



# ***“The 4 Vs of T&E”***

## ***FAA V&V Summit***

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# **DoD Test and Evaluation**

## **versus**

# **Systems Engineering**

# **Verification and Validation**



# DoD Test and Evaluation

versus

# Systems Engineering Verification and Validation

**Weapons Systems Acquisition Reform Act  
NDAA 2009**



# The Four Vs



**In a perfect world it would be V, V, V & V**

- **Validate Requirements**
- **Verify the Design**
- **Verify Specifications**
- **Validate Performance**

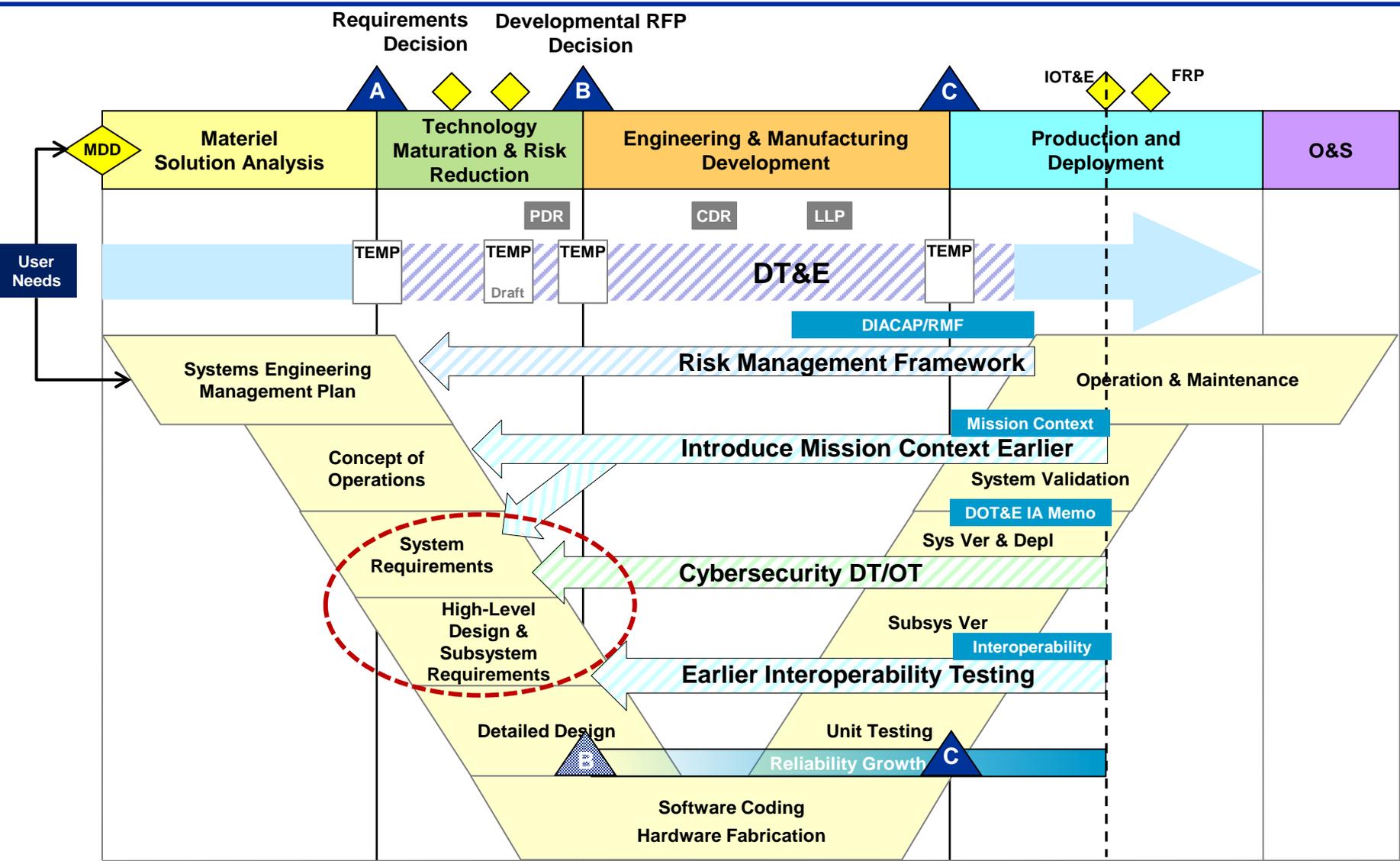
**To get the first 3 Vs right we have to “Shift Left”.**

