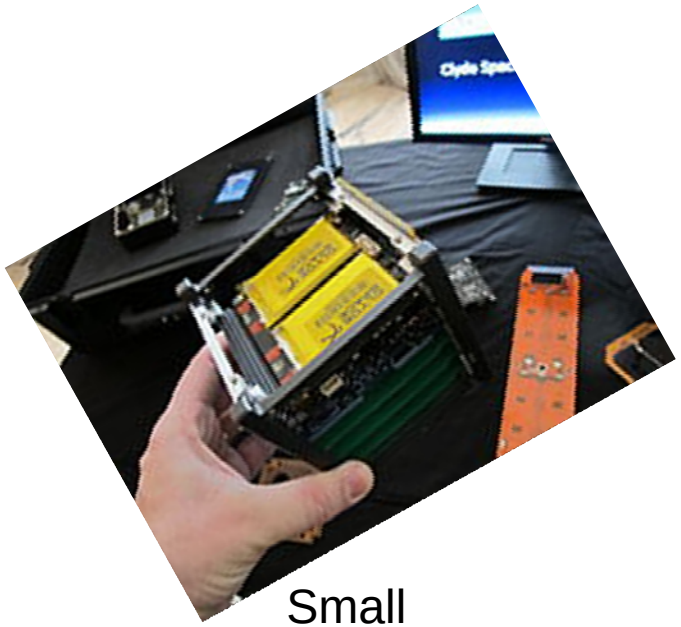
A Vision for Spaceflight Reliability: NASA's Objectives Based Strategy

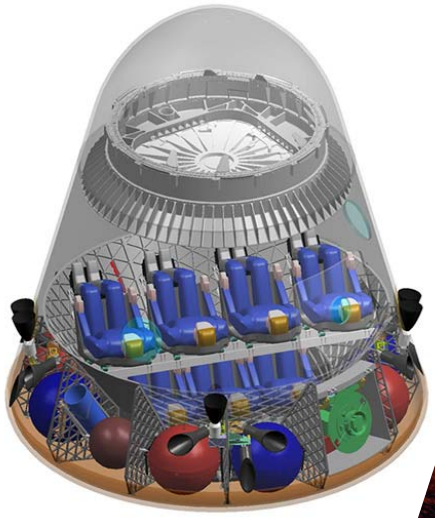
Frank Groen, John Evans – NASA OSMA
Tony Hall – ISL

