



**INCOSE**  
**2006**  
*Orlando, Florida*



**16th Annual  
International Symposium**  
*Systems Engineering:  
Shining Light on the  
Tough Issues*

**9-13 July 2006**  
**Orlando, Florida USA**

*Hosted by the Orlando, Central Florida and Space Coast Chapters*



# About INCOSE

## International Council on Systems Engineering

**INCOSE fosters the definition, understanding, and practice of World-Class Systems Engineering in Industry, Academia, and Government.**

INCOSE is an international organization formed to advance the state of the art of interdisciplinary engineering and associated means to enable the realization of successful systems. INCOSE:

- Provides a focal point for dissemination of systems engineering knowledge
- Promotes collaboration in systems engineering education and research
- Assures the establishment of professional standards, guidelines, and handbooks for the practice of systems engineering
- Improves systems engineering processes

INCOSE is a young, dynamic and growing organization. In some 15 years since its foundation, its growth to date has exceeded 5000 members and 54 chartered chapters or national societies worldwide.

The national or regional chapters, volunteer committees, and working groups provide the energy and direction for the organization. The overall orchestration of INCOSE is the responsibility of the Executive Committee

consisting of the President, President-Elect, Secretary, and Treasurer. The Executive Committee, six Directors and the Technical Director comprise the Board of Directors, which guides INCOSE activities. The Corporate Advisory Board, currently composed of some 53 international enterprises from different sectors of industry, academia, and government provides guidance and serves as the “voice of the consumer” for INCOSE’s products. Companies come from diverse fields such as aerospace, automotive, defense, electronics, energy, general machine building, health, IT, mining, and transport.

INCOSE conducts a multitude of international, regional, and local meetings. The two major yearly events are the International Workshop, held early in the year, serving as INCOSE’s principal projects planning platform, and the large International Symposium in the June/July period. The International Symposium is INCOSE’s foremost event, drawing 1000 or more participants for four days of technical exchanges, presentations, panel discussions, tutorials, and exhibits.

**For further information and to find links to INCOSE Chapters, Visit: [www.incose.org](http://www.incose.org)**

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 V. A. (Ginny) Lentz, 1996  
 James Brill, 1995  
 George Friedman, 1994  
 Brian Mar, 1993  
 Jerome Lake, 1992



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# Welcome



## from the INCOSE President

Dear Delegates,

On behalf of INCOSE, permit me to extend my warm welcome to our 2006 International Symposium in Orlando, Florida. Located in Central Florida, Orlando is internationally recognized for its high technology workforce, a vibrant academic community and many multi-cultural tourist attractions.



Widely known for its sunshine and citrus crops, Orlando is home to a thriving technical community. With over 8,000 technology companies, Central Florida employs over 150,000 people in sectors including: Aviation & Aerospace, Information Technology, Medical Technologies, Microelectronics, Modeling - Simulation & Training, and Photonics & Optics. Orlando is also home to the University of Central Florida who, together with the University of Florida and the University of South Florida, has established a strong partnership to support Central Florida's high tech industry in matters of education and research.

Our 2006 symposium theme, **Systems Engineering: Shining Light on the Tough Issues**, 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. The symposium reflects how systems engineering activities in commercial, academic, and government environments are converging on new best practices, novel technologies, and new methodologies.

Orlando offers a wide range of visitor attractions including beaches, water sports, golf, art, theater, music, a wide array of theme parks, fine dining and, of course, shopping. The cultural diversity of Central Florida provides additional richness across all of these venues.

So mark the 2006 International Symposium on your calendar and plan to spend a wonderful week with INCOSE in Orlando. 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

**"Systems Engineering: Shining Light on the Tough Issues"**, the symposium theme, recognizes both the difficulty in engineering systems and the energy and talent that our global engineering community applies to thoughtfully examine the problems and develop new, interesting, and effective solutions. The Central Florida, Orlando, and Space Coast chapters of the International Council on Systems Engineering forged an alliance to bring the sixteenth annual International Symposium to Orlando, a thriving metropolitan area in the heart of Florida known for its many entertainment venues: Walt Disney World, Universal Studios, Sea World, to name a few. We invite you and other engineering professionals from around the world to come together to enjoy the warmth of our tropical climate, to relax and learn from seasoned practitioners, tell your stories, exchange ideas, holding lively discussions, and, best of all, to get to know your engineering colleagues as your friends.

The International Council on Systems Engineering (INCOSE) is an international professional society for systems engineers with the mission to promote the definition, understanding, and practice of world-class systems engineering. In 1995, the organization officially transitioned from a national to an international council after recognizing the substantial contribution of professionals from a growing number of countries, Australia, Canada, France, Germany, and the United Kingdom, each with their unique perspectives. Today INCOSE members represent over 30 countries, and, with newly forming chapters in China, Korea, South Africa, and Taiwan, the number continues to grow.

This year's symposium offers you a way to increase your professional knowledge, expand your network of engineering colleagues, and learn about developments in the global marketplace. Systems engineers will delve into the challenges we face, discuss solutions available now, and discover new ones. Through our offering of 138 papers, 18 tutorials, technical information exchange sessions, thought-provoking panels, an academic forum, and exhibitors from the academic, industrial, vendor, and government communities; a wonderful variety of systems engineering information awaits you. Technical tours the day after the symposium provide insight into NASA's Kennedy Space Center, and University of Central Florida's Institute for Simulation and Training.

Evening receptions, the symposium banquet, keynotes, and entertainment offer a full schedule of activities. Tours run almost continuously from the hotel to many, fun-filled locations. Whether you like to fish, shop, golf, swim, or ride roller coasters, you can find it all nearby. Join us for an information-packed experience with other world-class systems engineering professionals. This July make your destination Orlando, Florida!

Wes Calhoun  
2006 Symposium General Chair

## Welcome from the Technical Committee

Challenges for the engineering profession have never been greater. With globalization, reduced time to market and the advent of Systems of Systems, the demands placed on the engineer are significant. The tough issues still present many challenges. The Systems Engineering discipline and INCOSE strive to meet the challenges by developing methods, tools, standards and engineering processes that facilitate the design, development and production processes. Join us in Orlando for INCOSE's 2006 International Symposium to discuss these issues. Relax and enjoy the magic that only Orlando offers; but most of all, be prepared to participate in intense engineering discussions of "TOUGH ISSUES WE ALL FACE." What better place to discuss this topic! Orlando combines the heart of Florida's Technical Corridor with Disney World and the nearby Kennedy Space Center. All are integrally involved with Systems Engineering in Academic, Commercial and Government roles. Attend tutorials on chaos and complexity; tough issues of Systems of Systems planning, estimating and execution; or, Effective Systems development algorithms. Listen to and participate with experts discussing Risk Management, or attend a panel comparing Natural Disasters to Terrorist Attacks. Additionally, tours are planned to Kennedy Space Center and the University of Central Florida Institute for Simulation and Training.

You can expect five top keynote speakers across international lines involved in academia, industry and government. Our paper presentations have been structured to align with the INCOSE Technical Infrastructure Guide enablers and sectors allowing you to conveniently select those areas of greatest interest to you. Tutorials are being scheduled throughout the week to offer you (our customer) the greatest opportunity to find the right mix of subjects.

We know that this will be a world class experience to advance the field and benefit everyone! System Engineering is only increasing in its importance to the world. Join the foremost minds in the field to help us understand how to tackle the issues of today and forego the ones of tomorrow. Bring a friend and share in the many opportunities for professional development as well as social exchanges. Our evenings are full with receptions, a banquet and magical entertainment. *So join us in Orlando and "experience the magic!"*

*Dave Cleotelis, Technical Program Chair  
Aaron Slone, Technical Program Co-Chair  
INCOSE International Symposium 2006*

## Welcome from the Member Board

Whether we are in the aerospace, commercial or defense world, systems engineers face challenges daily. They may be bringing a product to market quicker, expanding to a global environment, or engineering within a system of systems. The 16th Annual INCOSE International Symposium promises to shine a light on these topics.

