17TH ANNUAL INTERNATIONAL SYMPOSIUM

SYSTEMS ENGINEERING: Key to Intelligent Enterprises

INCOSE
International Council on Systems Engineering

24-28 June 2007
San Diego, California USA

Hosted by the Region 2 INCOSE Chapters

INCOSE2007

Photo credit: A. Michael Cutri

About INCOSE

What is Systems Engineering? Who is INCOSE?

Systems engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, and then proceeding with design synthesis and system validation while considering the complete problem: operations, performance, test, manufacturing, cost & schedule, training & support, and disposal.

Systems engineering integrates all the disciplines and specialty groups into a team effort by creating a structured development process that proceeds from concept to production to operation. Systems engineering considers both the business and the technical needs of all stakeholders with the goal of providing a quality product that meets the user needs.

The International Council on Systems Engineering (INCOSE) is a not-for-profit membership organization founded to advance the art and practice of systems engineering by helping individuals and enterprises turn complexity into competitive advantage. The Council is committed to shaping a future where systems approaches are preferred and valued in solving problems, whether providing solutions for product development or enabling holistic solutions to global challenges.

MISSION: The INCOSE mission is to foster the definition, understanding, and practice of world class systems engineering in industry, academia, and government.

GOALS

In pursuing this mission, INCOSE has set the following goals:

- To provide a focal point for dissemination of systems engineering knowledge
- To promote international collaboration in systems engineering practice, education, and research
- To assure the establishment of competitive, scaleable professional standards in the practice of systems engineering
- To improve the professional status of all persons engaged in the practice of systems engineering
- To encourage governmental and industrial support for research and educational programs that will improve the systems engineering process and its practice

INCOSE has grown significantly since its formation in 1990. Today, there are over six thousand members representing a broad spectrum — from student to senior practitioner, from technical engineer to program and corporate management, from science and engineering to business development. Members work together to advance their technical knowledge, exchange ideas with colleagues, and collaborate to advance systems engineering.

INCOSE is a young, dynamic and growing organization. Its 6000 individual members are affiliated with 51 chartered chapters or national societies worldwide. The chapters, volunteer committees, and working groups provide the energy and direction for the organization. In addition, nearly 60 international enterprises from industry, academia, and government participate in the Corporate Advisory Board that provides guidance to INCOSE's leadership. The industries represented include aerospace, automotive, defense, electronics, energy, general machine building, health, IT, mining, and transport.

INCOSE conducts two annual events; the International Workshop, held early in the year, serving as INCOSE's principal projects planning platform, and the International Symposium, held in the June/July period. The International Symposium is INCOSE's foremost event, drawing over 1000 participants for four days of technical exchanges, presentations, panel discussions, tutorials, and exhibitions.

For further information and to find links to INCOSE Chapters and Technical Working Groups, Visit: www.incose.org

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Welcome

from the INCOSE President

Dear Delegates,

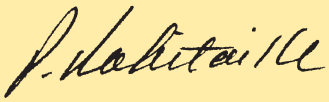
On behalf of INCOSE, permit me to extend my warm welcome to our 2007 International Symposium in San Diego, California. Located on California's Southern Coast, San Diego is internationally recognized for its beauty, climate, vibrant academic community and many multi-cultural tourist attractions.

Our 2007 symposium theme, ***Systems Engineering: Key to Intelligent Enterprises***, has been thoughtfully structured to enable an international community of systems engineers to come together, meet, and discuss a wide range of contemporary issues impacting industry, academia and society at large. As INCOSE grows, so does the international flavor of our symposium – the Plenary Speakers bring perspectives on SE for the London Underground, Pacific Rim, and South America.

Widely known for its fine weather and beautiful beaches, San Diego is California's second largest city and features over 90 golf courses, surfing, fishing, diving, cycling, many wonderful parks, museums and restaurants. From an educational perspective, San Diego is home to the University of California – San Diego, San Diego State, and Scripps Institution of Oceanography to name but a few.

Other neighboring attractions include the famous Mount Palomar Observatory, Los Angeles and Baja California. The cultural diversity of Southern California provides additional richness across all of these venues.

So mark the 2007 International Symposium on your calendar and plan to spend a wonderful week with INCOSE in San Diego. We look forward to hearing the latest in systems engineering, exchanging ideas with experts from around the world, renewing old acquaintances, and making many new ones!



Paul Robitaille
President, INCOSE

from the Symposium General Chair

We chose the symposium theme, ***"Systems Engineering: Key to Intelligent Enterprises,"*** to highlight the dramatic expansion of opportunities available to all who learn to see and treat enterprises as systems and systems as enterprises.

You can choose from a great agenda of papers, panels, tutorials/workshops, international plenary speakers, a plenary panel, a focused academic forum, working group sessions, exhibitors and even a tour of the tokomak. Social events and entertainment are included as are opportunities for networking. To enrich your experience we have invited professionals from other societies and a variety of champions and stakeholders to co-learn with INCOSE members.

This symposium is designed and produced by members for members. Whether you are a Systems Engineer, a Program Manager, an Exhibitor or a Sponsor, you can explore the value of systems engineering for leveraging both the hard and soft technologies in your future projects. Moreover, the agenda gives you plenty of information with which to plot your own personal and career development.

This symposium offers outstanding value. All of the above, packaged for your convenience, for fees that are lower than most comparable events make this your event of the year. Seize the opportunity.

Come early and stay late. Enjoy San Diego with your family or friends. See www.incose.org/Symp2007 for personal recreation and dining favorites of the local chapter members. Also use it to discover things to do and see in the Southern California area.

An alliance of Region 2 INCOSE Chapters (San Diego, Central Arizona, Colorado Front Range, Enchantment, Los Angeles, San Francisco Bay Area, Silver State, and Southern Arizona) started on this more than a year ago. We dedicated ourselves to ensuring a great experience with memories to treasure for all attendees. We think we have done it. Come and see for yourself. Welcome.

Randy W. Ade
2007 Symposium General Chair

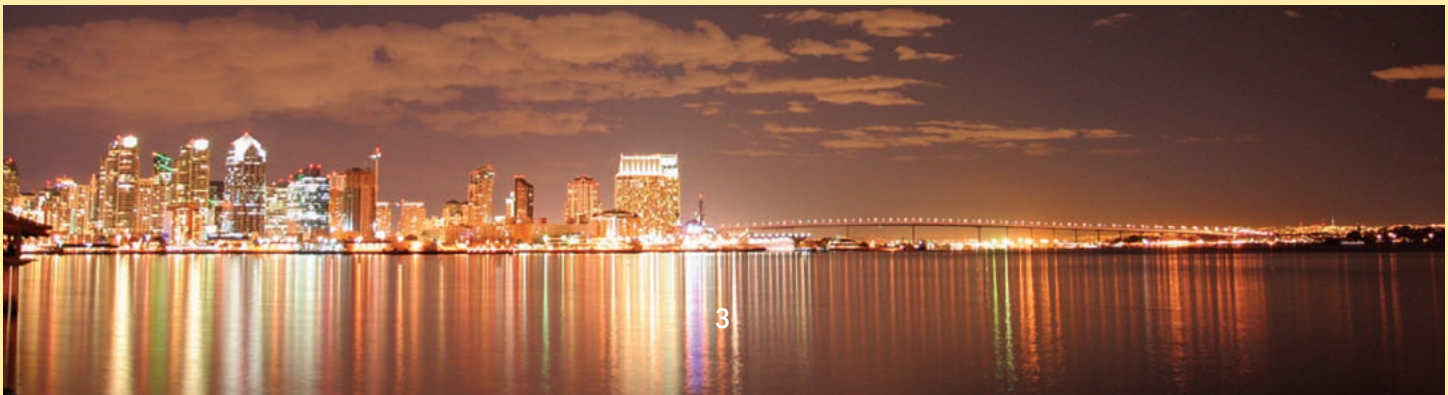


Photo credit: Oliver Asis

Welcome from the Technical Committee

The most successful enterprises in the world today excel at absorbing information, quickly assessing gaps between where they are and where they want to be, formulating actions which reduce these gaps while preserving options for future decisions, and then acting decisively. We invite you to come learn how to use the foundation of intelligent systems engineering to propel your organization to greater success. In the process, you can improve your own effectiveness as a professional – and probably make your job more rewarding and satisfying too!

I encourage you to participate in this 17th Annual INCOSE Symposium. Too often, we get so busy within our own organizations that we miss key opportunities to learn about new approaches and technologies. This Symposium, in a few short days, offers you an unparalleled opportunity to get a quick update on the art and practice of systems engineering. Peer reviews led by our Technical Leadership Team have resulted in an impressive collection of information and resources, with Best Papers identified for your attention. In addition, you will have the opportunity to participate hands-on with your choice of Technical Working Groups addressing many different application sectors and systems engineering enablers. We look forward to having you join us in San Diego for this year's premiere INCOSE event.

