



Introduction to Systems Engineering for Space



Course Description

A 2-day course that provides an overview and understanding of system engineering as used in the space industry. Aimed at a technical audience either new to the space domain, those wishing to gain an appreciation of systems engineering, and those moving into a system engineering role.

We will explore what is system engineering and why it's important, what is a system, system of systems and the System V diagram. We will explore the key areas of system engineering through the project lifecycle and are the key project gates, from the concept development phase, through project definition to mission design and finally to verification and validation.

We will explore the importance of understanding the users and stakeholder needs including external influences such as launch regulations. Requirements generation and management, developing concept of operations and spacecraft architectures and how to represent them. We will examine the importance of a robust spacecraft architecture and to design them. We will cover how to select preferred solutions, examining trade-off studies, technology readiness or qualification status and make/buy trade-offs.

We cover how to technically manage projects throughout the lifecycle exploring change and risk management, configuration control, recording system information and the use of a system model and the role of MBSE. How to manage requirements and interfaces throughout the project to verification and validation management. In addition, we will cover how we present system level performance through the use of System budgets and how we use design margin within them.

Course Topics

What is System Engineering

- Principals of system engineering
- Space Project Life Cycle

Users and Stakeholders

- Identifying stakeholders
- Understanding the objectives
- Challenging the requirements

Requirements

- Types of requirements
- How to write good requirements
- Flow down of requirements

Concept Generation

- How to develop a concept
- Concept of Operations

Architectures and Selection of a preferred solution

- What is an architecture
- Robust architectures for space and why we need them
- Trade-off analysis

Verification and Validation

- How do you verify requirement

System Budgets

- Margins and risk
- Overview of key mission budgets
- Technical Management
- System Engineering Management
- Change Management
- Interface and Requirements Management
- Test and Verification Management

Who Should Attend

Engineers wishing to gain a basic understanding of system engineering as used in the space industry, either a system engineer from another sector, or an engineer within the space sector wishing to move into systems engineering.

Course Materials

Each participant will receive:

- Course handout

Course Objectives

Gain Understanding of Systems Engineering in the Space Domain

- What is system engineering and why is it important.
- How does it fit into the space project lifecycle

Explore how requirements are developed and written

- Look at who are the users and other stakeholders and identifying their needs
- What makes a well written requirement

How we get from concept to a mission design

- Understanding of Concept of Operation and its importance in mission design
- Designing spacecraft architectures and why they need to be robust.
- How we manage risk and the use of margins

Explore how we verify/validate the spacecraft/mission

- What is the difference between verification and validation
- How do we verify requirements

Awareness of Technical management of space projects

- The system engineering management plan, how do we manage change and interfaces across the project.
- How do we manage requirements, testing and verification.



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