As chair of your Member Board, I encourage you to attend the premier event of the INCOSE year in Orlando, Florida. With a theme of "**Systems Engineering: Shining Light on the Tough Issues**" 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, and the Director's Award for most improved chapter during the banquet. And, the Circle Awards for chapter excellence will be presented at the Closing Plenary.

I look forward to seeing you in Orlando!



Michael D. Eagan  
Chair, Member Board



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

The Aerospace Corporation  
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US Army ARDEC  
Vitech Corporation  
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# Schedule-at-a-Glance



## ■ Saturday • 8 July 2006

0800 – 1700 Working Groups  
1000 – 1700 Cyber Café Open

## ■ Sunday • 9 July 2006

0700 – 1700 Symposium Registration  
0700 – 1900 Cyber Café Open  
0830 – 1230 Half-Day Tutorials *at No Extra Charge*  
0830 – 1700 Working Group Meetings  
1000 – 1800 Speaker Ready Room  
1300 – 1700 Half-Day Tutorials at no Extra Charge  
1700 – 1800 Chapter Presidents' Reception  
1800 – 2130 Sponsor/Corporate Advisory Board Dinner

## ■ Monday • 10 July 2006

0700 – 0745 Speakers/Session Chairs' Breakfast  
0700 – 1700 Symposium Registration  
0700 – 1800 Speaker Ready Room  
0700 – 1900 Cyber Café Open  
0800 – 0945 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 – 1300 Lunch  
1300 – 1430 Session 2: Four Simultaneous Technical Paper Tracks  
1300 – 1700 Two Half-Day Tutorials (*Ticket Required*)  
1530 – 1700 Session 3: Four Simultaneous Technical Paper Tracks  
1800 – 2030 Ice Breaker Reception – *Tropical Theme*

## ■ Tuesday • 11 July 2006

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  
0940 – 1730 Technical Information Exchange Session (TIES) & Key Reserve Paper Presentations  
0945 – 1715 Two Full-Day Tutorials (*Ticket Required*)  
1000 – 1130 Session 4: Four Technical Paper Tracks and Two Panel Tracks  
1130 – 1300 Lunch in Exhibit Hall

## ■ Tuesday • 11 July 2006 (continued)

1300 – 1430 Session 5: Three Technical Paper Tracks and One Working Group Track  
1300 – 1700 Two Half-Day Tutorials (*Ticket Required*)  
1500 – 1630 Session 6: Three Technical Paper Tracks and One Working Group Track  
1700 – 1800 Exhibit Hall Social Hour

## ■ Wednesday • 12 July 2006

0700 – 0745 Speakers/Session Chairs' Breakfast  
0700 – 1700 Symposium Registration  
0700 – 1800 Speaker Ready Room  
0700 – 1900 Cyber Café Open  
0800 – 0930 Wednesday Keynote Speaker  
0930 – 1700 Exhibits Open  
0945 – 1715 Two Full-Day Tutorials (*Ticket Required*)  
1000 – 1130 Session 7: Two Technical Paper Tracks, Two Panels, and Two Working Group Tracks  
1030 – 1700 Key Reserve Paper Presentations  
1130 – 1300 Lunch in Exhibit Hall  
1300 – 1700 Two Half-Day Tutorials (*Ticket Required*)  
1300 – 1430 Session 8: Three Technical Paper Tracks and One Working Group Track  
1500 – 1800 Robotics Demonstration  
1500 – 1630 Session 9: Three Technical Paper Tracks and One Working Group Track  
1800 – 1900 Reception in Exhibit Hall  
1900 – 2200 Banquet and Entertainment

## ■ Thursday • 13 July 2006

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 Two Half-Day Tutorials (*Ticket Required*)  
0830 – 1000 Session 10: Four Technical Paper Tracks and Special Topic Presentation  
1030 – 1200 Session 11: Four Technical Paper Tracks  
1200 – 1300 Lunch in Exhibit Hall  
1300 – 1500 Thursday Closing Keynote/Plenary Session  
1500 – 1600 Closing Reception

**FINAL PROGRAM SUBJECT TO CHANGE**

# Symposium Speakers



## Monday Opening Plenary Speaker



**James (Jim) W. Kennedy**  
*Director, NASA John F. Kennedy Space Center*

James W. Kennedy is the eighth director of NASA's John F. Kennedy Space Center (KSC) in Broward County, Florida. Prior to this appointment, he served as KSC's deputy director and earlier as the deputy director of NASA's George C. Marshall Space Flight Center (MSFC) in Huntsville, Alabama.

Mr. Kennedy began his career with NASA in 1968 in the Aerospace Engineering Cooperative Education Program, first at KSC and then at MSFC. After earning his Bachelor of Science degree in mechanical engineering from Auburn University in 1972, he was called to active duty with the U.S. Air Force. In 1977, he received his Master's in business

administration from Georgia Southern University.

Mr. Kennedy's work experience includes serving as project manager for major projects, such as the X-34, DC-XA, and Solid Rocket Booster Projects. He served as deputy director of MSFC's Science and Engineering Directorate and later as the first director of the Center's Engineering Directorate.

He has received numerous awards, including the National Space Club's Astronautics Engineer of the Year Award, MSFC Leadership Award, the Silver Snoopy Award, NASA's Distinguished Service Medal, and the Presidential Rank of Meritorious and Distinguished Service Awards. Most recently, he received the NASA Outstanding Leadership Medal.

Mr. Kennedy was born in Riverdale, Maryland, and currently resides in Cocoa Beach, Florida, with his wife, Bernadette. He has two grown children, Jeff and Jamie, and is the proud grandfather of Hayes.

## Tuesday Plenary Speaker



**Annik Magerholm Fet**  
*Professor, Norwegian University of Science and Technology (NTNU)*

Dr. Annik Magerholm Fet is a professor at the Norwegian University of Science and Technology (NTNU) where she is an expert in environmental management and life-cycle analysis. She currently leads multidisciplinary initiatives within NTNU for Corporate Social Responsibility. Dr. Fet has a MSc in Physics and a PhD in Systems Engineering from the University. She has authored five textbooks in Physics and sits on the editorial committee of several internationally

recognized periodicals, including Clean Technologies and Environmental Policy. Much of her experience comes from working on projects that combine education, research and industry partners, and she has published numerous research papers and reports. Her teaching and research have included guest positions with the University of California Santa Barbara and MIT in the USA, Lloyds Register of Shipping, UK, Delft University, the Netherlands, and Wuppertal Institute in Germany. She is an active participant in several international research networks and projects and has been a member of several Evaluation and Selection Committees for Norwegian and international research appointments. Professor Fet has extensive experience in the Maritime sector and has been recognized as a Fellow by the Institute of Marine Engineering, Science and Technology, IMAResT. She is also the Director of Education and Research for the Norwegian Systems Engineering Council.

## Wednesday Plenary Speaker



**Robert C. Stow**  
*Vice President of Engineering & Technology, BAE Systems Inc.*

Robert C. Stow leads the management of engineering and networking of technology development across Operating Groups for BAE Systems Inc. — a \$10 billion leading transnational aerospace and defense systems company. He is responsible for Engineering Life Cycle Management processes used throughout the businesses and also leads numerous world-class enterprise-wide common process improvement initiatives and associated efficiency savings to achieve performance excellence across the corporation. In addition he facilitates and supports technology strategy and planning collaboration across US Operating Groups and U.S. access to BAE Systems p.l.c. U.K. technology. He has 38 years of increasing engineering, technology, and project

management experience in defense electronic systems and software with Singer Kearfott/Plessey/GEC, now known as BAE Systems. He has also previously held responsibility for Project Management in addition to Engineering processes across the US enterprise. The application of systems engineering to network centric sensor to shooter defense systems has been a focus area throughout Bob's career.