Dorothy McKinney
Technical Chair of the INCOSE 2007 Symposium

Welcome from the Member Board

The 17th Annual INCOSE International Symposium provides you an outstanding opportunity to see and hear the latest in the world of systems engineering. This event is one of the highlights of INCOSE membership.

As chair of your Member Board, I encourage you to attend the premier event of the INCOSE year in San Diego, California. You will have the opportunity to hear from a wide range of practitioners in diverse areas, giving you new and valuable insights that you can take and apply in your work. For those of you who are in leadership positions, there also will be opportunities to meet others in similar positions, and exchange views and experiences.

The Symposium is not only a technical event but also an opportunity to recognize many contributions to INCOSE and systems engineering. This year, we will again celebrate the achievements of our chapters through the presentation of the President's Award for outstanding chapter, the Directors' Award for most improved chapter, and the Circle Awards for chapter excellence for all chapters that have served their members well over the last year.

I hope you can take advantage of this opportunity to improve your systems engineering knowledge and skills and look forward to seeing you in San Diego!

Jim Armstrong
Chair, Member Board

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INCOSE gratefully acknowledges the generous support of the Corporate Advisory Board (CAB)

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Schedule-at-a-Glance

Saturday • 23 June 2007

0800 – 1700	CAB
0800 – 1700	Working Groups
0900 – 1600	SEANET Workshop *(Ticket Required)*
0945 – 1715	Certification Course *(Ticket Required)*

Sunday • 24 June 2007

0700 – 1700	Symposium Registration
0700 – 1900	*Cyber Café* Open
0800 – 1700	Two Half-Day Tutorials *(Ticket Required)*
0945 – 1715	Certification Course *(Ticket Required)*
0945 – 1715	Two Full-Day Tutorials *(Ticket Required)*
0800 – 1700	Working Group Meetings
1000 – 1800	Speaker Ready Room
1300 – 1700	Two Half-Day Tutorials *(Ticket Required)*
1700 - 1800	Chapter Presidents' Reception
1800 – 2130	Sponsor/CAB Dinner *(Invitation Only)*

Monday • 25 June 2007

0700 – 0745	Speakers/Session Chairs' Breakfast
0700 – 1700	Symposium Registration
0700 – 1800	Speaker Ready Room
0700 – 1900	*Cyber Café* Open
0800 – 0930	Opening Plenary
0945 – 1715	Two Full-Day Tutorials *(Ticket Required)*
1000 – 1200	Session 1: Four Technical Paper Tracks and Two Panel Tracks
1000 – 1700	Academic Forum
1200 – 1330	Lunch
1200 – 1300	New Member Orientation Lunch
1300 – 1700	Two Half-Day Tutorials *(Ticket Required)*
1330 – 1500	Session 2: Four Technical Paper Tracks
1530 – 1700	Session 3: Four Technical Paper Tracks
1715 – 1800	Working Group Introductions
1800 – 2030	Ice Breaker Reception

Tuesday • 26 June 2007

0700 – 0745	Speakers/Session Chairs' Breakfast
0700 – 1700	Symposium Registration
0700 – 1800	Speaker Ready Room
0700 – 1900	*Cyber Café* Open
0800 – 0930	Tuesday Keynote Speaker
0930 – 1700	Exhibits Open
0945 – 1715	Two Full-Day Tutorials *(Ticket Required)*
1000 – 1200	Session 4: Four Technical Paper Tracks and Two Panel Tracks
1200 – 1330	Lunch/Exhibitor Presentations

Tuesday • 26 June 2007 *(continued)*

1300 – 1700	Two Half-Day Tutorials *(Ticket Required)*
1330 – 1700	Key Reserve Paper Presentations
1330 – 1500	Session 5: Two Technical Paper Tracks and Two Panel Tracks
1530 – 1700	Session 6: Three Technical Paper Tracks and MBSE Grand Challenge
1700 – 1800	Exhibit Hall Social Hour
1900 – 2200	Latin American Dinner

Wednesday • 27 June 2007

0700 – 0745	Speakers/Session Chairs' Breakfast
0700 – 1700	Symposium Registration
0700 – 1800	Speaker Ready Room
0700 – 1900	*Cyber Café* Open
0800 – 0930	Wednesday Plenary Panel
0930 - 1700	Exhibits Open
0945 – 1715	Two Full-Day Tutorials *(Ticket Required)*
1000 - 1200	Session 7: Four Technical Paper Tracks and Two Panels
1200 - 1330	Lunch/Exhibitor Presentations
1300 - 1700	Two Half-Day Tutorials *(Ticket Required)*
1330 – 1700	Technical Information Exchange Session (TIES)
1330 - 1500	Session 8: Four Technical Paper Tracks
1530 - 1700	Session 9: Four Technical Paper Tracks
1800 - 1900	Reception
1900 - 2200	Banquet and Entertainment

Thursday • 28 June 2007

0700 – 0745	Speakers/Session Chairs' Breakfast
0700 – 1600	Symposium Registration
0700 – 1500	Speaker Ready Room
0700 – 1500	*Cyber Café* Open
0800 - 1300	Exhibits Open
0800 - 1200	Three Half-Day Tutorials *(Ticket Required)*
0800 - 1000	Session 10: Six Technical Panel Tracks
1030 - 1200	Session 11: One Technical Paper Track and Five Working Group Presentations
1200 - 1300	Lunch/Exhibitor Presentations
1300 - 1500	Thursday Closing Keynote/Plenary Session
1500 - 1600	Closing Reception

Friday • 29 June 2007

0800 - 1300	General Atomics Technical tour *(Ticket Required)*

FINAL PROGRAM SUBJECT TO CHANGE

Symposium Speakers

MONDAY OPENING PLENARY SPEAKER

Mind the Gap: Applying SE to Address the Delivery Challenges of London Underground Programmes

Mr. Kuldeep Kumar Gharatya

Engineering Directorate, London Underground Ltd

Kuldeep was born in London, England. His Undergraduate degree is in Mechanical Engineering and he went on to study a Post Graduate Masters degree in Systems Engineering at University College London, which he achieved with distinction. His Masters project was titled 'SE—From Business Case to Organisational Implementation'.

Kuldeep is a Chartered Engineer and a member of the Institution of Mechanical Engineers and a member of the Institution of Engineering and Technology. He is also an active member of the International Council on Systems Engineering, and serves on the UK Chapter's Railway Interest Group. His INCOSE Intelligent Transportation and Transit Systems Working Group (ITTSWG) involvement has led to London Underground entering into an agreement with New York City Transit Authority on sharing knowledge and good practice in Systems Engineering.

Kuldeep joined London Underground in 1997 and has worked in the various departments of the company. This was an experience which led him to subsequently promote a Systems Engineering approach. He is now the professional head for systems engineering and human factors.

London Underground has begun an unparalleled level of upgrade work as part of a 30 year Public Private Partnership (PPP). Systems Engineering (SE) will play a vital role in ensuring these large programmes deliver in the challenging timescales set. For SE professionals the challenge is not 'doing' SE but embedding systems engineering as part of the delivery process.

In the past few years there has been an increasing recognition of the value of Systems Engineering and Kuldeep has overseen the development of a new team within the Engineering Directorate. He continues to work hard at embedding and raising the profile of Systems Engineering in London Underground and its delivery partners.

TUESDAY PLENARY SPEAKER

Singapore: An Example of a Large Scale System

Professor Lui Pao Chuen

Chief Defence Scientist, Ministry of Defence (MINDEF)

Professor Lui Pao Chuen graduated from the University of Singapore in 1965 with a degree in Physics. He joined the Ministry of Defence (MINDEF) in 1966 as the Officer-in-Charge of Tests, Evaluation and Acceptance Section. In 1970 he established the Science and Management Group, reporting directly to the Second Permanent Secretary of Defence for the planning and management of major development projects.

In 1971, he was awarded the first MINDEF fellowship for postgraduate education and elected to pursue his studies at the United States Naval Postgraduate School, Monterey, California. In 1973, after graduating with a Master's degree in Operations Research and Systems Analysis he was appointed acting Director, Logistics Division, MINDEF.

In 1975, he was appointed Special Projects Director and was made responsible for the planning, system engineering and management of the implementation of major weapon systems for the SAF. As he was responsible for both operational and technical matters he could adopt a "Conception to Retirement" systems approach which later became standard practice in MINDEF.

Photo credit: Salvatore Bonavita

In 1984, he held the appointment of acting Director, Joint Operations and Plans Directorate of the Ministry of Defence concurrently with his appointment as Director, Special Projects Organisation. In 1986 he was made Senior Director to set up the Defence Material Organization through the merger of the Material Management Organization and the Special Projects Organization. He was also appointed to the newly created post of Chief Defence Scientist to provide advice to the Ministry and the Singapore Armed Forces.

