



Army Test and Evaluation Command

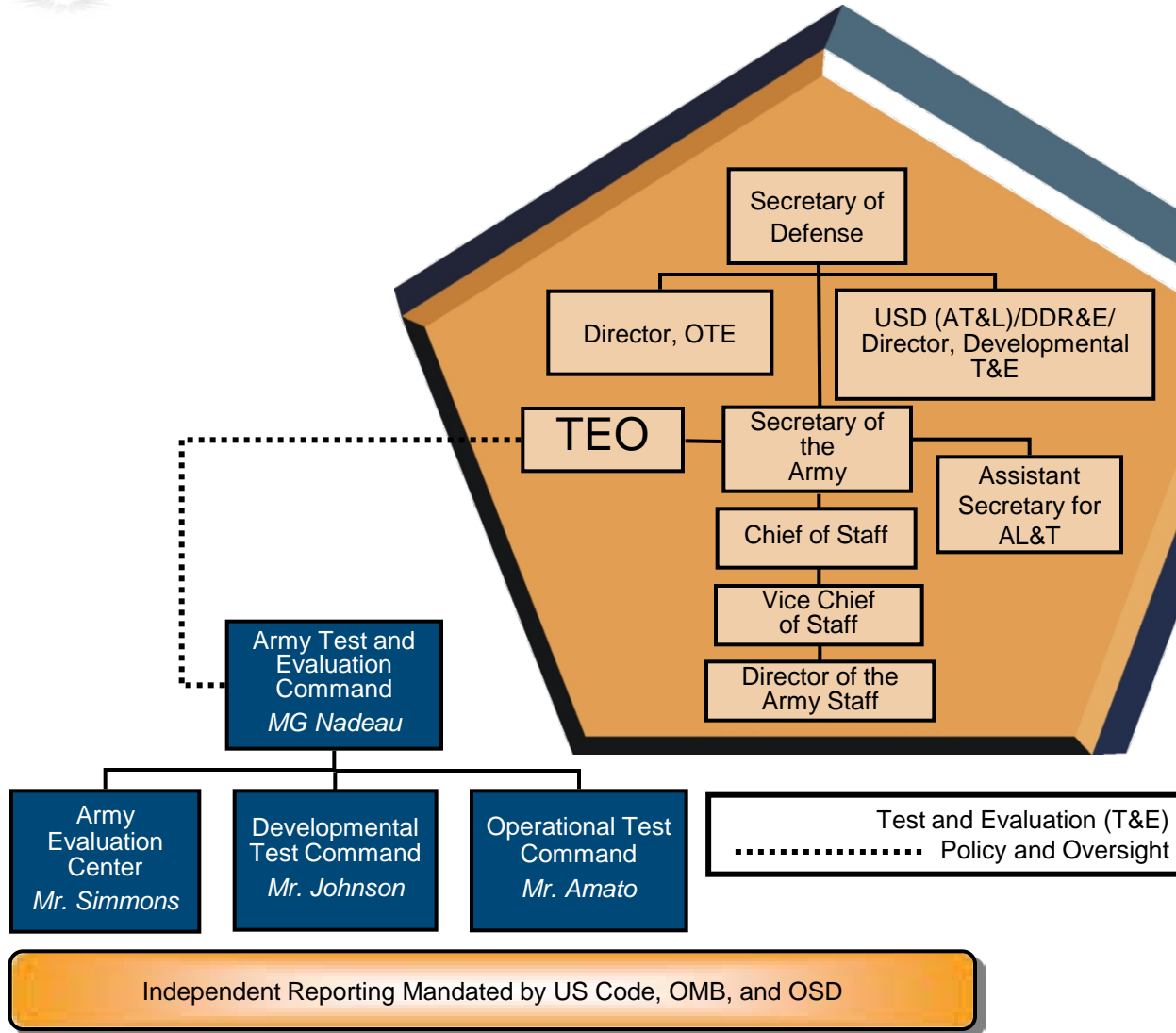


How Systems Engineering Supports Developmental Test and Evaluation

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*Army Proven
Battle Ready*

How We Fit



ATEC Mission

Plan, test, independently evaluate, and report throughout program lifecycles to advise combat developers/functional proponents, PEOs, and Senior Leadership

