

MEMBERS NEWSLETTER

September 2019 - Q3



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President's Corner

Garry Roedler, garry.j.roedler@lmco.com



President's Corner

Garry Roedler, garry.j.roedler@lmco.com

Once again, the INCOSE International Symposium (IS) has demonstrated why it is the premier event focused on systems engineering. I had the pleasure of welcoming those in attendance to the city I call home. This year, the IS continued to evolve, providing significant opportunities to listen to high-quality presentations and panels, as well as participate in interactive activities that were engaging and impactful. Last year, I said that the IS hit a high mark that set the gold standard for future events. I personally think we did it again.

Although the Symposium did not set another record for attendance, with 880 attendees, it surpassed the attendance for all but last year's event. However, the attendance was extremely global, spanning 65 chapters and 29 countries; very appropriate for a conference with the theme of "Systems Applications for Global Challenges." We are grateful to the Events Committee, Technical Operations, KMD Partners Events Management, other INCOSE staff, and the large number of volunteers who worked together to seamlessly provide an extraordinary event. Additionally, we are grateful to all the professionals who submitted papers and those who had the opportunity to provide a presentation or participate in a panel, or who were engaged in one of the other sessions, such as the practitioner's challenge. Thank you to all who had any role in IS 2019—you truly made it a success.

Over the past few years, INCOSE has placed a strong emphasis on driving the evolution of systems engineering to enable its application for systems applying advanced technologies or that are dynamic. We also have been working towards the application of systems engineering to help solve global challenges, such as those defined by the United Nations sustainability goals. The INCOSE "SE Vision 2025" presents this evolution and expansion of systems engineering application, and it has served well as a guide to focus these efforts. The IS highlighted these areas with a significant amount of forward-looking technical content. This included panels, innovative content sessions, great paper presentations, a thought-provoking practitioner's challenge, and keynote speakers that had messages to make us think. There was also a model-based systems engineering lightning round.

IS 2019 had a diverse set of dynamic keynote speakers who made us think beyond the norm. These included:

- Dr. Wanda Austin, interim president of the University of Southern California, addressed "Interdisciplinary Systems Engineering Inspired by da Vinci." Her keynote presentation used da Vinci as a historical precedent to illustrate systems and systemic thinking. The imagery of da Vinci was very insightful, particularly as many consider us to be operating in the "new renaissance period" under the fourth industrial revolution.
- Dhawan Prashant, co-founder of Biomimicry India, addressed "Biomimicry—A Bioinspired Approach to Systems Thinking." His talk drove new thinking and perspectives for the audience. It provided perspectives that are not common to most systems engineers, that is, focusing on how we can use natural systems to provide insights on how we engineer man-made systems. We always remind our system thinkers

 INCOSE President
[@incosepres](https://twitter.com/incosepres)

Delighted to open [#incoseIS](#) in [#Florida](#) with a forecast of "mostly sunny weather and a chance of learning"



to consider the human elements in their design, but it is not often the case that we look to nature as well.

- Winston Scott, who serves on the Board of Directors of Environmental Tectonics Corporation, addressed “To the Stars. The Sky is No Longer the Limit.” As an astronaut with NASA, his talk truly brought us all into an astronaut’s world; very fitting on the week we celebrated the 50-year anniversary of the first lunar landing. His colorful, riveting, inspiring, yet humorous stories transported us to be right there in space. As the scope of our world continues to increase with such initiatives as returning to the moon and traveling beyond, his stories made the challenges seem entirely surmountable with an expectation that “we can do this.” And for the audience he was a technical rock star with the first selfie queue after a keynote that we can remember!
- Grant Begley, CEO of Rocket Crafters, addressed “The Underway Global Unmanned Systems and Robotics Revolution.” His talk was not only technically inspiring, it was obviously an area of passion. He provided a keynote in 2014 and linked his current messaging with his previous IS keynote, showing the changes over time. The trend of a faster evolution of autonomous systems and robots than what was predicted five years ago truly emphasized to all that change is the new norm, and we need to get on board in order to embrace and lead in the fourth industrial revolution. It also pointed out the need for us to accelerate the evolution of systems engineering to better address dynamic, non-deterministic systems.

A couple of our keynote speakers attended the entire conference, participating in numerous activities and groups, learning about INCOSE, and providing inputs along the way. The membership really appreciated their engagement and perspectives.

There were a significant number of panels that explored the future direction of systems engineering. The following are some of the forward-looking panels that were featured:

- Artificial Intelligence in Systems Engineering

- Systems Engineering Transformation and the Future of Systems Engineering: Digital Engineering’s Opportunities and Challenges
- Improving our Definitions of System and Systems Engineering
- Embarking on a Grand Challenge–Clean Water
- Professional Development for Systems Engineers; Evolving Today’s Engineers to Meet Society’s Changing Needs

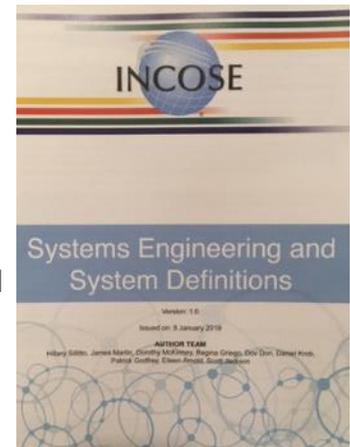
This was the sixth year we had a practitioner’s challenge. This year, it focused on “Applying Digital Engineering, Architecture, and Modular Open Systems Approach (MOSA) to Help Solve a Mission Level Sociotechnical Problem.” It provided a chance for symposium participants to work together in a collaborative manner to demonstrate how we can use systems engineering to address problems that are socio-technical, which is a new experience for most.

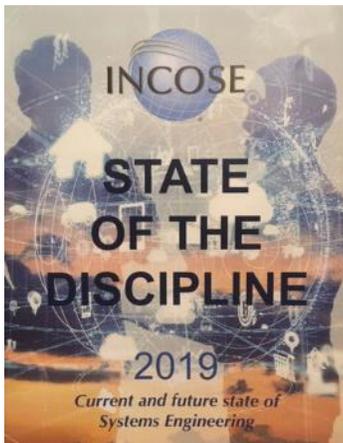
We were fortunate to be able to release two superior new products—the updated definitions for systems engineering and system, and the INCOSE report, “State of the Discipline.”

- The report on “Systems Engineering and System Definitions” presents the work of a team of INCOSE Fellows to recommend changes needed to align the definitions to current practice and to the aspirations of INCOSE’s “SE Vision 2025.” You can find it at:

<https://connect.incose.org/Pages/Product-Details.aspx?ProductCode=sedefinitions>. It is also available for free to all in the [INCOSE Store](#).

- “State of the Discipline” is a concise summary of a survey that was performed to better understand the state of the discipline and the direction needed to impact the Future of Systems Engineering (FuSE). It includes the major developments needed to enable systems engineering, the technological





advances that will require systems engineering the most, the biggest systems engineering challenges, growth of systems engineering in various domains, and things INCOSE is doing to shape the future of systems engineering. It is also available on

the INCOSE Store or at the following link: <https://connect.incose.org/Pages/Product-Details.aspx?ProductCode=stateofdiscipline>. Additionally, there were great opportunities to engage some of the various initiatives that INCOSE supports, including a strategy workshop for the Future of Systems Engineering (FuSE) initiative, the Empowering Women Leadership Forum, and a workshop on systems literacy, among others. The president of the International Society of Systems Science (ISSS), Peter Tuddenham, and the chair of the INCOSE Systems Science Working Group, James Martin, led the Systems Literacy Workshop.

For more than a year, INCOSE has been working to define and implement a comprehensive professional development capability for systems engineering. We are making great progress and we demonstrated a beta version of the INCOSE Professional Development Portal (PDP). Kiosks and laptops were in place for IS attendees to take a close look at the minimum viable product before its release and provide feedback to impact its development to be more valuable. Over half of those in attendance at the IS stopped by to examine the PDP.

Many of the INCOSE chapters operate under agreements with INCOSE that establish the business, management, and organizational aspects of their interactions with the INCOSE central organization. During the IS, we had two chapters (INCOSE Netherlands and INCOSE UK) sign renewals of their agreement. We also made progress towards completing agreement renewals with several other chapters prior to the end of 2019.