He has been on the board of directors of various Government-linked-companies, Government agencies and University of Singapore and the recipient of many service awards. Currently, he is holding appointments on the management boards of research institutes and corporations, and in the universities.

WEDNESDAY PLENARY PANEL

Dr. Elliot Axelband

Senior Engineer, RAND Inc.

Dr. Elliot Axelband is: a Director of Legacy Engineering LLC, a private consultant, an INCOSE Fellow and past chair of its Fellows Selection Committee, an IEEE Life Fellow, and a recipient of the IEEE Centennial Medal and the USAF Meritorious Service Award. His research at RAND has included the design of enterprises.

Azad M. Madni, Ph.D.

CEO, Intelligent Systems Technology, Inc.

Dr. Azad Madni is the founder and CEO of Intelligent Systems Technology, Inc., a company that he founded in 1994 to pursue innovative research in enterprise systems architecting, process design and transformation, and simulation-based e-learning. He is the recipient of several prestigious, international and national awards including the *2006 C.V. Ramamoorthy Distinguished Scholar Award* from the Society of Design and Process Science at the Ninth World Conference on Integrated Design and Process Technology, the SBA's National Tibbetts Award for California for excellence in technology innovation, and Mass Mutual and U.S. Chamber of Commerce's Blue Chip Enterprise Award for entrepreneurship. He is the only two-time (2000, 2004) Developer of the Year Award winner from the Technology Council of Southern California. He is an elected Fellow of the IEEE, INCOSE, SDPS, and an Associate Fellow of AIAA.

Abraham Meilich, Ph.D., C.C.P.

Certified Information Systems Architect

Lockheed Martin Integrated Systems and Solutions

Dr. Meilich's most recent position was Lead, Enterprise Architecture and Engineering in the Net Centric Integration, Advanced Concepts Organization at Lockheed Martin His career spans 36 years in the mechanical, electrical, computer, aerospace, space, and information systems engineering and architecture domains. His current professional focus is on the application of system engineering principles and best practices to enterprise architecture and systems of systems engineering to support the design of Net-Centric solutions for the DOD and modernization of government information systems.

Jack Ring

Systemist

Jack led more than 50 initiatives in enterprise development, operation and evolution during twenty years with GE and ten with Honeywell. During the subsequent nineteen years he similarly assisted dozens of high tech startups and turnarounds including IBM's Object Technology Practice, Ascent Logic and the Edelbrock Corp. Currently he is co-founder of Kennen Technologies LLC to commercialize semantic technologies for knowledge workers. In addition, he co-facilitates the Intelligent Enterprises Working Group, consisting of approximately 140 persons from 80 companies, which has produced the 99 page report on Intelligent Enterprise Knowledge Claims that is included on your symposium CD. Jack was elected INCOSE Fellow in 2002

Avigdor Zonnenshain, Ph.D.

Deputy for Operations

Ordinance Systems Division, RAFAEL

Dr. Zonnenshain is a Ph.D. for Systems Engineering from the University of Arizona, Tucson. Dr. Zonnenshain is an active member of the Israel society for quality (ISQ). He is the leader of the assessment team for the National Quality Award for Industry. He is the chairman of the standardization committee for management & quality. He is active in the community as the chairman of steering committee of RAFAEL for Social Responsibility. Dr. Zonnenshain is the president of INCOSE_IL.

THURSDAY CLOSING PLENARY SPEAKER

Engineering Risk Analysis: A Systems Approach

Dr. M. Elisabeth Paté-Cornell

Professor and Chair, Stanford University

Dr. M. Elisabeth Paté-Cornell was born in Dakar, Senegal. Her academic degrees are in mathematics and physics (BS, Marseilles, France, 1968), applied mathematics and computer science (MS and Engineer Degree, Institut Polytechnique de Grenoble, France, 1970; 1971), operations research (MS, Stanford, 1972), and engineering-economic systems (Stanford, PhD, 1978). She was an Assistant Professor of Civil Engineering at MIT (1978 to 1981). In 1981, she joined the Stanford Department of Industrial Engineering and Engineering Management, where she became Professor (1991), then Chair (1997). In 1999, she was named the Burt and Deedee McMurtry Professor in the Stanford School of Engineering. She oversaw from 1999, the merger of two Stanford departments to form a new department of Management Science and Engineering, which she currently chairs. She is a Senior Fellow (by courtesy) of the Stanford Freeman Spogli Institute for International Studies.

Dr. Paté-Cornell was elected to the National Academy of Engineering in 1995, to its Council (2001–), and to the French Académie des Technologies (2003). Her current memberships include the President's Foreign Intelligence Advisory Board (2001-2004; 2005–), the Advisory Council of NASA's Jet Propulsion Lab. (2002-), and the Boards of Trustees of the Aerospace Corp. (2004–) and of InQtel (2006–). She is a member of the Board of Advisors of the Naval Postgraduate School, which she chaired from 2004 to 2006.

Dr. Paté-Cornell is a world leader in engineering risk analysis and management and more generally, the use of Bayesian probability to process incomplete information. Her research and that of her Engineering Risk Research Group at Stanford have focused in recent years on the inclusion of both technical and management factors in probabilistic risk analysis models with applications that include the NASA shuttle tiles, offshore oil platforms, medical systems, and since 2001, terrorist attacks on the US, and the assessment of intelligence information.

Academic Forum

Monday, 25 June 2007 • 1000-1700

The Academic Forum is intended to further systems engineering (SE) education. In this forum, professors, students, university administrators, short course and tutorial instructors, researchers, intellectuals and innovators will share news and views regarding the education of SEs as well as the SE of education. Topics will range from innovations in SE to SE research, from internationalization of SE higher education to educational philosophy, from quality assurance in higher education to the pragmatics of accreditation. All Symposium attendees are welcome to attend all or part of this eclectic forum.

Discussion of hot topics such as, Should universities be allowed to offer a BS in SE? Why do SEs get no respect? What is a system of systems? Should universities be involved in the INCOSE certification system? How can we introduce SE topics into K-12 education? How can we infiltrate Colleges of Education? How can we affect State Departments of Education that set testing standards?

Biologically Inspired Systems Concepts — A personal history
George Friedman, *University of Southern California*

Nature's Predator-Prey Abstraction
Michael Gregg, *Boeing Phantom Works;* **Ann Miller** and **Cihan Dagli,** *University of Missouri – Rolla*

Reports on Two Dozen SE Society Activities
Chair: **Terry Bahill,** *University of Arizona*

Engineering Complex Systems
William Rouse, *Georgia Institute of Technology*

A Research Agenda for Systems of Systems Architecting
Ricardo Valerdi, *Massachusetts Institute of Technology,* with **Elliot Axelband, Thomas Baehren, Barry Boehm, Winsor Brown, Ed Colbert, Dave Dorenbos, Scott Jackson, Azad Madni, Gerry Nadler, Rod Robertson, Paul Robitaille, Stan Settles, Thomas Tran**

A Reference Curriculum for SE Including Distance Learning
Dinesh Verma, *Stevens Institute*

Measurement of Outcomes and Objectives in SE Programs
Peggy Brouse, *George Mason University*

SE Basics Using Measures, Concepts and Processes of Planguage
Tom Gilb, *RPL*

Meeting the Need for Defence SEs
David Cropley and **Alistair Campbell,** *University of South Australia*

A ConOps for a SE Education Community
Jack Ring, *Innovation Management* and **Wayne Wymore,** *University of Arizona*

Tutorials

Half-day tutorials: AM – Morning; PM – Afternoon

Saturday, 23 June 2007

- C00 – **INCOSE SE Handbook v2a in Preparation for the CSEP Exam** (Sat/Sun 2-day Course) John Clark, *Northrop Grumman*
- SEA – **SEANET Workshop** (doctoral students) (Full Day)

Sunday, 24 June 2007

- F0A – **Response Enabling Architecture & Design Principle for Agile Systems and Enterprises**
  Rick Dove, *Stevens Institute of Technology*
- F0B – **The Evolutionary Project Management Method: Practical Rules, Principles & Templates to Practice Evolutionary Project Management**
  Tom Gilb, *RPL*
- H0C – **Using Risk Management to Boost an Enterprise's IQ** (AM)
  Mark Powell, *SAIC, Stevens Institute of Technology*
- H0D – **Model Based Systems Engineering For Project Success: The Complete Process** (PM)
  James Long, *Vitech Corporation*
- H0E – **AP233 Systems Engineering and Design Overview** (AM)
  Philip Spiby, *Eurostep Limited*
- H0F – **AP233 Systems Engineering and Design Implementation** (PM)
  Philip Spiby, *Eurostep Limited*

