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INCOSE '98 Symposium Review

This issue of the Midwest Gateway Newsletter explores several aspects of INCOSE's Eighth Annual International Symposium that was conducted in late July. Our review comes in two parts: first, a look at the parts of the symposium with a special emphasis on how chapter members participated; then, a personal “best paper” recommendation from Jennifer Shylanski, for whom the Vancouver Symposium was her first INCOSE symposium experience.



Parts of a Symposium

Midwest Gateway Chapter Participation Was Quite Extensive

By Carol Wilke

When an engineer thinks of a symposium, the first picture that might come to mind is a white-coated scientist scratching equations on a black board. The reality of an INCOSE symposium is much different.

This article will try to explain some of the different pieces of the recent symposium in Vancouver, highlighting chapter member participation along the way.

The symposium was spread over 4½ days. Day zero, Saturday 25 July, started at 1 pm with the first of several Corporate Advisory Board meetings. The Corporate Advisory Board is composed of companies and organizations that represent the voice of the customer to INCOSE. Membership includes many aerospace organizations such as the US Naval Surface Warfare Center, The Boeing Company, Lockheed Martin Corporation, and Raytheon Systems Company. Also included are companies from other industries such as Delphi Automotive Systems. Richard Schwadron, Midwest Gateway Chapter Treasurer, represents Boeing - St. Louis in these meetings.

The full symposium kicked off on Sunday with meetings of the INCOSE Technical Board and the individual technical committees. These meetings further the heart of the technical work of INCOSE. In addition to the technical committee meetings on Sunday, chapter presidents and representatives from each of INCOSE's local chapters were invited to share the successes and frustrations of building and sustaining local chapters. Ken Kepchar, former chapter president and current co-chair of the INCOSE Chapters Committee, helped moderate this session and the similar one held on Monday.

Monday was dedicated to tutorials and technical committee meetings. Ken Kepchar and Richard Schwadron attended the tutorial titled Cross-Cultural Communication: Synergistic Solutions for International Systems Engineers. This tutorial set the tone for the entire symposium where the international flavor was very prevalent.

By Tuesday, the symposium was in very full swing, with the opening plenary session, featuring Bill Schoening, chapter member and current INCOSE President, leading the way. Bill's address to the assembly spoke to the growing INCOSE organization, it's technical triumphs and challenges, and again emphasized the international nature of systems engineering problems and solutions.



The technical paper and panel sessions started Tuesday morning and ran through late Wednesday afternoon. One hundred and twenty-seven papers were divided into six tracks: Processes and Methods, SE Management, Modeling and Tools, SE Applications, Measurement, and Education and Research.

The Processes and Methods track included explanations of systems engineering processes and case studies of their use. One paper of interest discussed "Systems Engineering in the Small". This paper described the pitfalls of small system development projects and how systems engineering processes can help the small contractor avoid them.

In the SE Management Track, Ken Kepchar was the session chair for the Managing Teams session and Richard Schwadron was the session chair for the Risk Management and Planning session. Carol Wilke and Jennifer Shylanski presented their paper on meeting the organizational challenges of Systems Engineering in the Managing Teams session. The abstract of this paper is printed later in this newsletter.

The sessions of the Modeling and Tools track included several papers concerned with how systems engineering tools interface (or don't interface) with object-oriented software development tools. Other papers in this track discussed applications of modeling techniques to teams and organizational development and using models to do proposal development.

The SE Applications track discussed a wide range of cases where systems engineering concept, methods and tools were successfully applied to a number of different industries. Individual sessions discussed case studies in the fields of Aviation, Defense and Aerospace, Telecommunications and Information Systems, and Health Care. The last session of the track then presented several papers dealing with SE applications in a multi-national setting. In the Aviation Applications session, Don Hess, Midwest Gateway Chapter Secretary, presented a paper with co-authors Matt Vance and Lt. Doug Bell, on the use of Quality Function Deployment in concept selection phase of a development. The abstract of this paper is printed later in this newsletter.

