The NorthCoast Interfacer

2008   **2009**   **2010**   **2011**   **2012**   **2013**

http://www.incose.org/cleveland/index.htm

President's Corner

This is my final column, as President.

The C-NO Board of Directors and Committee Chairs accomplished a great deal, over the past twelve months. We increased the frequency of our newsletter, held eleven well-attended chapter meetings, helped organize two regional conferences, and created and conducted our initial MBSE Workshop.

Many thanks to Carl, Cody, Dennis, Katie, Marian, and Sean for all their hard work. It really paid off!

Planning is already underway for the C-NO Chapter to host the next INCOSE Great Lakes Regional Conference (GLRC9), in October 2015. We are collaborating to hold GLRC9 jointly with EnergyTech 2015. Tell us what else we might do, to better serve your needs, in the future.

I wish everyone *all the best for 2015!*

Bill Klinger
C-NO President (2014)

Editor's Notes

Greetings all.

We have quite a bit in this issue of the newsletter. I'd like to thank the people that contributed to the newsletter throughout the year. Wow, what a year we've had and there's plenty to look forward to in 2015. INCOSE celebrates its 25th anniversary in 2015 so we'll keep you apprised of special events. We are hosting the regional conference in October, Chicago set the bar high so I think we'll entertain any ideas that you might have to make it a stand out event.

Wishing you all a safe, happy, and successful new year.

Sean Beckman
Communications Chair

Highlights of the 24th Annual INCOSE International Symposium
Part II

The Decision Analysis session featured a pair of papers on tradeoff studies, both given by Prof. Parnell: Session 4.3.1, "Systems Engineering Tradeoff Study Process Framework," Matthew Cilli (Stevens Institute of Technology) and Gregory Parnell (U. of Arkansas); and 4.3.2, "Tradeoff Study Cascading mistakes of Omission and Commission," Gregory Parnell (U. of Arkansas), Matthew Cilli (Stevens Institute of Technology), and Dennis Buede (Innovative Decision, Inc.). There is an INCOSE Decision Analysis Working Group that revised this section of the INCOSE Handbook. When framing the problem, identify the decisions that are already made and don't spend time on those, determine the focus of this decision, and determine what decisions are to be deferred to later or delegated. For measures and evaluation criteria, he recommended the use of Swing Weights, not Importance Weights. In Swing Weights, the weights depend on importance and range of measure. The highest weight is a defining capability (why system exists) and has a technology gap or high differentiation; low weight is enabling or enhancement, uses existing technology or low differentiation; and in-between weights are critical capability, more than enabling, but not defining. That way you differentiate between options with different ways of performing a defining capability. He also recommended weighting the bottom-level capabilities; don't assign weights to different levels and then multiply out, or you can get nonsensical priorities of system reliability being 10X more important than soldier survivability. The remainder of the talk was on problems of omission (don't do the right thing) and commission (do the wrong thing).

At the Tool Vendor Challenge, Gavin Arthurs, IBM talked about continuous engineering (IBM gave out *Continuous Engineering for Dummies* at their exhibit booth). He also mentioned the Open Services for Lifecycle Collaboration (OSLC), which is the way different software tools will interact in the future. The Web site is http://open-services.net/.

The Agile SE session featured a pair of papers, both given by Rick Dove: Session 8.4.1, "Fundamental of Agile Systems Engineering – Part 1," Rick Dove (Paradigm Shift Int.) and Ralph LaBarge (Johns Hopkins Univ./APL); and 8.4.2, "Fundamental of Agile Systems Engineering – Part 2," Rick Dove (Paradigm Shift Int.) and Ralph LaBarge (Johns Hopkins Univ./APL). Rick was there at the beginning of agile SE, its shift to software, and now the revisiting of agililty by systems engineering. He defined agility as the ability to respond effectively and with competence, to operational environments with increasing uncertainty and unpredictability (examples: Lego, Lincoln Logs, Tinker Toy, CubeSat). There are fundamental reasons that systems engineers need to be agile in their processes and in designing agility into their systems: 1) the pace of technology is reducing the useful lifetime of deployed systems and increases the risk of long development programs; 2) social collaboration on a global scale changes the effectiveness of government process and increases pace of innovation; and 3) global network dependencies of all kinds bring benefit and vulnerability. Rick went through the history beginning in 1991 to the present, and covered how software engineering does agile software development (sprints, scrums, review of the product and retrospective of the team and process). Rick stated it is time to develop an agile systems-engineering process

that can cover these areas of complexity: Discovery (very high complexity in problem space); Programmatic (complexity in solution space and organizational); and Approach (complexity in the variation of applications and product lines).