Monday, 25 June 2007

- F01 – **An Introduction to the OMG Systems Modeling Language** (OMG SysML), Sanford Friedenthal, *Lockheed Martin*; Alan Moore, *Mathworks*; Rick Steiner, *Raytheon*
- F02 – **Architecture Frameworks & Modeling**
  James Martin, *The Aerospace Corporation*
- H01 – **Integrating SE with Earned Value Management** (PM)
  Paul Solomon, *Performance Based Earned Value*
- H02 – **Thinking & Learning- Outside the Box** (PM)
  Howard Eisner, *The George Washington University*

Tuesday, 26 June 2007

- F03 – **From Research to Reality: Making COSYSMO a Trusted Estimation Tool in Your Organization**
  Ricardo Valerdi and Chris Miller, *MIT*
- F04 – **How to Define Practical Systems Engineering Metrics**
  Tim Olson, *Quality Improvement Consultants*
- H03 – **Connecting Enterprise Modeling and Requirements Using an Object-Oriented Approach** (PM)
  Hermann Kaindl, *Vienna University of Technology*
- H04 – **Managing Technical Uncertainty** (PM)
  Robert Dale, *MBDA* and A. Lagarrique, *Airbus*

Wednesday, 27 June 2007

- F05 – **Complex Systems for the Systems Engineer**
  Sarah Sheard, *The George Washington University*
- F06 – **Applying SE to the Intelligent Enterprise and its Work Products**
  Charles Wasson, *Author*
- H05 – **Systems Engineering Tools- Applying Systems to Defining, Choosing, and Developing SE Tools** (PM)
  Mark Sampson, *UGS*
- H06 – **Architecting & Engineering Systems, Processes, & Organization Using the Design Structure Matrix (DSM)** (PM)
  Tyson Browning, *Texas Christian University*

Thursday, 28 June 2007

- H07 – **ISO/IES 15288 & CMMI: SE Similarities & Differences** (AM)
  David Walden, *Sysnovation, LLC*
- H08 – **Managing Requirements Risk** (AM)
  David Gelperin, *Clear Specs Enterprises*
- H09 – **Enterprise Architecture Standards & Their Use in SE** (AM)
  Richard Martin, *Tinwisle Corporation*; Edward Robertson, *Indiana University*; L. Mark Walker, *Lockheed Martin Corporation*

Technical Papers

Commercial Applications

The Compilation of an Integrated Qualification and Commissioning Programme for a Nuclear Power Plant
B. C. Brits, *PBMR Ltd*

A Multi-Tier, Multi-Role Security Framework for E-Commerce Systems
M. Micallef, E. Cachia, *University of Malta*

Optimal Integration and Test Planning Applied to Lithographic Systems
R. Boumen, I. S. de Jong, A. van de Mortel-Fronckzak, K. E. Rooda, *Eindhoven University of Technology*

Communities & Systems Engineering

Analysis of Singapore's 1991 Strategic Economic Plan Using the Large Scale Systems Engineering Framework
E. S. Chia, *Defence Science and Technology Agency*

Coping with System Integration Challenges in Large Complex Environments
G. Muller, *Embedded Systems Institute*

No Vehicles on the Mall
C. Pringle, R. S. Carson, *Central Washington University*

The Story of Verdal: How One Intelligent Community Uses Systems Engineering to Enable Sustainable Development
C. Haskins, *NTNU*

Complexity

Better Use of Design Descriptions to Embrace Complexity and Creativity in Systems Engineering.
G. Strengers, *Tenix Defence Pty Ltd*

Principles of Complex Systems for Systems Engineering
S. A. Sheard, *Third Millennium Systems LLC*

System Resilience: Capabilities, Culture and Infrastructure
S. Jackson, *University of Southern California*

COSYSMO & Changeability

Defining Changeability: Reconciling Flexibility, Adaptability, Scalability, and Robustness for Maintaining System Lifecycle Value
A. M. Ross, D. H. Rhodes, D. E. Hastings, *Massachusetts Institute of Technology*

Incorporating Security and Survivability into the System of Systems Architecting
A. Singh, C. H. Dagli, *University of Missouri-Rolla*

Lessons Learned From Industrial Validation of COSYSMO
R. Valerdi, *MIT;* J. E. Rieff, *Raytheon*; G. J. Roedler, *Lockheed Martin;* M. J. Wheaton, *The Aerospace Corporation;* G. Wang, *BAE Systems*

Decision Assessment

Decision Analysis for Design Trades for A Combined Scientific-Technological Mission Orbit on Venus Micro Satellite
J. Herscovitz, D. L. Barnett, *RAFAEL*

Does INCOSE Need PR?
A. Zonnenshain, *RAFAEL*

Incorporating Software Cost and Risk Assessment into Early System Development Trade Studies
K.A. Weiss, *Jet Propulsion Laboratory*; N. G. Leveson, *MIT;* J. Francis, *Payload Systems, Inc.*

Developing SE Professionals

Challenges in the Development of Systems Engineering as a Profession
I. Dixit, *University of Southern California;* R. Valerdi, *MIT*

An Integrated Approach to Developing Systems Professionals
H. L. Davidz, M. W. Maier, *The Aerospace Corporation*

Measurably Improving Your Systems Engineering Requirements
T. Olson, *Quality Improvement Consultants, Inc. (QIC)*

A Model for Successful Engineering Internship: Growing Our Own Future Engineers
M. A. Malloy, *The MITRE Corporation*

Drivers for SE

Defining Lean Systems Engineering Processes and Procedures
T. Olson, *Quality Improvement Consultants, Inc.*

Milestone Driven Systems Engineering
B. H. Wells, *Raytheon Integrated Defense Systems*

The US Ballistic Missile Defense System: A Case Study in Architecting Systems-of-Systems
H. L. Hollon, C. H. Dagli, *University of Missouri-Rolla*

Frameworks

Architecture Frameworks in System Design: Motivation, Theory, and Implementation
M. G. Richards, N. Shah, D. Hastings, D. Rhodes, *Massachusetts Institute of Technology*

The Hitchins-Kasser-Massie (HKM) Framework for Systems Engineering
J. E. Kasser, *University of South Australia*

A Metrics Framework for Capability Definition, Engineering and Management
S. Lam, J. G. Pogotto, *Defence Research and Development Canada;* C. Pogue, D. Hales, *CAE Professional Services Inc*

Framework & Commonality

An Enterprise Architecture Framework for Developing Command and Control Systems
L. Yeoh, C. Lam, *Defence Science and Technology Agency;* H. Syn, *ST Electronics Pte Ltd*

The Evolution of Commonality Strategies
R. Boas, E. Crawley, *Massachusetts Institute of Technology*

Using Weak Bisimulation for Enterprise Integration Architecture Formal Verification – I
E. Cachia, M. Vella, *University of Malta*

Human Factors

Human Functional Analysis of Lean Staffing: Extensions to the Department of Defense Architecture Framework (DoDAF)
G. Lintern, *General Dynamics*

Organizational Strategies for Systems Engineering Capability Improvement
Maria. M. So, J. F. Andary, M. Caldwell, *NASA/Goddard Space Flight Center*

Overcoming Engineering Challenges of Providing an Effective User Interface to a Large Scale Distributed Synthetic Environment on the US Teragrid: A Systems Engineering Success Story
R. S. Kalawsky, I. R. Holmes, *Loughborough University*

Intelligent Decisions

A Decision Support System to Schedule Design Activities in Aircraft Industry
I. Lizarralde, *EADS Corporate Research Centre; P. Esquirol, LAAS-CNRS;* A. Riviere, *EADS CRC France*

Case Study: Tailoring CMMI®-based Command Media for a Company's Individual Business Areas
D. Turner, R. Adkins, *Harris Corporation*

Emerging Real-Time Intelligent Agents In Space Launch Verification and Anomaly Resolution
D. G. Beshore, *The Aerospace Corporation*

Time-Expanded Decision Networks: A Framework for Designing Evolvable Complex Systems
M.Silver, O. de Weck, *Massachusetts Institute of Technology*

Intelligent Enterprises

Analyzing Interactive Product Development Tasks Using Social Network Metrics
S. T. Collins, *University of Connecticut;* P. Seshadri, *Hamilton Sundstrand*

Intelligent Enterprises *(continued)*

An Approach to a Network Centric Product Development System
R. Abbott, A. Miller, C. H. Dagli, *University of Missouri-Rolla*

Capability Engineering: Learning from Practice
W. Robbins, C. Lalancette, M. Lizotte, C. Necaille, J. Pagotto, B. Waruszynski, *Defence R&D Canada*

Get Smart- Enabling Enterprise Systems Intelligence and Decision Making through Critical Parameter Management
C. N. Hamman, N. A. Mackertich, *Raytheon Integrated Defense Systems*

