



# Verification and Validation — An OSD Perspective —

Fred Myers

Deputy Director, Test Infrastructure  
Test Resource Management Center  
November 4, 2009



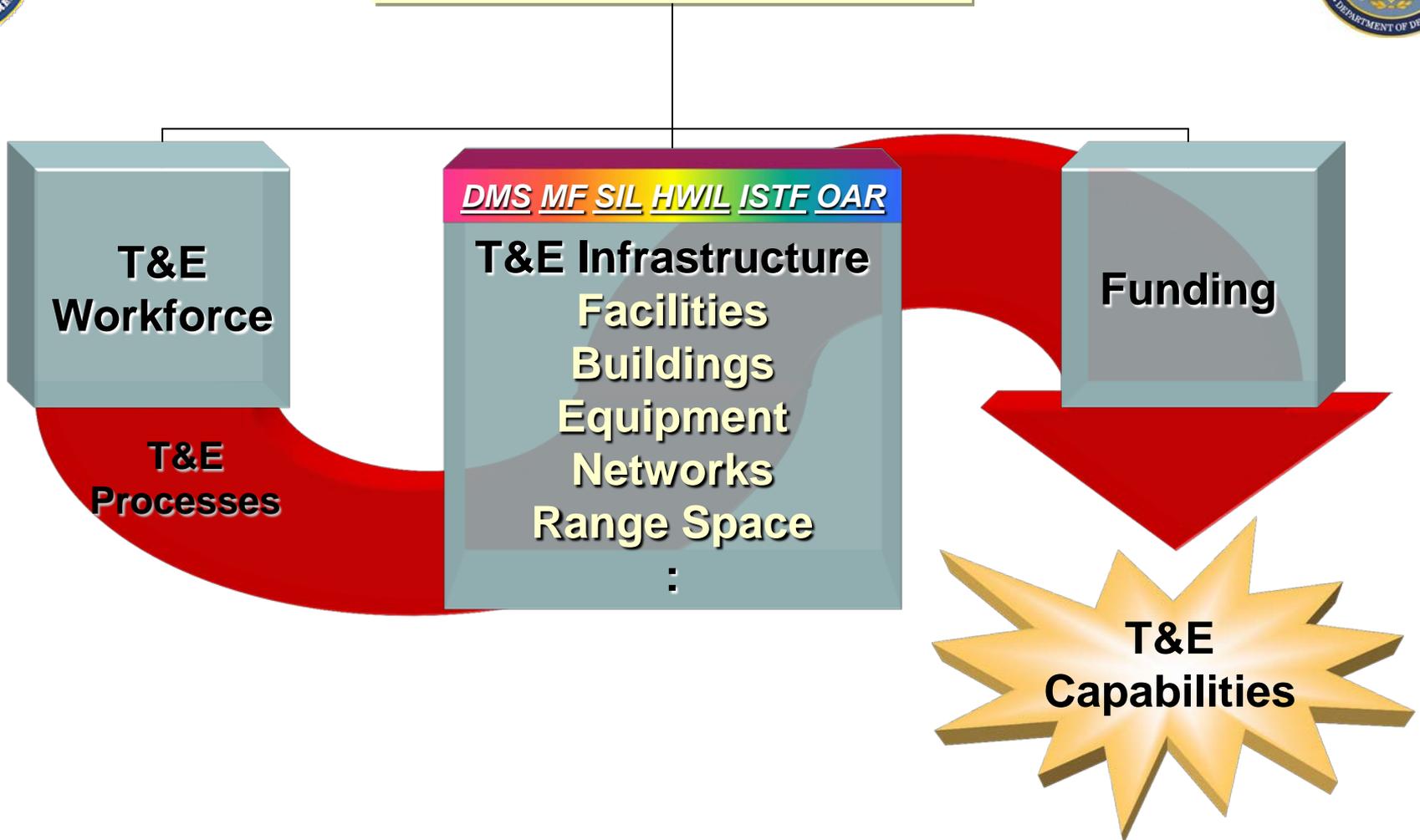
# Outline



- Test Resources
- Test Organizations within the DoD
- Definitions
- Acquisition Time-line for the DoD
- Systems Engineering (SE)
- T&E Life Cycle (TES/TEMP)
- Relationship between SE and T&E
- DoD T&E Best Practices
- Summary