Presented at RAMS 2015

NASA Challenges

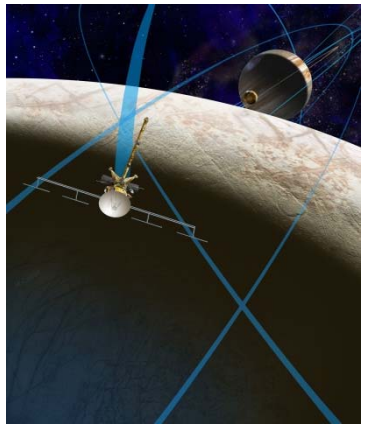


Small Sats



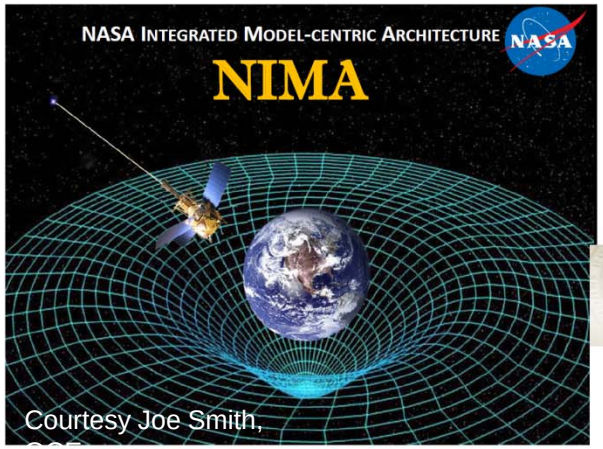
Commercial Crew

Mars



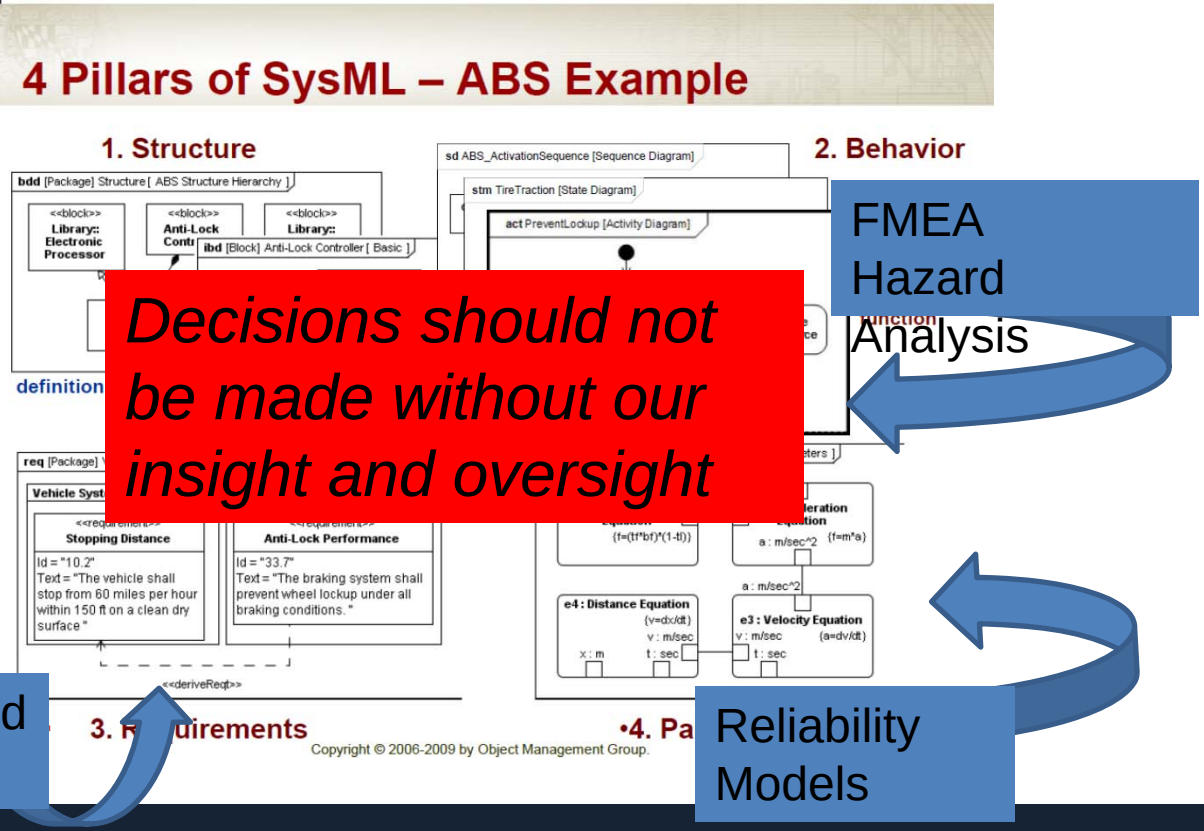
Europa and Beyond

MBSE



Our products may need to be different in a model based environment

NASA OCE direction *will* enable model centric capability



Decisions should not be made without our insight and oversight

FMEA Hazard Analysis

Safety Requirements and Quality Demands

Reliability Models

Mission Assurance Challenges

- NASA's Mission Assurance faces challenges
  - Changing missions
  - Changing acquisition models
  - Changing engineering practices
  - Changing technology