One theme that arose from the presentations of the Measurement track was the evolving nature of evaluating the Systems Engineering capability of an organization using some kind of maturity model. Several papers discussed the development and integration of various maturity models that have been evolving over the past several years. The next article in this newsletter explores one of these papers. A general membership meeting that focuses on this issue is planned for this month as well.

The final track of the symposium was focused on Education and Research. In this track, many papers described efforts underway at various universities to better educate potential systems engineers.

Thursday morning of the symposium was kicked off by the general INCOSE membership meeting. Included in this meeting was the presentation by Bill Schoening of the first class of INCOSE Fellows. This was followed by two lively panel sessions dedicated to working systems engineering issues across international boundaries.

Those panel sessions concluded the formal part of the symposium. However, Thursday afternoon provided several interesting technical tour options. Carol Wilke and Ken Kepchar took advantage of the tour of the Vancouver Air Traffic Control Centre. While the tour participants were not able to watch actual controllers in action, the Centre provided a fascinating introduction to the new air traffic control system that is in testing right now, and will soon replace the existing system across Canada.

In between all of the presentations, meetings, tutorials, panels and tours, many of those "hallway discussions" occurred that seem to happen whenever you get two or more technical people together. Don Hess noted that the conversations he participated in indicated that the INCOSE organization has less "angst" over what systems engineering is. Instead, practicing Systems Engineers are focusing on practical ways to get the job done. In particular, Don noted that this symposium was much more focused on current and potential SE practices than were the Boston and St. Louis Symposiums he had previously attended.

One of the favorite meeting places for symposium participants was the exhibit hall, where SE practitioners and tool vendors showed off their wares. On both Tuesday and Wednesday, a box lunch was provided for symposium participants in the exhibit hall, so everyone got a good chance to see how the automation of systems engineering processes is progressing. As Don Hess put it, the exhibits indicated that SE is "alive and prospering", since the number of companies developing and marketing tools for systems engineers is ever increasing.

With all of that plus fabulous scenery (oceans and mountains in the same vista), several good meals (salmon, of course), First People's dancing, and a harbor cruise with fireworks, the first outside-of-the-United States symposium of the International Council on Systems Engineering was both useful and delightful. Everyone should now be ready to head to Brighton in '99.

A Personal “Best Paper” Recommendation

by Jennifer Shylanski

INCOSE’s 8th Annual International Symposium presented many new and interesting ideas. One interesting concept for which several papers were presented was the merging of systems engineering capability maturity models and software engineering capability maturity models into a single capability maturity model for an organization. Another idea that received a lot of attention was the use of object oriented techniques in the system design. However, one of the most thought-provoking, and certainly the most entertaining, paper was presented by James R. Armstrong entitled “How Maturity Modeling Saved My Softball Team”. This paper’s thesis stated that while capability maturity models have a great benefit to systems engineering, there is a risk of overemphasis on the institutionalization of processes rather than the value and effectiveness of the effort.

The paper presented the efforts of a slumping softball team to use a capability maturity model (CMM) to improve its performance. The team apparently did everything correctly. They determined which CMM to implement. They assessed their maturity against the model. They documented their processes and trained the team members in teamwork. The league adopted their methodology. Metrics were defined, gathered and analyzed. The results? The league all-star team was clobbered in the end of season tournament.

The team assessed this abysmal result and came to the following conclusions:

- A good process does not make the task independent of personnel skills
- The wrong metric can be worse than no metric at all
- It is not enough to control processes; they must be worth the investment and do the job

The story did not end on this grim note, however. The team got a second chance the next season. This time around, they cut a lot detail out of the processes and focused on the things that made a difference and were basic to their level of play. They found that with this very focused application of processes and process improvement, things started to go right. Eventually, the league came to be recognized as the best-run league in the county. Competitors even felt that the league had an unfair advantage.