# T&E Resources



**T&E Resources**: A collective term that encompasses the requisite **Workforce**, **Infrastructure** and **Funding** resulting in a **T&E Capability**, by means of the **T&E Processes**



# Test Organizations within the DoD



Secretary of Defense

Under Secretary of Defense  
Acquisition, Technology & Logistics

Director  
Operational Test &  
Evaluation

- *Certify weapon systems for:*
  - *Operational Effectiveness and Suitability*
  - *Live-fire System Vulnerability and Lethality*

Director  
Test Resource  
Management  
Center

- *DoD Strategic Plan for T&E Resources*
- *Certification of Service / Agency T&E Budgets*
- *Oversight of T&E Infrastructure*

Director  
Defense Research  
and Engineering

Director  
Developmental Test  
and Evaluation

- *DT&E Policy*
- *Acquisition T&E Career Workforce*
- *DT&E Program Oversight*



# Definitions



**Systems Engineering** is defined by ANSI/EIA-632-1999, "Processes for Engineering a System" as *"An interdisciplinary approach encompassing the entire technical effort to evolve and verify an integrated and total life cycle balanced set of system, people, and process solutions that satisfy customer needs"*

**Integrated Testing** is defined by OSD Memo, "Definition of Integrated Testing," dated 25 April 2008 as *"The collaborative planning and collaborative execution of test phases and events to provide shared data in support of independent analysis, evaluation, and reporting by all stakeholders, particularly the developmental (both contractor and government) and operational test and evaluation communities"*

**Verification** is defined by DoD Directive 5000.59, "DoD Modeling and Simulation (M&S) Management" as *"The process of determining that a model implementation and its associated data accurately represents the developer's conceptual description and specifications"*

**Validation** is also defined by DoDD Directive 5000.59 as *"The process of determining the degree to which a model and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model"*

**Verify:** To establish the truth, accuracy, and reality of a system's performance

**Validate:** To corroborate on a sound or authoritative bases--confirm



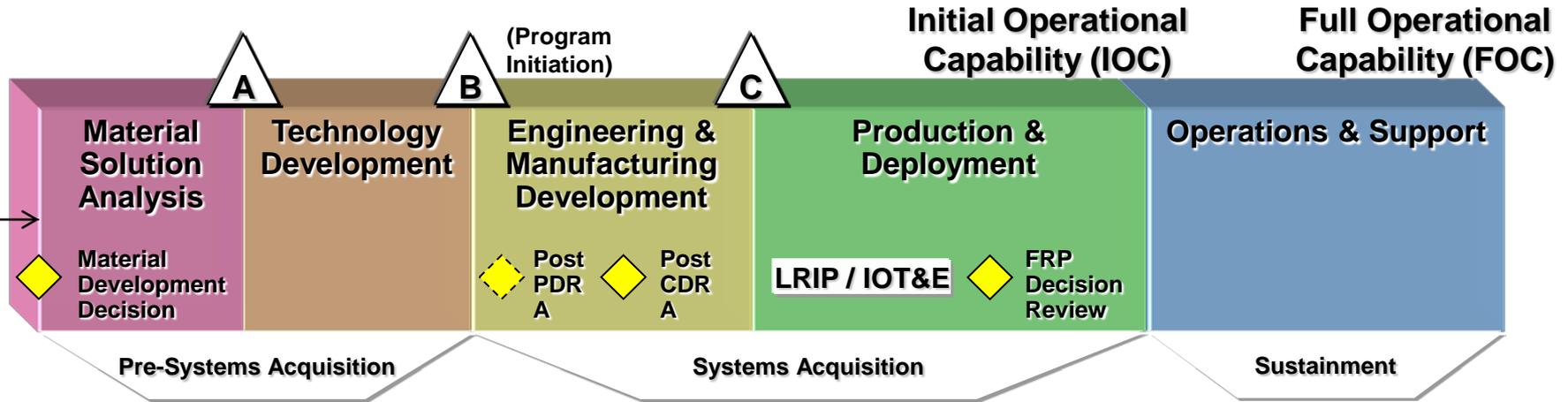
# Acquisition Time-line for the DoD



- *The Material Developer Decision precedes entry into any phase of the acquisition Management System*
- *Entrance Criteria met before entering phase*
- *Evolutionary Acquisition or Single Step to Full Capability*