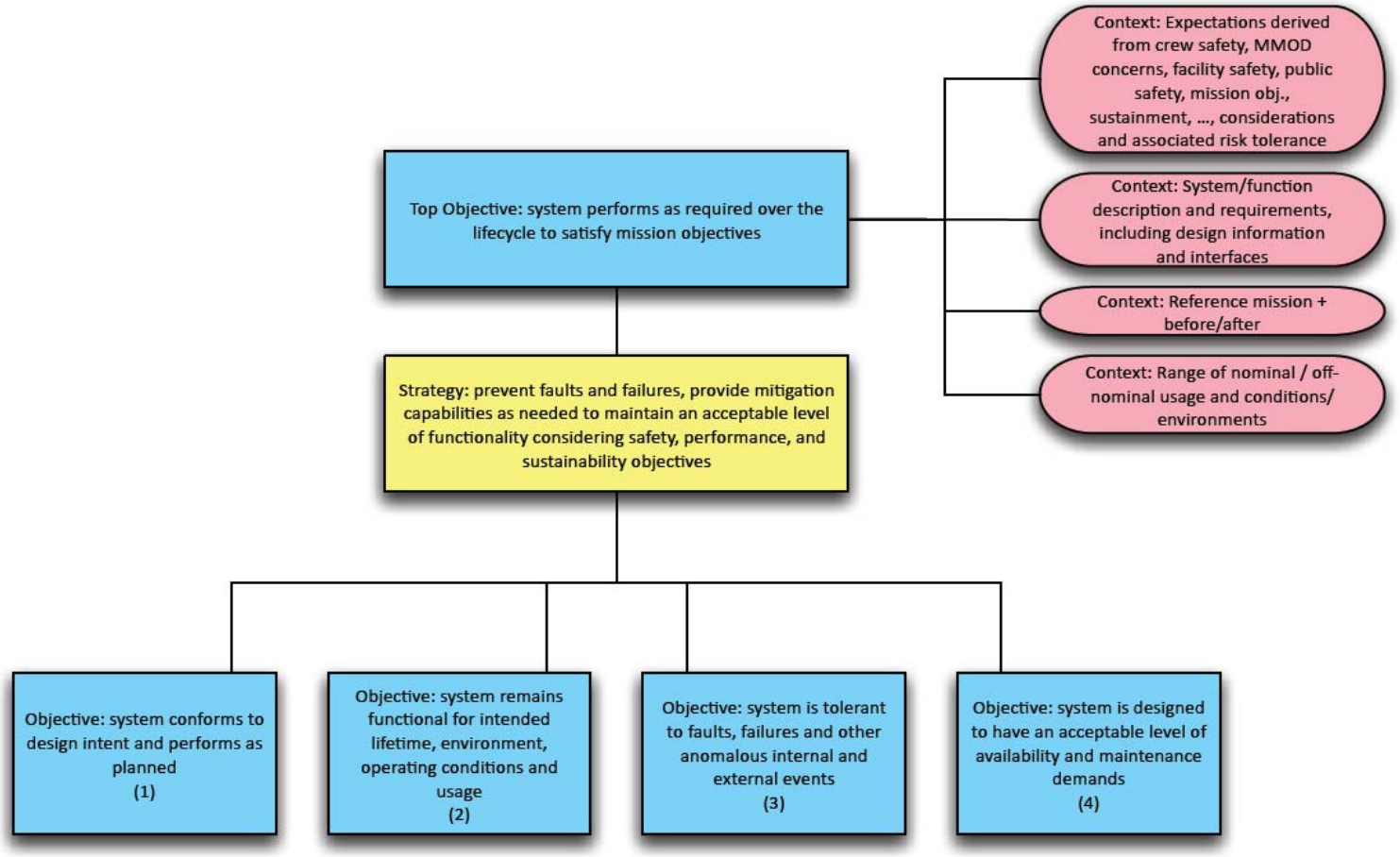
- We must reconsider our practices to stay relevant
  - Don't necessarily hang on to 'proven' practices
  - Consider the intent behind R&M methods and techniques

“Subset of Considerations”