And it was my honor to provide awards to several very deserving individuals and teams, including a Pioneer Award winner for his significant accomplishments and contributions



to systems engineering. These included Dr. Barry Boehm, recognized for his pioneer work in systems uniquely contributing to the advancement of systems engineering through extensive research, education, and the application thereof in industry. It has truly been my honor have had the opportunity to know and work with Barry for more than two decades. I personally know his diverse contributions to both systems engineering and software engineering. Azad Madni received the INCOSE Founders Award for significantly advancing INCOSE's professional status through sustained contributions to our organization. Azad is unique in that he is the only person to receive the Pioneer Award, Founders Award, and Fellows Award from INCOSE. Congratulations to all our INCOSE Award winners.

Finally, there were plenty of opportunities to network at IS 2019. The layout of the venue was perfect for finding places for ad hoc meetings, as well as socializing, and the Events Committee went above and beyond to enable people to meet and get engaged in the activities. The top-notch social events included a fun and relaxing Island Night Social.

If you were fortunate enough to have been at the INCOSE IS, I truly hope you enjoyed it as much as I did. If you were not able to attend, there is a wealth of resulting artifacts from the IS for you to explore. Please take some time to look at a few of the papers in the proceedings, view the recorded content, or review the outcomes of the various other activities. And most of all, get engaged in the many opportunities in INCOSE—make a difference

Notes from the Board

Lisa Hoverman, marcom@incose.org

The Board kicked off their July meeting in Orlando, FL with an opportunity to participate in or lead Strategy Sessions. The Strategy Sessions covered the following topics:

- Developing a Value Proposition,
- Future of Systems Engineering (FuSE),
- Professional Development (PD) / Training Needs,
- Re-energizing Chapters, and
- Web Wow Factor!

Each of these topics align with one or more of our three Strategic Objectives –

- Premier – To be the premier choice everywhere for professional Systems Engineering development needs.
- Future – To lead the community in shaping the future of Systems Engineering.
- Value – To deliver ever greater value to a growing and increasingly diverse membership.

Collectively these topics will guide our advancement across our value streams of

Products, Events, Training, Certification, and Membership. Our efforts for the day aided in unearthing new ideas and concepts, focusing our endeavors to achieve our strategic objectives, and better enable us to live our vision of ***“a better world through a systems approach.”***

The Board then covered the following topics in the Board Sessions:

- Finalizing outstanding policies and procedures to bring all of INCOSE policies and procedures up to date
- Reviewing an update of our IT infrastructure and an overview of improvements to come in late 2019-2020
- An improved Budget Process for determining the 2020 INCOSE Budget
- Priorities for 2020

The Board enjoyed a lovely off-site dinner at Chuy's with the local host chapter - Orlando, our President's Home Chapter, and fully participated as attendees, presenters, and more at the INCOSE IS 2019.



INSIGHT Magazine

September 2020

Systems Security and Product Line Engineering

Call for Articles

Mission

The Systems Security Engineering Working Group and the Product Line Engineering Working Group is working a joint project to explore cyber secure and resilient approaches for feature based variation management. This call for articles focuses on the intersection between systems security engineering and product line engineering including:

- Techniques for implementing systems security as part of product line design
- Patterns for product line architectures that address systems security
- Variation management approaches for secure and resilient product line assets

Approach

The Theme Issue will accommodate ten ~2,000 word articles, preceded by a theme introduction and overview. The INSIGHT audience is the Systems Engineering community, who are concerned with systems of multiple engineering domains. Articles

General Guidance:

- Articles must speak meaningfully to systems engineers
- The INSIGHT style and citation guides will be sent to all authors
- These are not journal articles. Approximately 2,000 words is the target. Reference lists should be minimal

- Do not use the MS Word reference tool, make them standard text in "Chicago Style," per INSIGHT style guide
- Acceptance of an abstract does not guarantee publication of an article. Final decision for publication will be made by the Editorial Board based on the final article.

Submissions

All submissions should be MS Word, 12 point Times New Roman, single spaced, with minimal or no (preferred) use of styles. With 1 inch margins on 8 ½ x 11 inch layout this is about 4 pages of text, exclusive of graphics.

Graphics are highly encouraged and do not take away from word count. NO PDF. Send submissions to Theme Editor wilsondrbeth@aol.com attached as an MS Word Document. Be sure to include a title, and also your name and email address in your by-line underneath the article title.

Key Dates

Abstracts due	Nov 15 2019
Draft Paper due	Jan 01 2020
Final Paper due	Apr 15 2020
Publication	Sep 2020

President-Elect Update

Alan Harding, socialmedia@incose.org

In September/October, we will choose INCOSE's next President-Elect who serves two years before becoming INCOSE's President for 2022 and 2023. Before casting your vote, learn more about the candidates Joe Marvin and Marilee Wheaton by listening to the recording of the Sept. 12th Webinar. Hear their visions for INCOSE and listen as they respond to questions. During this hour webinar, the candidates offered brief introductory remarks and answered prepared questions from the moderator as well as your questions from the audience. The recording can be found on INCOSE Connect at <https://connect.incose.org/Library/Webinars/Pages/INCOSE-Webinars.aspx>



President-Elect Candidate Joseph W. Marvin, ESEP

Joe Marvin is PSG founder and president and focuses the company to combine core competencies with

research initiatives in a defined technology roadmap. Joe is a systems engineer who started his career with the United States Air Force as a Space System Research and Development Engineer. After military service he held Chief Systems Engineering and Program Manager industry roles with Lockheed Martin and SAIC on major system acquisitions in defense. He currently serves as President of Prime Solutions Group, Incorporated, a systems and software integration small business he founded in 2007. At PSG, he applies his experience with product development and delivery to market of large software development baselines to the PSG research agenda. PSG's core expertise in sensor data processing and multi-intelligence product development is augmented by innovative software tool development with Big Data technologies to support complex system modeling & simulation, and Artificial Intelligence/Machine Learning applications.

Joe has served in a number of INCOSE roles across the organization since 2007 as a member of the Central Arizona Chapter. These roles include: Chapter President, Chair of the Small Business Systems Engineering Working Group (formerly VSEWG), Tech Ops Assistant Director for Industry, Tech Ops Assistant Director for Internal Operations, Assistant to Director for Outreach and Future of Systems Engineering (FuSE) Artificial Intelligence

subcommittee member. In addition, Joe championed PSG's membership in the Corporate Advisory Board and acts as the PSG CAB Representative. Back at PSG, he uses the INCOSE Leadership Institute to develop SE by sponsoring a PSG employee in the current cohort. Joe was awarded ESEP certification in 2011 and has participated in both IS and IW continuously since 2009.

Locally, Joe has served as President of the Arizona Air Force Association and President of the Maricopa Trails and Parks Foundation. He earned a MS in Engineering Science from Northrop University, in Los Angeles, CA, and BS degree in Engineering Science from Arizona State University. Joe and his wife, Sharon, live in Phoenix, AZ and have two children, Jared and Megan and two grandchildren, Charley and Leo.



President-Elect Candidate Marilee J. Wheaton

Marilee J. Wheaton is a Systems Engineering Fellow at The Aerospace Corporation, a Federally Funded Research and

Development Center (FFRDC) headquartered in El Segundo, California. In this role, she is responsible for providing technical leadership and building capability across the corporation to include enterprise systems engineering, systems architecting, and model-based systems engineering. Her previous assignment was as the executive director and general manager of The Aerospace Institute which coordinated all education, training, and staff development activities at the corporation. Wheaton has held

several executive level technical leadership positions at Aerospace, including general manager of the Systems Engineering Division (SED) and general manager of the Computer Systems Division. As general manager of SED, she provided functional engineering leadership for space systems architecture and design, acquisition and planning, systems analysis and simulation, and mission assurance. From 1999 to 2002, Wheaton was a director with TRW Systems providing leadership for cost estimation, metrics, and quantitative management goals. She is a trained CMMI appraiser and led process improvements as a Six Sigma Black Belt.

Wheaton holds a B.A. in mathematics and a B.A. in Spanish from California Lutheran University both magna cum laude. She earned an

M.S. in systems engineering from the University of Southern California (USC) and is a graduate of the UCLA Anderson School Executive Program in Management. Wheaton is currently a Systems Engineering Research Center (SERC) Fellow, completing her PhD at USC in the Systems Architecting and Engineering Program.

A member of INCOSE since 2002, she was selected as an INCOSE Fellow in 2009; received an INCOSE Outstanding Service Awards in 2018; and received the INCOSE Foundation Kossiakoff Award for best systems engineering research in 2018. She is one of the leaders in

the Empowering Women Leaders in Systems Engineering (EWLSE) working group. Wheaton has been a member of the Corporate Advisory Board representing Aerospace from 2006 - 2009 and from 2015 to the current time. She has held leadership roles for the 2014 and 2017 Conference on Systems Engineering Research (CSER) to include the Technical Program Committee and Conference Management.

