Track 1

1. Michael Connally, “Service Model”

   The presentation addresses the implications of the Service Model to the Systems Engineering of large infrastructure systems, drawing from the experience with the continued development of the Deep Space Network at NASA’s Jet Propulsion Laboratory

2. Richard G. Cline, “System Engineering Analysis on System of Systems Problems”

   This presentation examines and highlights the system engineering and analytic challenges associated with large system of systems problems. These challenges include: 1) system of system requirements definition and allocation, 2) bringing to bear the “right” metrics and models to the generally large and complex trade space, and 3) identifying best-value solutions.

3. James Jones, “Automating compliance with FDA Quality System Regulation”

   The presentation describes the System Engineering and Integrated Product/Process Team (IPPT) methods applied to automatic generation of evidence for compliance with FDA QSR Design Controls during embedded systems medical devices development.

4. Jorg Largent, “Classical Systems Engineering – Four Types”

   The presentations discusses four types of classical systems engineering, providing examples of each. It concludes that “real” System Engineering as defined by INCOSE is sufficient, though not without considerations of scale and scope.

5. Deanna Kidd, “Systems Engineering Applied to On-Air Video Distribution”

   This presentation is on DIRECTV's broadband video service development and Video-On-Demand delivery. It is a case study of the application of Systems Engineering to an existing system for adding services.

6. Malcolm Currie, “Transportation Systems to Transport What? Examining the Why of Systems Engineering”

   This presentation discusses the purpose of a system and how systems engineering can aid in the development when the nature of the stakeholders is changing and evolving. In the language of such development technologies as UML, what are the Use Cases for a new urban transportation system? It also

addresses the implied and possibly un-recognized needs that require exploration during systems planning.

7. Andre J. Lee, “Systems Engineering Applied to Emergency Response”

   The emergency response environment is inherently a system of systems and traditional approaches rooted in the command and control paradigm limit analysis and synthesis. This presentation demonstrates the critical role systems engineering can play in the development of these systems.

8. Bo Oppenheim, *Introduction to Lean Enablers for Systems Engineering*

   The presentation is a brief introduction to a major product called Lean Enablers for Systems Engineering recently developed by INCOSE Lean SE Working Group. Lean Systems Engineering represents a synergy of Lean Thinking and traditional Systems Engineering, hopefully leading to superior systems engineering process.

   Lean Enablers for Systems Engineering is a product designed by 14 international experts from industry, academia, and government, supported by over 100 members of the Lean SE Working group. Lean Enablers for SE are formulated as 194 "do's" and "don'ts" of Systems Engineering practices focused on Mission Assurance and elimination of waste. The presentation covers the project history, lean fundamentals, the synergy between Lean and SE, a brief product presentation, validation, and summary of the most important points.

Track 2

1. Jose S. Garcia, Jr., “An Executable And Integrative Approach To Whole-System Modeling”

   A traditional systems engineering process emphasizes requirements, traceability, functional decomposition, architecture, optimization, and static modeling. The lack of an executable modeling paradigm in this process constricts the operational evaluation of requirements for agent-based systems. A holonic systems engineering process identifies requirements in terms of processes and interactions and facilitates an executable and integrative approach to Whole Systems Modeling (WSM). Requirements and system architecture are developed in terms of system behaviors and capabilities.

2. Jack Ring, “Test Case for Model Based Systems Engineering (MBSE) of an Information Enterprise (IE)”

   Model-based Systems Engineering offers a way to overcome several shortcomings of traditional systems engineering. It is time to establish ways to assay MBSE approaches both for their inherent value and for moving them along the innovation path. This presentation introduces a Test Case for those who claim to have methods, tools and techniques for model-based systems engineering. The Test Case will reveal the Quality, Parsimony and Beauty of any candidate model-based systems engineering method, technique or tool.

3. Malcolm Currie, “So You Have Use Cases – Now What? Partitioning the Operations of a Use Case”

   Many people do not know what to do with the Use Case after they are developed; much less understand the availability or the power of executable models of the Use Cases. Modeling the functionality discovered in the use cases helps to forestall making premature implied design decisions.

4. A. Winsor Brown, Dr. Barry Boehm and Ms. Jo Anne Lane, “Feasibility Evidence and the Incremental Commitment Model”

   This presentation could just as easily have been titled "How to increase the usefulness of System Specification Reviews (SSR) and Preliminary Design Reviews (PDR) while avoiding death by PowerPoint". The purposes of the Feasibility Evidence Description (FEDs) will be presented. Working backwards from those purposes and how the FEDs is used the system(s) life cycle model at the anchor point commitment reviews, the evolving content (in both depth and breadth) of the FED will be exposed.
5. James Robert van Gaasbeek, “Applicable Documents”

It is a common practice to refer to applicable documents in contracted development. The practice permits inclusion of a vast amount of lessons-learned and Government and commercial standards and best practices. This is an advantage and a disadvantage. Experience has shown that there is a wide variation in the manner in which applicable documents are incorporated in product specifications. This paper will discuss the different approaches to utilizing applicable documents within product documents and the issues and risks that arise, illustrated with examples.

6. Scott Bryant, "Technical Management Is Not Technical Control or All I Really Need to Know About System Engineering I Learned From Farming"

   This paper tries to define some systems engineering practices as common sense approaches independent of technical areas. It will provide a common language for discussing the same SE approach applied to different types of engineering and levels of project complexity. Illustrations from farming practices are used to show how system engineering methods deal with complexity and uncertainty. The paper also describes how to avoid the illusion of controlling the project versus the reality of managing your expectation of all results.