A very entertaining paper was Session 9.2.2, "When "Yes" is the Wrong Answer," Richard Beasley, Andy Noland, and Andrew Pickard, Rolls-Royce. (Andrew is the INCOSE moderator at the webinars, so many of you have heard his voice.) There is a tendency to say "yes" in answer to a question because we know it is the desired answer. However, inappropriate "yes" statements result in a tendency to stop formulation work, start the solution state prematurely, or lead to false confidence. Systems engineers are often pressured to answer questions such as these with a yes: Are your requirements complete? Have you used stage gates / independent review? Do you understand all the interfaces? Have you mitigated all of the risks? Are you going to get it right the first time? Have you got a solution yet? Can you improve the system by changing one part? It's only a small change – can I skip the analysis and test? Do you think your customer is an idiot? The paper discussed how to rephrase the question to make it useful, and things to watch out for. The presenters concluded with some parting statements: Showing progress on a linear path is not necessarily good, as the path might be in the wrong direction. Recognizing uncertainty is the first step to success. You don't make a project cheaper by not doing things; you make it cheaper by doing more of the right things. Finally, the customer may well not be right, but their position is valid from their (current) point of view and should be respected.

Karen Weiland

December Chapter Meeting

Back to Systems Engineering Basics at the Cleveland Northern-Ohio Chapter Meetings through World Cafe

Our Chapter has received requests to regularly cycle through the basic and recent advances in the Systems Engineering processes. In December, we tried a new technique for accomplishing this request, using the popular "World Café" format (www.theworldcafe.com .) The December chapter focused on "Capturing and Managing Stakeholder Requirements" using this format with this topic question:

"What challenges do I face as a Systems Engineer, capturing and managing stakeholder requirements? What can I share with other Systems Engineers to make this process work better?"

The question was broken down into four sub questions and distributed to four tables. We had about 20 members and guests attending, which allowed for approximately 4-6 people per table. The chapter leadership team facilitated at each table (Thanks to Katie Trase, Marian Cronin, and Bill Klinger for facilitating!)

World Café is used to engage people, especially those who don't know one another, in authentic conversation, generate input, share knowledge and conduct in-depth exploration of key strategic challenges or opportunities in a very short period of time.

This easy to use method keeps people moving, thinking creatively and building on one another's ideas as they rotate from table to table. World Café replicates the spontaneous and

productive conversations that often happen when people share meals. Paper tablecloths and crayons inspire doodling and jotting down ideas. At our meeting, we used Easels due to the lighting at the facilities.

Provocative   questions,   relating   to   the   topic   at   hand,   stimulate   meaningful discussions. Participants gather at small tables with each table focusing on different questions that revolve around a strategic theme. The groups are small, 4-5 participants, with one of them serving as the host. After a set amount of time, typically 20-40 minutes all participants, except the host, move to another table. The host then introduces the insights and highlights from the previous conversation to the next group. World Café fosters collaborative dialogue, particularly in large groups, keeps people moving, thinking outside the box and building on one another's ideas as they rotate from table to table.

At the end of four, 15 minute rotations, we had filled several sheets of easel paper. Each facilitator then reported out for their table. There was large agreement that this technique was fruitful and enjoyable, allowing people to talk to one another about the work they did in small groups, instead of the typical chapter meeting where they sit in the audience and quietly listed to a speaker.

Figure 1 Marion out briefs with Bill looking on

We hope to continue the use of the World Café methodology throughout 2015 to help our members stay current with critical Systems Engineering Process Areas, learning from (and about) each other.

Carl Dister
C-NO Vice-President (2014)

Applying Systems Engineering Principles in Public Policies: Electricity Theft Policies

Electricity is no more a necessity but a fundamental human need. It is one of the indices to measure development of a nation and well being of its people. It is therefore the priority of any nation to provide its people with quality and reliable electricity; however, one major problem facing the provision of this essential service is the phenomenon of people using the service without paying for it at all or not paying for the actual amount used. This phenomenon is commonly referred to as electricity theft or fraud. Electricity fraud can be defined as a dishonest or illegal use of electricity equipment or service with the intention to avoid billing charge [1]. Fighting this 'enemy of development' has been difficult due to political, socio-economical, socio-cultural reasons and also management style of the utility. The impact of electricity theft on the utility include lack of profits, shortage of funds for investment in power system capacity and improvement, a necessity to expand generating capacity, damage to grid infrastructure and reduction of grid reliability. Some power systems in worst affected countries are near bankrupt. Electricity losses can be classified as technical and non-technical. Technical losses include measurement errors, installation problems and transmission losses while non-technical losses include frauds, undetected consumption, illegal electricity connections and non-payment of bills.