The paper presented the following conclusions:

- Process improvement can often focus on the existence of processes rather than how good the processes are.

- While in theory, good processes will develop as an organization matures to levels 4 and 5, less mature organizations still require effective processes.
- Process expertise is most valuable when combined with real systems engineering expertise.

Fall Tutorial on Risk Management

By Dean Bristow

Mark your calendar for November 7, 1998, so you can be sure to attend our Risk Management Tutorial. Dr. Donald W. Hurta will present some of the most successful methods for analyzing and managing risk. He will address risk management for new business planning, program management, strategic planning, and business analysis. For marketing, manufacturing, cost analysis, source selection, and product development, risk management provides key decision-makers with the information that can spell the difference between success and failure.

Dr. Hurta was a Professor of Management at the U.S. Naval War College and Head of both the Decision/Risk Analysis Division and Systems Acquisition Policy and Process Division within the Defense Systems Management College Department of Program Management. Dr. Hurta currently works as a private consultant on the topic. His clients include three dozen major companies, ranging from 3M to Bell Labs to Bristol Meyers.

The tutorial will be held all day Saturday, 7 November, in Lopata Hall at Washington University in St. Louis. A flyer will be published in a few weeks with instructions for registration.

September Chapter Event Features Discussion on Systems Engineering Maturity Models

Event to be held at Engineers’ Club of St. Louis

On September 28th, Midwest Gateway Chapter Members are invited to the Engineers’ Club of St. Louis for our September Chapter Program.

The program for the event will feature Bill Schoening discussing recent work of INCOSE members on the integration of various systems engineering maturity models. These models have been developed for use to characterize an organization’s capability to perform systems engineering. In particular, Bill will be focusing on how the EIA-731, INCOSE’s Systems Engineering Capability Model, is being used as the basis for this integrated framework through the Capability Maturity Model Integration Project. Anyone who is aware of

how the Software Capability Maturity Model (CMM) that was developed by the Software Engineering Institute has become a driver of software process improvement knows that this is a topic that should be of interest to all of us. Bill will tell us how we can get more involved in the project's outcome.

Jeff James, the chair of the chapter's Programs Committee, has arranged us to take advantage of our recent affiliation with the Engineers' Club (see From the President's Desk later in this newsletter for more information on this development) for this event. The facility, at 4359 Lindell in the Central West End, will be open to us at 4 pm, for general socializing and networking until our program starts at 5. The program will last until about 6:30 pm. A cash bar will be available.

For more information on the event, contact Jeff James at 314-233-2869.

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Events Around the Chapter

By Don Hess

The Midwest Gateway Chapter has been active with a social outing at a St. Louis Cardinals baseball game and a review of the papers that were to be presented by local chapter members in Vancouver at the INCOSE Symposium.

In June, twenty-six chapter members and guests attended a St. Louis Cardinals baseball game to watch Mark McGwire's attempt at surpassing a long-standing metric of 61 home runs in one season. While Mark thrilled us with another home run, the Cardinals lost the game.

Our July membership meeting featured symposium paper presentations by our local members headed for the INCOSE Symposium in Vancouver. Following a lavish spread of hors d'oeuvres, we were treated to very interesting presentations on Quality Function Deployment, and the Organizational Challenges of Systems Engineering. Abstracts and author contact information for these two papers are printed below. In addition, Dr. Vicki Johnson, from Embry-Riddle University, provided a captivating assessment of systems engineering at Boeing.

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Abstracts

Use of QFD as an Integrated Product Team Tool to Select Concepts Based Upon Requirements

By Don Hess, Matt Vance and Lt. Doug Bell

The potential for improved weapon loadouts on advanced aircraft was recognized by the Wright

Laboratories Munitions Division as a key enabling technology for dramatic improvements in the system performance and affordability. The dilemma faced by the Laboratory was the plethora of enabling technologies, and design concepts. Their combinations were staggering. Given recent weapon technology investments and varying strongly held professional opinions on the best aircraft integration approach, the way ahead was not obvious. Over 1000 potentially feasible combinations of options were available.