7. Dr. Edmund H. Conrow, "Balancing Cost, Performance, Schedule, and Risk"

   It is not uncommon for DoD and NASA programs to have moderate to substantial cost growth and schedule slippage while meeting many desired performance parameters. This presentation provides an analytical framework that examines typical DoD and NASA development, and can also be applied to non-aerospace and purely commercial programs. Five specific hypotheses were developed from the framework, tested and proved correct when examined against actual data from more than 50 large-scale development programs. Recommendations are that can alleviate cost, performance, schedule, and risk problems on a wide variety of programs.

8. Jared Fortune, "Estimation Methods for Systems Engineering Reuse"

   Systems engineering reuse is the utilization of previously developed systems engineering products or artifacts such as architectures, requirements, and test plans across different projects. Such reuse is intended as a means of reducing development cost, project schedule, or performance risk, since reusing products or artifacts may result in some systems engineering activities not having to be repeated. This paper will provide an overview of systems engineering reuse and recent developments with the Constructive Systems Engineering Cost Model (COSYSMO) to estimate the effect of reuse on systems engineering effort.

Track 3

1. Jack Ring & Antonio Pizzarello, Ph.D., “System of Systems Viability Assessment Capability”

   The movement toward Systems of Systems (SoS) is changing the methods for all aspects of system development and deployment. In contrast no method exists for quickly and confidently certifying viability of an SoS. This presentation introduces a System of Systems Viability Assessment Capability currently at the proof of feasibility stage. Various classes of SoS’s are considered to ensure both generality of the ideas and foresight into limits of applicability. They are: Error discovery technology Pattern recognition/classification hardware and Ontology interoperability technology.

2. John C Hsu and Marion Butterfield, “Emergent Behavior of a System-of-Systems”

   Emergent behaviors exist in biological systems, physical systems and human performance. Little is currently known about constructing an interoperable network of systems and the incorporation of known emergent behaviors. Definitions of emergence are introduced. The four principles of emergence are outlined and discussed. Conceptual agent-based modeling is discussed to illustrate possible modeling approaches for identifying and assessing emergent behaviors according to the emergent principles. It is recommended that the integration of agent-based simulation and neural network methods with SysML be considered.

3. Kent D. Palmer, “Self- Adaptation, Self- Organization and Special Systems Theory”

   This paper points out an existing candidate theory for understanding Self-organizing and Self-adaptive systems previously formulated as Special Systems Theory. Special Systems Theory is understood in the context of Systems Theory and its inverse dual Metasystems Theory. But once we recognize the value of Special Systems theory we also are led to question the nature of the System as a schema in relation to other schemas, which ultimately leads to our questioning of the meta-schema which is composed of finitudes of the worldview which appear to us as transcendentals. This regress by which we try to understand dualities like that between Self and Other, eventually leads to providing a definition of Nondual Science as an alternative to Dualistic Science, as a means of situating the Special Systems Theory which calls into question the very nature of the ‘Self.’

4. Anna Warner, “Services Oriented Architecture for Network Centric Environment”

   Companies are experiencing increasingly more complex architecture. Service Oriented Architecture (SOA) is the next evolutionary step to help organizations to meet their growing challenges. SOA combines adaptable connections with the well defined, standards based interfaces to help to build in flexibility into existing infrastructure. The steps in the development of a system based on SOA are presented. The presentation will describe the critical governance processes that have to be implemented during deployment of SOA environments to ensure that they serve business well.

5. Malcolm Currie, “Use Cases for Systems Engineering of a System of Systems”

   An SoS (System of Systems) is a System. One important characteristic an SoS is that the interface to and functionality of each constituent part is pretty much fixed. Each constituent system in an SoS is also different from a subsystem in that it performs some function whether or not it is connected to the SoS. The primary focus of a Systems Integrator of a SoS must be on the interfaces, as they are often unchangeable. Each system in the System has its own independent goals along with those dictated by the SoS. Use Cases are a valuable tool for defining and controlling system interfaces throughout the development lifecycle

6. Dr. Scott Workinger, “Systems of Systems Engineering: Where’s the Beef?”

   “Are “Systems of Systems” something new? It has been suggested that Systems of Systems are a distinct kind of system having: 1) special characteristics, 2) special engineering processes, and 3) special training needs for Systems of Systems Engineers. If true, these claims suggest that System of Systems Engineering is a new, distinct paradigm within Systems Engineering. But the burden of proof is on the innovators. This presentation looks at an overview of the relevant details from a pragmatic standpoint. Special emphasis is given to: Architectural Patterns and Processes, Integration Patterns and Processes, Collaborative Engineering Processes, Testing and Evaluation Processes and Strategies for managing Complexity in Systems of Systems.”

7. Scott Jackson, “Architecting Resilient Systems: The Fourth Dimension of System Development”

   Traditional systems engineering has attempted to balance three dimensions of system development: performance, cost and schedule. This presentation introduces a fourth dimension: resilience. Resilience is the ability of a system to anticipate and avoid a disruption, survive a disruption and recover from the disruption. Resilience is characterized by four attributes: capacity, flexibility, tolerance, and inter-component

collaboration. Resilience may be implemented through the process of architecting and the use of heuristics. Other holistic considerations, such as management of culture and risk, are also essential to resilience. Case studies, such as the recent Metrolink accident are cited as examples of non-resilient systems. Apollo 13 is an example of a resilient system.

8. John Clymer, "Simulation of an Intelligent Enterprise as a Complex Adaptive System"

   An intelligent enterprise in this paper consists of an interacting set of project processes where each process performs one of the organizations main functions such as marketing, finance, systems engineering, hardware design, software design, manufacturing, product support, etc. Each project process consists of an intelligent agent that communicates with other process projects to allocate resources and set priorities that maximize the organizations goals. The expected emergent behavior in the complex adaptive system is the self-synchronization of the projects to optimize organizational goals. The methods discussed in this paper apply to any complex system of systems utilizing network centric operations.