The amount of theft vary from system to system, some systems have very high theft level especially in systems in developing countries. The weighted average system loss in the power sector as a whole around the world is estimated at 35% which include 17% technical loss and 14% non-technical (pilferage, theft and unauthorized used [2]. Even for the systems with low levels of theft, like systems in developed countries, electricity theft is very expensive. For example, in the United States, electricity theft ranges between 0.5% and 3.5% which can be said to be on the low side as compared to that in Africa and Southern Asia which are hooping around 19.95% and 27.55% respectively. However, in the U.S., electricity revenue is in the ranges of $280 billion, meaning electricity theft is costing the utilities between $1 billion and $10 billion a year [2]. There have been numerous policies around the world (especially developing countries) to address the non-technical part of the canker. Most of those policies seem to achieve a lot at the insert of the policy but fail at the end. This article seeks to find out how systems engineering principles can be used in the formulation of non-technical solutions.

INCOSE defines a system as a construct or collection of different elements that together produce results not obtainable by the elements alone [3]. This definition contains three keyword: collection of elements, together, and results. Systems engineering principles are approaches for bringing systems and their products into being. If a policy can be considered as a system then the systems engineering principles can be applied to bring it into being. Consider a typical policy to solve electricity theft as system: what are the **elements**? Policy objectives – what the policy is intended to achieve, policy instruments – the actions used to carry it out to achieve the objectives and the methodologies to carry out the actions, and the people involve – the policy makers, the utility providers, the enforcers and the electricity users themselves. All these elements/parts should come **together** to achieve success. And the obvious **results** is reduction in electricity theft which cannot be achieve by the people involve (policy makers, utility providers, enforcers and electricity users) alone without objectives and policy

instruments so as objectives and policy instruments alone cannot bring reduction in electricity theft. Therefore, by the definition of a system, policy to address electricity theft can be considered as **a system** and that systems engineering can be applied to bring electricity theft policy to being.

The concept of feedback is central to many systems. One of the things that contributes to failure of many electricity theft policies (especially in the developing nations) is the luck of feedback component of the policy as a system. Many electricity theft policies in developing nations are more of an open systems and have no or little feedback in the policy. For these policies to work effectively, policy makers should move from 'open system' policies to 'closed system' policies. Thus the results must fed back into the policy and amend the policy accordingly to produce the required results. Another important thing policy makers ignore most often is external factors on the policy, example salaries of utility worker, economic situation of the people, electricity pricing and political influence. Typical example is the Ghana case, there are policies in place with all the legislation backing but electricity theft keeps on increasing year after year.

To reduce theft in the poor communities, the Government of Ghana introduced a policy called 'Life-line Policy' to give the poor relieve and the ability to pay for electricity. Life-line pricing policy is basically an Increasing Block Tariff (IBT) pricing scheme. IBT pricing is the most coming pricing scheme for many utilities around the world. Under this scheme, consumers pay different consumption levels. The rate per unit of electricity increases as the kWh of consumption increases. As stated earlier, the 'Life-Line' pricing policy is fundamentally the same as IBT. What makes it different in Ghana's Life-line pricing is that, the first block of the tariff is heavily subsidized by the Government. The first block (0 to 50 kWh usage per month), was subsidized with the assumption that the poor do not have a lot of household appliance to consume more than 50 kWh of electricity in a month. This was a good assumption in my opinion, because the poor in Ghanaian society use electricity basically for lighting purpose. Though the policy has totally failed to achieve its operational goal, it is still in use. The policy has turned to favor the rich while most poor households suffer under the policy.

The one major factor that led to the failure of the policy was the fact that the developers of the policy failed to take into account the social setting of the Ghanaian society. The poor families in Ghana (especially in the urban centers) live in 'compound houses'. Compound house is kind of housing where one building host multiple household. In Ghana, some of these compound houses holds as much as fifty (50) households, in some situations more. These compound houses contain multiple bedrooms with shared kitchens and bathrooms and in most situations one bedroom hosts one family, making each bedroom in the building a household on its own. Most of these compound houses in Ghana have only **one meter** and share the bill among themselves at the end of each month. If we accept the assumption that poor households use approximately 50 kWh a month, what it means is that a compound house with, say, 20 households is going to consume 1000 kWh of electricity every month which pushes them into high blocks of usage. Thus enjoying subsidies on only the first 50 kWh and pay economic price for the remaining 950 kWh. While the rich lives in one household house, use average of 200 kWh of electricity per month and enjoy same subsidies on the first 50 kWh. The basic solution is to enforce the utility companies to provide separate meters for each household in such building which the utilities do not have the financial and technical capacity to do, at least in the near future. So policy should have recognized that and dealt with it in a different way.

