



Modelling the Management of Systems Engineering Projects

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Outline

- Systems Engineering Management
- Aims of the Systems Engineering Management Model
- Modelling of Systems Engineering Processes and Management
- The SEMP as Output from the Model
- Architecture of the Model
- Example
- Benefits



Systems Engineering Management Introduction

- NASA Systems Engineering Handbook:
“Systems engineering management is a technical function and discipline that ensures that systems engineering and all other technical functions are properly applied.”
- The goal of the Management Process is to organise the technical effort in the project lifecycle



Aims of the Systems Engineering Management Model

- Provide a template of the Systems Engineering Processes, Controls and Plans
- Implement this as model of Project Management aspects
 - Specifically concentrating on Systems Engineering Management
 - Linked through MBSE tool to the System and Operational models
- Output SEMP from model
 - Reduce effort and possibilities of inconsistencies when tailoring a SEMP



Implementing Systems Engineering Processes



Selected Systems Engineering Standards

eg:

IEEE Std 1220-2005
ISO/IEC 15288

Existing processes
Experience

Select, define specifics



Enterprise-wide Systems Engineering Processes

"The way things are done around here"

- May include template for a SEMP



Client requirements
Stakeholder needs
Project size
Specialty disciplines
...

Implement, refine, tailor



Project-specific Systems Engineering Management Plan and subordinate plans



Modelling Systems Engineering Processes

- A template is made to be modified for implementation
- Key is linking of data together in the model
 - a change in one place reflects in others
- Have an Enterprise-wide Systems Engineering Process Model
- Instantiate this model for each project, refining, tailoring and extending as required



Modelling Systems Engineering Management

- The SE Management Model is:
 - A representation of the systems engineering processes and structure
 - Built within a software tool (we have chosen Vitech's CORE, with it's Program Management modules)



The SEMP as Output from the Model

A Systems Engineering Management Plan (SEMP) is the key document used to guide all technical aspects of the project

- It defines SE organisation, process, products, and speciality engineering integration
- An evolving document capturing current SE strategy and relationship with overall Project Management effort



DoDAF 2.0 Project Viewpoints

- PV-1: Project Portfolio Relationships
 - Represents an organisational perspective on the project
- PV-2: Project Timelines
 - Can be Gantt chart view of the project, including dependencies
- PV-3: Project to Capability Mapping
 - Maps project to capability, showing how elements help to achieve a capability
 - Analogous to SV-5a (Operational Activity to System Function Traceability Matrix)
- UPDM provides a standardised way for representing these viewpoints