Human Factors Integration for MODAF: Needs and Solution Approaches
A. Bruseberg, *Systems Engineering and Assessment Ltd.*

Integrating the Intelligent Enterprise
K. Dixon, *University of Bath;* S. Brown, *BAE Systems;* J. Keirl, *Dstl*

Seven Secret Tips To Building Intelligent Enterprise Architectures
J. W. Carl, *Riverside Research Institute / Air Force Center for SE;* J. M. Colombi, *US Air Force Center for SE;* R. Kaffenberger, *Ferchau Engineering GmbH*

Simple Yet Profound Enterprise Impact
H. Mooz, *The Center for Systems Management*

SE for the Intelligent Enterprise – More Important Than You May Think
R. Kaffenberger, *Ferchau Engineering GmbH*

System Evolution in the Intelligent Enterprise: An Historical Case Study of VISA's Transaction Processing Systems
M. S. Cokus, J. W. Dahlgren, *The MITRE Corporation*

Systematic Enterprise Definition
J. O. Grady, *JOG System Engineering, Inc.*

"Tour d'horizon" in Requirements Engineering – Areas Left for Exploration
M. F. Kossmann, C. Ingamells, *AIRBUS UK*; M. Odeh, A. Gillies, *Univ. of the West of England*

Towards an Integrated Model of Enterprise Systems
G. A. Kennedy, C. E. Siemieniuch, M. A. Sinclair, *Loughborough University/Systems Engineering Innova*

Modeling

Benefits and Costs of Model-Based Fault Diagnosis for Semiconductor Manufacturing Equipment
J. Pietersma, A. J. van Gemund, *Delft University of Technology*

Driving System Development Process from Strategic Goals to Requirements Specification
H. El Ghazi, *Centre de recherche en informatique (C.R)*

HCI Aspects of SysML and Architectural Frameworks
M. C. Hause, F. Thom, *Artisan Software Tools*

Hybrid Systems Dynamics, Petri Net, and Agent-Based Modeling of the Air and Space Operations Center
B. E. White, *The MITRE Corporation*

MBSE Challenge
INCOSE Technical Leadership Team MBSE Participants

Model-Based Design and Verification of Fault-Tolerant Systems
M. Sorea, *EADS Corporate Research Centre;* H. Ruess, *Vector Consulting GmbH*

Model-Based Techniques for Intelligent Integration and Testing in Industry
N.CW.M Braspenning, J.M. van de Mortel-Fronczak, J.E. Rooda, *Eindhoven University of Technology*; D.O. van der Ploeg, *ASML*

Modeling of Hardware Software Performance of High-Tech Systems
G. Muller, *Embedded Systems Institute;* P. van den Bosch, *Oce Technologies;* M. Verhoef, *Chess;* O. Fluorescu, *Technical University Eindhoven*

Modeling Hierarchy, Coping with the Dynamic Range from Design Details up to Business Metrics; Illustrated by a Semiconductor Case
G. Muller, *Embedded Systems Institute*

Reuse and Usage for System Engineering Model Elements
D. K. Smith, *UGS*

A Vision for Super-Model Driven Systems Engineering
S. R. Piggott, L. Hartman, P. Melanson, *Canadian Space Agency*

Notable Approaches

Object Oriented Systems Engineering Method (OOSEM) Applied to Joint ForceProjection (JFP), a Lockheed Martin Integrating Concept (LMIC)
L. Izumi, A. Meilich, S. Friedenthal, *Lockheed Martin*

Optimized Airport Security Infrastructure System (OASIS)
J. M. Gonzalez, S. L. Harris, E. R. Castaneda, J. Kim, *George Mason University*

Standardized Process as a Tool for Higher Level Systems Thinking
C. M. Lamb, D. H. Rhodes, *Massachusetts Institute of Technology*

Organizational Challenges

Five Avoidable Problems in Process Improvement
M. Hoppe, *HOOD Group*

From Foresight to Insight: A Strategic Alignment Model for New Product Development
H-K Lee, *National Tsing Hua University* and *INER*; C-M. Liu, M-H. Lee, *National Tsing Hua University*

Requirements for Outsourcing
T. S. Gilb, *RPL*

Perspectives on SE

Coupling Enterprise and Technology by a Compact and Specific Architecture Overview
G. Muller, *Embedded Systems Institute*

Development and Application of Abstract Relation Types for Use in Systems and Systems-of-Systems Design and Evaluation
C. H. Dagli, A. Miller, S. E. Grassman, D. L. Enke, *University of Missouri-Rolla;* J. J. Simpson, *Systems Concepts*

Some Early History of SE – 1950's in IRE Publications (part 1): The Problem
T. L. Ferris, *SEEC/Univeristy of South Australia*

Some Early History of SE – 1950's in IRE Publications (part 2): The Solution
T. L. Ferris, *SEEC/University of South Australia*

Requirements & Stakeholders

Combined Requirements Engineering (CRE): The Quest for Widening the Applicability of Requirements Engineering Practices in the Emerging Product-Service Paradigm
V. Agouridas, *Univ. of Leeds;* M. Kossmann, *University of West England and Airbus UK*

Eight Deadly Defects in Systems Engineering and How to Fix Them
J. E. Kasser, *University of South Australia*

Using Stakeholder Analysis to Define the Problem in Systems Engineering
T. E. Trainor, G. S. Parnell, *USMA*

Review Approaches

Applying Measurement Principles and Adapting a Defect Predictability Model to Hardware Development
P. J. Frenz, *General Dynamics Advanced Information Systems*

Measurement-Driven Systems Engineering Using Six Sigma Techniques to Improve Software Defect Detection
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Rule-Based Design Reviews: Objective Design Reviews and Using Evolutionary Quantified Continuous Feedback to Judge Designs
T. S. Gilb, *RPL*

Systems Architecture: A View Based on Multiple Impacts
T. S. Gilb, *RPL*

Risk

Controlling Project Risk by Design
N. Malotaux, *N R Malotaux – Consultancy*

Cultural Models of Organizational Risk in Product Development
S. T. Collins, *University of Connecticut*

Risk Analysis
E. D. Smith, *University of Missouri – Rolla*; T. Bahill, *University of Arizona*

Taking Out the Garbage: How to Get Good Risks into Your Risk Tool
V. Parker, *Northrop Grumman Corporation*

Scenarios & States

Architecture Scenario Analysis: Estimating the Credibility of the Results
M. Gammelgard, M. Ekstedt, P. Narman, *Royal Institute of Technology / KTH*

Exploring Concurrent Activities: Using State Machines to Understand Net-Enabled Operations
R. Sorensen, *Vitech Corp.*; R. Funk, M. Ball, *Centre for Operational Res. and Analysis*

Intelligent Operational Scenarios: A Strategy for Cost-Saving Scenario Selection
S. H. Dam, *Systems and Proposal Engineering Company (SPEC)*

SE Principles & Heuristics

Case Study in Establishing Systems Engineering Principles: One Organization's Experience
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"Damn the Torpedoes!" ... Lessons from Underwater Warfare
T. Fossnes, *Norwegian Defence Procurement Division – Submarines*

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T . S. Gilb, *RPL*

Systems are Imaginary — Systems are Not Real: Some Thoughts on the Nature of Systems Thinking
J. N. Martin, *The Aerospace Corporation*

SE Processes

Managing Dynamic New Product Development Processes
Y. Reich, A. Karniel, *Tel Aviv University*

Practical Process Implementation: Using SE Methods to Develop SE Processes
J. T. Nolte, D. W. Newbern, P. S. Vanghel, *Northrop Grumman*

Synthesizing the Organizational System
E. P. Arnold, *BAE Systems*

Using CORE Model-Based SE Software to Support Program Management in the U.S. Department of Energy Office of the Biomass Program
P. J. Simpkins, *Vitech Corporation*; C. Riley, D. Sandor, *National Renewable Energy Laboratory*

SE Standards

Applying Creativity in Modelling and Simulation
D. H. Cropley, *University of South Australia*

Evolution of Assessment in a Hierachical Team Project at Final Year Undergraduate Level
T. L. Ferris, *SEEC/University of South Australia*

Self-Assessment Scheme and an Evaluation of its Reliability Based on ISO 9004:2000
Y. Hwang, S. Kim, *Electronics and Telecommunications Research Institute*

YADSES: Yet Another Darn Systems Engineering Standard
D. D. Walden, *Sysnovation, LLC*

SysML

Bridging the Chasm – Tracing from Architectural Frameworks to SysML
M. C. Hause, F. Thom, *Artisan Software Tools*

Enterprise Domain Modelling Process Using SysML for the Tooling Enterprise at the U.S. NNSA's Pantex Plant
D. A. McGrath, L. M. Mayes, *BWXT Pantex*; R. M. Griego, *Sandia National Laboratories*