Wheaton is also a Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and is an active member of the organization's technical committees on economics and systems engineering. A Fellow and Life Member of the Society of Women Engineers (SWE) and a past President of the Los Angeles Chapter, Wheaton has taken on high-profile leadership positions for SWE both locally and nationally. She is also a Senior Member of IEEE, and an active member of the IEEE Systems, Man and Cybernetics (SMC) Society. She is the recipient of several awards for her contributions to these Societies.

Wheaton currently serves as a member of the Advisory Board for the California State University Northridge (CSUN) Bonita J. Campbell Endowment for Women in Science and Engineering (WISE) and on the CSUN College of Engineering and Computer Science Industrial Advisory Board. Wheaton also has served as adjunct faculty for over a decade in the Systems Architecture and Engineering Program at USC.

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International Council on Systems Engineering 

Dear INCOSE Member,

This year, we are electing officers and directors who will join the INCOSE Board of Directors and help guide the strategic and financial future of our organization. Positions to be elected this year are President-Elect, Treasurer, Director for Strategic Integration, and Director for Academic Matters. In addition the Director for the EMEA (Europe, Middle East and Africa) Sector will be elected by the EMEA chapter presidents.

And, there is a Bylaw Change that is brought forward for approval – the explanation of the change is uploaded in a PDF on the ballot.

Balloting for the 2019 INCOSE elections will open at 12:00 am Pacific Time on 14th September and will close at 11:59 pm Pacific Time on 5th October 2019. If you encounter any difficulties voting or have questions about voting online, please contact info@incose.org.

To assist you in making your selections, vision statements and profiles for each candidate are available in the INCOSE News section of the public website at <https://www.incose.org/>. This material can also be accessed by clicking on the Details by the candidate's name when you vote online.

On behalf of the Nominations and Elections Committee, thank you for taking the time to shape our future by casting your vote. Your vote is important as you help select the leadership body that shapes our vision and strategy to advance both INCOSE and the systems engineering profession.

Sincerely,
Alan Harding
Chair, Nominations & Elections

UserName

Password



Voting takes place via eBallot; if you don't receive balloting instructions as an INCOSE Member, please reach out to info@incose.org.

INCOSE 2019 International Symposium

Michelle Bender, marcom@incose.org

Keynote Speakers. The 2019 International Symposium (IS 2019) engaged attendees with four riveting keynote speakers that all tied their diverse perspectives into this year's theme, "Systems Applications for Global Challenges." Although all four speakers brought very different backgrounds to the table, they all brought up the same themes throughout their speeches: the need for systems engineers to provide leadership in the industry to address the current and future global challenges safely and ethically.

The first speaker, Dr. Wanda Austin, Interim President of the University of Southern California, set the tone for the symposium with "Interdisciplinary Systems Engineering Inspired by da Vinci." She spoke passionately about how systems engineering has given her the opportunity to change the world and how it is shaping the future of nearly every industry.

Because challenges are solved by talented teams that can view these problems through multiple lenses and views, systems engineers need to take the leadership role in the future. To do this successfully, systems engineers need to be flexible and to be open to receive new information, to acknowledge that what you learned yesterday may not be relevant today, to anticipate change and harness it, and to recognize that not making a decision is, in fact, making a decision.

On Tuesday, Prashant Dhawan, Co-Founder, Biomimicry India, gave INCOSE members the chance to view systems thinking through the lens of biomimicry in his speech, "Biomimicry: A Bioinspired Approach to Systems Thinking."

Through many vivid examples, he urged the audience to reexamine how we look at human systems and ask ourselves if there is a more efficient way to solve our problems that already exists in nature. At present, the scientific community has attacked most problems purely intellectually. Systems engineers need to be the leaders in the industry to shift the focus from approaching challenges in a human-centered way to a life-centered way.

Captain Winston Scott, who serves on the Board of Directors of the Environmental Tectonics Corporation, delighted IS attendees

on Wednesday with "To the Stars. The Sky Is No Longer the Limit." He spoke of his experiences in the US Navy and as a NASA astronaut and provided a slide show that highlighted a particularly harrowing spacewalk to manually capture the Spartan satellite in the 1997 Columbia mission. Through his story, he provided insight on how important systems engineers are in developing these complex systems as they can bridge the gaps between not only the technological system, but also the human system. A systems approach to connect all the human stakeholders is essential to moving forward with the global challenges that we face today and in the future.

Finally, Grant Begley, CEO of Rocket Crafters, rounded out the IS with "The Underway Global Unmanned Systems and Robotics Revolution" giving spectators a data-driven picture of the evolution robotics and unmanned systems industry and an informed snapshot of what systems engineers can expect from these industries in the future. Going along with the theme of the symposium, he urged the audience to not be spectators in the coming revolution. For the future to be successful, systems engineers will need to "contribute to the revolution responsibly, ethically, and safely."

We would like to extend a special thank you to the Events Committee for organizing such an engaging and inspiring group of keynote speakers for the 2019 International Symposium.



INCOSE President-Elect Lunney and Keynote Speaker Winston Scott, US NASA Astronaut

INCOSE 2019 International Symposium

Lisa Hoverman, marcom@incose.org; Marilyn Pineda, marilyn.pineda@lmco.com

Web WOW Factor Strategy Session.

INCOSE International Symposium 2019 (IS) kicked off with several dynamic strategy sessions, attended by a cross-section of INCOSE thought leaders. Kerry Lunney introduced the five strategy sessions and gave the participants a refresh of INCOSE's overarching strategic objectives, which must inform all our decisions on strategy implementation:

- Premier—to be the premier choice everywhere for professional systems engineering development needs
- Future—to lead the community in shaping the future of systems engineering
- Value—to deliver ever greater value to a growing and increasingly diverse membership

The Web WOW Factor strategy session led by Lisa Hoverman and Marilyn Pineda attracted a vibrant group, ready to work and produce a particularly lively set of conversations. The main objective of this session was to expand our thinking about our web-based community and how to design our web presence to attract a wide variety of potential users. For this discussion, our web presence includes INCOSE websites, social media, blogs, video, and basically any web-based property that represents the organization to its constituents.

The Digital Communications Group, led by Christina Clary, joined us to provide context around interpreting current web analytics, as well as some insight into the details of web design and branding. These topics create the basis of planning for an effective, appealing web presence.

Taking the design thinking approach to help build our product around user needs, Marilyn led an exercise where participants were to create persona archetypes of the potential groups we want to reach. Some of the ideas included high school students, engineering

students, executives, different practitioner engineers, professionals in other disciplines (such as project management and finance), new college graduates, professionals reentering the field after a career break, and the “boomer professional” who does not typically use social media as much as earlier career cohorts but wants a site to mine data.

Focusing on the demographics created in the design thinking exercise, the group generated some key strategies to move towards achieving the previously discussed goals. These included successfully infiltrating all social media platforms to corral current and potential members back to the INCOSE website and creating an “ask an engineer” section where volunteers can go in and answer questions. Any common issues and questions addressed can then be archived into a frequently asked questions page. Finally, members suggested providing links from the SEBoK page that lead users to professional groups to foster networking within the site.

Challenges that participants brought to the table were to improve the current website functionality, work out accessibility issues for all users, and how to effectively serve such a large and diverse organization spanning multiple generations and cultures. Goals members addressed were using the website to create a brand that draws people in and keeps them coming back that accurately portrays the unique and engaging personality of INCOSE. The end goal, as INCOSE Fellow Patrick Godfrey so eloquently stated, is to create a product with ‘WOW’ factor to keep people coming back and to provide people in the systems community with “the thing you didn’t know you needed but you suddenly need tremendously.”

This meeting was very successful in creating a clear vision for designing the wow factor our web presence will need to satisfy current members’ needs and to draw new members into the future of systems engineering.

Sector Updates—Americas

Sector I Updates

Tony Williams, antony.g.williams@gmail.com

It has been a busy quarter with the International Symposium (IS) in Orlando providing an amazing jolt of intellectual stimulation and energy. Here is a quick update of the Sector I activities/initiatives.