**To get them all right we have to use the  
Systems Engineering V**





# DT and SE Role in Shift Left





# Measurable, Testable Requirements



## Validate Requirements

## Verify Specifications

Concept of Operations

Initial Capabilities Document

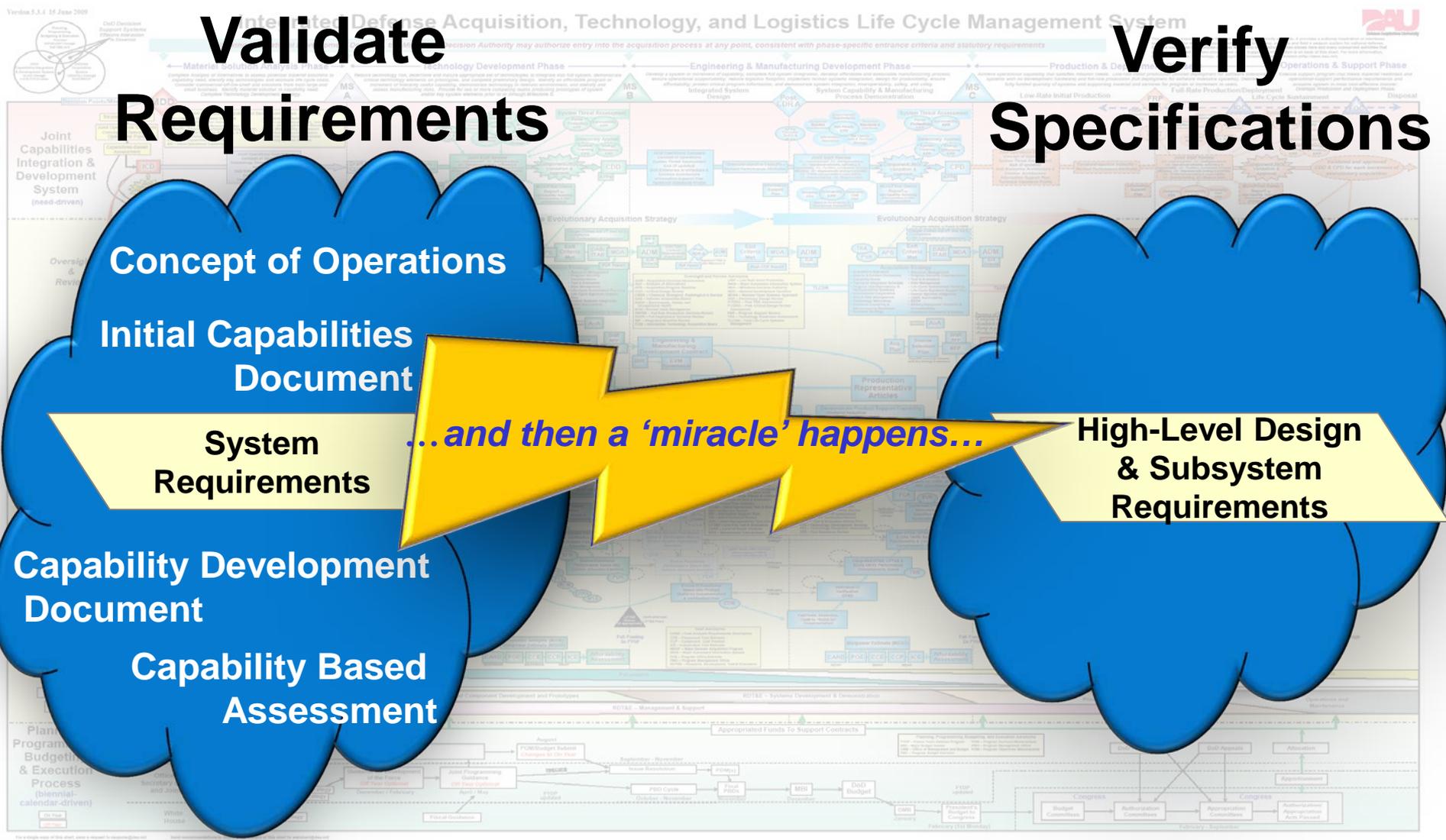
System Requirements

Capability Development Document

Capability Based Assessment

*...and then a 'miracle' happens...*

High-Level Design & Subsystem Requirements



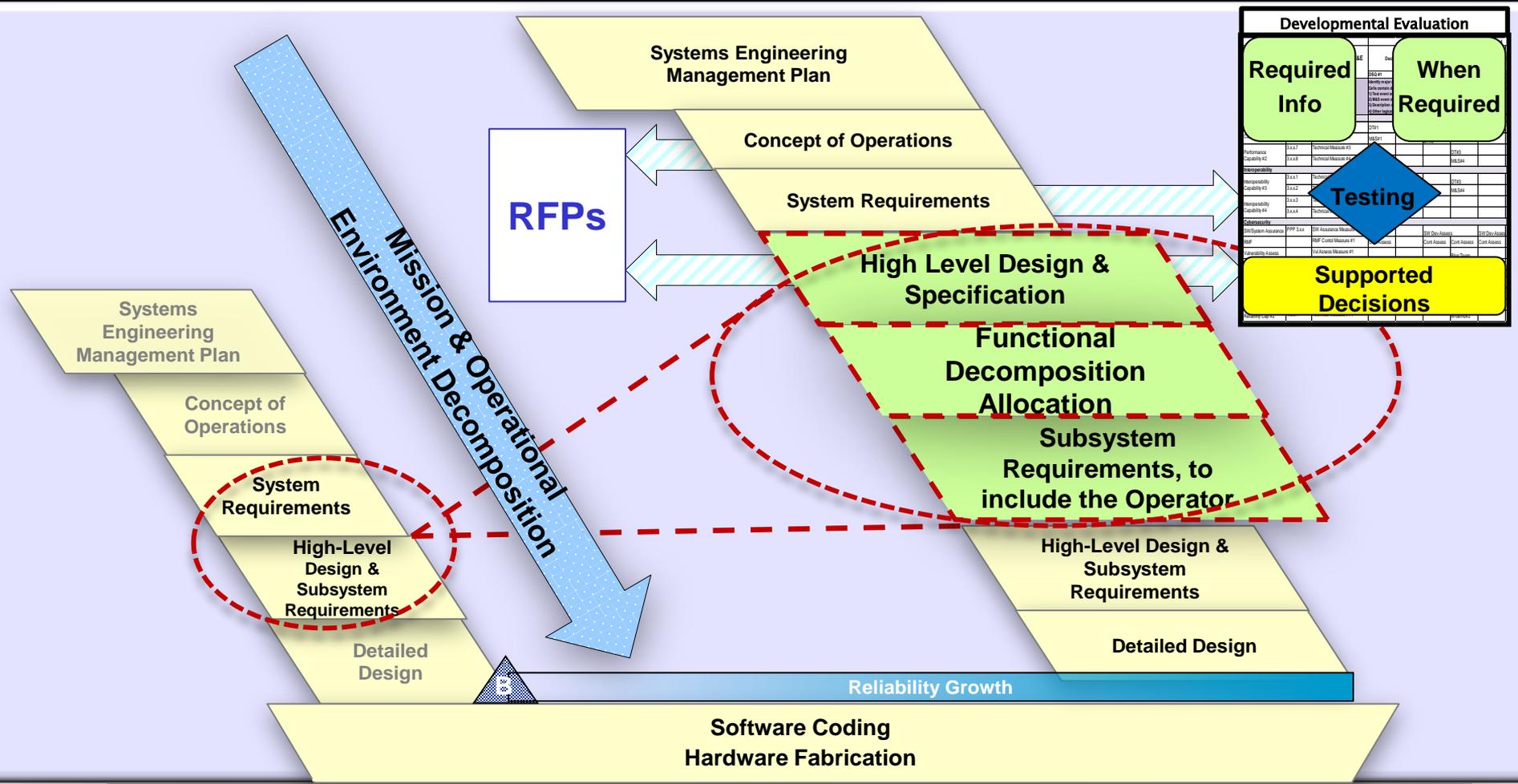


# How Developmental Test and System Engineering can Help



Requirements Decision    Developmental RFP Decision

A    B    C    IOT&E    FRP



Developmental Evaluation									
Required Info					When Required				
Performance Capability K1	FAK7	Technical Mission #1	MS21	Cost	MS21	MS21	MS21	MS21	MS21