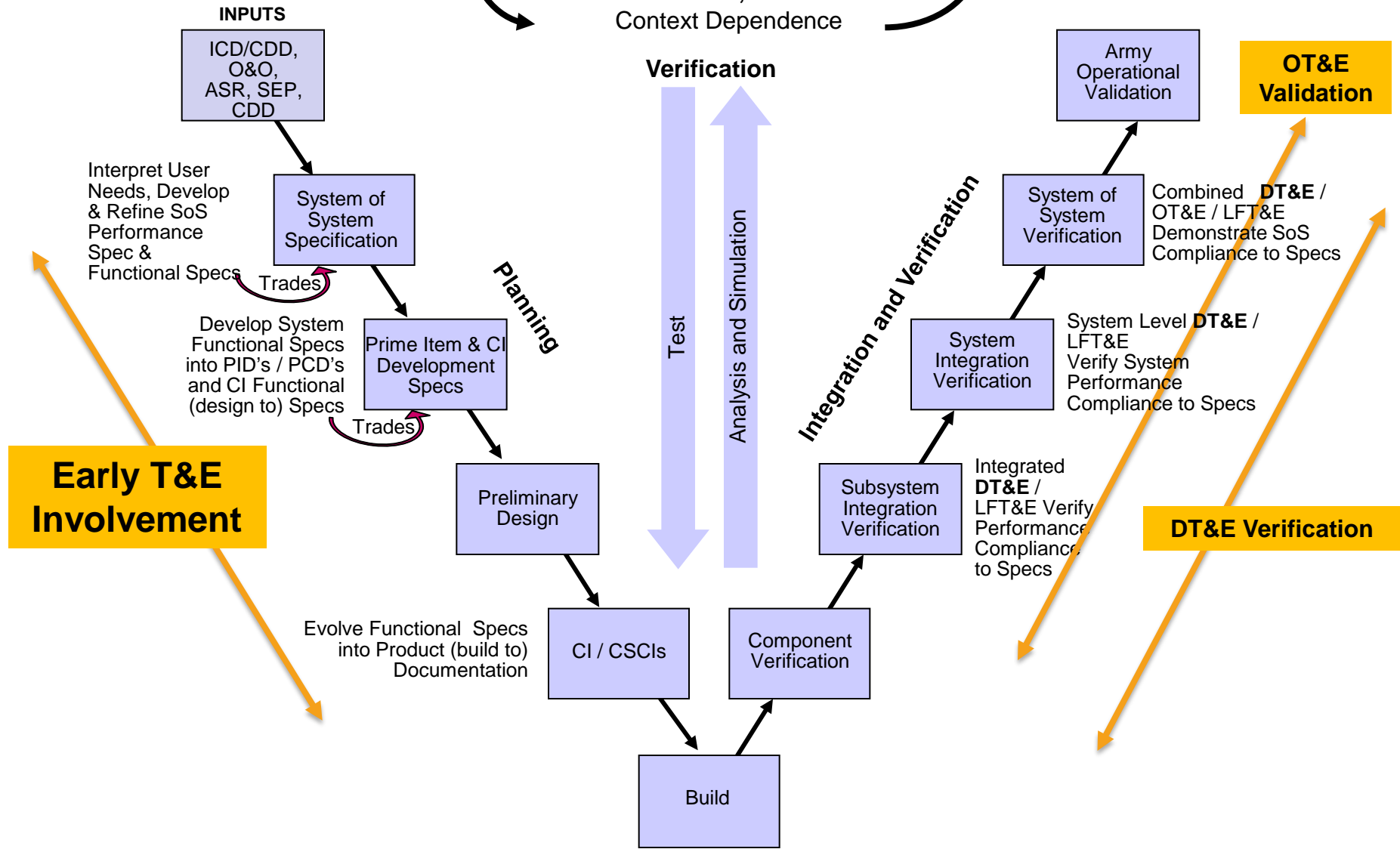
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Systems Engineering