The Laboratory was interested in demonstrating feasible technologies to reduce risk and increase the technical readiness of compressed weapons technologies.

The overall goal was to increase the sortie effectiveness of small, F-16 class fighters by over an order of magnitude using new smaller more accurate munitions currently in development. Resources were available for further development of a limited number of compressed weapons technologies and aircraft carriage technologies. The way we chose to rapidly and accurately identify the high payoff concepts was the use of Quality Function Deployment (QFD) as a formal systems engineering tool in an Integrated Product Team environment. The use of QFD enabled the IPT to select high payoff technologies based upon "system requirements" and a high degree of professional knowledge and experience. The QFD process enabled us to eliminate biases built in from the different organizational views of the team which was made up of government / industry, weapon / aircraft, primes and suppliers and to identify synergistic concepts worthy of additional design and development.

For more information contact Don Hess at 314-233-7834.

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Task Teams – Meeting the Organizational Challenges of Systems Engineering

By Jennifer Shylanski and Carol Wilke

The organization required to engineer complex systems is complicated by many factors. The organization must ensure that the overall system requirements are understood, analyzed and allocated. It must also provide focus on the subsystems to which system requirements have been allocated to ensure cost effective design and implementation of the requirements. And, the organization must integrate the subsystems to form the system and ensure that system requirements are met. Often, organizations must also produce and support multiple configurations of the system simultaneously.

From The President's Desk

by Robert P. Scheurer

To meet this organizational challenge, Boeing's F/A-18 Avionic Weapon Systems team has established a formal organization of Integrated Product Teams focused on the avionic subsystems on the aircraft. Networked across that IPT organization, are project-oriented teams, known as task teams, that are focused on a particular system configuration update of those subsystems that must work together to provide coherent, integrated capabilities to the F/A-18 aircrew.

The task teams face many challenges that come from operating outside the formal organization. Boeing's F/A-18 Avionic Weapon Systems team determined, through an analysis of task team performance, that for the task teams to operate effectively, the teams and particularly the task team leaders must be well trained; there must be coordinated support from the formal organization; and the tools that support cost and schedule performance must provide insight into task team performance.

This paper addresses the steps to help the task teams meet these challenges. For the current configuration update, the F/A-18 Avionic Weapon Systems team developed a training program, a management support system, and PC-based management tools to help the task teams operate more effectively. The training, management support, and tools are being utilized in the current configuration update. A description of these changes is provided, and results from a survey of the task teams and task team leaders that was recently performed to assess the effectiveness of these changes is discussed.

For more information contact Carol Wilke at 314-233-8451.

INCOSE Symposium Plans

9th Annual Symposium to be Held in Brighton, England in '99

Are you working on a draft paper for INCOSE's 1999 Symposium? Now is the time to get those ideas polished up, because the submission deadline, 2 Oct 98, is less than one month away.

The theme for this symposium, to be held in Brighton, England on 6-10 June 99, is "Systems Engineering: Sharing the Future". Due to its location, this symposium promises to provide new and exciting insights into how Systems Engineering is practiced outside North America, particularly in Europe.

From all reports, INCOSE '98 in Vancouver was a huge success. A new record was set in attendance, with over 800 members and visitors experiencing the event. As the international organization tracks its progress in meeting attendance and membership numbers, your local chapter uses similar metrics to see how we are doing.

Through the first eight months, your Midwest Gateway Chapter has held a dinner meeting, a spring tutorial and spring tour, attended a Cardinal Baseball game, conducted our annual symposium paper preview, published two newsletters, issued six president's e-mail messages, held eight board meetings, and maintained a web site. For the remainder of the year, we are planning a member appreciation banquet, fall tutorial, fall tour, election of 1999 officers, two newsletters (including this one), four more president's e-mail messages, four monthly board meetings, an updated/remodeled web site, and a partridge in a pear tree. (Sorry, I'm getting a little ahead in the seasons – though the local department stores say it's never too early!). As you can see, metrics can reveal quite a lot of interesting information.