Mr. Stow was a prime innovator and engineering project manager for CNIR's (formerly Singer Kearfott) JTIDS (Joint Tactical Information Distribution System) Class 2 Terminals, which provided jam resistant digital communication, relative navigation, TACAN and inherent identification. Follow-on programs such as the Air Force/Army JTIDS Full Scale Development (FSD), Army PJH, U.K. FSD programs, MIDS, and other development activities in the vast C3I market all benefited from his technical expertise and project management leadership. For his outstanding technical contributions, Mr. Stow received the Singer Kearfott Engineer of the Year Award in 1983.

*continued*

### Wednesday Plenary Speaker *continued*

Mr. Stow holds a B.S. degree in Mechanical Engineering from Worcester Polytechnic Institute and two graduate degrees (M.S. and Engineers) in Aeronautics and Astronautics from the Massachusetts Institute of Technology. His professional affiliations include memberships in AFCEA,

ADPA, and the Association of Old Crows (Electronic Defense Association). He serves on the Technical Operations Council (TOC) of the Aerospace Industries Association, the Lean Aerospace Initiative executive board, the Systems & Software Consortium Inc executive board and the Network Centric Operation Industry Consortium (NCOIC).

### Thursday Plenary Speaker



**Dr. Herbert Negele**  
*Project Manager, BMW Group*

Dr. Herbert Negele is Project Manager for the implementation of systems engineering at BMW Group, presently with focus on Driver Assistance Systems. Prior to this assignment, he was leading major project, risk, and process management initiatives within the electrics/electronics system development and at the overall vehicle level. Until November 1999 he worked as an Assistant Professor at the Institute of Astronautics in the field of systems

engineering with special focus on systems modeling and simulation, integrated product and process development, and project management. He received a Master's Degree in aerospace engineering in 1993 and his Ph.D. in systems engineering in 1998 from the Technische Universität München. Dr. Negele is a co-founder of the German Chapter of INCOSE (Gesellschaft für Systems Engineering, GfSE e.V.) and was its first Vice President in 1997 and 1998. He has authored/co-authored more than 30 articles and technical papers on various systems engineering topics and received several best paper/presentation awards, including the Outstanding Paper Award from *Systems Engineering* for the best journal paper in the years 1998-2003. Herbert is Co-Editor of the German Systems Engineering book series in the Herbert Utz Verlag and a member of the INCOSE Commercial Steering Board.

### Banquet Speaker



**William B. Rouse**  
*Executive Director, Tennenbaum Institute at the Georgia Institute of Technology*

This university-wide center pursues a multi-disciplinary portfolio of initiatives focused on research and education to provide knowledge and skills for enterprise transformation. He is also a professor in the College of Computing and School of Industrial and Systems Engineering.

of *Strategic Management* (Wiley, 2001) and the award-winning *Don't Jump to Solutions* (Jossey-Bass, 1998). He is editor of *Enterprise Transformation: Understanding & Enabling Fundamental Change* (Wiley, 2006), co-editor of *Organizational Simulation: From Modeling & Simulation to Games & Entertainment* (Wiley, 2005), co-editor of the best-selling *Handbook of Systems Engineering and Management* (Wiley, 1999), and editor of the eight-volume series *Human/Technology Interaction in Complex Systems* (Elsevier).

Rouse is a member of the National Academy of Engineering, as well as a fellow of three professional societies—the Institute of Electrical and Electronics Engineers, the Institute for Operations Research and Management Science, and the Human Factors and Ergonomics Society. He received his B.S. from the University of Rhode Island, and his S.M. and Ph.D. from the Massachusetts Institute of Technology.

# Academic Forum

#### Welcome

**Muzaffar Shaikh**, *Florida Institute of Technology*

#### SE Certification Programs in Academia

**Stanley Weiss**, *Stanford University*

#### INCOSE 2020 Vision for SE Education & Research

**Andrew Sage**, *George Mason University*

#### Reports: from INCOSE Academic Council and from CESUN

**Dan Hastings**, *MIT, INCOSE Academic Council Chair*

#### Panel: Perspectives on How Industry Tailors University Programs to Satisfy Needs

**Tom Wells**, *Harris Corporation*

#### Panel: Systems of Systems – What Is the Research Agenda

**Stephen Cook**, *University of South Australia*

#### Development of Systems Thinking in Engineers

**Heidi Davidz**, *Aerospace Corporation*

#### Closing Remarks

**Muzaffar Shaikh**, *Florida Institute of Technology*

## Modeling & Tools: Aerospace & Defense

**The FAR Approach : Functional Analysis/Allocation and Requirements Flowdown Using Use Case Realizations**

M. Eriksson, K. Borg, *Land Systems Hägglunds AB*; J. Börstler, *Umeå University*

**Human Performance Modeling for Enterprise Transformation**

G. Lintern, *General Dynamics-AIS*

**Interactive Courseware Project Cost Modeling**

R. Smith, L. Edwards, *SPARTA Inc.*

**Performing Functional Analysis/Allocation and Requirements Flowdown Using Use Case Realizations: An Empirical Evaluation**

M. Eriksson, K. Borg, *Land Systems Hägglunds AB*; J. Börstler, *Umeå University*

**Strategy For the Composition and Development of the Authoritative System Representation (ASR)**

R. Clayton, *Booz Allen Hamilton*

**Tying Requirements to Design Artifacts**

H. C. Briggs, *California Institute of Technology*; M. Sampson, *UGS*

## Modeling & Tools: Consumer Goods

**Applying Systems Modeling Language to A Simple Hardware System**

J. C. Hsu, *The Boeing Company*

**Platform Identification Using Design Structure Matrices**

K. Kalligeros, O. de Weck, *Massachusetts Institute of Technology*

## Modeling & Tools: Emerging Technologies

**An Enterprise Systems Engineering Model**

R. S. Swarz, J. K. DeRosa, G. Rebovich, *The MITRE Corporation*

**The "Big Navy" Meta-model as a Framework for Major Defense Development Projects**

C. M. Ryder, *Johns Hopkins University APL*

## Modeling & Tools: Enterprise

**Generating Predictive Models Using Decision Trees and Neural Networks for Large-Scale Systems Engineering**

R. Selby, *Northrop Grumman*

**Top 40 Systems Engineering Work Products Using Large Word Lists and Self-Organizing Maps**

D. G. Beshore, *The Aerospace Corporation*

**Toward the Institutionalization of Capability Engineering**

W. Robbins, C. Lalancette, M. Lizotte, C. Nécaille, B. Waruszynski, *Defence R&D Canada*

## Modeling & Tools: Information Systems

**Using the Knowledge Pyramid to Characterize Systems**

J. N. Martin, *The Aerospace Corporation*

## Modeling & Tools: Multiple Sectors

**An Approach to Simulation Effectiveness**

D. P. Goncalves, *CSIR*

**Cross Cutting Concerns and Ergonomic Profiling Using UML/SysML**

M. C. Hause, *Artisan Software Tools*

## Modeling & Tools: Public Interest

**Meeting the Challenge of Knowledge-Creating Systems**

J. N. Martin, *The Aerospace Corporation*

## Modeling & Tools: Transportation

**Introducing Structured Information Handling in Automotive EE Development**

D. Malvius, O. Redell, S. Ritzén, *Royal Institute of Technology, KTH*

## SE Management Process: Aerospace & Defense

**An Index to Measure and Monitor a System of Systems' Performance Risk**

P. R. Garvey, *MITRE*

**Integration Challenges of Complex Systems**

B. R. Haskins, J. M. Striegel, *The Boeing Company*

**Reaching CMMI Level 5 is More Than Just Having Adequate Metrics**

R. O. Lewis, J. F. Duckworth, *The Boeing Company*

**Using Earned Value to Track Requirement Progress**

P. Solomon, *Northrop Grumman*

## SE Management Process: Consumer Goods

**Challenges in the Application of Systems Engineering Principles to the Design of Appealing Consumer Products**

V. Agouridas, J. R. Longstaff, T. H. Childs, A. McKay, *University of Leeds*

**The Systems Project: Life Cycle Development/Management of as Many as Four Interrelated Systems**

A. S. Paul, C. Owunwanne, *Howard University*

## SE Management Process: Emerging Technologies

**Enhancing SE Deployment in Large Organisations by Proactively Managing Service Quality of SE Training and Support Services**