Capability Gap Identification JCIDS
FAA, FNA, FSA

Capabilities, Limitations
ATEC FAA, FNA, FSA results

Mission-Task, SoS-Task
Context Dependence



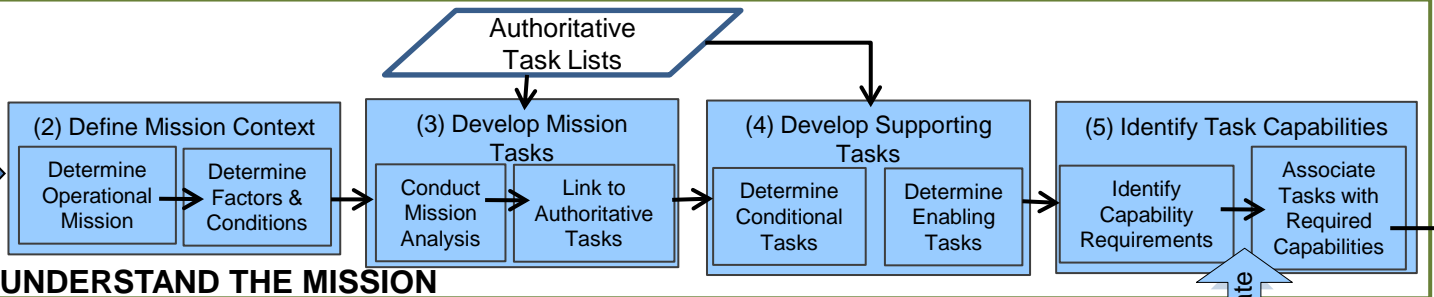


Mission-Based Systems Engineering

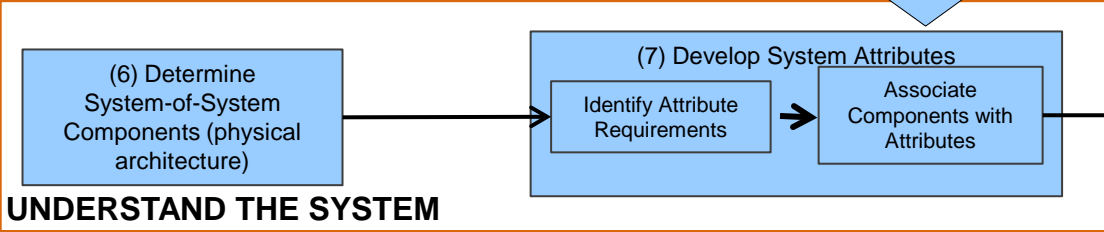
- Unlike the commercial arena, systems engineering for military applications must be more rigorous to ensure effectiveness, suitability, and personnel survivability in the harshest environments.
- As such, effective systems engineering must expand requirements analysis into the mission context.
- The expansion requires an understanding of the engineered attributes (function and performance) of the system. Part of that understanding is learned through DT.
- Mission-based approach can lead the way to research, develop, test and verify mission capabilities.
 - Goal is robust application for SoS, commercial-off-the-shelf intensive systems, and recapitalized systems.