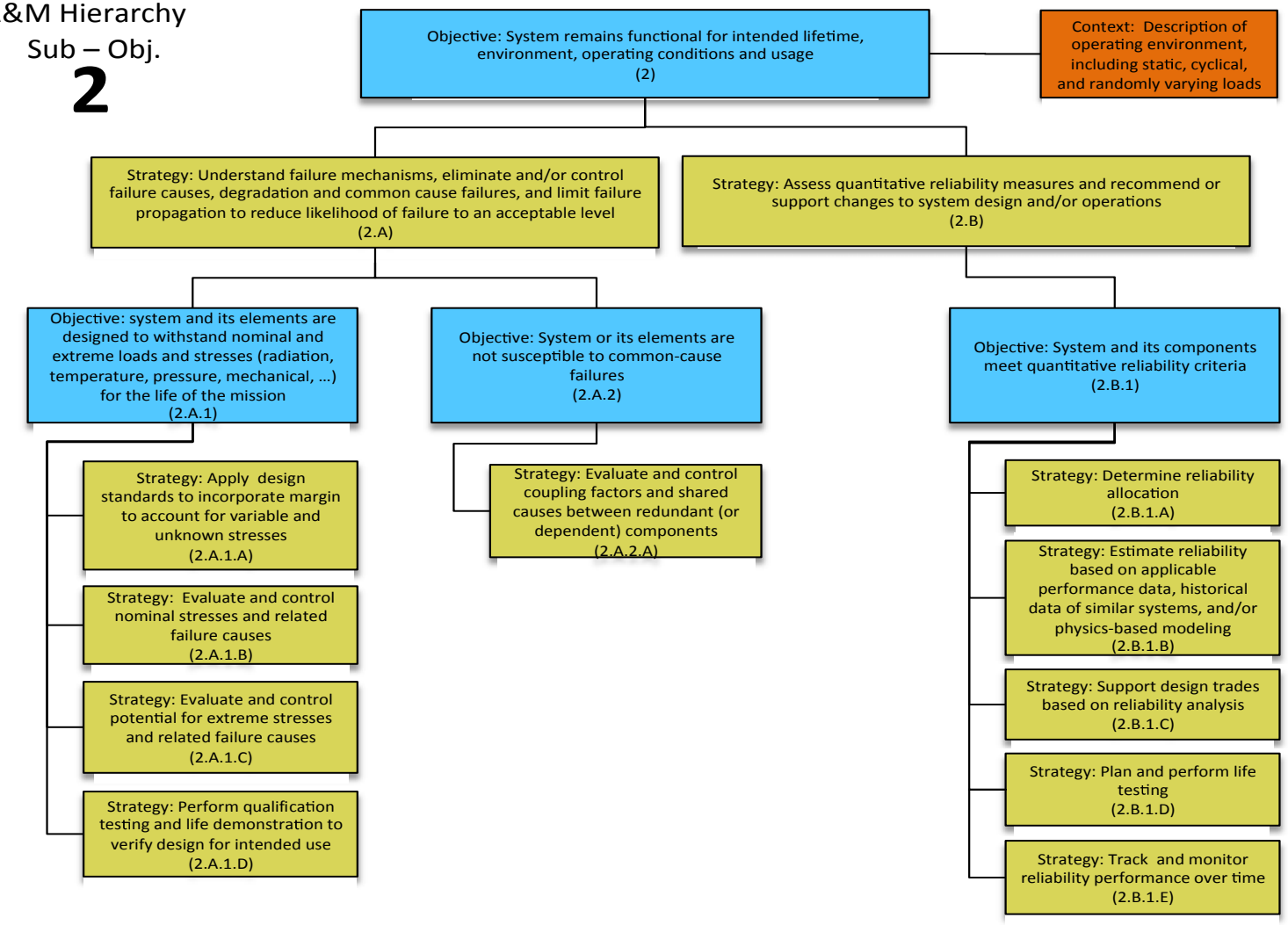
- Focus on the *what*:
  - Emphasize R&M objectives and related strategies
  - Leave choice of methods and techniques to implementing organizations
  - Allow for innovation and adaptation to new engineering practices

Decomposition of R&M Objectives

R&M Objectives Structure – Top-Level



R&M Hierarchy
Sub – Obj.
2



Laying the Foundation

- Logically decompose top-level R&M objective
  - Use elements of the Goal Structuring Notation
  - Structure shows why strategies are to be applied

- Structure forms basis for a proposed R&M standard
  - Specifies the technical considerations to be addressed by projects
  - Forms basis for evaluation of plans, design, and assurance products

Summary

- Changes in missions, acquisition/engineering practices, and technology challenge proven R&M practices
- Define R&M objectives and strategies to enable adaptation and innovation
- Logically decompose the top-level R&M objective to identify the elements of an R&M argument

Final Thoughts

- MBSE is not *the* rationale for the proposed approach, but is considered to help devise R&M tools and methods within MBSE contexts.

- Community will have to work towards open standards for documenting R&M arguments and evidence
  - As part of broader assurance framework
  - Enable infrastructure of MBSE-compatible R&M tools