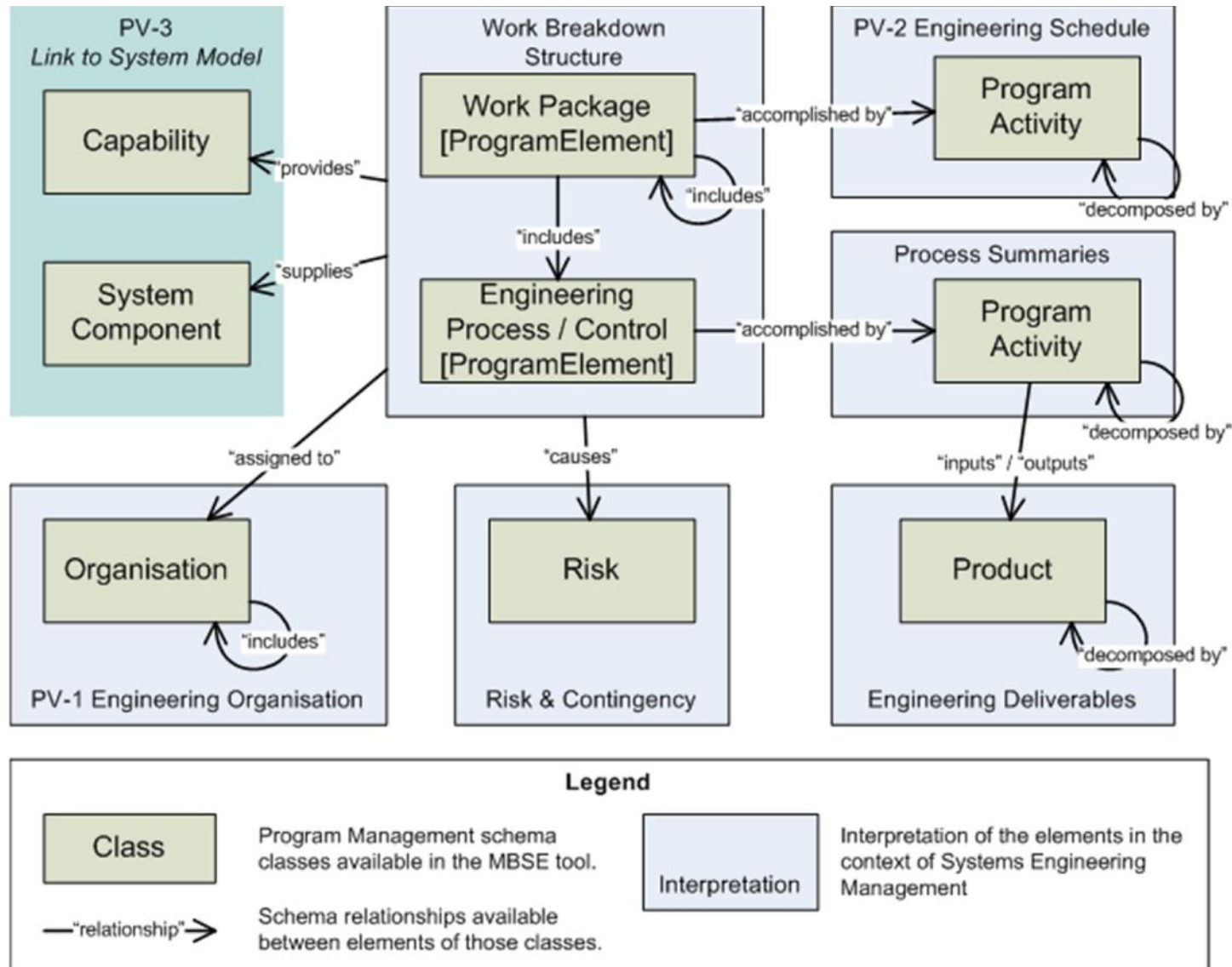


SEMP Viewpoints on the Model

- Work Breakdown Structure
 - Hierarchy of all work packages for the project
 - *Systems Eng Processes and Controls are a part of this WBS*
- Descriptions of each Systems Engineering Process and Control
 - Process and Control descriptions
 - Activity models allowing Flow-Block Diagram outputs
 - Responsibilities linking to Engineering Organisations
- Implementations of the three DoDAF 2.0 Project Viewpoints
 - PV-1 to describe the Engineering Organisations, including:
 - Engineering authority and delegation of responsibility
 - Defined relationships with subcontractors, suppliers etc
 - PV-2 to bring all work packages together in an Engineering Schedule
 - *via higher-level activity model for the overall project*
 - PV-3 to map Activities to Engineering Deliverables and Capabilities