MBT&E and SE

Mission-Based T&E

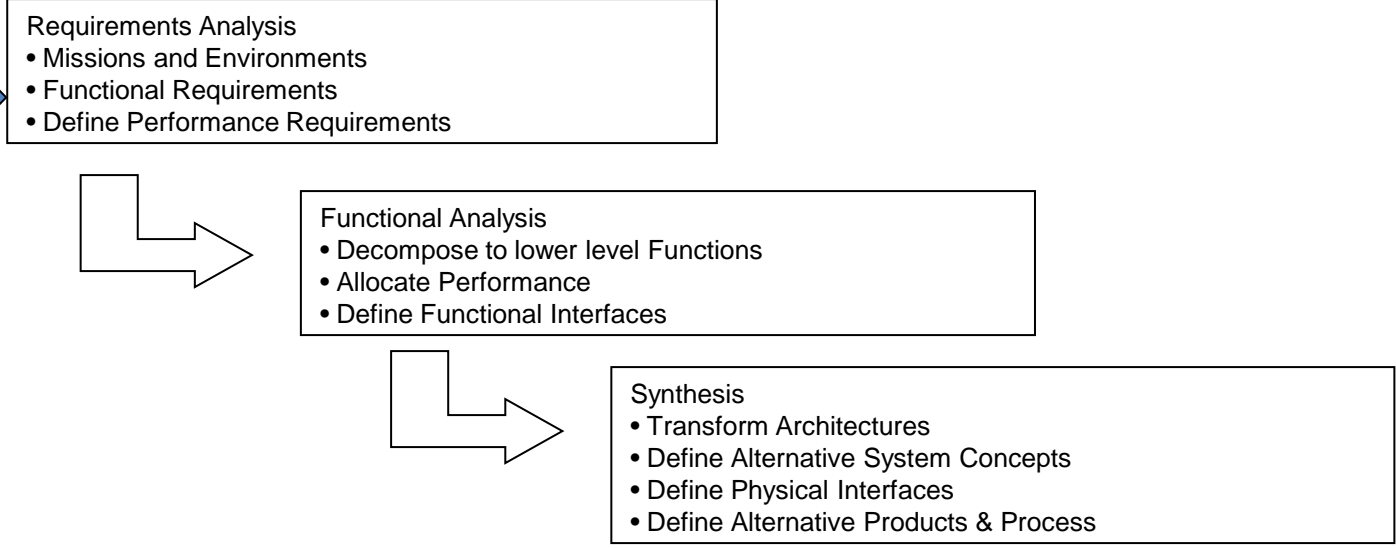


UNDERSTAND THE MISSION



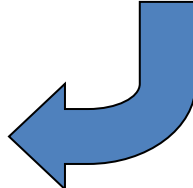
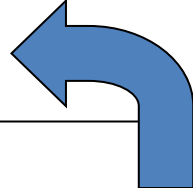
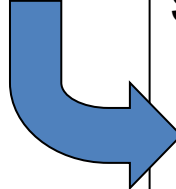
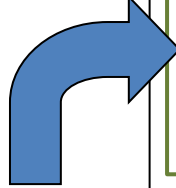
UNDERSTAND THE SYSTEM

Systems Engineering



Understand the Mission

Understand the System





MBT&E & SE Aligned Goals*

- Execute SE and scope T&E efforts earlier in the acquisition cycle based on mission task capabilities.
 - Addresses:
 - “Insufficient systems engineering applied early in the program life cycle...”
 - “Requirements not always well-managed, including the effective translation from capabilities statements into executable requirements...”
 - By: Focusing on mission task capabilities as the starting point.
- Enable robust SE and T&E strategy development for Joint networked SoS and a common environment for collaborative effort between capabilities developer, materiel developer and T&E.
 - Addresses: “Collaborative environments, including SE tools, are inadequate to effectively execute SE at the joint capability, SoS and system levels.”
 - By: Using a framework that links all components of the SoS to the mission capability and uses a common definition of terms.



SE Connections to T&E

- T&E must be an integrated aspect of the SE process from virtually the beginning to the end.
 - Both DT and OT are integral to the SE process.
 - DT addressing the technical maturity and specification compliance.
 - OT addressing customer needs and satisfaction.
- Testers working together with requirements systems engineers assure requirements and specifications are unambiguous and verifiable.
- The role of SE is determining and translating operational needs to engineering specifications. MBT&E checks both.
- T&E supports the system engineering process by turning information into knowledge.
 - The cost associated with obtaining information is not trivial. However, the cost of ignorance is huge.
 - Some believe testing is expensive but fixing the problems found late in the program is far more expensive.
- Successful design reviews answer questions, assure risk is appropriate and convince decision makers to approve moving into the next phase.
 - T&E results provide the most compelling rationale.



Challenges

- Integrating DT/OT
- Information Assurance/Network security
- Software
- System of Systems integrations
- Live, Virtual, Constructive considerations