Performance Capability K2	FAK8	Technical Mission #2	MS22	Cost	MS22	MS22	MS22	MS22	MS22
Reliability Capability R1	FAK1	Reliability	MS21	MS21	MS21	MS21	MS21	MS21	MS21
Reliability Capability R2	FAK2	Reliability	MS22	MS22	MS22	MS22	MS22	MS22	MS22
Reliability Capability R3	FAK3	Reliability	MS23	MS23	MS23	MS23	MS23	MS23	MS23
Reliability Capability R4	FAK4	Reliability	MS24	MS24	MS24	MS24	MS24	MS24	MS24
Reliability Capability R5	FAK5	Reliability	MS25	MS25	MS25	MS25	MS25	MS25	MS25
Reliability Capability R6	FAK6	Reliability	MS26	MS26	MS26	MS26	MS26	MS26	MS26
Reliability Capability R7	FAK7	Reliability	MS27	MS27	MS27	MS27	MS27	MS27	MS27
Reliability Capability R8	FAK8	Reliability	MS28	MS28	MS28	MS28	MS28	MS28	MS28
Reliability Capability R9	FAK9	Reliability	MS29	MS29	MS29	MS29	MS29	MS29	MS29
Reliability Capability R10	FAK10	Reliability	MS30	MS30	MS30	MS30	MS30	MS30	MS30