M. F. Kossmann, *AIRBUS UK*

**How Do We Win This Game When the Rules Keep Changing? A Case for the**

**Increased Application of Design for Six Sigma in Systems Engineering**

N. A. Mackertich, D. G. Cleotelis, *Raytheon Company*

**A Requirements Guide for All (REGAL)**

J. Dick, *INTEGRATE Systems Engineering*; G. Fanmuy, *PSA Peugeot Citroën*

L-H. Thevenet, *Universite Paris 1*

**Role of Flow-Down Approach and Orthogonal Arrays in System Design and Testing**

R. Jugulum, J. Singh, *MIT*

## SE Management Process: Enterprise

**Capitalizing On Systems Engineering**

J. J. Sherey, *ICTT, Inc.*

**Implementing Three Levels of Risk Management--Risk Management Challenges x 3**

T. H. Holzer, *National Geospatial-Intelligence Agency*

**Optimizing Quality Assurance for Better Results**

N. Malotaux, *N R Malotaux - Consultancy*

**A Practical Program of Research to Measure Systems Engineering Return on Investment (SE-ROI)**

E. C. Honour, *Honourcode, Inc.*

**Real Options and Value Driven Design in Spiral Development**

J. W. Dahlgren, *The MITRE Corporation*

**Towards a Work Breakdown Structure for Net Centric System of Systems Engineering and Management**

G. Wang, *BAE Systems*; J. Lane, B. Boehm, *USC*; R. Valerdi, *MIT*

## SE Management Process: Information Sciences

**i-pub: Status, Insights and Visions**

E. Herzog, A. Pandikow, *Syntell AB*

**Project-driven Adaptation of Software Life Cycle Model**

E. M. Barnard, *IFS South Africa*

## SE Management Process: Information Sciences (continued)

**Ten Design Principles: Some Implications for Multidimensional Quantification of Design Impacts on Requirements**

T. S. Gilb, *RPL*

### **SE Management Process: Infrastructure**

#### **A National Approach to Systems Integration Skills Base Development in Australia**

S. Cook, *CEDISC, UniSA*; L. Sciacca, B. Bates, N. Nandagopal, *DSTO*; S. Allsion, *Scot Allison and Associates*; D. Shackleton, *Shackleton Management Solutions Pty Ltd*; A. Yates, *Government of South Aust. Defence Unit*

### **SE Management Process: Multiple Sectors**

#### **Giving the Integrator Role a Sporting Chance**

J. R. Armstrong, *Systems and Software Consortium*

### **SE Management Process: Transportation**

#### **Applying System Engineering to Naval Shipbuilding**

B. H. Wells, *Raytheon Company*

#### **Implementing a Risk-Based Test-Planning and Test-Specification Process in Automotive Development.**

M. de la Cruz, A. Vollerthun, *3D Systems Engineering GmbH*

### **SE Support Process: Aerospace & Defense**

#### **How Planning for Success Can Lead to Catastrophic Failure**

W. W. Schoening, *Boeing*

#### **Quantitative Analysis: Clawing your Way to the Top of the Maturity Pinnacle**

P. J. Frenz, A. C. Gurvin, *General Dynamics AIS*

#### **Use of Architecture for System Engineering: The Good, The Bad, and The Ugly**

G. Osvalds, *Wells Landers Inc.*

#### **Use of Technical Business Practices by Geographically Separated Teams to Facilitate Concurrent Engineering of Ultraquality Systems**

W. E. Neff, *Los Alamos National Laboratory*; C. H. Dagli, *University of Missouri-Rolla*

### **SE Support Process: Consumer Goods**

#### **The Dual Vee – Illuminating the Management of Complexity**

H.A. Mooz, K. Forsberg, *The Center for Systems Management*

### **SE Support Process: Emerging Technologies**

#### **How Good Is A Process? Evaluating Engineering Processes' Efficiency**

T. S. Gilb, *RPL*

#### **Using Fuzzy Decision Support to Compare Systems Modelling Tools**

E. Rajabally, S. Whittle, *Systems Engineering Innovation Centre*

### **SE Support Process: Enterprise**

#### **Context Based Measurement of Requirements Instability**

M. A. Biddle, S. J. Moritz, *SAIC*

#### **Enabling Measurement-Driven System Development by Analyzing Testing Strategy Tradeoffs**

R. Selby, *Northrop Grumman*

#### **On the Alignment between System Architectures and Organizational Structures**

T. Strandberg, *Syntell AB*

#### **Quantifying the Benefit of Introducing Systems Engineering Processes – Myth or Reality?**

E. Knippel, *BMW Group*; F. Bartel, A. Schulz, *3D Systems Engineering GmbH*

### **SE Support Process: Information Systems**

#### **Evolution of a Standard - EIA-632 From 1994 to 2006**

R. M. Harwell, *SYSTEM Perspectives*

### **SE Support Process: Infrastructure**

#### **A Diagnostic Approach to Risk Driver Definition**

E. Stump, *Galorath Incorporated*

#### **A Value-Based Theory of Systems Engineering**

B. Boehm, A. Jain, *University of Southern California*

### **SE Support Process: Multiple Sectors**

#### **IDEFO Lessons Learned**

D. K. Smith, *UGS Corporation*

### **A Proposed Paper Template for Improving the Quality of Practitioner Written Papers at Conferences and Symposia**

J. E. Kasser, *Systems Engineering and Evaluation Centre*

### **Systems Engineering Professional Development and Certification**

G. H. Fisher, *The Aerospace Corporation*

### **SE Support Process: Transportation**

#### **On the Use of Semantic Web Technology for Requirements Satisfaction, or How Do I Find a Good Bike?**

D. Price, R. Bodington, *Eurostep Limited*

### **SE Technical Process: Aerospace & Defense**

#### **Innovative Systems Engineering: A Creative System Development Approach**

R. A. Powell, *United States Military Academy*; D. Buede, *Innovative Decisions, Inc.*

#### **An Introduction to Network Centric Warfare**

A. Gastelum, *The Boeing Company*

#### **Technical Performance Measures**

J. Oakes, R. Botta, *BAE Systems*; T. Bahill, *University of Arizona*

### **SE Technical Process: Consumer Goods**

#### **Lessons Learnt From the Applications of QFD to the Definition of Complex Systems**

A. Hari, J. E. Kasser, *University of South Australia*; M. P. Weiss, *Technion*

#### **On the Systematic Use of Budget-Based Design**

H. J. Freriks, *Océ-Technologies B.V.*; M. Heemels, G. J. Muller, *Embedded Systems Institute*

#### **Trade Study Cost Analysis Model**

E. J. Casey, D. M. Davis, *Raytheon Missile Systems*

### **SE Technical Process: Emerging Technologies**

#### **Directed Energy Weapons System Architecture to Meet Network Centric Operations Requirements**

P.R. Marbach, *The Boeing Company*

#### **Integration and Test Strategies for Semiconductor Manufacturing Equipment**

I. S. de Jong, *ASML*; R. Boumen, J. M. van de Mortel-Fronczak, J. E. Rooda, *Eindhoven University of Technology*

#### **Test Time Reduction by Optimal Test Sequencing**

R. Boumen, I. de Jong, A. van de Mortel-Fronczak, J. E. Rooda, *Technische Universiteit Eindhoven*

### **SE Technical Process: Enterprise**

#### **Application of Patterns to Systems Engineering and Architecting**

R. J. Cloutier, J. Boardman, D. Verma, *Stevens Institute of Technology*

#### **Capability Engineering for Strategic Decision Making**

M. Lizotte, C. Nécaille, C. Lalancette, *Defence R&D Canada – Valcartier*

#### **Systems Engineering Net-Centric Solutions: An Analysis of Different Perspectives**

D. H. Kemp, G. Crosby, D. Snell, *UK Ministry of Defence*

#### **Technology and Obsolescence Sustainment for Integrated Systems**

T. E. Herald, D. J. Genaw, *Lockheed Martin*

### **SE Technical Process: Infrastructure**

#### **Threads of Reasoning: A Case Study in Printer Control**

H. Sandee, *Eindhoven University of Technology*; M. Heemels, G. Mueller, *Embedded Systems Institute*; P. van den Bosch, *Océ Technologies BV*; M. Verhoef, *Chess Information Technology BV*