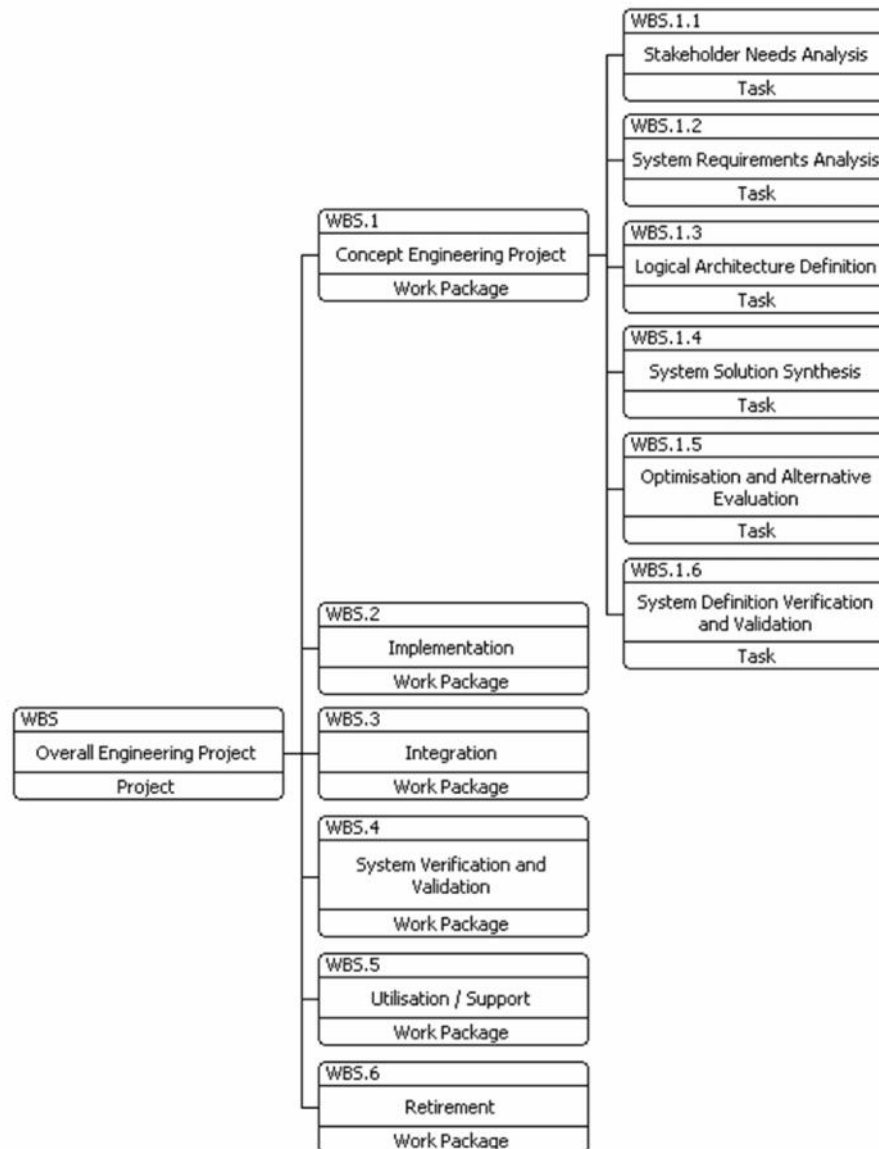


Reference Model Architecture



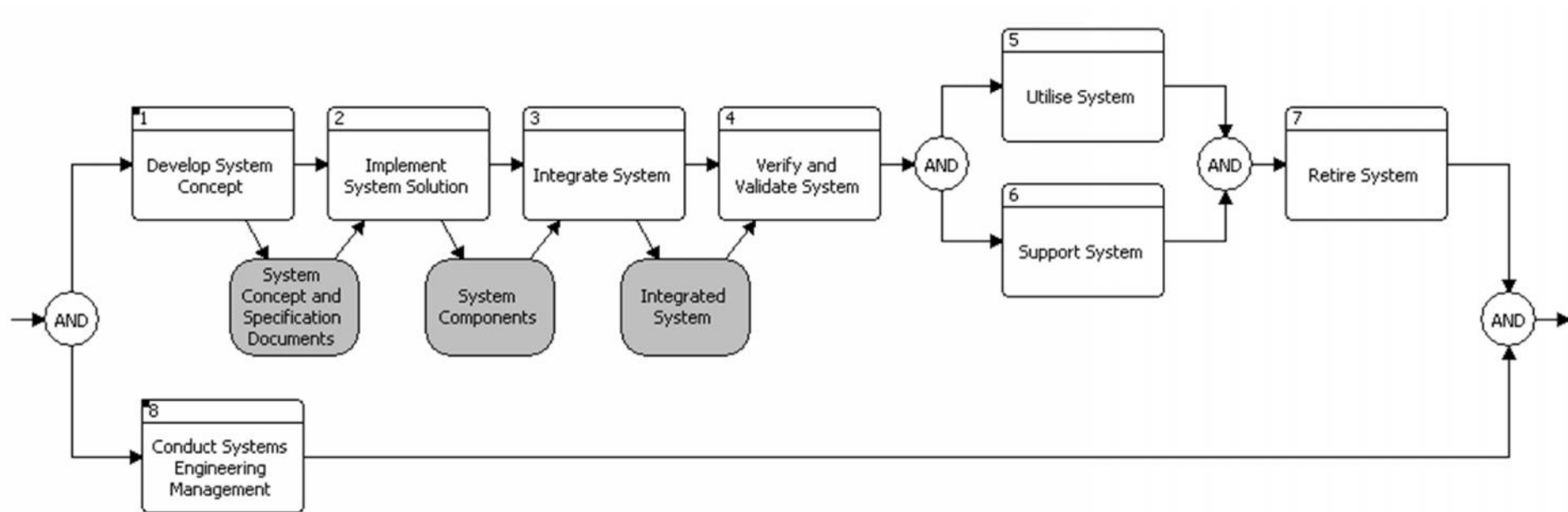


