Thursday, 14 July

0700-0745

Speakers/Session Chairs' Breakfast – *Riverside Court*

0700-0800

Continental Breakfast – *Galleria*

0700-1500

Speaker Ready Room – *Aqueduct AB*

0700-1500

Cyber Café *sponsored by* **Boeing** – *Empire Lounge*

0700-1600

Symposium Registration – *Galleria*

0800-1300

Exhibits Open

0800-1200

Half-Day Optional Fee Tutorials *(Ticket Required)*

Tutorial H07 — **Unified Life Cycle Modeling**
Peter Hantos, *The Aerospace Corporation*
Location: *Cascade DEF*

Tutorial H08 — **How to Establish and Maintain Integrated Teams – CMMI Level 3.5**
Tim Kasse, *Kasse Initiatives LLC*
Location: *Highland DG*

0800-1700

INCOSE Meetings – See INCOSE Business Meeting Sections

0830-1000

SESSION 10: Six Simultaneous Technical Paper & Panel Tracks – See page 67

1000-1030

Coffee Break - *Exhibit Hall*

1030-1200

SESSION 11: Five Simultaneous Technical Paper & Panel Tracks – See page 68

1200-1300

Light Lunch - *Exhibit Hall*

1300-1500

Thursday Closing Keynote / Plenary Session – *Lilac Ballroom*
Bugs in the Space Program: The Role of Software in Systems Failure
Steve Easterbrook, *University of Toronto*

1500-1600

Closing Reception – *Riverside Court*

Keynote Speaker

Thursday, 14 July 2005, 1300

Bugs in the Space Program: The Role of Software in Systems Failure

Steve Easterbrook, *University of Toronto*

Steve Easterbrook is an associate professor of computer science at the University of Toronto, director of the Bell University Labs, and associate director of the Knowledge Media Design Institute. He received his PhD in 1991 from Imperial College, London, on the topic of negotiation and communication of system requirements. He joined the faculty in the School of Cognitive Science at the University of Sussex, where he pioneered new degree programs in human-centered software design, leading an interdisciplinary team of cognitive and socialpsychologists, human-computer interaction specialists and computer scientists. From 1995 to 1999, he led the research team at NASA's Independent Verification and Validation (IV&V) Facility in West Virginia. During this time he investigated techniques and processes for software verification, and acted as an expert advisor for NASA on the independent assess ment and IV&V contracts for the Space Shuttle Flight Software, the International Space Station, the Earth Observation System, as well as several planetary probes.

In 1999 he joined the faculty at University of Toronto, where he continues his research and teaching in software verification, systems analysis, and requirements engineering.

He has published over 60 papers in software engineering, including pioneering work on the introduction of formal verification techniques into software practice, and on managing inconsistencies in software specifications. He served as general chair for the International Symposium on Requirements Engineering in 2001, and continues to serve on the RE conference steering committee. He has served on the program committees for many international conferences and workshops in Requirements Engineering and Software Engineering, and is a member of the editorial boards of the Requirements Engineering Journal and the Journal of Automated Software Engineering.

Abstract:

Software has an important role to play in making modern systems more flexible, adaptable and autonomous. But we don't yet have a mature engineering discipline for software development. For the systems engineer, important questions are still unanswered: how risky is software in comparison with other parts of a system? Can software be treated as 'just another component'? Or does software demand special attention in systems engineering?

The emerging field of software forensics can shed some light on these questions. By investigating the circumstances surrounding software failures, we get a sense of the risks involved. In this talk, I will use a series of case studies from the space program to draw out some crucial lessons. The examples include the European Space Agency's original Ariane-5 launch vehicle, and several of NASA's Mars probes. Each of these case studies makes a fascinating story in its own right. In each case, the failure appears to be a normal accident: a relatively simple technical problem led to a systems failure because a whole series of systems engineering mistakes allowed it to. However, the failure profiles in these cases reveal some of the key distinguishing characteristics of software. These characteristics have important implications for systems engineering.