This policy has actually led to increase in electricity theft in these communities. This is because of one reason, one cannot tamper with one part of a complex system from the outside or inside without the risk of setting off negative or positive effect that hadn't accounted for in other parts. This failure was not a feature of policy but a sign that the understanding of the system was narrow and flawed. Because this policy was developed in isolation without understanding the type of settlement situation of the people whom the policy is for (consumers of the policy), the policy faced integration issues. The interface between the policy, as a subsystem of a big complex social system, and another subsystem (social settlement system in the country) was not properly accounted for and engineered. The policy also failed to properly account for the capacity and capability of the implementer of the policy (or operators of the system), which are the utilities. As in design of every system, where the designer have to take into account the human-machine interface and operators of the system, so policymakers have to take into account the implementer of the policy during the development.

It seems to be like the policymakers are missing the "model building" or "Architecture" part of public policy, followed by Validation of the model. After deployment, there should be Measurement and Feedback to make sure the model is working. If they used Model Based Systems Engineering, they could design the policies first, then, have a panel of experts run a simulation to validate the models, identifying key measurement points in the model. Then, both the policy plus its measurement could be rolled out at the same time. In developing such policy, policymakers have to fully analysis the societies in which this policy is going to operate to understand the communities and dynamics in these communities. Such complex mixes of social, technical and financial realities problem should be solved with multi-disciplinary approach, bring engineers, social scientists, politicians, community advocators, etc. together.

Reference:
[1]   J. Nagi, et al, *NTL Detection of Electricity Theft and Abnormalities for Large Power Consumers In TNB Malaysia*, Proceedings of 2010 IEEE Student Conference on Research and Development, 13 - 14 Dec 2010, Putrajaya, Malaysia
[2]   T.B Smith, *Electricity theft—comparative analysis*, Energy Policy, vol 32, 2067–2076, 2004
[3]   INCOSE, *Systems Engineering Handbook,* INCOSE, October 2011

Ernest Ansu-Gyeabour
ReliabilityFirst Corp

Chapter Election Results

Congratulations to the three newly elected C-NO Chapter Officers for 2015:

- Ernest Ansu-Gyeabour (Treasurer)

- Katie Trase (Secretary)

- Marian Cronin (Vice President / President-Elect)

As stipulated in the *C-NO Chapter Bylaws,* the current Vice President—Carl Dister—will automatically transition to President (2015).

The Board Members shall serve a one-year term, beginning at the end of the January Chapter Meeting.

I thank everyone who participated in the Nominations and Elections Process.

Cody Farinacci
Nominations and Elections Committee Chair (2014)

IW2015

There's still time to register for the International Workshop in Torrence, CA at the end of January 2015. See the <u>INCOSE IW2015 web site</u> for more information.

The (SysML) Model Wedding, Article 2

My fiancé and I have met several "wedding planning milestones" since I last wrote in our August newsletter. We asked some very special family members and friends to be in our bridal party, and we've made reservations for the ceremony and reception venue, DJ, wedding cake, and photographer. I've also found "The Dress!"

To keep track of these wedding parameters in my model, I added more detailed blocks to my "Wedding Breakdown Structure (WBS)" that I didn't include in my first revision. I referenced "the-only-wedding-checklist-you-will-ever-need" to make sure I didn't forget anything. I also considered a few "requirements" my fiancé and I have for our big day and created an extension to SysML to help me track costs and planning progress, discussed below.

