for systems engineering, the current state has a strong dominance in this domain. Dutch governmental organizations embraced systems engineering and made it mandatory for almost all of their projects. However, systems engineering is also applied in the Netherlands industries like defense, consumer electronics, lithography, and aerospace. In this

chapter of the Netherlands-specific Vision we created insight in the state-of-the-art terminology used for these domains and industries.

Chapter 3; The future state of systems engineering. The Dutch-specific chapter differs from the original Vision 2025, especially since we used a different horizon where applicable. This led to a series of 'from – to' statements. Some remain the same, some are modified to the Netherlands specific situation, or for the 2035 horizon. All modified 'from – to' statements are identified respectively as changed or original in the Netherlands Systems Engineering Vision 2025.

The Netherlands-Vision team presented the (intermediate) results in November 2016 and March 2017 to obtain feedback from the membership on the analysis and the future states formulated. We also specifically solicited feedback from a group called Young INCOSE, to get their perspective on things.

Even though we widened the horizon for the future state to 2035, the team has chosen to name the result the Netherlands Systems Engineering Vision 2025, because of its strong comparison to the original Systems Engineering Vision 2025. We

published the presentation covering our work in June 2017.

As indicated, the Netherlands Systems Engineering Vision 2025 is available for download, here. I would like to challenge other Chapters to start a similar project, to project the INCOSE Vision on to your specific chapter, country, state-of-the-art, and future needs.

Netherlands Systems Engineering Vision 2025 team:

- Maarten Bonnema
- Rob Hamann
- Michiel van der Korst
- Thomas Munster
- Paul Schreinemakers
- Mike van Spall
- Heinz Stoewer
- Willem-Jan de Vlieger

28th Annual INCOSE international symposium
Washington, DC, USA
July 7 - 12, 2018

SAVE THE DATE !

PMI-MIT Alliance

Paul Schreinemakers,
schreinemakers@me.com

Update on the INCOSE-PMI-MIT Alliance

The alliance between INCOSE, PMI and MIT is alive and well, now concentrating on promotion of the book published earlier this year. We provided an overview of the work during the 100th Tech Ops webinar, a very special webinar that was open to the public and conducted two times during the day to support worldwide attendees. The archive of that webinar is available to both INCOSE members and anyone outside the organization you may wish to influence.

We have a major outreach effort taking place on September 27th that is open to anyone interested in improving program outcomes. Hosted by PMI on their Virtual Conference platform, the event is expected to attract thousands of attendees worldwide - registration and more info available here.

Chapters are strongly encouraged to spread the word about this major event, and many are considering or already have plans to host a live meeting location for people to congregate and discuss findings. If you have questions about the virtual conference or any aspect of our relationship with PMI and MIT, please feel free to contact INCOSE Alliance representative Randy Iliff, randall@eintllc.com for assistance.

Spotlight ON!

Interviewed by Sandy Young, info@incose.org

Name: Gina Guillaume-Joseph, Ph.D.

Titles/Organizations: Systems Engineer and Project Lead at The MITRE Corporation and Adjunct Professor at The George Washington University School of Engineering and Applied Science, Worcester Polytechnic Institute, and George Mason University

Place of Birth: Port-au-Prince, Haiti

Current Residence: Leesburg, Virginia, USA

Domains: Software development, requirements management, systems architecture, modeling and simulation, software testing, deployment, and quality assurance

Studied in college: Computer science, information systems, systems engineering

Spotlight ON!

Year joined INCOSE: 2013

Roles in INCOSE: INCOSE assistant director Northeast region; INCOSE assistant director, Standards Initiative; president emeritus and former vice president, INCOSE Washington Metro Area Chapter

Years in systems engineering: 10 years

1.   What are your biggest challenges?

One of the challenges systems engineers face is that a problem could have multiple solution paths. We must perform analysis of the multiple alternatives to find the best one. Notice that I didn't say to find the optimum solution, as there is not usually an optimum solution because each one has to take into account the cost, schedule and performance quality. No project has unlimited cost funding or an indefinite amount of time. We have to carefully select the best solutions within the parameters set out up front by the stakeholders and users of the system.

On a more personal level, being a woman in a predominantly male profession has been challenging. However, I have surrounded myself with mentors who guide me and help me overcome some of those challenges. I am a member of INCOSE Empower Women Leaders in Systems Engineering. The members are both men and women who understand the challenges and strive to build mechanisms and support systems for women within INCOSE and inside their own organizations.

2.   What are your goals for INCOSE's Standards Initiative?

As the associate director of Standards Initiatives, I work with a team of systems engineering experts in identifying, shaping, and developing standards. Standards are very important for any industry, specifically, in engineering. They are strategic tools that set the guidelines to support different aspects of engineering to ensure that products and services are fit for use, safe, reliable and of high quality. As systems engineers, our uimate goal is to guide a project, system, or solution through to a successful implementation using a core standard or set of standards assists in achieving that goal.