A Formal Universal Systems Semantics for SysML
M. H. Hamilton, W. R. Hackler, *Hamilton Technologies, Inc.*

Simulation-Based Design Using SysML – Pt 1: A Parametrics Primer
R. S. Peak, M. W. Wilson, M. Bajaj, I. Kim, *Georgia Tech*; R. Burkhart, *Deere & Company*; S. Friedenthal, *Lockheed Martin*

Simulation-Based Design Using SysML – Pt 2: Celebrating Diversity by Example
R. S. Peak, M. W. Wilson, M. Bajaj, I. Kim, *Georgia Tech*; R. Burkhart, *Deere & Company*; S. Friedenthal, *Lockheed Martin*

Teaching SysML Through a Process Led Approach for Systems Engineering: Lessons for the SysML Standard
D. J. Battersby, *BAE Systems Systems Engineering Innovation Centre*

Systems of Systems

Architecture-Based Drivers for System-of-Systems and Family-of-Systems Cost Estimating
G. Wang, P. Wardle, A. Ankrum, *BAE Systems*

NASA's Lunar Architecture and the Development of the Next Lunar Lander
B. J. Derkowski, *NASA Johnson Space Center*

System of Systems Model by Pseudo-Hierarchial Multistage Optimization
H. M. Kim, J. Hidalgo, *University of Illinois at Urbana-Champaign*

Uncertainty & Knowledge Management

Defining Military Pilot Training Requirements for 2015+ Through the Application of Systems Approaches
J. Cleveley, M. Woodhead, *Loughborough University*

Dialogic Design as Organizational Strategy: The Structured Design Process for Constructing Enterprise Ontologies
P.H Jones, *Redesign Research*; A.N. Christakis, *CWA. Ltd.*; T. Flanagan, *University of Massachusetts, Boston*

Extracting Value from Uncertainty: A Methodology for Engineering Systems Design
M. Cardin, R. de Neufville, *Massachusetts Institute of Technology;* W. J. Nuttall, *Judge Business School, University of Cambridge*; J. Dahlgren, *MITRE Corporation*

Knowledge Management- A Key Element of Success
L. P. Long, *The Boeing Company;* C. H. Dagli, *Univeristy of Missouri-Rolla*

Validation & Verification

The Continued Evolution of Validation: Issues and Answers
J. R. Armstrong, *Systems and Software Consortium*

MV² tool: Management of Validation & Verification of Engineering Requirements
C. Ducamp, A. Lagarrigue, *Airbus*

Usability of Formal Verification on EFFBD Models: Applying Petri Nets to Systems Engineering Issues
C. M. Seidner, J. Lerat, *Sodius*; O. H. Roux, *IRCCyN*

Value of SE

Promoting The Real Value of SE Using an Extended SCARIT Process Model
S. J. Saunders, *Raytheon Australia Pty. Ltd.*

The ROI of Systems Engineering: Some Quantitative Results
R. Valerdi, *MIT*; B. W. Boehm, *USC*; E. Honour, *Univ. of South Australia & Honourcode, Inc.*

The Value-Based Theory of SE: Identifying and Explaining Dependencies
B. Boehm, A. Jain, *University of Southern California*

Key Reserve Papers

A Conceptual Glossary for Systems Engineering: Define the Concept, Don't Quibble about the Terms
T . S. Gilb, *RPL*

Creative Product Development
M. J. Dick, *Northrop Grumman Corporation*

Cultural Differences – and How They Affect Systems Engineering.
A. Pandikow, *Syntell AB*; R. Larsson, *Saab Training Systems AB*; L . Ruhe, *Saab Svs USA*

Effective Industrial Modeling for High-Tech Systems: The Example of Happy Flow
G. Muller, *Embedded Systems Institute*; J. Beckers, *Oce;* M . Heemels, B . Bukkems, *Technische Universiteit Eindhoven*

Enabling Economics-Driven SE Through Reusable Software Architectures and Components
R. W. Selby, P. C. Selby, *Northrop Grumman*

Everything Always Works the Way It's Supposed to Right? The Importance of Tool Integration and Customization in Today's Development Programs.
J. L. Colwell, *The Boeing Company*; C. H. Dagli, *Unversity of Missouri – Rolla*

The Evolving Joint Perspective and Meta-Systems Theory: A Case Study Based on the Joint Vision Document
K. D. Palmer, *SEEC Student*

Expanding Functional Analysis to Develop Requirements for the Design of the Human-Computer Interface
B. P. McKenna, J. Gualtieri, W. C. Elm, *ManTech – Cognitive Systems Engineering Center*

Exploring Intelligent Entreprise System Limitations
K. D. Palmer, *SEEC Student*

From Research to Reality: Making COSYSMO a Trusted Estimation Tool in Your Organization
R. Valerdi, *MIT*; C. Miller, *SSCI*

Improvement of Software Engineering Performances a Case Study at Bombardier Transportaion-Total Transit Systems Signaling Group
C.Y.Laporte, *Ecole de Technologie Superieure*; D.Roy, *Centre de Recherche Informatique de Montreal*; M.Doucet, M.Drolet, *Bomardier Transportation*

Key Reserve Papers *(continued)*

Modeling Emergent Behavior for System-of-Systems
J. C. Hsu, *The Boeing Company*

Requirement Relationships: A Theory, Some Principle & A Practical Approach
T. S. Gilb, *RPL*

Using a Boundary Object Framework to Analyze Interorganizational Collaboration
A. Fong, J . Srinivasan, R . Valerdi, *MIT*

Technical Information Exchange Session (TIES)

CSEP Applicaton Preparation
R. B. Wheeler, *The Center for Systems Management*

Optimally Organizing System Engineering Activities for Project Success
N. Malotaux, *N R Malotaux- Consultancy*

System Requirements Reuse
M. Mannion, *Glasgow Caledonian University;* H. Kaindl, *Vienna University of Techonology*

Unified Life Cycle Modeling
P. Hantos, *The Aerospace Corporation*

Technical Panels

Challenges and Successes in the Deployment of Systems Engineering in Commercial World

A. Jain, *UTC/P&W*
Bank of America
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Baxter Healthcare
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Cultural, Psychological and Motivational Factors in Risk Management: "Major Issues" or "Let's Not Go There"

J. Stein, *Terumo Cardiovascular Systems Corp*
S. Jackson, *University of Southern California*
R. Williams, *Carnegie Mellon University SE Institute*
T. Gilb, *Result Planning Limited*
A. Dolan, *University of Toronto*
W. Siefert, *Boeing*
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Discovering a Strategy for Whole Systems Modeling

J. Ring, *Innovation Management*
C. Jacoby, *Jacoby Consulting*
J. Clymer, *Cal State Fullerton*
R. Sorenson, Vitech Corp.
J. Skipper, Cal Tech

Do We Have Systems Resilient to Natural Disaster Events and/or to Terrorist Attacks? A Debate on the Issues

W. Mackey, *Vitech and University of MD*
S. Sutton, *Northrop Grumman TASC*
J. Long, *Vitech Corporation*
J. Carl, *Mosaic Renaissance International*
S. Jackson, USC
J. Nolte, *Northrop Grumman*
C. Tulodieski, *Northrop Grumman*

Heading Down a New Track: Growing an SE Practice in a Big, Bureaucratic, Legacy Enterprise

Collette Ericsson, *New York City Transit*
K. Gharatya, *London Underground, Ltd.*
B. Halliday, *Network Rail*
A. O'Neil, *New York City Transit*
P. Brouwer, *ProRail*

Integrating SE with Program and Project Management

R. Ade, *SAIC*
A. Pyster, *SAIC*
H. Mooz, *The Center for Systems Management*
D. Van Gemert, *Booz Allen/UCI Ext*
M. Wartenberg, *ZeroBoundary/UCI*

Is the Systems Engineering Profession Quantitative Enough?

A. Zonnenshain, *RAFAEL*
E. Honour, *Honourcode, Inc.*
D. Dori, *Technion*
J. Kasser, *University of South Australia*
N. Malotaux, *N.R. Malatoux Consultancy*

Managing Rail Requirements: Case Studies Applying SE to Rail/Transit Projects

M. Krueger, *ASE Consulting LLC*
D. Chin, M. Moran, *New York City Transit*
M. Irving, *Atkins Rail*
P. Thomas, *Parsons Transportation Group (PTG)*
K. Gharatya, *London Underground, Ltd*

Model Based Systems Engineering – Model Based Standards and Standard Based Modeling

M. Sampson, *UGS*
J. Martin, *The Aerospace Corporation*
J. Long, *Vitech Corporation*
P. Spiby, *Eurostep Limited*
C. Kobryn, *PivotPoint Technology Corp.*
R. Bullard
D. Oliver

Modeling the Enterprise: Case Studies and Approaches

R. M. Griego, *Sandia National Laboratories*
D. Mc Grath, *BWTX Pantex*
S. Krane, *Parker Aerospace*
K. Lloyd, *Watt Systems Technologies Inc.*
R. Dove, *Stevens Institute of Technology*
J. Martin, *The Aerospace Corporation*

Requirements Engineering for Software vs. Systems in General?