Requirements
For each one of my WBS categories, I created a corresponding top-level requirement that I broke down into specific requirements. Figure 2 depicts some of the requirements for the number of guests we invited, the reception location, and availability of a back-up location for the outdoor ceremony in the event of bad weather. I utilized the SysML requirements relationship, *<<copy>>,* to indicate the number of guests we could invite must be the same as the maximum number of guests allowed at the reception venue.
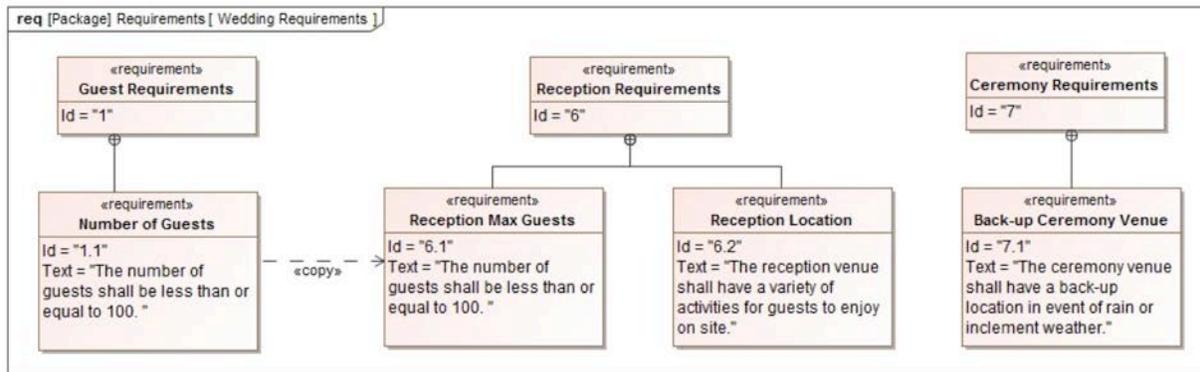

Figure 2

Specialization of SysML

I wanted to come up with a way to integrate the wedding costs with the rest of the model, and track both those things we have accomplished or decided, and those we have yet to complete.

Since SysML didn't already have elements defined to store this information, I created a few stereotypes.

The *<<Wedding Element>>* stereotype has three properties: *ActualCost,* for recording the amount we actually spent on an item; *EstimatedCost,* for noting the amount "the-only-wedding-checklist-you-will-ever-need" claims we should spend; and *Status,* to indicate if we've started working, completed, or need to start thinking about that element.

I wanted to be able to differentiate those elements that we are "contracting out" from those we are making "in house," so I created two stereotypes that inherit the properties of the *<<Wedding Element>>* stereotype: *<<Purchased Items>>* and *<<DIY Items>>*. I added a *Vendor* property to the *<<Purchased Items>>* stereotype to record the name of the business we will work with. Figure 3 shows the relationships between the stereotypes and their respective properties.
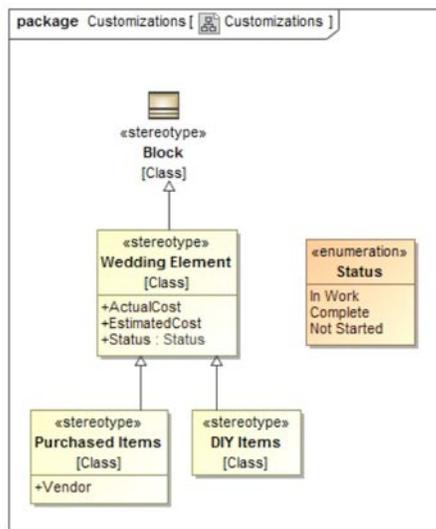

Figure 3
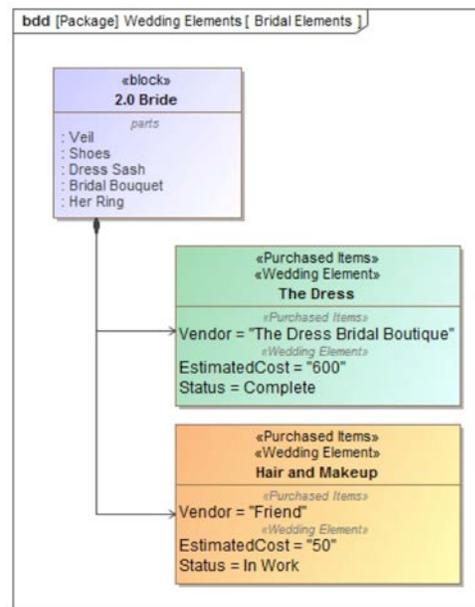
Figure 4

Figure 4 depicts the application of the new
stereotypes to my wedding. Some of the detailed "parts" of my Bride WBS element are listed in the *parts* compartment of the block, 2.0 Bride: Veil, Shoes, Dress Sash, Bridal Bouquet, and Her Ring. The Dress and Hair and Makeup parts are shown with callout notation. I filled in the stereotype properties for both parts, as shown in each block's compartment.