Thursday, 14 July 2005

SESSION 10

Session Chair:	Lilac Ballroom North 10.1 SE Principles *Brian White*	Highland AK 10.2 SE Management *Melinda Whitfield*	Highland BJ 10.3 SE Process *Phillip Rust*	Highland CH 10.4 Process Improvement *Dieter Scheithauer*	Cascade ABC 10.5 PANEL 6	Highland EF 10.6 PANEL 7
0830-0855	10.1.1 **A Systems Approach to Process Infrastructure** J.R. Armstrong, *Systems and Software Consortium, Inc.*	10.2.1 **Requirements—The Good, the Bad, and the Ugly** J. Martin, *The Aerospace Corporation;* S. Arnold, *QinetiQ*	10.3.1 **The Producing System** A.S. Paul, *Howard University;* G.A. Yerace, *US Army Research Laboratory*	10.4.1 **Measuring the Lifecyde Value of a System** T.R. Browning, *Texas Christian University;* E.C. Honour, *Honourcode, Inc.*	Panel - **Requirements Development in Commercial Industry** ***Moderator:*** R. Gonzales, *Sandia National Labs* ***Panelists:*** H. Kaindl, *Vienna Univ. of Tech.* M. Sampson, *UGS* E. Asiaksen, *Sinclair Knight Merz* R. Dove, *Paradigm Shift Int'l*	Panel - **Psychological, Technical and Managerial Aspecits of Effective Design Review** ***Moderator:*** A. Zonnenshain, *RAFAEL* ***Panelists:*** T. Gilb, *RPL* E. Honour, *Honourcode* J. Armstrong, *Systems Software Consortium* J. Kasser, *Univ. So. Australia* S. Shoshani, *RAFAEL*
0900-0925	10.1.2 **Canadian Capability Engineering Process Foundations** M. Mokhtari, M. Lizotte, C. Lalancette, G. Dussault, M. Couture, F. Bernier *Defence R&D Canada - Valcartier* S. Lam, *Defence R&D Canada – Ottawa*	10.2.2 **Proposition of a Methodology and Tools for the Management of Innovative Design Projects** C. Baron, S. Rochet, C. Gutierrez, *LESIA/INSA*	10.3.2 **A Conflict Resolution Approach to Capturing System Architecting Lessons Learned** C.J. Bryan, *The Boeing Company;* C. Dagli, *University of Missouri - Rolla*	10.4.2 **System Integration Frameworks** J.J. Simpson, M.J. Simpson, *System Concepts*		
0930-0955	10.1.3 **Agile SYSTEMS ENGINEERING Versus AGILE SYSTEMS Engineering** R. Haberfellner, *Technical University Graz;* O.L. de Weck, *Massachusetts Institute of Technology*	10.2.3 **Guidance on Tailoring of Systems Engineering Processes for Quick Reaction Capability (QRC) Developments** A. Richstein, *Space Technology Office;* J.T. Nolte, *Northrop Grumman IT-TASC*	10.3.3 **10 Golden Questions for Concept Exploration and Development** D.C. Surber, *Raytheon Technical Services Company, LLC*	10.4.3 **Putting Leadership into Systems Engineering - A Model for Systems Engineering Leadership Development** T.H. Holzer, *National Geospatial-Intelligence Agency*		

SESSION 11

Session Chair:	Lilac Ballroom North 11.1 Measurements & Analysis *Garry Roedler*	Highland AK 11.2 Patterns & Model-Based SE *Terje Fossnes*	Highland BJ 11.3 Application *Alain Faisandier*	Highland CH 11.4 SE Management *Erik Aslaksen*	Highland EF 11.6 PANEL 8
1030-1055	11.1.1 **Calculations of Flexibility in Space Systems** R. Nilchiani, D. Hastings, C.Joppin, *Space Systems Laboratory, MIT*	11.2.1 **Requirements Statements Are Transfer Functions: An Insight from Model-Based Systems Engineering** W.D. Schindel, *ICTT, Inc., and System Sciences, LLC.*	11.3.1 **What are Levels?** T. Bahill, R. Botta, *BAE Systems;* E. Smith, *University of Arizona*	11.4.1 **From Waterfall to Evolutionary Development (Evo): How We Rapidly Created Faster, More User-Friendly, and More Productive Software Products for a Competitive Multi-National Market** T. Johansen, *FIRMAS;* T.S. Gilb, *RPL*	Panel - **The Value of Systems Engineering to Program Management** ***Moderator:*** M. Schaeffer, *OUSD(AT&L)* ***Panelists:*** B. Sakalamer, *OUSD(AT&L)* D. Castellano, *OUSD(AT&L)* R. Lockhart, *OUSD(AT&L)* W. Anderson, *OUSD(AT&L)*
1100-1125	11.1.2 **A Case Study of Multi-Disciplinary Modeling Using MATLAB / Simulink and TrueTime** P. van den Bosch, *Oce-Technologies BV;* E. van de Waal, *Imtech ICT Technical Systems*	11.2.2 **Application of Patterns and Pattern Languages to Systems Engineering** C. Haskins, *The Norwegian University of Science and Technology*	11.3.2 **Development of an Object-Oriented Multi-Leg Route Choice Model on Transportation Network Simulation** E-S. Yang, E. Garcia, D. Mavris, *Georgia Institute of Technology*	11.4.2 **Managing Priorities: A Key to Systematic Decision Making** T. Gilb, *RPL;* M.W. Maier, *The Aerospace Corporation*	
1130-1155	11.1.3 **The Nuts, Bolts and Duct Tape of Establishing a System Engineering Measurement Program** P.J. Frenz, *General Dynamics Advanced Info Systems*	11.2.3 **Developing Section 4 Verification Text: Getting Early Buy-In from Industry & Government Stakeholders** B.R. Haskins, J.M. Striegel, *The Boeing Company*	11.3.3 **Acknowledging Uncertainty in the Provision of Defence Capability: Insights from Literature** E. Rajabally, *Systems Engineering Innovation Centre;* S. Snape, P. Sen, *University of Newcastle;* S. Whittle, *BAE Systems*	11.4.3 **The Tradespace Exploration Paradigm** A.M. Ross, D.E. Hastings, *Massachusetts Institute of Technology*	