H. Kaindl, *Vienna University of Technology, ICT*
M. Hause, *Artisan Software Tools*
R. Griego, *Sandia National Laboratories*
M. Mannion, *Glasgow Caledonia University*
A. Díez, *TCP SISTEMAS E INGENIERIA*

SysML Early Applications and Lessons Learned

S. A. Friedenthal, *Lockheed Martin*
R. Peak, *Georgia Institute of Technology*
R. Steiner, *Raytheon*
C. Bialowas, *EmbeddedPlus*

Tailoring to Transit: Case Studies Applying SE to the Rail/Transit Domain

A. O'Neil, *New York City Transit*
D. Price, *Parsons Brinckerhoff*
K. Gharatya, *London Underground, Ltd.*
A. Kouassi, *Parsons Transportation Group (PTG)*
B. Hutchison, *Atkins Rail*

U.S. ORD Systems of Systems Engineering Guide: Status Report and INCOSE Support

C. Dickerson, *BAE Systems*
A. Meilich, *Lockheed Martin*
K. Baldwin, *UOSD (AT&L)*
J. Osterholz, *BAE Systems*
S. Bratt, *WWW Consortium*

Special Events

OPENING ICE BREAKER RECEPTION
Monday, 25 June 2007 • 1800 – 2030
Join your colleagues and the INCOSE 2007 Symposium exhibitors for the traditional "Ice Breaker" Reception on Monday evening. Do not miss an opportunity to reacquaint with INCOSE colleagues, meet new friends, and make plans for your week in San Diego.

EXHIBIT HALL SOCIAL HOUR
Tuesday, 26 June 2007 • 1700 – 1800
Come and have fun playing Bingo with the exhibitors as you enjoy further time to view the exhibits in this Tuesday evening Social Hour.

INCOSE LATIN AMERICA & CARIBBEAN DINNER
At the University of San Diego *(2 miles from Town & Country Hotel)*
Tuesday, 26 June 2007 • 1900 – 2200
Cost: $50/person *(Includes transportation from hotel)*
The INCOSE Latin America & Caribbean Initiative is holding its second-ever dinner to promote interest in the expansion of systems engineering in that part of the world. It will be held on the campus of the University of San Diego (www.sandiego.edu). The event is open to anyone but we are especially interested in attracting individuals from Latin America & the Caribbean or with interests in the region.

INCOSE RECEPTION AND BANQUET
Wednesday, 27 June 2007
Keeping with the INCOSE tradition of offering good food, stimulating conversation and enjoyable entertainment, we invite all attendees to attend the Symposium Reception and Banquet on Wednesday, 27 June. Dress will be business casual.

INCOSE TECHNICAL TOUR
DIII-D: THE GENERAL ATOMICS NATIONAL FUSION FACILITY
Friday, 29 June 2007 • 0800 – 1300
Don't miss this unique opportunity to tour DIII-D, the nation's largest and most versatile magnetic confinement fusion tokamak facility, where researchers heat deuterium plasmas to over 100,000,000 K in a global quest to better understand plasma confinement and nuclear fusion's role in future electricity production. The tour is open to attendees and their family members over 10 years old. Limit: 100 persons. Details about this exciting tour can be found on the symposium website: www.incose.org/symp2007.

Exhibitors-To-Date

The Aerospace Corporation
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The Center for Systems Management
ClearSpecs Enterprises
Compliance Automation, Inc.
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Defense Contract Management Agency
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Predicate Logic
Project Performance International
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For exhibit information and opportunities, please contact Tom Kudlick at SynchroCubed@aol.com, or see the INCOSE Symposium website at http://www.incose.org/symp2007.

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Are you the **presenter of a paper** in a technical track? ☐ Yes ☐ No

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REGISTRATION TYPE	BENEFITS
SYMPOSIUM REGISTRATION	• *Includes Technical Sessions, Exhibits, CD Proceedings, Symposium Meals, Receptions, Banquet* ***(Students do NOT receive Banquet)***
PASSPORT REGISTRATION	• *Includes Monday-Thursday Technical Sessions and/or Tutorials, Exhibits, CD Proceedings, Symposium Meals, Receptions, Banquet.* ***Limited to first 75!***
DAY REGISTRATION	• *Includes Technical Sessions, lunch, & Exhibits for the Selected Day(s), and CD Proceedings*
TUTORIAL ONLY	• *Includes full day or half day tutorial(s) selected and handout(s). Full Day tutorial includes lunch*

What **Sector** do you work in *(check)*: ☐Industry ☐Government ☐Academia ☐Non-Profit

Is there an INCOSE Working Group (WG) that you would like to learn more about? *(check one)*

☐Anti-Terrorism International ☐Architecture ☐Commercial Air Transportation ☐Cost Engineering
☐DOE Facilities ☐Emerging Technology ☐Global Earth Observation System of Systems (GEOSS)
☐Human Systems Integration ☐Intelligent Transit ☐Lean SE ☐Measurements ☐Model Based SE
☐Model Based Systems Design ☐Process Improvement & Evaluation ☐Requirements
☐Resilient Systems ☐Risk Mgmt ☐SE Handbook ☐SE in the Commercial World ☐SE Mgmt
☐Space Systems ☐Specialty Engineering ☐System Safety ☐Systems Science ☐System Security
☐Tools Integration & Interoperability ☐Transportation Systems ☐Verification & Validation

PAYMENT METHOD

☐Check, money order or bank wire (copy of wire) made payable to **INCOSE**

☐VISA ☐MasterCard ☐American Express ☐Purchase order (PO)

Credit Card Number or Purchase Order Number (PO) Expiration Date /CVV Number

Name on Credit Card or Purchase Order Contact

Credit Card or PO Billing Street Address

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- Check and money orders must be issued in U.S. dollars drawn on a U.S. Bank.
- Bank drafts and bank transfers in U.S. dollars will be accepted.

All bank fees are the responsibility of the sender and must be paid at the time of the transaction.

■ MEMBER REGISTRATION • *ALL FEES ARE LISTED IN US DOLLARS* •

INCOSE Member # _____

	by 5 MAY	after 5 MAY	
☐**Symposium Member**	$760	$825	$ _____
☐**Symposium Senior Member** *(Status MUST be pre-approved by INCOSE Central)*	$380	$415	$ _____
☐**Symposium Student Member**	$ 80	$ 80	$ _____
☐**Passport Member** *	$1215	$1295	$ _____
☐**Passport Senior Member** *	$615	$650	$ _____

** Passport Registrants make your tutorial selections here.* ***You may only select one tutorial per day*** *(either one half-day or one full day tutorial). Early selection is strongly recommended.*

Mon ☐F01 ☐F02 PM ☐H01 ☐H02 **Wed** ☐F05 ☐F06 PM ☐H05 ☐H06
Tues ☐F03 ☐F04 PM ☐H03 ☐H04 **Thur** AM ☐H07 ☐H08 ☐H09

☐**1-DAY Member** **	$260	$295	$ _____
☐**1-DAY Senior Member** **	$130	$150	$ _____
☐**2-DAY Member** **	$500	$540	$ _____
☐**2-DAY Senior Member** **	$250	$270	$ _____

**Select Day(s): ☐Mon, 25 June ☐Tues, 26 June ☐Wed, 27 June ☐Thurs, 28 June

☐Annual Membership Dues	$105	$105	$ _____
☐Annual Senior Membership Dues	$ 55	$ 55	$ _____
☐Annual Student Membership Dues	$ 20	$ 20	$ _____

■ NON-MEMBER REGISTRATION

	Early	Late	
☐**Symposium Non-Member**	$ 865	$ 930	$ _____
☐**Symposium Student Non-Member**	$ 100	$ 100	$ _____
☐**Passport Non-Member** *	$1320	$1400	$ _____

** Passport Registrants make your tutorial selections here.* ***You may only select one tutorial per day*** *(either one half-day or one full day tutorial). Early selection is strongly recommended.*

Mon ☐F01 ☐F02 PM ☐H01 ☐H02 **Wed** ☐F05 ☐F06 PM ☐H05 ☐H06
Tues ☐F03 ☐F04 PM ☐H03 ☐H04 **Thur** AM ☐H07 ☐H08 ☐H08

☐**1-DAY Non-Member** **	$365	$400	$ _____
☐**2-DAY Member** **	$605	$645	$ _____

**Select Day(s): ☐Mon, 25 June ☐Tues, 26 June ☐Wed, 27 June ☐Thurs, 28 June

■ OPTIONAL COURSES

		Early	Late	
☐C00	C00: CSEP Exam Preparation *(Sat/Sun Course)*	$ 350	$ 400	$ _____
☐SEA	SEANET Workshop (Doctoral Students Only) *(Sat)*	$ 20	$ 20	$ _____
☐F0A	Response Enabling Architecture & Design Priciple *(Sunday full-day, includes lunch)*	$ 35	$ 35	$ _____
☐F0B	The Evoutionary Project Management Method *(Sunday full-day, includes lunch)*	$ 35	$ 35	$ _____
☐H0C	Using Risk Mgmt to Boost an Enterprise's IQ *(Sunday AM)*	$ 0	$ 0	$ _____
☐H0D	Model Based SE for Project Success *(Sunday PM)*	$ 0	$ 0	$ _____
☐H0E	AP233 SE & Design Overview *(Sunday AM)*	$ 0	$ 0	$ _____
☐H0F	AP233 SE & Design Implementation *(Sunday AM)*	$ 160	$ 185	$ _____

■ TUTORIALS (MONDAY-THURSDAY: offered at an additional fee unless Passport Registration is selected.)