One nagging problem with metrics is that they sometimes reveal facts that we don't like to see. As I look over our own chapter membership numbers, I observe that our renewals for 1998 are down. Because of that, I have to believe that we're still missing the mark in producing and marketing the type of product that systems engineers are looking for. While your board of directors has been busy trying to bring high quality programs and events to the chapter, we still need help from you. If there is some systems engineering subject, speaker, company, tool, etc. which you would like to know more about or who will be in your area, please let us know. Jeff James, our Programs/Events chair, can be reached at 314-233-2869. Likewise, if you have friends, colleagues, co-workers, etc. who are interested in systems engineering, feel free to bring them to the next general membership meeting. Remember that the chapter covers the cost for prospective members on their first visit!

Other steps are being taken as well by your Board of Directors to boost interest and diversity in the chapter. Among these is an associate membership in the Engineer's Club of St. Louis. It is anticipated that this affiliation will introduce the advantages of systems engineering and the Midwest Gateway Chapter to members of other professional organizations and societies in the region. In conjunction with this membership, we are working on a new package that

explains to prospective members what systems engineering is and promotes the benefits of becoming an INCOSE member. If you would like to help in this endeavor, contact John Schrader at 314-232-6430.

On a final note, the chapter will be conducting its annual election of officers for the 1999 calendar year in the near future. If you or someone you know are interested in getting more involved with setting the course of the chapter as we enter the next millennium, please give serious consideration to running for one of the available offices: president-elect, secretary, or director (2 positions). Thanks in advance for your consideration and continued support.

Chapter Business

Highlights of Actions by the Board of Directors

The Board of Directors of the Midwest Gateway Chapter meets regularly on the second Tuesday of each month, with special meetings scheduled when needed. Any chapter member is welcome to attend. Actions and discussions at recent Board meetings have included:

- Decided to affiliate the chapter with the St. Louis Engineer's Club.
- Planned for the Fall Tutorial.
- Appointed the nominating committee for the 1999 Board of Directors

Please contact Board Secretary, Don Hess, for more information on particular items or on how to attend future meetings.

Information on how to contact each board member and the chair of each standing committee is listed on the last page of this newsletter.

Upcoming Programs

Mark Your Calendar for These Events

- 28 Sep, 5-6:30 pm, General Membership Program, to be held at Engineers' Club of St. Louis. Program topic is Capability Maturity Models for Systems Engineering. Cash bar available starting at 4 pm. See September Chapter Event article earlier in this newsletter for more information.

- 2 Oct, Deadline for submittal of draft papers for '99 INCOSE International Symposium, scheduled for June 99 in Brighton, England
- 7 Nov, Risk Management Tutorial

If you have ideas for upcoming programs, comments on past programs, questions on any of the programs listed or would like to participate on the Programs Committee, contact Jeff James at (314) 233-2869.

Got an Idea?

How to Contribute to this Newsletter

This Newsletter is published four times a year, with the goals of

- providing technical articles of interest to chapter members;
- stimulating discussion on systems engineering issues;
- keeping chapter members informed on upcoming programs and events.

The Newsletter staff is always looking for good articles, information on the technical issues Systems Engineers face on a daily basis, questions you'd like answered about the chapter or the International organization, and topics on which you'd like more information.

You can reach Newsletter editor Carol Wilke at (314) 233-8451. Contributions of articles or announcements, and letters to the editor can be sent to Carol Wilke at carol.e.wilke@boeing.com, or

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MS Word 6.0 format is preferred, but we can work with text from most word processing formats, if necessary. For graphics, please call. Please include name, e-mail and mail addresses, and phone number in all correspondence.

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