Web-meeting calendar: We are now tracking and distributing a three month look ahead of INCOSE online chapter events, conferences, and other special events. These online events are open to all INCOSE members regardless of chapter affiliation. Through these we meetings, Sector I members (as well as members worldwide) can scan the list for topics of interest, and then join in to the programs, either individually or with colleagues. The chapter technical programs are a wonderful contribution to our intellectual capital, and as such, they are a great benefit of INCOSE membership. The schedule is posted at the INCOSE Connect Americas Page, here: <https://connect.incose.org/Chapters/Americas/SitePages/Home.aspx>. (note—we are working to share the same information to the public INCOSE page events list, however it is not yet as comprehensive as this list).

Re-energising Chapters: On the Friday before the International Symposium (IS 2019), the three sector directors (Paul Schreinemakers, Serge Landry, and I) facilitated a strategy session on the question, “How can we re-energise chapters?” Thank you for those of you who were able to attend! The discussion was robust, and I believe we captured a lot of great ideas. Here are some of the topics we discussed:

- Finding good meeting locations, with good acoustics, technology, and other necessary meeting features
- Language barriers
- Compatibility between web meeting apps and company security practices
- Regions with less corporate systems engineering engagement, emerging regions, lack of critical mass in a location
- Membership costs
- Operating cost for Memorandum of Agreement (MoA) chapters (most often

- country chapters, for example: INCOSE UK)
- Accessibility to Corporate Advisory Board members
- Lack of an integrated, online event schedule to enable routine participation in webcast meetings worldwide (see above)
- Please see this link if you would like to see the full summary of the session: Re-energising Chapters.
- Please let Paul, Serge, and I know of any questions, comments, or concerns.

Circle Award updates: Together with the directors of Sectors II and III, Paul and Serge, we are kicking off an effort to collect comment for use in updating the current Circle Awards score sheet. While all comments are welcome, the ones that really help are executable, meaning you have taken the time to tell us exactly how to correct the concern you have identified. (Example: Replace cell A54 “old words” with the following “new words”). We will use these comments to improve the Circle Award spreadsheet we will use next year, 2020. To meet that schedule, we need your comments by 15 October, to give us time to review, reconcile, and make the updates to the spreadsheet in time for January 2020.

INCOSE merchandise: One cool initiative that went live in the last few months is an online store to purchase various types of INCOSE logo wear and logo items. You can even pick up the famous and popular INCOSE Americas logos! Here is an idea—buy your chapter leaders matching INCOSE polo shirts as a “thank you for your service” gift and to help advertise the chapter.

- Here is the direct link to the store: https://stores.inksoft.com/incose_merchandise_store/shop/home.
- To navigate to the site from the INCOSE home page, INCOSE.ORG, click on the right menu (the three lines), click Chapter Resources, then select Store in the list of bullets (sixth bullet).
- It is an exciting time to be part of INCOSE, and I am excited to continue to work with the Sector I chapters!

INCOSE-LA September Speaker Event— “OpenMBEE: An Open Source Model- Based Engineering Environment”



On 10 September 19, INCOSE LA hosted speaker, Sean Marquez, as he spoke on the topic, “OpenMBEE: An Open Source Model-Based Engineering Environment” at The Aerospace Corporation in El Segundo, US-CA. Speaker Sean Marquez graduated with a BS in

mechanical engineering, specializing in design of dynamic systems, from the University of California, Irvine in 2013. After graduating, he worked as an associate mechanical design engineer for Max Q Systems – an OEM aerospace consulting firm. In 2015, he joined and collaborated with a global think tank, performing numerical simulations and control systems design for rLoop, a non-profit organization that competed and won the innovation award for the first SpaceX hyperloop pod competition. Sean currently does software and systems engineering at Space Cooperative Inc., a worker-owned cooperative focused on space expansion, crewed by a diverse global team that includes engineers, architects, futurists, and software developers. Below are some the topics that Sean touched on in his presentation.

OpenMBEE is an open source community-driven model-based engineering environment, with several major organizations leading its development, including JPL, Boeing, and Lockheed Martin. Unlike most proprietary model-based engineering software suites, OpenMBEE is free to use, dominantly licensed under Apache 2.0, inherently designed to serve multiple modeling languages, as well as a variety of techniques for model checking, simulation, and document generation.

OpenMBEE GitHub has a variety of open source projects supporting this pursuit as well as open source models and model libraries contributed by the community, including, but not limited to plugins or extensions for commercial tools, such as SysML desktop clients like MagicDraw, light-weight web-based clients like View Editor, mathematical computation programs like Mathematica, and any other tools that can utilize RESTful web services. With infrastructure for versioning, workflow management, and access control, OpenMBEE facilitates multi-tool and multi-repository integration across engineering, computing, and management disciplines.

INCOSE-LA 8 October 2019 Speaker



Rick Hefner, PhD, Program Director, Caltech Center for Technology and Management Education

Topic: Systems Engineering: An Enabler for Artificial Intelligence

Where: The Aerospace Corporation, 200 North Aviation Blvd., Bldg. D8, Room 1010 El Segundo, US-CA 90245

Registration Link: <http://events.constantcontact.com/register/event?llr=l4ihvgeab&oeidk=a07egjoddeu29a4f3c2>

Attendance: Virtual or in-person

Abstract: Artificial intelligence (AI) is being increasingly applied to develop high-performance systems specialized for particular problem domains like image and speech understanding. These knowledge-based systems rely on large amounts of problem-specific knowledge and heuristics. This presentation will review current AI knowledge-based applications and discuss systems engineering principles required for their design and implementation. In addition, this presentation will discuss the possibilities of using AI to support systems engineering.

San Diego Chapter Updates

The San Diego INCOSE Chapter has some exciting upcoming events, including an MBSE Presentation a fun, family STEM night, and the 2019 INCOSE San Diego Mini-Conference.

Model-Based Systems Engineering: A Practical Approach Presentation, 25 September 2019; 5:30-7:00 p.m.



Model-based system engineering (MBSE) is a methodology that focuses on creating and exploiting domain models as the primary means of information exchange between engineers, rather than relying on document-based information exchange. In fact, the audience for MBSE artifacts is not just engineers, but also organizational leadership, and even the customer, which means systems engineers need to speak each target audience's native language. In the push to expand implementation of MBSE methods, the industry has introduced various tools to create the associated artifacts, but to date, no single product offers a comprehensive solution that meets the communication, coordination, and collaboration needs of every target audience. Just as one model does not fit all, one tool does not model all. In this presentation, you will learn how to establish an end-to-end modeling approach that creates views appropriate for each of your audiences.

Charley Patton, CSEP, will deliver the MBSE: A Practical Approach presentation, which is webcast. He is a systems engineering lead for Northrop Grumman, which he joined in 2004. He has a BS in electrical engineering and computer science from the University of Colorado, Boulder, an MS in business management from San Diego State University, and several certificates, including a systems engineering certificate from University of California, San Diego and a model-based

systems engineering certificate from the California Institute of Technology (Caltech). Charley transitioned from software engineering to systems engineering the old-fashioned way—his boss directed him to derive the system requirements because he was the most experienced member of the project team. From this first excursion into systems engineering, he learned increasingly disciplined methods for determining and documenting requirements and architectures; planned and executed system test and deployment activities; eventually joined the ranks of functional management leading a group of mostly software, integration, and test engineers; and even managed a hardware development team for a year. Today he splits his time performing systems engineering lead functions, responding to proposals, executing technical systems engineering tasks, and trying to get his dachshund to understand the value of properly documented concepts of operations (CONOPS).

Interested participants can join by phone:
United States (Toll Free): 1 877 309 2073
United States: +1 (646) 749-3129
Access Code: 859-043-445

A Fun Night of STEM-Based Family Education, Honoring Teachers and Students!

Please join us for our 2019 INCOSE San Diego Science-Technology-Engineering-Math (STEM) celebration event in honor of our San Diego county teachers and students and their STEM projects, sponsored by the generous STEM donations of San Diego corporations, individuals, and INCOSE members! This year's event will be held at the San Diego Children's Discovery Museum in Escondido, CA. This museum provides hands-on educational exhibits and programs focusing on science, art, and world cultures for over 100,000 visitors including children, families, and school groups annually.



Tickets to the STEM event will include dinner and admission to the museum! This event will take place on Saturday, 28 September 2019, from 5:00 p.m.-9:00 p.m. at the Escondido Children Discovery Museum, 320 North



Broadway, Escondido, US-CA 92025.

The cost is \$20 adults, \$10 children (grades K-12), \$50 family pack (includes 2 adults and 4 children—children under 5 are free!

We encourage a semi-formal dress code for this event. The STEM event will include fun hands-on experience with science, art, and world culture activities. In addition, the Fleet Science Center will present a live superhero stage show as well as a robotics demonstration! Dinner will include freshly-cooked Mexican food and beverages (please let us know if you would like a vegetarian option).