### **SE Technical Process: Multiple Sectors**

#### **Impact of Embedded Software Technology on Systems Engineering**

L. J. Doyle, *ITT*; M. C. Pennotti, *Stevens Institute of Technology*

#### **No Cure No Pay: How to Contract for Software Services on a No Cure No Pay Basis**

T. S. Gilb, *RPL*

#### **Trade Studies with Uncertain Information**

D. G. Ullman, *Robust Decisions*; B. Spiegel, *Honeywell Aerospace, Defense & Space*

## Specialty Engineering: Aerospace & Defense

### The Application of Architecture Frameworks to Modelling Exploration Operations Costs

R. Shishko, *Caltech Jet Propulsion Laboratory*

### Using Cognitive Engineering to Improve Systems Engineering

C. A. Bonaceto, K. J. Burns, *The MITRE Corporation*

## Specialty Engineering: Emerging Technologies

### A Basic Primer in Life Cycle Cost Analysis

F. Q. Redman, A. T. Crepea, *Raytheon Missile Systems*

### SysML-Based Systems Engineering Using a Model-Driven Development Approach

P. Hoffmann, *I-Logix*

### Using a Coupled-Design Structure Matrix Framework to Screen for Real Options "In" an Engineering System

J. E. Bartolomei, D. Hastings, D. Rhodes, R. de Neufville, *MIT Engineering Systems Division*

## Specialty Engineering: Enterprise

### Balancing Performance and Affordability

E. J. Casey, D. M. Allen, *Raytheon Missile Systems*

### Certification & Accreditation: The Role of Security Engineering in the Systems Development Life Cycle

J. S. Tysenn, *Harris Corporation - GCSD*

### Defining, Finding, and Hiring REAL Systems Engineers

E. P. Arnold, *BAE Systems L.P.*

## Specialty Engineering: Multiple Sectors

### Managing Compatibility Throughout the Product Lifecycle of Embedded Systems: Definition and Application of an Effective Process to Control Compatibility

F. H. Bornemann, *Systems Engineering Consultant*; S. Wenzel, *Systems Engineering Senior Consultant*

## Specialty Engineering: Public Interest

### Corporate Social Responsibility (CSR)-the System Perspective & the Systems Engineering Role

A. Zonnenshain, *RAFAEL*

## Specialty Engineering: Transportation

### Extending Platforming to the Sequential Development of System Families

R. C. Boas, E. F. Crawley, *Massachusetts Institute of Technology*

### Fine-grained Method and Tool Integration for Better Automotive Software

F. Altheide, *University of Paderborn*; K. Buhr, *Technische Universitaet Berlin*; H. Doerr, *DaimlerChrysler AG*

### Lessons Learned from Synchronizing Complex Systems Development within Automotive Industry

H. Negele, R. Schmidt, *BMW Group*; S. Finkel, S. Wenzel, *3D Systems Engineering GmbH*

## Systems Science: Aerospace & Defense

### Defining the Trade Space for CAIV Optimization Using a Cost Model Derived from Linear Regression of NASA Project Data

J. F. Krupa, *Westinghouse Savannah River Company*; P. J. Compton, *University of Alabama at Huntsville*

### Joint Cognitive Systems: Considering the User and Technology as One System

B. P. McKenna, J. W. Gualtieri, W. C. Elm, *ManTech - CSEC*

### Part Count and Design of Robust Systems

D. D. Frey, *MIT*; J. Palladino, *General Electric Aircraft Engines*; J. P. Sullivan, *Pratt & Whitney*; M. . Atherton, *Rolls-Royce International Limited*

## START Analysis for ESAS Capability Needs Prioritization

W. P. Lincoln, J. Mrozinski, H. Hua, S. Merida, K. Shelton, V. Adumitroaie, C. R. Weisbin, *Jet Propulsion Laboratory*

## Systems Science: Consumer Goods

### Designing Systems for Adaptability by Means of Architecture Options

A. Engel, *Israel Aircraft Industry*; T. R. Browning, *Texas Christian University*

### Feelings and Physics: Emotional, Psychological, and Other Soft Human Requirements, by Model-Based Systems Engineering

W. D. Schindel, *ICTT, Inc. and System Sciences, LLC*

## Systems Science: Emerging Technologies

### A Dynamic Modeling Approach Enhancing Classic Scenario Generation Techniques

S. J. Eelman, S. Föller, *Technical University of Munich*

### How Should We Use the Term "System of Systems" and Why Should We Care?

D. T. Cocks, *Lockheed Martin - MS2*

### Network Centric Operation Implementations in Several Domains, a Literature Survey

C. Adler, *The Boeing Company*; C. Dagli, *University of Missouri-Rolla*

### A Study of Applying Game Theoretic Concepts on Distributed Engineering System Design

H. Wang, D. Frey, *MIT*

## Systems Science: Enterprise

### Cross-Cultural Issues Associated with the Application of ISO/IEC 15288 Standard

T. L. Ferris, *University of South Australia*

### Enterprise Opportunity and Risk

B. E. White, *The MITRE Corporation*

### Systems Engineering an INCOSE Chapter

P. R. Davies, *Thales UK Ltd., Aerospace Division*

## Systems Science: Information Systems

### Systems Engineering Model for Integrability (SEMI): A Three Step Process for the Continuous Development of Highly Integrated Enterprise Applications

L. W. John, *L3 Communications Titan*

### Tradeoff Studies and Cognitive Biases

E. D. Smith, T. Bahill, *University of Arizona*

## Systems Science: Infrastructure

### Application of Systems Engineering to Industrial Supply Chains

C. Haskins, *NTNU*

## Systems Science: Multiple Sectors

### Conflict in Systems Engineering Product Data Exchange Standardisation

R. Eckert, *EADS Deutschland GmbH*

## Systems Science: Public Interest

### Architecting Synthetic Environments to Support the Systems Engineering of Capability

D. J. Battersby, *BAE Systems (SEIC)*

### A Framework for a National Undergraduate Systems Engineering Stream of Studies in Discipline-centric Degrees: Proposal Analysis

T. L. Ferris, *University of South Australia*; Y-S. W. Peng, *Overseas Chinese Institute of Technology*

### A Merlin Perspective Shines Light on Tough Issues

J. W. Carl, *Retired*

## Systems Science: Transportation

### Identification of Real Options “in” Projects

T. Wang, *Morgan Stanley*; R. de Neufville, *Massachusetts Institute of Technology*

### Key Reserves Paper

#### Achieving Information System Implementation Success through Satisfied Customers

P. S. Camilo, *BAE Systems, E&IS*; L. Wallach, *Xerox Corporation*

#### The Architecture of Enterprise Architecture

T. Blevins, *The MITRE Corporation*

#### Balancing Cost and Performance During Design

D. M. Cronin, *Cognition Corporation*; K. Ash, *Raytheon Company*

#### Can Systems Modeling Language Impact Systems Engineering?

K. E. Orr, *The Boeing Company*; K. Ramakrishnan, C. H. Dagli, *University of Missouri-Rolla*

#### Capturing Total System of Systems Costs Using SEER-H with Total System Vision (TSV) and SEER-SEM: An Example Application