Example – Partial WBS





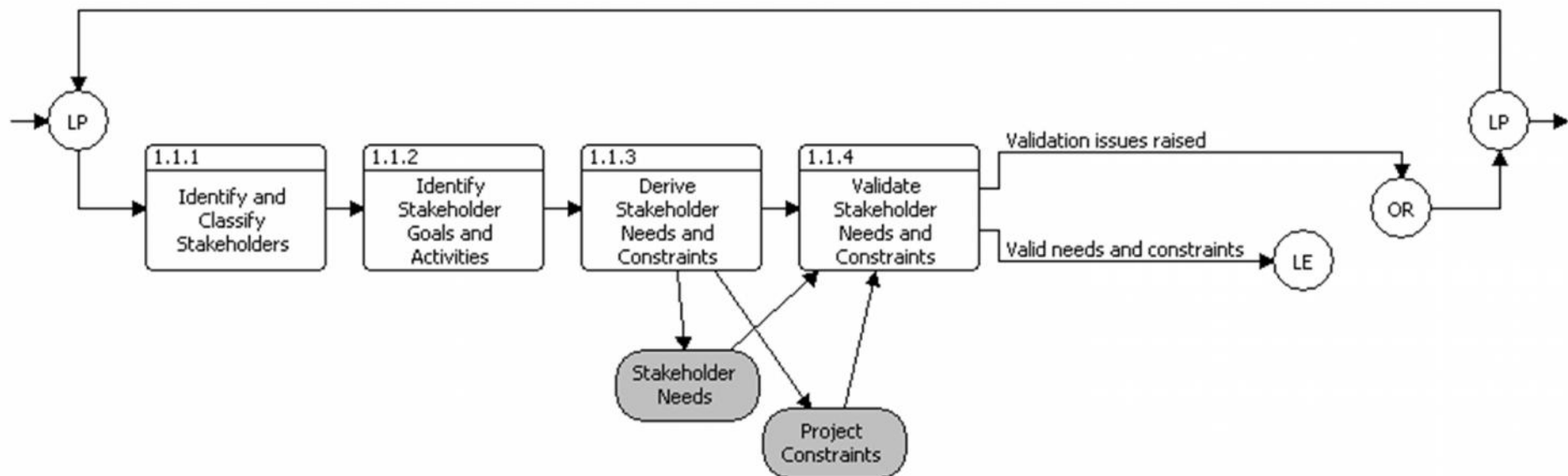
Example – Overall Engineering Activity Model