# What Information is Needed When and How to Get It

Requirements Decision

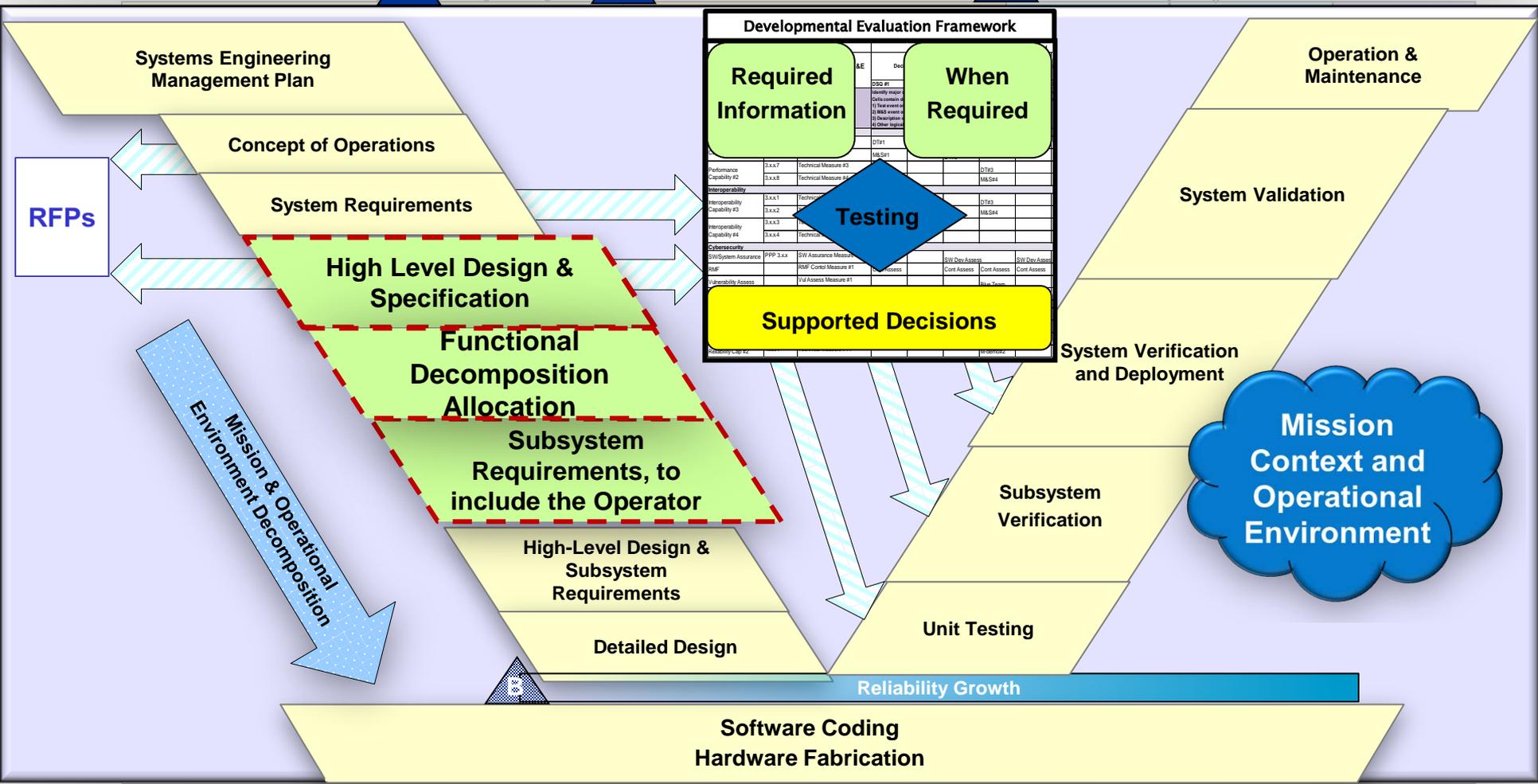
Developmental RFP Decision

IOT&E  
FRP

A

B

C





# Chief Developmental Tester's Role

in conjunction with

## Industry Test Lead



- ***Testing and Engineering can make the 'miracle' happen!***  
CDTs and ITLs, together with their staffs must:
  - Test and Evaluation and SE work to get the mission aspects into the specifications
  - Ensure the derived specs:
    - Represent the impact of the mission and its environment,
    - Are verifiable in a mission based environment

If the technical requirements and specs are informed by the mission, then verifying the technical requirements and specs is doing testing in a mission context!



# Test and Evaluation Resources



- Test Capabilities

- *Understand and simulate* the operational environment
- Emerging weapons technologies are *straining the capabilities* of our infrastructure



- Workforce

- Government civilians, military, and contractors are a *critical resource*
- Test organizations and testers must *understand the operational missions*
- Leverage available expertise: *create opportunities* for testers





# MRTFB Capability Overview





# Questions