F. P. Joseph, R. A. Michael, *Galorath Incorporated*

#### Competency Framework for Systems Engineering

F. Ondore, *QinetiQ*

#### Cost Models with Explicit Uncertainties for Electronic Architecture Trade-off and Risk Analysis

J. Axelsson, *Volvo Cars / Mälardalen University*

#### Development Program Risk Assessment based on Utility Theory

J. Z. Ben-Asher, *Technion*

#### Enterprise Analysis and Assessment

J. J. Roberts, *The MITRE Corporation*

#### The Failure of the FBI Virtual Case File System: A Systems Engineering Perspective

J. L. Nix, *University of Maryland University College*

#### Heuristics and Genetic Algorithms

M. D. Mobley, *The Boeing Company*; C. H. Dagli, *University of Missouri-Rolla*;

D. Enke, *University of Missouri-Rolla*

#### Improving the Structure and Content of the Requirement Statement

W. R. Scott, J. Kasser, X-L. Tran, *Systems Engineering & Evaluation Centre*

#### Integrated Project Control Loop Concept – Surviving in the Jungle of Complex Projects with an Advanced Project Management Decision Basis

T. Laudan, A. Mauritz, *EADS*

#### Lean Six-Sigma with Systems Engineering

P. O. Songcuan, *Seattle Metropolitan*; D. H. Chian; V. Allada

#### Preparing SEBOK for Korea Defense Systems Acquisition Processes

M-D. Han, *INCOSE Korea Chapter*

#### A Prioritization Process

R. Botta, T. Bahill, *BAE Systems*

#### Process for ABET Accreditation in a Systems Engineering Undergraduate Program

P. S. Brouse, *George Mason University*

#### Process in Enterprise Systems Engineering

L. K. McCaughin, J. K. DeRosa, *MITRE Corporation*

#### Systems Engineering (SE) Patterns and Pattern Language

J. J. Simpson, M. J. Simpson, *System Concepts*

#### Universal Electronic Health Record: Just what the doctor ordered

R. Shahi, *Capital Technology Information Systems I*

# Panels

## The Integration Process – An Unresolved Issue for Systems Engineers

**Moderator:** Dr. Avigdor Zonnenshain of RAFAEL

**Panel Members:**

Mr. Eric Honour of Honourcode, Inc.

Prof. Joseph Ben Asher of Technion – Israel Institute of Technology

Mr. Jeffery Grady of Jog System Engineering

Mr. Uzi Orion of El-Op Israel

Mr. Jean Phillip Lerat of Sodijs Corporation

Dr. Joseph Kasser of University of South Australia

## Is Systems Engineering for “Systems of Systems” Really Any Different?

**Moderator:** Ms. Sarah Sheard of Third Millennium Systems LLC

**Panel Members:**

Dr. Lawrence Pohlmann of Strategics Consulting

Mr. James Long of Vitech Corporation

Dr. Tim Ferris of University of South Australia

Dr. Russ Abbot of Aerospace Corporation & Cal State U, LA

Dr. Barry Boehm of University of Southern California

## How Are Natural Disasters Events Similar or Dissimilar to Terrorist Attacks?

**Moderator:** Dr. William Mackie of CSC and Univ. of MD Univ. College

**Panel Members:**

Mr. Stephen Sutton of Northrop Grumman TASC

Dr. George Loup of University of New Orleans

Mr. James Long, President of Vitech Inc.

Dr. Joseph Carl, President, Mosaic Renaissance International

## Different Approaches to Realizing Net-Centric Solutions

**Moderator:** Mr. Duncan Kemp of UK MOD

**Panel Members:**

Mr. Karl Geist of US Naval Air System Command

Mr. John Hsu of The Boeing Company

Mr. Staffan Stroembaeck of Swedish Defence Material Agency, FMV

Mr. Cihan Dagli of University of Missouri-Rolla

## Our Multiplying Myriad of Risk Management Standards: “Converging Toward Best Practice” or “A Divergent Tangled Web Destined to Entrap Us?”

**Moderator:** Mr. Jack A. Stein of Terumo Cardio-vascular Systems Corp.

**Panel Members:**

Dr. Robert N. Charrette of ITABHI Corp.

Mr. Raymond C. Williams of Carnegie Mellon University Software Engineering Institute

Mr. Mark A. Powell of Futron Corp.

Dr. Alfred M. Dolan of The University of Toronto

Mr. Richard W. Kitterman of Northrop Grumman

Mr. Garry J. Roedler of Lockheed Martin Management and Data Systems

## Graduate Education and Research Considerations for “System of Systems” Engineering – The Georgia Tech Air Force Long Range Strike Capability Project as an Example

**Moderator:** Dr. Daniel Schrage of The Georgia Institute of Technology

**Panel Members:**

Dr. Dimitri Mavris of The Georgia Institute of Technology

Mr. Dave Brown of the U.S. Airforce Research Laboratory

Mr. Carl Weiss of Pratt and Whitney

Mr. Bob Nelson of Raytheon

Mr. Pat Cassidy of Boeing



## Sunday • 9 July 2006

Free, Half Day Tutorials

- **Model-Based System Engineering – A Primer on What, Why, and How**  
Mr. James Long, *Vitech Corporation* – HOA (PM)
- **Introduction to Patterns Through Writing Systems Engineering Patterns**  
Ms. Cecelia Haskins, *NTNU* and Mr. Amir Raveh, *Omnisys* – HOB (PM)
- **A Global Vision of Systems Engineering**  
Mr. Jean-Philippe Lerat, *SODIUS* – HOC (AM)
- **Stand on the Standards**  
Mr. John Clark, *Northrop Grumman* – HOD (AM)

## Monday – Thursday

Tutorials Available at an Additional Fee

### Monday, 10 July 2006

- **F01 Complete Picture to Model Complex Systems: What, When, How, and Why Model Systems** (full day)  
Mr. Jean-Philippe Lerat, *SODIUS* and Mr. Alain Faisandier, *MAP système*
- **F02 What You Will Need to Know About Chaos, Complexity, and Complex Adaptive Systems to do System Engineering Well Into the 21st Century** (full day)  
Ms. Sarah Sheard, *Third Millenium Systems, LLC*
- **H01 Working the Tough Issues of Systems of Systems Planning, Estimating, and Execution** (PM)  
Dr. Barry Boehm and Ms. Jo Ann Lane, *USC Center for Software Engineering*
- **H02 Verifying Requirements** (PM)  
Mr. David Gelperin, *ClearSpecs Enterprises*

### Tuesday, 11 July 2006

- **F03 Introduction to the System Modeling Language (SysML)** (full day)  
Mr. Sanford Friedenthal, *Lockheed Martin* and Mr. Alan Moore, *Artisan Software*
- **F04 System Analysis, Design, and Development** (full day)  
Mr. Charles S. Wasson, *John Wiley Author*
- **H03 Introduction of the Systems Engineering Dual Vee Model** (PM)  
Mr. Hal Mooz and Dr. Kevin Forsberg, *Center for Systems Management*
- **H04 Architecting and Engineering Systems, Processes, and Organizations Using the Design Structure Matrix (DSM)** (PM)  
Mr. Tyson R. Browning, *MJ Neeley Sch of Business, Texas Christian University*

### Wednesday, 12 July 2006

- **F05 Architecture Frameworks and Modeling** (full day)  
Mr. James N. Martin, *The Aerospace Corporation*
- **F06 An Effective Specification Development Algorithm** (full day)  
Mr. Jeffrey O. Grady, *JOG System Engineering, Inc*
- **H05 Competitive Systems Engineering: How to do System Engineering in Hot Competition. Detailed Pragmatic and Unconventional Techniques** (PM)  
Mr. Tom Gilb, *Result Planning Limited*
- **H06 Performance-Based Earned Value** (PM)  
Mr. Paul Solomon, *Northrop Grumman Corporation*

### Thursday, 13 July 2006

- **H07 CSEP Application Preparation Tutorial** (AM)  
Mr. Robert B. Wheeler, *The Center for Systems Management*
- **H08 Introduction to Architecture Frameworks** (AM)  
Mr. Rolf Siegers, *Raytheon Company*