Sponsors for this STEM event include:

- CUBIC
- Viasat
- Northrop Grumman
- Dassault Systems

Sponsorships: In addition, INCOSE is accepting event sponsorships for STEM grant teachers and students. Please help support STEM recipient school teams—the teacher and two students—to attend this event free. You can sponsor a student or teacher for \$20 in addition to your own ticket, or sponsor them alone in the event you cannot make the event. We greatly appreciate your help—thank you!!

The 2019 INCOSE San Diego Mini-Conference, Saturday, 2 November 2019



Join us for a day of stimulating thought and discussion with fellow professional systems engineers! The conference is centered on systems engineering in practice, emerging trends, and new directions. Stay tuned for the schedule, speakers, and keynotes.

- **When:** Saturday, 2 November 2019
8:00 a.m.–4:30 p.m.
- **Location:** 5005 Wateridge Vista Drive, San Diego, US-CA 92121 (Google Maps)
- **Cost:** \$40 INCOSE members, \$60 non-members, \$25 students (registrants will also receive a \$10 discount from the cost of the “Requirements Systems Engineering” tutorial,

to be held the day prior on 1 November 2019. Please check back for details).

- **Refreshments:** A continental breakfast as well as a lunch of sandwiches and drinks will be provided and are included in the registration fee. Please state vegetarian preferences with your registration.

Preliminary list of topics:

- Model-based systems engineering (MBSE) applications
- Systems of systems (SoS) engineering
- Health care applications of systems engineering
- Applications of systems engineering to laws and lawmaking
- Systems engineering agile processes
- Systems engineering data science applications
- Systems product line architecting
- Systems engineering interoperability best practices
- Machine learning and artificial intelligence
- Applications in systems engineering
- Systems engineering economics and cost estimation
- Systems engineering and manufacturing
- Management using systems thinking
- Digital engineering
- Systems engineering education and more

Contact us at info@sdincose.org.

We invite papers on the above topics and others related to system engineering, and we highly encourage practices relevant to local industries.

Please see the Call for Papers page, and Instructions for Authors page for further details.

Presenters: Final papers should be 5–10 pages in length. Please see the above webpage for details.

Important Dates for Presenters:

- 13 September—abstract and author biography due
- 25 September—notification to authors
- 9 October—initial draft presentation, initial draft paper due
- 16 October—review committee comments returned to authors
- 26 October—final presentation and final paper due
- 2 November—in-person presentation at the conference

Sponsors: Science of Laws Institute

Questions? Contact us at info@sdincose.org

INCOSE Brazil

Scott Jackson, jackson@burnhamsystems.net

In February, I had the pleasure of visiting Brazil where I conducted workshops in systems engineering for the Embraer aircraft company. In addition, I spoke to the INCOSE Brazil Chapter where I made a 30-minute video. In short, I found the Brazilian systems engineers to be extremely enthusiastic about systems engineering and how to apply it to commercial aircraft. In addition, their manager, Viana Tavares, is perfectly suited to carry systems engineering into the future in Brazil. Below is the link to the video I made in Brazil about systems and systems engineering.

<https://www.youtube.com/watch?v=u6teUjNc8oo&feature=youtu.be>



Sector Updates—Asia-Oceania

IS 2019 Orlando

Serge Landry, serge.landry@incose.org

I will make use of this article to give you a glimpse of the International Symposium (IS) 2019, held at Orlando in July, as seen through my perspective. The IS is always an intense experience that I recommend to any INCOSE member, and because there are so many activities happening concurrently in and around the Symposium, each attendee comes back with different stories to tell

It usually takes effort and dedication to go for an international conference in a faraway place. As an illustration of this, here is a photo of our Japanese attendee, Junji, taking a rest at a US airport after his flight was cancelled because of a storm. It took him more than 30 hours to reach the conference. Now, that is dedication! When I met with him at the conference, he was all smiles, proof that it was all worth it.

19 July INCOSE Leaders Strategy Day: I participated in the morning “Developing a Value Proposition” session where we brainstormed ideas to refine our value proposition in line with INCOSE’s latest value streams.

I assisted during the “Re-Energizing Chapters” afternoon session, led by Tony Williams (Director of the Americas Sector) with the help of Paul Schreinemakers (Director of the EMEA Sector) and myself. We debated and captured the challenges and opportunities that the various chapters and sectors of INCOSE see and experience.

Saturday 20 July: I co-led a session on “What Makes a Chapter Successful” where we (new as well as seasoned volunteers) reviewed and debated the content of the Chapter Resources site on INCOSE Connect. In particular, we focused on the wiki section, Keys to Effective Chapters, which is a treasure of good practises our dedicated volunteers have captured and refined over the years

22 July: I contributed to the session “President’s Invited Content—Embarking on a Grand Challenge,” led by Kerry Lunney, where the audience was:

- Introduced to the grand challenge by Patrick Godfrey and Michael Pennotti in



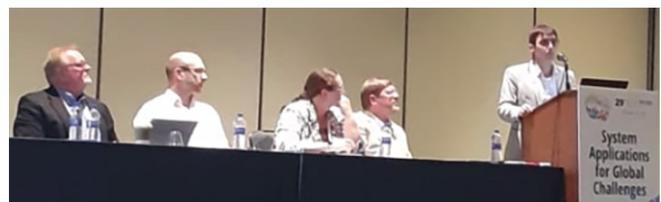
Japanese attendee, Junji, taking a rest during his 30 hour trip (including storm delays) to IS 2019

a presentation called “Evolving Systemic Approaches for Complex Challenges: Launching a Learning Journey”

- Encouraged to discuss the topic in a café style workshop
- Enticed to vote on specific questions and answers.

I also managed to engage with first time attendees of the International Symposium at the New Member Lunch.

That afternoon I contributed to the session “President’s Invited Content Panel Discussion—Professional Development of System Engineers: Evolving Today’s Engineers for Change.” That session was organised and lead by Don Gelosh and Marilyn Pineda, with contributions from Ed Moshinsky, Duncan Kemp, and Nicole Hutchison.



“President’s Invited Content Panel Discussion Professional Development of System Engineers: Evolving Today’s Engineers for Change.”



Asia-Oceania Sector leaders' meeting, representatives from Australia, India, Japan, Mongolia, and Singapore



The Asia-Oceania Sector held its usual informal networking dinner to renew and strengthen chapters bonds.

The Asia-Oceania Sector leaders' meeting was held on the 20th and 22nd of July with good attendance from Australia, India, Japan, Mongolia, and Singapore. Garry Roedler, Kerry Lunney, and INCOSE secretary, Kayla Marshall, made special guest appearances.

We had the privilege to welcome a keynote speaker from India, M. Prashan Dhawan, who spoke about Bio-Mimicry. His presentation is available at the INCOSE YouTube channel, <https://www.youtube.com/watch?v=oMqXuQ2MwpU>.



Prashant Dhawan (centre) next to Serge Landry, director of the Asia-Oceania Sector with Stueti Gupta (right), president of the Indian Chapter, and Ramakhrisnan Raman (left), assistant director for INCOSE's Asia-Oceania Sector



Congratulations to the chapter award winners: Australia (gold), India (silver), and Singapore (gold) well done to all!

We held chapter award review discussions to capture feedback from chapter leaders on the current effort to transform the chapter award scheme, and I participated in the Technical Leadership Institute brainstorming session to define the TLI response to the Grand Challenge

23 July: I participated to the Early Career Professionals (ECP) session lead by Ali L. Raz, Kayla Marshall, and Don Boyer. During the ECP Task Team meeting, we brainstormed several ideas and initiatives that will aid INCOSE in educating, nurturing, and growing the early career systems engineering professionals.

For more updates on the Asia-Oceania Sector, do not miss the write ups of Australia, India, and Mongolia.



The Singapore Chapter president, Liew Pak San, (right) and president elect, Tham Ming Wag, (left) could not resist their moment of fame with Captain Winston Scott, another famous keynote speaker.



System engineering students from the Singapore Institute of Technology attending the Symposium

Systems Engineering in Mongolia

Bayartsengel Batsaikhan,
bayartsengel@tussolution.mn

Greetings from Mongolia. This year, TUS Solution LLC and its employees became the first Mongolian members of INCOSE. As a new member organization, we attended our first official systems engineering event, the 2019 INCOSE International Symposium (IS 2019) this July. During the event, TUS set up a booth and introduced how we are utilizing system engineering and systems thinking into social systems.