To consolidate the information in the Block Definition Diagrams, I created a table within my model of all elements with the *<<Purchased Items>>* stereotype. Figure 5 shows two entries in that table as an example. Since I'm working in a model, changes I made to model elements in a diagram like Figure 3 will automatically be reflected in the table, and vice versa.

#	Name	EstimatedCost	ActualCost	Status	Vendor
1	Cake	250		In Work	Friend
2	Centerpieces	50	10	In Work	DIY

Figure 5

With several major milestones met, there aren't too many critical decisions we have left to make! I'm glad we've accomplished these big picture tasks, but I'm dreading the upcoming decisions about the details for which I don't have an opinion, such as table linens, cuff links, stemware, etc. It's time to break out the random number generator!

Katie Trase
C-NO Secretary (2014)

Great Lakes Regional Conference and Energy Tech 2015

Don't forget that our chapter is hosting the Great Lakes Regional Conference next October in conjunction with Enery Tech. Visit the INCOSE GLRC page for more information.

Upcoming Events

January 20, 2015: The Cook-Rasmussen System Performance Model - with the Fuller interpretation

Please join us as David Fuller, Operations and Systems Engineer at NASA Glenn Research Center provides his interpretation of the Rasmussen and Cook System Performance Model.

Jens Rasmussen and Richard Cook have developed a model of system performance that graphically illustrates the organizational and behavioral forces at work in system operations. This presentation will help the system engineer understand the interaction of these forces and the concept of normalization of deviance that can lead to system failure.

Chapter meeting held at:

Moosehead Hoof and Ladder
7989 Columbia Rd
Olmsted Falls, OH 44138
440-235-5511

New Chapter Member

We welcome Ernest Ansu-Gyeabour, who works for ReliabilityFirst Corporation, as a new member to the Chapter. He has attended a number of Chapter events, joined the Chapter in November, and stepped right up to become our 2015 Chapter Treasurer. Ernest joined ReliabilityFirst Corp as Associate Electrical Engineer from graduate school in June 2013. He obtained a Master of Science in Electrical Engineering (Power) at the University of Toledo. Prior to that, he obtained Master of Science degree in Water Supply & Environmental Sanitation from Kwame Nkrumah University of Science & Technology, Ghana. He is certified as an Engineer-in-Training by the National Society of Professional Engineers. He is now

working on a graduate certificate in Systems Engineering at Colorado State University. He is also working towards INCOSE's ASEP certification and PMI's CAPM certification. We look forward to Ernest's continued participation with the Chapter and involvement as Treasurer.

We also welcome David Fuller as a new member in the Chapter, having joined in December. He has been a guest at a number of Chapter events, and was a speaker at a Chapter meeting in 2013. David Fuller has worked in space and aviation operations and System Safety for over 35 years. His experience includes air traffic control, Space Shuttle, Spacelab and International Space Station operations, and commercial satellite operations. He has worked for the FAA, NASA, the German Space Agency, the European Space Agency, and several aerospace contractors. He is currently a systems and operations engineer at NASA Glenn Research Center, and is a member of the NASA Human Factors Steering Committee, where his interests include human cognitive performance and decision making in operational environments.

Dennis Rohn

Employment connections

Job Seekers

Sean Beckman - I am currently seeking employment as a systems engineer so in the North East Ohio area. I have been a systems engineer for over 13 years mostly in the area of government contracting in aerospace with some in commercial aircraft. Most of the time has been at NASA but also subcontracting to Boeing on the 747-8 commercial aircraft and most recently supporting the Army with trade studies. I hold an active secret clearance. I have experience in requirements management, risk managements, model based systems engineering, trade studies, systems architecture, interface definition and integration and verification. sean.beckman@incose.org

Consulting Services

TBD

Job Openings

TBD

IS2015

INCOSE celebrates its 25th anniversary this year by holding the International Symposium where it all started, in Seattle, WA. Visit the INCOSE IS2015 web site for more information.
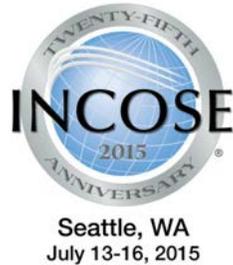
Did you know?

Today in the US, 77 universities offer undergraduate or graduate level degree programs in Systems Engineering.

Like us on Facebook

If you are on Facebook, search for Cleveland-Northern Ohio INCOSE Chapter and "like" us. And of course don't forget to check our website for information and updates. http://www.incose.org/cleveland/index.htm

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