Honourcode, Inc.
1169 McCoury Lane, Spring Hill, TN 37174 – (615) 614-1109

November 2015 v4.0

Developing and Implementing a SEMP

A 3-Day Course Tailored to NASA Needs

Technical Management Provides the Path to Enhance Technical Quality

Without a well-considered, documented, articulated plan, a system development effort can easily founder on the complexity of the many technical issues. The plan provides the means to put each issue in context and ensure that each gets the attention it deserves. Roles and responsibilities must be clearly defined and widely understood, and this applies just as much within a project as at higher levels.

As NASA moves forward in its work on many projects, continuous planning is essential. "No plan survives contact." (Gen. Helmuth Graf von Moltke 1800-1891) The purpose of technical management is to continually move the project along a valid technical path, updating the plans as necessary. It is a discipline that is often viewed as a combination of technical and management skills, spanning the gap between project management (with its focus on cost and schedule) and technical design (with its focus on the product).

Selected by NASA as an APPEL training course.

This course introduces participants to the processes that support planning and execution of technical management using a Systems Engineering Management Plan (SEMP) developed in accordance with NPR-7123.1B. Participants learn how systems engineering deliverables are planned and managed. They experience systems engineering technical reviews and appreciate the value of these "gates."

***You should attend this course if you are*:**

- A technical team leader
- Responsible either for creating or for executing technical management plans
- Concerned about how to coordinate the efforts of a large technical team.
- Looking for proven methods

The course is aimed at

- Program managers,
- Systems engineers,
- Technical team leaders,
- Logistic support leaders, and
- Others who participate in defining and developing complex systems.

Participants walk through the planning and then execution of a SEMP for the development of a Mars Habitat.

The course exercise is based on a future NASA program to develop a viable space habitat that can be home for 100 people living on Mars. The specific project is the water recycling facility that includes agriculture, waste disposal, and treatment within a large closed environment.

Topics Covered in the Course

A Systems Engineering Framework – Problems with complex projects. How systems engineering provides the solutions. The connection between planning and technical management.

Technical Planning and the SEMP – The essentials of planning for technical work. How technical teams work. The SEMP as described in NPR 7123.1B. Basic description of what's in the SEMP and why. Key NASA planning issues and examples of past programs with planning trouble.

SEMP Overview Material – SEMP 1.0 and SEMP 2.0: purpose, scope, applicable documents. Specific formats to use in these chapters.

Technical Summary – SEMP 3.0 and the planning work necessary to write it.

- Defining Technical Work – How to identify the work to be done.
  - Gather Information.
  - Define Technical Work.
  - Schedule, Organize and Cost the Technical Work.
- *Mars Habitat Exercise A* – Defining the Technical Work
- SEMP 3.0 outline and specific sub-sections, with guidelines for writing
  - System description
  - System structure
  - Product integration
  - Planning context
  - Boundary of technical effort
  - Cross references
- *Mars Habitat Exercise B* – Technical Summary Storyboards. Introduction to the powerful "storyboard" technique. Use of storyboards to define SEMP 3.0 for the project.
- Technical Reviews – Using effective reviews as a control process to assess performance against the SEMP.
  - Management Reviews
  - Entrance/Exit Criteria.
  - Technical Reviews
  - Managing Reviews.
- Tailoring Plans –Ttailoring processes to meet the needs or requirements for particular programs.
  - Concepts of Tailoring.
  - Sources for Planning Materials.
  - Verification/Validation Plans.
  - Patterns in Tailoring.
- *Mars Habitat Exercise C* – Tailoring the Plan. Using various lessons learned to change and improve the plans already created.

Technical Effort Integration – SEMP 4.0 and the planning work necessary to write it.

- Technical Management Concepts – Understanding the technical management discipline that fits between technical work and project management work.
  - NASA challenges in management
  - Technical Management.
  - Leadership and its application to technical work
- SEMP 4.0 outline and specific sub-sections, with guidelines for writing
  - Responsibility and authority
  - Technical contract oversight
  - Support integration
- *Mars Habitat Exercise D* – Technical Effort Integration Storyboards. Using storyboards to define SEMP 4.0 for the project.

Common Technical Processes – SEMP 5.0 and the planning work necessary to write it.

- SEMP 5.x Typical "Common Technical Process" outline and specific sub-sections, with guidelines for writing
  - Introduction to 17 Common Technical Processes (CTP)
  - SEMP content for each CTP
  - Handling the size of SEMP 5.0
  - Small project formats
- Process Descriptions – Familiarization with the 17 CTPs, the types of work that can be included in a technical plan.
  - System Design Processes
  - Product Realization Processes
  - Technical Planning & Control Processes
  - Technical Assessment

- Technical Decision Analysis

- Technical Assessment – Developing and maintaining a usable and accurate management view of how the technical part of the project is moving forward.
  - Technical Performance Measurement
  - Metrics for SE
  - Productivity Assessment.
- *Mars Habitat Exercise D* – Common Technical Process Storyboards. Using storyboards to define SEMP 5.0 for the project.

Technology Issues – SEMP 6.0 (Technology Insertion) and SEMP 7.0 (Additional SE Functions) and the planning work necessary to write them.

- Technology Insertion – Key technology identification, assessment, and insertion plans.
- Additional SE Functions – System safety, engineering methods & tools, specialty engineering.

Management Issues – SEMP 8.0 (Integration with the Project Plan) and SEMP 9.0 (Waivers) and the planning work necessary to write them.

Technical Plan Execution Using the SEMP – Focus in this entire section is on the technical management during a project. How to use the plan. Technical control methods.

- Characteristics of Good and Bad Plans – Examples of typical problems with SEMPs. Over-use of boilerplate, inadequate detail, emphasis on cost/schedule control to exclusion of technical control, inadequate consideration of technical risks or technical structure or trade-offs, etc.
- Technical Work Directives. Passing on the plans to those who execute them.
- Scope Control. Keeping the technical scope within bounds during a project, across the barriers of space, time, and technical concepts.
  - Stakeholder Involvement
  - SEMP as a Contract among Stakeholders
  - Change management
  - Focusing Management Attention
  - Applying Expertise
  - Technical Contract Oversight
- Cycles of Control – How often should the SEMP be updated?

The Presenter:

Dr. Eric Honour, CSEP, INCOSE Fellow, and former INCOSE President, has been in international leadership of the engineering of systems for 20 years, part of a 45+ year career of complex systems development and operation. His energetic and informative presentation style actively involves class participants. He was the founding Chair of the INCOSE Technical Board in 1994, and served as Director of the Systems Engineering Center of Excellence (SECOE). He was selected in 2000 for Who's Who in Science and Technology and in 2004 as an INCOSE Founder. He is on the editorial board for *Systems Engineering*. He has been a successful entrepreneur, 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 17 major systems, including the Air Combat Maneuvering Instrumentation systems, the Battle Group Passive Horizon Extension System, the National Crime Information Center, and the DDC1200 Digital Zone Control system for heating and air conditioning. Dr. Honour now heads Honourcode, Inc., a training and consulting firm offering effective methods in the development of system products. Dr. Honour has a BSSE (Systems Engineering) from the US Naval Academy, MSEE from the Naval Postgraduate School, and PhD from the University of South Australia based on his ground-breaking work to quantify the value of systems engineering.