As soon as the official event started, fellow INCOSE Corporate Advisory Board (CAB) members welcomed us openly throughout the conference, and we were delighted to introduce our organization briefly during the CAB meeting. In addition, we want to point out that it is our honor to be part of the growing worldwide systems engineering community.

On the third day of the symposium, we presented the topic, "Social Systems Engineering Supported by Nomadic Mindset," which highlighted how can we contribute to the systems engineering community through widening the scope of its practice by introducing our social systems engineering concepts.



Also, while in Orlando, we had a fruitful discussion regarding the possibilities of creating an INCOSE Mongolia Chapter with the leaders of the INCOSE Asia Oceania Sector.

Since our engagement with INCOSE, we have planned many initiatives to actively contribute to the systems engineering community. One of these initiatives will be our presentation at the INCOSE Human Systems Integration Conference (HSI 2019), where our CEO Mr. Jargalsaikhan will be presenting "Results of Applying the Strategy Systems Model (SSM) for Building and Using a Human-Centered Enterprise Model (HCEM).



Sector Updates—EMEA

INCOSE ESPAÑA

INCOSE Artificial Intelligence for Systems Engineering (AI4SE) Workshop. AI4SE is the first workshop on the application of artificial intelligence for systems engineering. The event is directly promoted by INCOSE at large, EMEA Sector, and INCOSE Spain. Get the latest insights and skills from technology leaders and practitioners shaping the future of systems engineering and artificial intelligence. Immerse yourself with the new tools, technology, and experiences that matter, and hear the latest updates and ideas directly from the experts.

Provide feedback and influence the future of the discipline. For more information, visit <http://www.kr.inf.uc3m.es/ai4se/>.

- **When:** 12-13 November 2019
- **Organizer:** Knowledge Reuse Group, Informatics Department, Carlos III University of Madrid, and INCOSE Spain
- **Sponsors:** INCOSE, INCOSE Spain, The REUSE Company
- **Location:** Carlos III University of Madrid, Madrid, ES



- Interface management
- The Future of Systems Engineering
- Beginning in Systems Engineering
- Novel Applications

More information about this year's presentations and tutorials can be found at ASEC2019.org.uk.

All the successful papers will be published in the ASEC2019 proceedings. The awards for the Best Overall Paper and the Best Paper by a New Author and Presenter will be presented at the event dinner.

You can also find up to date information on Twitter and LinkedIn by following the hashtag #ASEC2019UK.

INCOSE UK's 25th Anniversary: INCOSE UK is celebrating 25 years this year and this is how it started. Sixty representatives, all practising systems engineers and managers from UK industry, universities and the Ministry of Defence gathered at the Royal Military College of Science (RMCS) Shrivenham on Thursday 28th September 1994 for what turned out to be the inaugural meeting and foundation of the UK Chapter of NCOSE. The day was hosted by Professor Derek Hitchins of RMCS. He event in conjunction with a working group of five senior

industrialists. By the end of the day the UK Chapter had been successfully and officially launched; the requisite minimum of 25 signatures of active NCOSE members had been well exceeded with a total of 65.

Z0: INCOSE UK is delighted to announce the launch of its latest Technical Product - Z0. The Z-guides provide a bite-sized introduction to a specific area of Systems Engineering and are available to anyone who wishes to dip their toe into the world of Systems Engineering.

Z0 is a full-sized poster that provides an overview of all aspects of Systems Engineering in a colourful and visual way. It covers processes, life cycles, products, systems, systems thinking and contains a few familiar faces! Z0 will be launched at the ASEC 2019 and will be available to purchase from [the INCOSE UK store](#).



ASEC 2019



The ASEC2019 programme is final and published.

Delegates will be able to gain an excellent perspective from a range of different domains including defence, space, rail and energy to name but a few. This year's sessions include these categories:

Working Group Updates

INCOSE Free Systems Engineering Training Webinars

Gabriela Coe, gabriela.coe@incose.org

The INCOSE Training Working Group (TWG) presents free systems engineering training webinars for all INCOSE members, employees of the INCOSE Corporate Advisory Board (CAB) members, and employees and students of the INCOSE Academic Council members. The INCOSE TWG would like to invite you to the a series of three webinars on Systems Engineering Principles by Michael Watson. This series begins on Thursday, 26 September 2019. Each session starts at 12:00 p.m. US eastern standard time (EST) and will last approximately one hour. To access the live webinars per the dates on the initial schedule below, click

on meeting link, log in as a guest, and follow the prompts. The initial schedule is subject to change. To access the latest schedule, slides, and past webinar recorded files, log in to INCOSE Connect using your username and password, click on <https://connect.incose.org/Library/Tutorials/training/SitePages/Home.aspx>, scroll down to Systems Engineering Technical Processes, click on the Tutorial ID that you want, and download the files. Other past TWG tutorial sessions include: SE Fundamentals (Tutorial ID: 02_October 2014), SE Handbook v3.2.2 (Tutorial ID: 02_October 2014), SE Handbook v4.0 (Tutorial ID: 01 October 2015), and Leadership Skills (Tutorial ID: 01 thru 04). All sessions are recorded for later download. Questions? Contact gabriela.coe@incose.org or john.clark@incose.org.

1. Introduction and Basis.

Systems engineering is based on a set of principles that define the approaches to take fo a specific system and provide guidance on the implementation of the systems engineerin processes. These principles are separate but dependent on system principles. This session will discuss the relationship between systems engineering principles and systems principles, review the principles describing the basis of systems engineering, and review the Hypotheses. (Principles 1, 2, 11, 15; Hypotheses 1, 2, 3)

Time: 12:00 pm EST https://incose.pgimeet.com/INCOSE_GMOne

2. System Design and Integration Aspects

Systems engineering principles define the characteristics for th design and integration of systems. This focuses on the physical or logical (for information systems) aspects of the system, providing guidance on how to approach the engineering of a system throughout the system life cycle. (Principles 2, 5, 6, 7, 8, 9)

Time: 12:00 pm EST https://incose.pgimeet.com/INCOSE_GMOne

25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
September 2019						October 2019																			

3. Social Aspects

Systems engineering deals not only with the system, but also the organizational system that develops or operates the system. The systems engineering principles provide guidance on the social aspects of integrating the different engineering and business disciplines in th development and operations of the system. (Principles 3, 4, 10, 12, 13, 14))

Time: 12:00 pm EST https://incose.pgimeet.com/INCOSE_GMOne



Instructor: Michael D. Watson is the INCOSE Systems Engineering Principles Action Team chair and co-chair of the Complex Systems Working Group.

Michael D. Watson is the INCOSE Systems Engineering Principles Action Team chair and co-chair of the Complex Systems Working Group. He is in the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC) Systems Engineering Office. He is leading the NASA System Engineering Technical Discipline Team Research and Technology efforts responsible for definition of elegant product-focused systems engineering. He has served as the Space Launch System (SLS) lead discipline engineer for Operations Engineering. He started his career with NASA developing International Space Station (ISS) operations capabilities. He also worked to develop remote operations support capabilities for the Spacelab Program

in the United States, Europe, and Japan. He subsequently served as chief of the Optics Branch responsible for the fabrication of large x-ray telescope mirrors, diffractive optics and telescope systems. He served as chief of the Integrated Systems Health Management (ISHM) and Sensors Branch and led a NASA team defining vehicle management system capabilities for human missions to Mars. His branch work included the definition of ISH capabilities for the Ares family of launch vehicles. He graduated with a BSEE from the University of Kentucky in 1987 and obtained his MSE in electrical and computer engineering (1996) and PhD in electrical and computer engineering (2005) from the University of Alabama in Huntsville.



Just a glimpse of the fun at INCOSE IS 2019

Academic Updates

American Society of Engineering Education (ASEE) News

Alice Squires, ewlse@incose.org

INCOSE continues to make strides in bringing systems concepts, principles, and practices to all engineers. This series of articles reports on events held at the American Society of Engineering Education (ASEE) Annual Conference and Exposition in Tampa, US-FL from 15-19 June, to educate the educators, while also reaching out to students and industry. First, Kirsten Davis reports on a workshop hosted by the Systems Engineering Division, developed by Alejandro Salado, Kirsten Davis, and Tom McDermott, and delivered by Kirsten Davis and Alejandro Salado on Sunday morning at the conference. Next, we hear from Federica Robinson-Bryant and Alice Squires on the Systems Engineering Division and Corporate Member Council outreach activities.