3.   Do your daughters share your interest in STEM and STEM education?

I am raising three daughters, and they are "kid-founders" to a STEM club that two of my girlfriends and our children started. The club is "for kids completely run by kids." My daughters all learned to code and build robots and now they are teaching other kids how to code, science experiments and build robots. From this club, my daughters are also learning leadership skills. They are honing their listening skills and their communication skills. They now understand that to succeed in any field they decide, coding skills as well as the softer leadership skills they are learning in the club will be a tremendous asset to them.

INCOSE INSIGHT

William Miller, insight@incose.org

A Note from the INSIGHT Editor-in-Chief

INSIGHT will soon be out! The focus of September 2017 issue of INSIGHT is transitioning Systems Engineering Research Center (SERC) research into practice. The SERC is a University-Affiliated Research Center (UARC) of the United States Department of Defense that leverages the research and expertise of faculty, staff, and student researchers from more than 20 collaborating universities throughout the US. We thank guest editors Dinesh Verma, Jon Wade, and Barry Boehm for explaining the SERCs charter and research program and the relevance of the theme articles towards advancing the systems engineering discipline. This issue of INSIGHT features relevant articles sponsored by the SERC selected from past INCOSE symposia papers, as well as abstracts from past issues of INSIGHT. We thank the authors and their sponsoring organizations for granting permissions for publication.

We continue to solicit contributions for special features, standalone articles, book reviews, and op-eds for 2018 and beyond. Please send your proposals to insight@incose.org and help us grow this publication into an impactful journal!

Note from the Editor

Lisa Hoverman, newsletter@incose.org

Welcome to the 3rd Newsletter of 2017! With the exciting 27th International Symposium (IS) just 2 months behind us, and the INCOSE EMEA Biennial Workshop days away, exciting events like the Socorro Systems Summit, the GLRC11, the South Africa Systems Engineering Conference and more on the calendar, the world-impacting role that INCOSE members play is increasingly clear. We need to be better and better at telling those stories, especially the work that comes from the talented working groups that gather at each.

The Newsletter continues to grow and improve in content to inform our readership on all things INCOSE – both current, upcoming, but also historically. Please use this venue as a start or a highlight to the stories and great work that you are doing in your working groups, and then, use this update as a spur to publish your work (and then let us know here!) in one of our three systems engineering journals (The SE Journal, INSIGHT, or JET). This is how we will move INCOSE and systems engineering further forward.

There is a great article on how the Netherlands Chapter

Note from the Editor

is aligning with the overall INCOSE 2025 Vision, yet tailoring it for their particular niche to move their organization forward for the next 20 years. Do you have a similar story from your Chapter or Working Group? We are in our third year of publication and growing with your stellar submissions – but we need to keep improving this newsletter, and our journals, so please help us! Keep sharing your updates and items of interest with us as we continuously work to improve our communications. I hope that you see some of your suggestions and contributions in this issue. As always, we welcome feedback and contributors!

I end with a sincere note of appreciation to all who contributed to this Newsletter and updated members on the many events, and opportunities in INCOSE and your specific areas of systems engineering. I look forward to your upcoming contributions (submission dates below!) as we continue to improve and grow the Newsletter.

Have a terrific 4th Quarter!

Due Dates for final 2017 Newsletter:

Q4 Newsletter, General Content (GC): November 15; Late Breaking News (LBN): November 20

Due Dates for 2018 Newsletters:

Q1 Newsletter, GC: February 15; LBN: February 20

Q2 Newsletter, GC: May 15; LBN: May 20

Q3 Newsletter, GC: August 15; LBN: August 20

Q4 Newsletter, GC: November 15; LBN: November 20

Enjoy these few fun parting photos of all the magic that is the INCOSE IS 2017 and Members enjoying it!

INCOSE Member Newsletter

Publication of the International Council on Systems Engineering

Publication Schedule. The INCOSE Member e-Newletter is published four times per year. Issue and article/advertisement submission deadlines are as follows: 4th Qtr 2017 issue – 15 Nov. For further information on submissions and issue themes, visit the INCOSE website as listed above.

Who are we? INCOSE is a 10,000+ member organization of systems engineers and others interested in systems engineering. Its mission is to share, promote, and advance the best of systems engineering from across the globe for the benefit of humanity and the planet. INCOSE charters chapters worldwide, includes a corporate advisory board, and is led by elected officers and directors.

A great INCOSE IS 2017!

Follow us

7670 Opportunity Rd, Suite 220

San Diego, CA 92111-2222

USA

info@incose.org

www.incose.org

+1 858 541-1725