### Technical Information Exchange Session (TIES)

- **Multi-Objective Decision Analysis Techniques for System Engineering**  
Dr. Edward A. Pohl, *Dept of Industrial Eng, University of Arkansas*  
Dr. Gregory S. Parnell, *US Military Academy and Innovative Decisions, Inc*
- **Dealing with Uncertainty in System Engineering**  
Mr. Mark A. Powell, *Attwater Consulting*
- **Definition of New Complex System Using Quality Functional Deployment (QFD)**  
Dr. Amihud Hari, *RAFAEL*
- **System Engineering and Management – Thinking Outside the Box**  
Dr. Howard Eisner, *The George Washington University, SEAS/EMSE*
- **Multi-Channel Modeling**  
Mr. Jeffrey O. Grady, *JOG System Engineering, Inc.*

# Exhibitors-To-Date

3SL Inc.  
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BAE Systems  
CA Institute of Technology Industrial Relations Center  
Cognition Corporation  
Compliance Automation, Inc.  
Cornell University Systems Engineering Program  
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of Engineering Management & SE  
USC Viterbi School of Engineering  
Vitech Corporation

For Exhibit information and opportunities, please contact Judith Feliciano at [2006-exhibits@incose.org](mailto:2006-exhibits@incose.org)  
or see the INCOSE Symposium website at [www.incose.org/symp2006](http://www.incose.org/symp2006).

# Special Events

## OPENING ICE BREAKER RECEPTION

Monday • 10 July 2006, 1800-2030

Join your colleagues and the INCOSE 2006 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 Orlando.

## EXHIBIT HALL SOCIAL HOUR

Tuesday • 11 July 2006, 1700-1800

Come dressed as vacationers (sun hats, shorts, Hawaiian shirts, sandals, etc...) and get set to experience some interactive fun with the exhibitors as you begin the *Discovery Card Fun Game!* This is only the start, the game will finish during the Wednesday Reception.

## INCOSE RECEPTION AND BANQUET

Wednesday • 12 July 2006, 1800-2200

All delegates are invited to attend the Symposium Reception and Banquet on Wednesday, 12 July. The Reception will take place in the Exhibit Hall where the *Discover Card Fun Game* will finish with prizes awarded. From there you will go to the Banquet where you will enjoy a night of fine food and entertainment. Dress will be business casual.

# Organizing Committee

## Symposium

Wes Calhoun, *Raytheon Company*

Becky Matz, *SAIC*

## Technical Program

David Cleotelis, *Raytheon Company*

Aaron Slone, *Pratt & Whitney Rocketdyne (ret.)*

## Tutorials

B. David Krigelman, *Krigelman & Associates, Inc.*

Jack Baumgardner, *NAVAIR Orlando Training Systems Division*

## Panels

Vern Densler, *Northrop Grumman Corporation*

Melvianne Cady, *Pratt & Whitney Rocketdyne*

## Academic Forum

Dr. Muzaffar Shaikh, *Florida Institute of Technology*

Joseph Vandeville, *Northrop Grumman Corporation*

## Marketing

Dr. Steven Gordon, *Georgia Tech Research Institute*

Earl Valencia, *Raytheon Company*

Sven-Olaf Schulze, *Airbus Deutschland GmbH*

## Exhibits

Judith Feliciano, *Lockheed Martin Missiles & Fire Control*

J. Leon Wheeler, *Lockheed Martin Missiles & Fire Control*

## ROBOTICS DEMONSTRATION

Wednesday • 12 July 2006, 1500-1800

Enjoy Robotics Demonstrations on Wednesday afternoon. Presentations will be given by Florida schools and companies.

## Technical Tours

### KENNEDY SPACE CENTER: BEHIND THE SCENES

Friday • 14 July 2006, 0800 - 1600

Tour is open to all attendees and their family members. Children must be at least 12 years of age to participate. Security Forms are required and must be received by PCM *by 8 May*. Tour is limited to the first 40 paid individuals who have fulfilled the required paperwork by the 8 May deadline. No exceptions can be made after this date.

Specific tour details, guidelines and security form are available on the symposium website: [www.incose.org/symp2006](http://www.incose.org/symp2006)

### UCF INSTITUTE FOR SIMULATION & TRAINING

Friday • 14 July 2006, 0800 - 1200

Tour is open to all attendees and their family members. See the symposium website for tour details.



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<input type="checkbox"/> 2-DAY Member **	\$475 \$515 \$ _____
<input type="checkbox"/> 2-DAY Senior Member **	\$238 \$258 \$ _____
**Select Day(s): <input type="checkbox"/> Mon., 10 July <input type="checkbox"/> Tues, 11 July <input type="checkbox"/> Wed, 12 July <input type="checkbox"/> Thurs, 13 July	
<input type="checkbox"/> Annual Membership Dues	\$105 \$105 \$ _____
<input type="checkbox"/> Annual Senior Membership Dues	\$ 55 \$ 55 \$ _____
<input type="checkbox"/> Annual Student Membership Dues	\$ 20 \$ 20 \$ _____

NON-MEMBER REGISTRATION (Registration includes a one-year INCOSE membership)	
<input type="checkbox"/> Symposium Non-Member	\$ 830 \$ 890 \$ _____
<input type="checkbox"/> Symposium Student Non-Member	\$ 100 \$ 100 \$ _____
<input type="checkbox"/> Passport Non-Member *	\$1260 \$1340 \$ _____
* Passport Registrants make your tutorial selections here. <b>You may only select one tutorial per day</b> (either one half-day or one full day tutorial). Early selection is strongly recommended.	
Mon <input type="checkbox"/> F01 <input type="checkbox"/> F02 <input type="checkbox"/> PM <input type="checkbox"/> H01 <input type="checkbox"/> H02	Wed <input type="checkbox"/> F05 <input type="checkbox"/> F06 <input type="checkbox"/> PM <input type="checkbox"/> H05 <input type="checkbox"/> H06
Tues <input type="checkbox"/> F03 <input type="checkbox"/> F04 <input type="checkbox"/> PM <input type="checkbox"/> H03 <input type="checkbox"/> H04	Thur <input type="checkbox"/> AM <input type="checkbox"/> H07 <input type="checkbox"/> H08
<input type="checkbox"/> 1-DAY Non-Member **	\$355 \$385 \$ _____
<input type="checkbox"/> 2-DAY Member **	\$580 \$630 \$ _____
**Select Day(s): <input type="checkbox"/> Mon., 10 July <input type="checkbox"/> Tues, 11 July <input type="checkbox"/> Wed, 12 July <input type="checkbox"/> Thurs, 13 July	

SUNDAY FREE HALF-DAY TUTORIALS (no cost, but seating is limited and pre-registration is required)	
HOA Model-Based SE: A Primer on What, Why & How (PM)	YES, I plan to attend _____
HOB Introductions to Patterns through Writing SE Patterns (PM)	YES, I plan to attend _____
HOC Global Vision of SE (AM)	YES, I plan to attend _____
HOD Stand on the Standards (AM)	YES, I plan to attend _____

TUTORIALS (MONDAY-THURSDAY: OFFERED at AN ADDITIONAL FEE Unless Passport Registration Is Selected.)	
Please indicate your selections.	
<input type="checkbox"/> Student Full Day Tutorial	\$200 \$225 \$ _____
<input type="checkbox"/> Student Half-Day Tutorial	\$100 \$115 \$ _____
<input type="checkbox"/> Senior Member Full Day Tutorial	\$145 \$170 \$ _____
<input type="checkbox"/> Senior Member Half-Day Tutorial	\$ 80 \$ 93 \$ _____
<b>Monday</b>	
H01 Working the Tough Issues of Systems of Systems(PM)	\$160 \$185 \$ _____
H02 Verifying Requirements (PM)	\$160 \$185 \$ _____
F01 Complete Picture to Model Complex Systems (FULL)	\$290 \$340 \$ _____
F02 What You Will Need to Know About Chaos, Complexity, & Complex Adaptive Systems to do SE (FULL)	\$290 \$340 \$ _____
<b>Tuesday</b>	
H03 Introduction of the SE Dual Vee Model (PM)	\$160 \$185 \$ _____
H04 Architecting and Engineering Systems, Processes, & Organizations Using the Design Structure Matrix (PM)	\$160 \$185 \$ _____
F03 Introduction to the System Modeling Language (FULL)	\$290 \$340 \$ _____
F04 System Analysis, Design, and Development (FULL)	\$290 \$340 \$ _____
<b>Wednesday</b>	
H05 Competitive Systems Engineering (PM)	\$160 \$185 \$ _____
H06 Performance-Based Earned Value (PM)	\$160 \$185 \$ _____
F05 Architecture Frameworks and Modeling (FULL)	\$290 \$340 \$ _____
F06 An Effective Specification Development Algorithm (FULL)	\$290 \$340 \$ _____
<b>Thursday</b>	
H07 CSEP Application Preparation Tutorial (AM)	\$160 \$185 \$ _____
H08 Introduction to Architecture Frameworks (AM)	\$160 \$185 \$ _____