Please indicate your selections. Senior Members (preapproved by INCOSE Central) and Students are eligible for reduced rates. Select your fee and then indicate your tutorial selection.

		Early	Late		Early	Late
☐ Member/Non Member:	Full Day	$290	$340	Half-Day	$160	$185
☐ Student:	Full Day	$200	$225	Half-Day	$100	$115
☐ Senior Member:	Full Day	$145	$170	Half-Day	$80	$95

Mon	F01	Introduction to the OMG SysML (FULL)	$ _____
Mon	F02	Architecture Framworks & Modeling (FULL)	$ _____
Mon	H01	Integrating SE with Earned Value Mgmt (PM)	$ _____
Mon	H02	Thinking & Learning – Outside the Box (PM)	$ _____
Tues	F03	From Research to Reality: Making COSYSMO a Trusted Estimation Tool in Your Organization (FULL)	$ _____
Tues	F04	How to Define Practical SE Metrics (FULL)	$ _____
Tues	H03	Connecting Enterprise Modeling and Requirements Using an Object-Oriented Approach (PM)	$ _____
Tues	H04	Managing Technical Uncertainty (PM)	$ _____
Wed	F05	Complex Systems for the Systems Engineer (FULL)	$ _____
Wed	F06	Applying SE to the Intelligent Enterprise & Its Work Products (FULL)	$ _____
Wed	H05	Systems Engineering Tools (PM)	$ _____
Wed	H06	Architecting & Engineering Systems, Processes, and Organization Using (DSM) (PM)	$ _____
Thurs	H07	ISO/IES 15288 and CMMI: SE Similarities and Differences (AM)	$ _____
Thurs	H08	Managing Requirements Risk (AM)	$ _____
Thurs	H09	Enterprise Architecture Standards (AM)	$ _____

■ Optional Tickets *(additional cost items)*

	Guest(s)	
Monday Ice-Breaker Reception	$25 x _____	$ _____
Tuesday Social Hour	$20 x _____	$ _____
Symposium Banquet (Wednesday)	$75 x _____	$ _____
Proceedings (CD-ROM)	$60 x _____	$ _____
Lunch: ☐Mon. ☐Tues. ☐Wed. ☐Thurs.	$35 x _____	$ _____
Latin America & Caribbean Dinner (Tuesday)	$50 x _____	$ _____

■ Optional Technical Tour

General Atomics Technical Tour, Fri, 29 June (AM) $20 x _____ $ _____
(See website for info and Security Forms)

Name of Guest(s) *(Required for badge if purchasing guest events/meals or optional tour)*

_____

▶ TOTAL REMITTANCE $ _____

Mail completed form with payment to:

INCOSE 2007
7916 Convoy Court • San Diego, CA 92111-1212 • USA
Fax (*MasterCard, VISA, or AMEX only*): +1 858 565 9954

Register by 15 June to be included in the Symposium List of Participants!

Hotel & Registration Information

PLEASE HELP INCOSE KEEP COSTS DOWN

INCOSE and its Symposium participants benefit when you **book your hotel reservation at The Town & Country Resort by identifying yourself as an INCOSE 2007 Symposium participant.** The hotel helps offset the cost of the meeting space which allows INCOSE to keep Symposium registration fees affordable. We encourage you to use the INCOSE hotel reservation links when booking your room reservation. If you have any difficulty making a hotel reservation, please contact PCM at incose@pcmisandiego.com or by phoning: +1 858-565-9921. Thank you!

■ THE TOWN & COUNTRY RESORT (INCOSE 2007 Symposium Hotel)

The Town and Country Resort, located in Mission Valley, the heart of San Diego is just minutes from the San Diego airport and attractions like the World Famous San Diego Zoo, Balboa Park, Sea World, Mission Beach and Old Town. Shopping and numerous dining options are all within walking distance or a trolley ride away.

The hotel offers both high-rise and ground level accommodations: two towers or 1 & 2 story ranch style garden bungalows that capture the feeling of a cozy retreat. The property is known for its charm and relaxing feel. You can enjoy one of the sparkling pools, take in a round of golf, or take advantage of the first class spa facilities complete with a state of the art fitness center and full service salon. The hotel offers luxurious accommodations, and countless amenities to make your stay memorable after a long day of meetings.

■ ROOM RATE AND RESERVATIONS

A rate of US **$139.00 per night** (single or double occupancy) for a Garden Room, **$145** for a Regency or Royal Palm Room or **$129** (Government Rate) has been negotiated with the hotel for attendees of INCOSE 2007. The rate is exclusive of applicable city tax, currently 10.52%. **Reservations must be made by Thursday, 31 May 2007 in order to receive the discounted group rate.**

Discounted rates apply until the reservation deadline of 31 May 2007 or until all rooms in the group block have been reserved, whichever occurs first. After 31 May, guest rooms and discounted group rates may not be available. We encourage you to confirm your reservations early and in writing to avoid any confusion. A credit card or check will be required to guarantee your reservation.

Please contact the hotel directly to make your room reservations. Be sure to mention you are attending the INCOSE 2007 Symposium to receive the discounted group rate if you are phoning the hotel directly.

THE TOWN & COUNTRY RESORT
500 Hotel Circle North • San Diego, CA, 92108 USA

Phone: +1 619 291-7131
Toll Free (US): 800 772-8527
Hotel Website: www.towncountry.com
Online Hotel Reservations: https://resweb.passkey.com/go/incose07

You can modify or cancel your reservations from this site at anytime up until 31 May 2007.

San Diego's local attractions:
http://www.towncountry.com/attractions.htm

■ HOW TO REGISTER:

The Online Registration can be found on the Symposium website at: www.incose.org/symp2007/registration.html

This year, the Symposium is again featuring a **Passport Registration**, which entitles the delegate to the full Symposium Registration ***and*** admittance to **Monday – Thursday optional Tutorials.**

■ CONFIRMATION OF REGISTRATION

Payments may be made by credit card or check payable to INCOSE. To pay by bank transfer, please contact PCM at incose@pcmisandiego.com for wire transfer instructions. Confirmation letters will be emailed within two weeks of receipt of registration form *and payment*. If you do not receive a confirmation letter within three weeks of payment, please contact PCM by fax, e-mail, or telephone.

If payment is to be made by **purchase order**, *please ensure that correct billing information is furnished on the Symposium Registration Form.* Payment is due within thirty (30) days of receipt of registration. In the case of purchase orders, confirmation letters will be mailed along with an invoice. **NO PURCHASE ORDERS WILL BE ACCEPTED ON-SITE. Payment in full of all Symposium registration fees must be made by, or at the time of, on-site registration.**

■ SYMPOSIUM CANCELLATION POLICY

A written request must be received by 8 June 2007. No refunds will be given for cancellations made after 8 June 2007 or in the case of registrant no-shows. ***Substitutions are allowed.***

Members will receive a refund less a $75 processing fee. Payments of any INCOSE membership renewal fees will not be refunded.

Non-members will receive a refund less a $180 processing fee. Non-member registrant will retain the complementary one-year INCOSE Membership.

Questions? For further information and assistance, please contact:

Professional Conference Management (PCM)
7916 Convoy Court • San Diego, CA 92111-1212 USA
Phone: +1.858.565.9921 • **Fax:** +1.858.565.9954
E-mail: incose@pcmisandiego.com

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For more information visit our booth in the INCOSE 2007 Exhibit Hall or refer to our website **www.incose.org/symp2008**

mark your calender

15-19 June

Submission date for papers, tutorials and panels: 5 Nov 2007

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