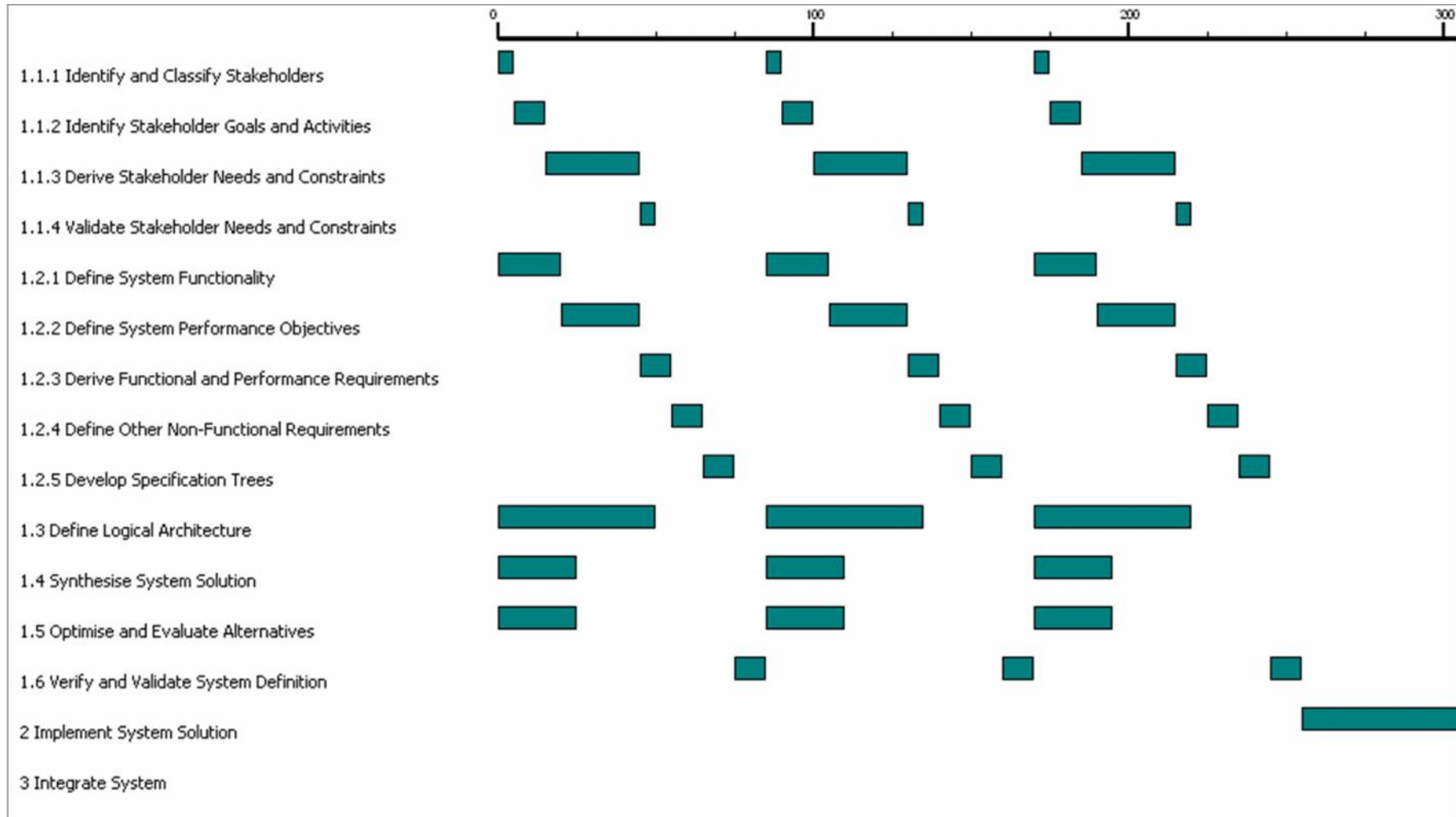
Example – Process Summary Activity Model

- Analyse Stakeholder Needs activity





Example – Engineering Schedule





The Alternative

- Document-based approach to developing a SEMP
 - Systems Engineering approach not linked to WBS or master schedule
 - Responsibilities not linked to project organisation
 - System Engineering tasks not linked to capability
- In the alternative approach, changes made to these aspects of the SEMP need to be made in multiple places



Benefits of the Modelling Approach

- Common benefits of MBSE approach:
 - Consistency
 - Traceability
 - Reuse
 - Information sharing
- Interfacing models through an MBSE tool
 - Between Management Model and various engineering and technical models
 - Clearly define responsibilities
 - Improve abilities for assurance on these responsibilities
- Produce a more robust, complete and consistent SEMP



Benefits of a robust SEMP

- Provide clear, unambiguous guidance to technical staff
- Improve efficiency of project effort
- Improve capability quality, cost and schedule

The bottom line

- Improve likelihood of project success



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Questions?

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