TEACHING SCIENCE AND TECHNOLOGY, INC.

Space Mission Operations

Turning Mission Concepts into Operational Reality

Course Description

Mission operations begin long before launch. Early project decisions drive operational complexity, staffing, ground architectures, and lifecycle cost. The Space Mission Operations (SMO) course teaches you how to plan and design missions that can be executed reliably, affordably, and sustainably.

Taking an end-to-end view of operations, the course covers operations planning, Concept of Operations (ConOps) development, operational requirements, and the allocation of responsibilities across spacecraft, payloads, ground systems, and operators. You'll also examine the practical realities of TT&C, data delivery, flight control, contingency planning, and organizational readiness.

SMO is designed for engineers, operators, and project leaders responsible for planning, designing, or executing space mission operations. Whether you're preparing for first flight or improving an existing mission, you'll gain practical tools to reduce operational risk and improve mission success.

Who Should Attend

Systems engineers, payload principle investigators, subsystem engineers or project managers who are responsible for the detailed design and operation of space systems.

Course Objectives

At the end of this course the student should be able to...

- Define and explain the critical activities of space mission operations
- Develop a mission concept of operations (ConOps) and be able to critically analyze one of these key documents
- Describe the elements that contribute to mission operations complexity and perform trade-off analyses to reduce that complexity
- Apply principles of orbital mechanics to plan and implement key operations activities
- Describe and analyze key elements of mission ground systems including communication link budgets
- Compare and contrast operations concepts for military, civil, scientific and human space missions
- Develop the planning, execution and support requirements for real-time space mission operations

Course Materials

Each participant will receive:

- A complete set of course notes with copies of all slides used in the presentations
- An e-copy of the *Cost Effective Mission Operations* (edited by Boden and Larson) textbook

Course Topics

- **Course Introduction and Overview**
  - Course Introduction
  - Mission Operations Overview
- **Mission Operations Planning**
  - ConOps Development
  - Operations Complexity
- **Tracking and Navigation**
  - Understanding and Using Orbits
  - Predicting Orbits
- **Mission Data Receipt and Delivery**
  - Introduction to TT&C
  - Ground Systems and Communication Architectures
- **Spacecraft Support and Analysis**
  - Environmental Effects and Spacecraft Design
  - Contingency Planning and Anomalies
- **Flight Control and Training**
  - Activities, Roles and Responsibilities
  - Organization and Training
- **Numerous case studies and exercises throughout the course**

Testimonials

"I have a new appreciation for the scope of mission ops, and appreciate [the] importance of planning, tools, and training."

"I now have a much greater understanding of the context for some of the things we do in daily space mission operations."

"The most valuable lessons were real-life experiences, solutions to anomalies, and the SMAD sheet and how to work with it."