Adopting Studio Art Instructional Practices to Teach the Art of Engineering

Kirsten Davis, daviska@vt.edu

After observing that we can compare systems engineering activities, competencies, and mindsets to those of artists, we began to wonder if this should influence how educators teach systems engineering. We developed an approach for teaching systems architecture using a studio art class format and implemented it for the first time in fall 2018. Based on this initial attempt, we felt that there were several benefits to using this model and wanted to share the experience more broadly. This led to us holding a workshop at the American Society of Engineering Education (ASEE) Annual Conference and Exposition in June 2019 to demonstrate this method and seek feedback from other systems engineering educators.

We structured the first half of the workshop as a typical course session using the studio art format. Attendees sat in groups at tables to enable discussion, and we provided them with paper, markers, and post-it notes to participate in the design activities. The class

started with a short lecture on systems: how to define them, diagram them, and consider their relationship with external entities. After the lecture, we provided attendees with three in-class problems to work on during the studio portion of the class. These problems provided attendees with the opportunity to explore smaller concepts from the lecture first, then combine these topics to create a larger system design in problem three. This trajectory mirrors the learning approach used in typical studio art courses. During the studio portion of the class, the instructors moved around to answer questions and provide additional information as attendees worked through the problems (see Figure 1).

After working on the problems individually, workshop attendees had the opportunity to discuss their solutions with others in their groups. This allowed them to challenge each other's ideas and see gaps in their own understanding. After completing the third problem (a design diagram), all participants hung their solutions on the wall so the entire class could review them (see Figures 2 and 3). We call this final portion of the class the exposition, and it provides an important opportunity for students to identify strengths and weaknesses of different approaches to the problem. The instructor can also highlight common misunderstandings across solutions or identify unique insights from individual students. The exposition phase not only allows students to see different ways to approach a problem, but they develop skills in providing feedback and critique to others.

Having experienced a sample studio art format class, we had a discussion with the workshop attendees about what they had observed



Figure 1. Studio portion of the class



Figure 2. Exposition example 1



Figure 3. Exposition example 2

and experienced. Attendees found the group discussions and exposition helpful, particularly in courses (like systems engineering) where problems do not result in one correct answer. Much of the discussion also focused on how this method could be successful in a large classroom setting. Thus far, we have only implemented the studio art format in a small graduate level course, so this was important feedback for us. Attendees suggested that in such a setting, it would be important to have students in smaller groups for the exposition portion of the class. We also discussed that having one or more teaching assistants would help with moving around the class to answer student questions in a timely manner. The workshop ended with attendees brainstorming how they could apply the studio art model in their own classes.

ASEE Systems Engineering Division and Corporate Member Council Outreach

Federica Robinson-Bryant,
Alice Squires, alice.squires@incose.org

As part of its outreach activities, the ASEE Systems Engineering Division (SED) put together a “Keep Calm and Let the Systems Engineer Handle It!” gift basket (courtesy of Federica Robinson-Bryant) with a shirt, towel, mug and other items for a raffle as engineering students and engineering educators visited their table at the ASEE Division Mixer. The SED also collaborated to set up and man the INCOSE booth on Sunday in the Exhibit Hall at ASEE (see Figure 4), where we awarded the SED gift basket to the winner Amanda Lombardo (see Figure 5).

Annually, INCOSE and the SED collaborate to deliver systems engineering-related content to engineering educators and



Figure 4. Federica Robinson-Bryant and Alice Squires at the INCOSE booth on Sunday

students at the conference. Events this year included a workshop (previous article), a panel on accelerating experiential learning with games, and three technical sessions covering applications of systems engineering, instructional experiences with systems engineering education, and systems thinking. In addition, the Corporate Member Council, comprised of industry and association members including INCOSE, delivered two related panels. The first panel covered Industry 4.0 where systems engineering held a key place in the discussion. The second panel, moderated by INCOSE representative Alice Squires, covered brainstorming diversity, equity, and inclusion approaches and challenges, and featured panel members from Chevron, Siemens, Northrop Grumman, and Boeing.

Purdue Student Receives INCOSE Stevens Award

DeEtte Starr, starrd@purdue.edu

Bill Bihlman received the 2019 Stevens Doctoral Award from the International Council on Systems Engineering for promising research in systems engineering and integration. His research is on a systems methodology for additive manufacturing's impact on production networks. Professors C. Robert Kenley and Gary Cheng of the Purdue School of Industrial Engineering co-advised Bihlman during his research. The award was presented during the Tuesday morning plenary session on July 23rd.



Figure 5. SED gift basket awarded to Amanda Lombardo at the INCOSE booth

"I'm quite thrilled—and surprised—by this award. It's an honor," said Bihlman. "I attribute my success to Professor Kenley's mentorship. He has been an advocate both intellectually and professionally, and it has been a real pleasure to collaborate."

Mr. Bihlman's research will broaden the applicability of methods from model-based systems engineering (MBSE) and systems of systems engineering (SoSE) to configuration item design and to production and manufacturing," explained Kenley. "The proposed methodology will demonstrate how to use MBSE and SoSE methods to construct a predictive model that investigates the broad trade-offs between component design, manufacturing process design, and supply chain network effects. Other than the current work of Leon McGinnis at Georgia Tech and of the INCOSE Production and Logistics MBSE Challenge Team, this is one of the few research activities to apply systems engineering methodologies to production and manufacturing since the development of the Purdue Enterprise Reference Architecture, which used structured analysis and design techniques to advance computer integrated manufacturing in the 1990s."

Bihlman has over 20 years of experience in aerospace, both as an engineer and as a management consultant. His PhD research involves modeling the adoption of additive manufacturing within aerospace. In particular, Bihlman is developing a methodology using a

systems approach to predict the behavior of sub-tier suppliers, which will likely be adversely affected by this new paradigm.

The Stevens Doctoral Award is given to inspire and recognize innovative doctoral-level research related to the field of systems engineering and integration. This award includes a cash grant to the doctoral student along with a plaque and recognition at the Annual INCOSE Symposium (IS). Students are awarded the grant based on their advancement of the state-of-the-knowledge in systems engineering and integration, and their potential for the advancement of the state-of-the-practice of systems engineering and integration within the next 5-10 years

Abstract: "A Systems Methodology for Additive Manufacturing's Impact on Production Networks"

Additive manufacturing (AM) is emerging technology that could substantially disrupt the existing paradigm. Most of the research focuses on understanding the physical phenomena. Very little information has been published regarding the implications for the supply chain. This research focuses on aero gas turbine production network, which arguably has the highest barriers-of-entry for new technology of any industry.

The gas turbine is a complex machine that demands a sophisticated production ecosystem. Considerations such as financial risk, technology expertise, and access to market encourage a globally diverse supply base. A typical gas turbine original equipment manufacturer (OEM) has over 2000 suppliers. A fundamental understanding of the supplier network is imperative to properly understand the industrialization of AM. The goal of this research is to determine how the quantity, structure, and capability of suppliers fundamentally shifts upon adopting AM parts by the OEMs.

The working hypotheses is that the Tier 3 suppliers—the small shops that number in the thousands and build-to-print detailed parts—will decrease in quantity. The beneficiaries will be the larger and more capable suppliers, likely at the Tier 1 and 2 level, and perhaps the OEMs themselves. This is predicated upon several relevant examples, including GE Aviation, GKN Aerospace, and Arconic.

The nuances in the AM process will favor firms with considerable capital and a sophisticated digital-production protocol associated with AM systems. Some experts, nevertheless, have speculated that AM will "democratize" the supply chain by enabling smaller suppliers. Meanwhile, this will also encourage new entrants as exemplified by Oerlikon's recent investments.

There are three steps involved in developing this methodology. The first step is to identify the parts within the gas turbine that would be candidates for AM replacement. This screening process involves elements of design—such as size, complexity, and application—as well as the economics associated with batch-serialized part production. The second step is to model the plant workflow. The objective is to quantify the impact upon the various work-steps for AM parts versus traditionally manufactured parts such as forgings, castings, and extrusions. In particular, discrete event simulation (DES) will be used to approximate the relative change in cost associated with the new design. The third and final step is to aggregate each of the plant outputs to ascertain the net effect on the production network.

This will involve an agent-based model (ABM) subjected to various supply chain conditions. We will use parametric studies to determine the best or most likely supply chain structure. We will in turn compare this against actual behavior within the marketplace.



INCOSE President Garry Roedler presenting Bill Bihlman with the Stevens Doctoral Award at the IS 2019.