Optional Event Tickets for Guest(s), and Extra Proceedings (additional cost items)	
Ice-Breaker Reception & Tuesday Social Hour	\$40 x _____ \$ _____
Symposium Banquet (Wednesday)	\$75 x _____ \$ _____
Proceedings (CD-ROM)	\$60 x _____ \$ _____
Lunch: <input type="checkbox"/> Mon. <input type="checkbox"/> Tues. <input type="checkbox"/> Wed. <input type="checkbox"/> Thurs.	\$35 x _____ \$ _____
INCOSE Pin	\$15 x _____ \$ _____

Optional Technical Tours	
NASA Kennedy Space Center Tour, Fri, 14 July (all day)	\$40 x _____ \$ _____
UCF Institute for Simulation Training, Fri, 14 July	\$20 x _____ \$ _____
(See website for info and Security Forms)	

Name of Guest(s) (Required for badge if purchasing guest events/meals or optional tours)  
\_\_\_\_\_

► TOTAL REMITTANCE \$ \_\_\_\_\_

# Hotel & Registration Information

## OMNI ORLANDO RESORT AT CHAMPIONSGATE

1500 Masters Boulevard • ChampionsGate, Florida 33896

Phone: (407) 390-6664

Fax: (407) 390-6600

Hotel website: [http://www.omnihotels.com/hotels/default.asp?h\\_id=65](http://www.omnihotels.com/hotels/default.asp?h_id=65)

Reservations: [https://resweb.passkey.com/Resweb.do?mode=welcome\\_ei\\_new&eventID=23154](https://resweb.passkey.com/Resweb.do?mode=welcome_ei_new&eventID=23154)

Driving: <http://www.omnihotels.com/FindAHotel/OrlandoChampionsGate/MapAndDirections.aspx>

Just moments from Disney World yet seemingly in a world of its own, this new 730 room resort hotel is a paradise for families, golfers, and others looking for comfort and relaxation within close proximity to all that Orlando has to offer. Guest rooms at the Omni Orlando Resort include an executive work desk, complimentary high-speed wireless Internet access, two phones, in-room safe, coffee maker, iron and board, bathrobes and more.

The Resort features a range of dining options including *Zen*, offering a menu of Pan-Asian dishes and sushi; *Trevi's*, featuring Mediterranean-style dishes in an Italian garden atmosphere; the *Broadway Deli* which offers an array of light snacks and refreshments; *Croc's*, a poolside grill, the *Lobby Bar*, the *Clubhouse Restaurant*, and *David's Club*, a casual sports bar and grill with three plasma TVs, pool table, foosball table and electronic darts.

During your leisure time, make plans to enjoy the full-service health club, the European Spa, two championship golf courses designed by Greg Norman, the 850-foot lazy river water attraction that winds through tunnels and gentle rapids, a formal outdoor swimming pool and a family activity pool with waterslides, volleyball, basketball and tennis courts. For families, Omni makes kids feel welcome with their Omni Kids' Program – <http://www.omnikidsrule.com/kidsprogram.asp>.

## ■ INCOSE 2006 GROUP RATES:

A special Group Rate of \$129 per night; or \$95 Government Rate (Single or Double occupancy plus \$10 per room, per night Resort Fee\*; \$20.00 for additional persons above double occupancy) has been negotiated with the hotel for attendees of the INCOSE 2006 Symposium. The rate is exclusive of applicable state and local taxes, currently 12%. **Reservations must be made by Saturday, June 10, 2006 in order to receive the discounted group rate. Please be sure to mention you are attending the INCOSE 2006 Symposium to receive the group rate.**

Discounted group and government rates apply **until the reservation deadline of June 10, 2006** or until all rooms in the group block have been reserved, whichever occurs first. After June 10, 2006 group and government rates might not be available so please make your reservations early. A credit card will be required to guarantee your reservation. Check in time is 3:00 pm (Eastern) with a checkout time of 11:00 am (Eastern). Group rates will be honored three (3) days prior to and three (3) days after the meeting dates, subject to availability of rooms at the time of reservation.

Please contact the hotel directly to make your hotel reservations.

By Telephone: Toll Free 1-(800)-400-1700 or 1-(321)-677-6664

Online: [https://resweb.passkey.com/Resweb.do?mode=welcome\\_ei\\_new&eventID=23154](https://resweb.passkey.com/Resweb.do?mode=welcome_ei_new&eventID=23154)

Promotional Code for Government Attendees: INCOSEGOV

\*Resort Fee covers use of health club, all recreation activities including Lazy River pool, tennis, volleyball and basketball, driving range balls, transportation to Disney theme parks, daily newspaper, local and toll-free phone calls, high speed internet access and self parking.

## ■ GROUND TRANSPORTATION

The **Omni Orlando Resort at ChampionsGate** is 25 minutes from the Orlando International Airport.

Transportation from Orlando International Airport:

**Round Trip Shuttle Service:** Approximately \$29 roundtrip per person (may have additional stops)

**Taxi Service:** Approximately \$65 one way

**Town Car Service:** Approximately \$70 one way

**Shuttle Service:** Approximately \$12 per person one way

See hotel driving instructions: <http://www.omnihotels.com/FindAHotel/OrlandoChampionsGate/MapAndDirections.aspx>.

## ■ HOW TO REGISTER:

The Online Registration Form can be found on the Symposium web site at: <http://www.incose.org/symp2006>

This year, the Symposium is again featuring a **Passport Registration**, which entitles the delegate to the full Symposium Registration **and** admittance to all 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](mailto: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 of fee, 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 in the space provided 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

If you enroll and cannot attend, the registration fee less a \$50 (US\$) processing fee will be refunded if **a written request is received by PCM by 15 June 2006**. For cancellations after that date, 50% of the fee paid will be deducted from the refund. No refunds will be given to registrants who fail to cancel by **15 June 2006** or who do not show up on site. In the case of a cancelled event, the full event fee will be refunded.

**Please Note:** If you register as a non-member (new member) or renewing INCOSE member, and you register for the Symposium by check or credit card, and then cancel your registration, the \$105 (US\$) membership fee will be retained. This also applies to registrants who are replaced by another attendee. If you fall into this category and have paid by purchase order, your registration and membership fees will not be invoiced, your membership fee will not be credited, and you must pay INCOSE directly for your 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: [pcminc@pcmisandiego.com](mailto:pcminc@pcmisandiego.com)

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The INCOSE 2006 Planning Committee thanks and acknowledges the following Sponsors for their commitment and generous contributions to this International Symposium. Their support helps to ensure the ongoing quality of the Symposium.

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## The Seventeenth International Symposium of the International Council on Systems Engineering

Town and Country Resort · San Diego, California, USA

### Systems Engineering: Key to Intelligent Enterprises

The INCOSE 2007 theme highlights the dramatic expansion of opportunities available to those who learn to see and treat enterprises as systems and systems as enterprises.

For more information and program updates visit our booth in the INCOSE 2006 Exhibit Hall or refer to our website at [www.incose.org/symp2007](http://www.incose.org/symp2007)



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