



## **Measurable Systems Engineering**

### *A Full-Day Tutorial*

#### *Effective Systems Engineering Requires Measurement*

Teams develop complex products and systems using engineering methods of varied effectiveness. Whether it is called “product design” or “systems engineering,” the process moves at an overwhelming pace that sometimes seems to drown good practice. Good design groups, however, constantly seek to improve their design effectiveness. Measurement is essential to that improvement, providing the necessary control tools.



This full-day tutorial gives you practical measurement and improvement techniques that apply to the design of complex products and systems. These techniques and measurements are both usable and effective for any systems engineering effort, and they have been proven to work without requiring massive expenditures or process improvement bureaucracies. Many techniques provide real-time information that can guide each project while it is in work. Measurements include the most recent “Value of Systems Engineering” information learned through research by the INCOSE *Systems Engineering Center of Excellence* (SECOE). They are simple to use and can be implemented on your program now.

#### *You should attend this tutorial if you are:*

- Experienced systems engineers
- Novice systems engineers
- Design engineers
- Process managers
- Project leaders / program managers
- Support engineers

#### *Topics covered:*

This tutorial covers the topic of measuring systems engineering from beginning to end, including descriptions of the scope of measurement, statistical techniques, effective methods and metrics, and expected quantitative relationships. At each step, the course includes description of common pitfalls and how to avoid them. You will participate in exercises that practice the techniques in realistic case studies and examples.

**Process Implementation** – (60 minutes) Goals and objectives in codifying processes. Methods to achieve process definition. Measurement as an impetus to standardization and improvement.

**Systems Engineering Processes** – (60 minutes) Pragmatic processes used in system-level engineering. Sources for process standards. Improving system development processes.

**Statistical Data Collection** – (60 minutes) Review of statistics as applied to engineering and process measurement. Variation in engineering, tolerances, methods of specifying variance. Types of statistical

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distributions. Data collection for statistical use. Valid data analysis. Hypothesis testing using Student-t and Z tests. *Includes exercises on statistical methods with discussion.*

**Measurement Methods** – (120 minutes) Methods to gather and evaluate metrics. Process improvement through a cycle of do, measure, modify. Enterprise-level improvement vs. project-level improvement. *Includes both short-answer and group exercises on measurement methods with discussion.*

**Systems Engineering Metrics** – (90 minutes) Available metrics for systems engineering and their use at enterprise-level, project-level, and task-level. Metrics that apply to the system quality, the project quality, and the systems engineering quality. Limitations of known metrics. Specific how-to-use methods with examples. *Includes exercises on use of metrics in an SE process.*

**Quantitative Relationships** – (30 minutes) Quantification of heuristic knowledge. How to know if Systems Engineering is effective. Relationships to expect and how to understand whether what you obtain is what you wish. Value of Systems Engineering as studied by SECOE.

**Case Study** – (30 minutes) Study of real projects to consider how to apply effective measurement. Based on projects selected by the participants from their own work.

**Summary** – (30 minutes) Review of the material and key messages. Course evaluation.

***The Presenter:***

**Mr. Honour** has been an international leader in the engineering of systems for over a decade, part of a 35-year career of complex systems development and operation. His energetic and informative presentation style actively involves class participants. He is a former INCOSE President, was the founding Chair of the INCOSE (International Council on Systems Engineering) Technical Board in 1994, and continues as Director for Sponsored Research. He was selected in 2000 for Who's Who in Science and Technology and in 2004 for the INCOSE Founders Award. He has been a systems engineer, engineering manager, and program manager at Harris Information Systems, E-Systems Melpar, and Singer Link, preceded by nine years as a US Naval Officer flying P-3 aircraft. He has led or contributed to the development of 18 major systems, including the Air Combat Maneuvering Instrumentation systems, the Battle Group Passive Horizon Extension System, the National Crime Information Center 2000, and the DDC1200 Digital Zone Control system for heating and air conditioning. Mr. Honour now leads Honourcode, Inc., a consulting firm offering effective methods in the development of system products. Mr. Honour has a BSSE (Systems Engineering) from the US Naval Academy and MSEE from the Naval Postgraduate School.