EWLSE Updates

Alice Squires, ewlse@incose.org

Empowering Leaders at INCOSE IS 2019

Andy Pickard,
Andrew.C.Pickard@Rolls-Royce.com
Hazel Woodcock,
communications-director@incoseonline.org.uk
Bill Parkins, bill.parkins@bigpond.com
Alice Squires, ewlse@incose.org

There were several important Empowering Women: Leaders in Systems Engineering (EWLSE) related events held at INCOSE IS 2019 with participation from the team pictured in Figure 1. First was a paper presentation on “Women in Engineering: Not a Damsel in Distress” by authors Anne Pickard, Andy Pickard, Adriana D’Souza, Alan Harding, and Angelika Spaengler. The presentation excited a lot of audience discussion, not only about gender diversity, but also about broader aspects of diversity like the effectiveness of teams having team members with a diverse variety of preferred roles. The broad agreement that diversity is an important factor in team success demonstrated that systems engineers have a major role to play in seeking to create diverse teams.

This theme carried on during the panel, “How Essential are Cognitive Flexibility and Cognitive Diversity to Developing Effective World-Wide Sustainable System Solutions?” with moderator Rusty Eckman, and panelists Eric Specking, Lisa Hoverman, Hazel Woodcock, Bill Parkins, and Alice Squires. In support of the topic, the panel team assessed their own cognitive diversity by completing the Clifton Strengths Finder and

Myers-Briggs Type Indicator inventory. Overall, the panel team recognized that the assessment and comparison of individual styles using well-known methods was a particularly insightful exercise. Several panelists had particular insights to share.

Hazel Woodcock, who aggregated the assessment results for the team, went into the panel thinking that there would be convergence on what an engineer is made of (Clifton Strengths and Myers Briggs Type Indicators) but came out of it thinking that there probably is not. For Bill Parkins, the panel process was an opportunity to compare views on team behaviour with other systems engineering leaders from different fields. He recognized his strengths, but the responses of others challenged him to wonder if he over-used some styles at the expense of others, thereby generating a weakness. For example, in a job interview situation, should you form an opinion early in the process or wait until you have explored all aspects before judging? He tended to wait which may indicate an inability to make fast decisions. Like many things, there is no single right answer. He found the panel format to be intellectually challenging and lots of fun, especially as a Learner.

Alice Squires, also a Learner, was surprised to find in her individualized Clifton Strengths report that she had to prove herself to herself every day; she thought that was an externally driven requirement! Alice shared Anita Williams Woolley’s findings that stated that social perceptiveness drives a team’s collective intelligence, which is a skill that is found



at a higher level more often in teams with mostly women, but the team's performance required one additional factor: equality in communication, that is, everyone needed to have an equal voice. Similarly, Reynolds and Lewis reported that teams with higher cognitive diversity also had to have higher psychological safety to achieve a higher level of organizational performance. One takeaway from the open panel discussion was that it is the responsibility of the leadership of the organization to ensure that the organizational environment encourages open and equal communication and psychological safety—the two prerequisites of a high performing team when the team is sufficiently diverse.

One additional insight from the panel audience discussion involved the “black bag.” This was a bag that, as an audience participant shared, we all have, and into which we put input that we receive that we do not understand and that does not match our perceptions and beliefs. The black bag represents a sort of filter that promotes stereotyping. However, Hazel offered an alternative for what she does with her black bag, an option for all to consider. That is, when an input comes in that she does not understand, yes, she puts that in her black bag, but that is only for safekeeping. Later, she opens her black bag and rummages through to look at and explore what is there, eventually finding a way to integrate new perspectives from the contents.

At one final EWLSE event late Wednesday afternoon, we welcomed 85 advocates for gender equity in systems engineering leadership to our networking reception which also included a signing of the IEEE-USA e-book, “Dandelion Wishes: A World Where We Collaborate as Equals” by Alice Squires (see Figure 2).

EWLSE continues to invite ideas for potential chapters on new and emerging topics supporting systems engineering leadership using unique, creative, and innovative approaches. Please send “intent to submit a chapter” submissions in the form of a chapter



Figure 2. President-elect Kerry Lunney and EWLSE founder Alice Squires celebrate Alice's recently published book, “A World Where We Collaborate as Equals”

description, up to 500 words, to both editors (ewlse@incose.org, marilee.j.wheaton@aero.org) by 1 October 2019. The chapter submissions will support the final organization of the book chapters, and a formal call for chapters in the fall.

Those interested in supporting the field of systems engineering by becoming a mentor for a systems engineer, or those seeking an experienced systems engineer as a mentor who can help you navigate the field and INCOSE— please email incose-mentor@incose.org or complete the brief survey at <https://bit.ly/2G6TJPL>. EWLSE is also seeking workshop ideas for INCOSE IW 2020; please email ewlse@incose.org with your interests and ideas. In closing, we invite and encourage men and women to join EWLSE and support women in engineering by adding “Empowering Women” to your committee/working groups under your INCOSE profile (click on your name after you log into INCOSE, select Profile, and proceed from there).

Social Media Update

Alan Harding, alandharding@gmail.com

Our International Symposium in July 2019 gave us our usual spike in social media traffic, across [Twitter](#), [Facebook](#), [LinkedIn](#), and our [new Instagram account @incose_org](#). We posted the Keynote speeches on the [INCOSE YouTube channel](#), together with the set of MBSE Lightning Round presentations and they have already had a total of over 1,100 views. This is a great way to see the keynotes for the first time, or to listen again if you had the good fortune to see them in Orlando. One of our biggest social spikes was down to our Wednesday Keynote, Astronaut and Navy Aviator Captain Winston Scott USN, who graciously allowed many of us to have a photo taken with him and have a chat. I wonder when a systems engineer will command a queue of fans around the room?

Please send any photos of INCOSE activities or INCOSE people to socialmedia@incose.org or tweet them to [incose_org](#) and we will share them on Instagram. We would love to have you share photos of your favorite systems as well!

We are recruiting members for the INCOSE Social Media team - do you want to help INCOSE spread the work on our activities and membership and do you have a few hours a month available to help out? If you do then right now we are currently looking for an Instagram lead, and an assistant to help us manage our Twitter presence.



Note From the Editor

Lisa Hoverman, newsletter@incose.org

Welcome to the third Newsletter of 2019! We are coming off of our second largest attended International Symposium and our very first United Nations (UN) appearance!

We really pushed into where we want to be as we move INCOSE forward at the IS, and took that momentum forward by hosting a workshop and booth at the United Nations 68th Civil Societies Conference, where attendees are dedicated to *our vision - a better world!* What we took to them, was our unique part - how you do that from a *Systems* perspective! This effort was one that initiated at the INCOSE International Workshop, and through the insight and persistence of INCOSE Member Bruce Hecht, first enabled by member Ian Presland and then sustained by the INCOSE Marketing and Communications we pushed to make being a part of a conference whose focus is accomplishing the UN's [Sustainable Development Goals](#) through non-governmental global organizations with aligned missions.

We will share more on this monumental event in the next Newsletter, as the event took place as we were finalizing edits and layout to this one. Check out our awesome booth below!



As always, we welcome feedback and contributors at newsletter@incose.org.

We look forward to seeing you participating, networking at, and presenting at, one of the many terrific upcoming INCOSE events. I end with a sincere note of appreciation to all who contributed to this Newsletter. Have a wonderful September 2019, I hope to see you at the upcoming IW if not before!

INCOSE Member Newsletter

Publication of the International Council
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Editor: Lisa Hoverman, newsletter@incose.org

Member Services: INCOSE Administrative Office
info@incose.org

+1 858 541-1725

On the Web <http://www.incose.org>

Article Submission newsletter@incose.org

Publication Schedule. The INCOSE Member e-Newsletter is published four times per year. Issue and article/advertisement submission deadlines are as follows:

- Q1 Newsletter, General Content (GC): 15 Feb, Late
- Breaking News (LBN): 25 Mar
- Q2 Newsletter, GC: 15 May, LBN: 25 May
- Q3 Newsletter, GC: 15 Aug., LBN: 25 Aug
- Q4 Newsletter, GC: 15Nov; LBN: 25 Nov.

For further information on submissions and issue themes, visit the INCOSE website as listed above.

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Who are we? INCOSE is a 17,000+ 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 chapters worldwide, includes a corporate advisory board, and is led by elected officers and directors.

Follow us



7670 Opportunity Rd, Suite 220
San Diego, CA 92111-2222
USA

info@incose.org
www.incose.org
+1 858 541-1725