User Needs

Technology Opportunities & Resources



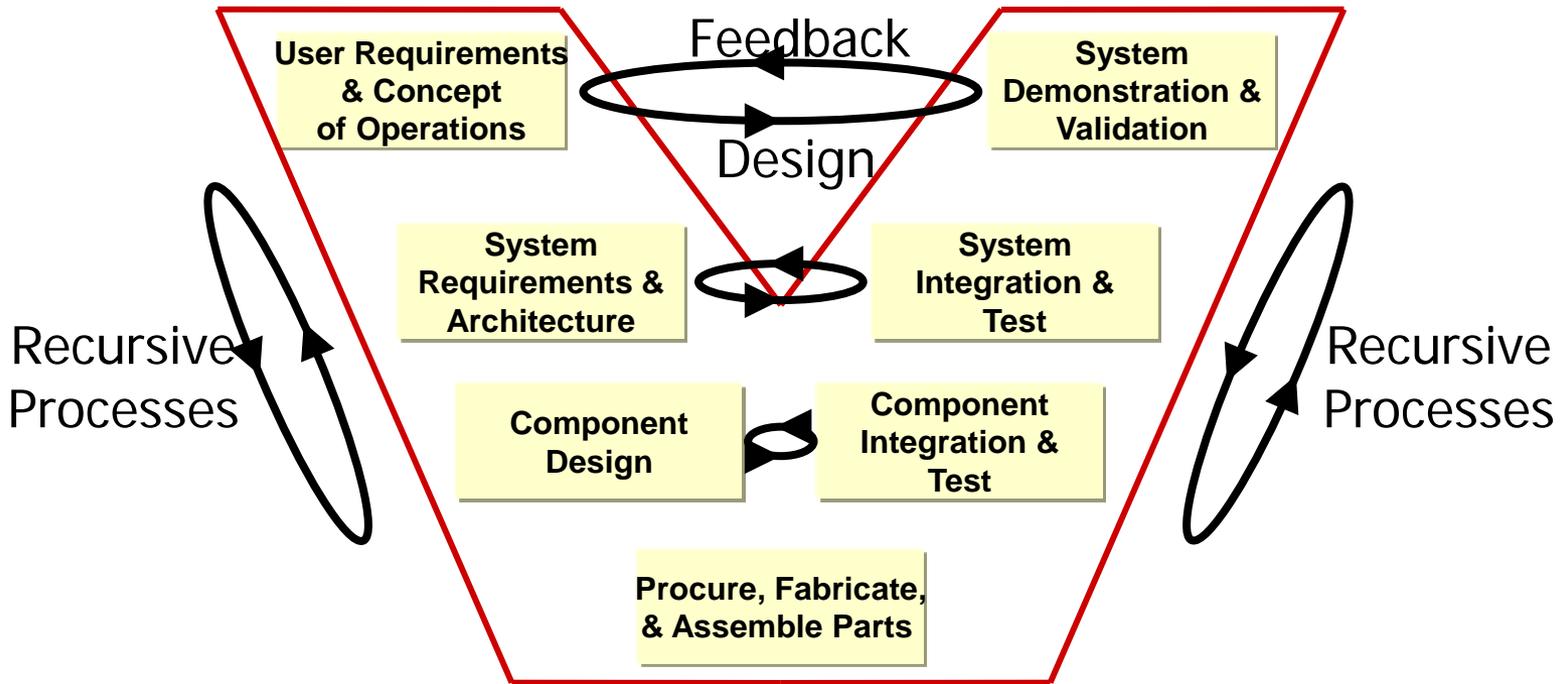
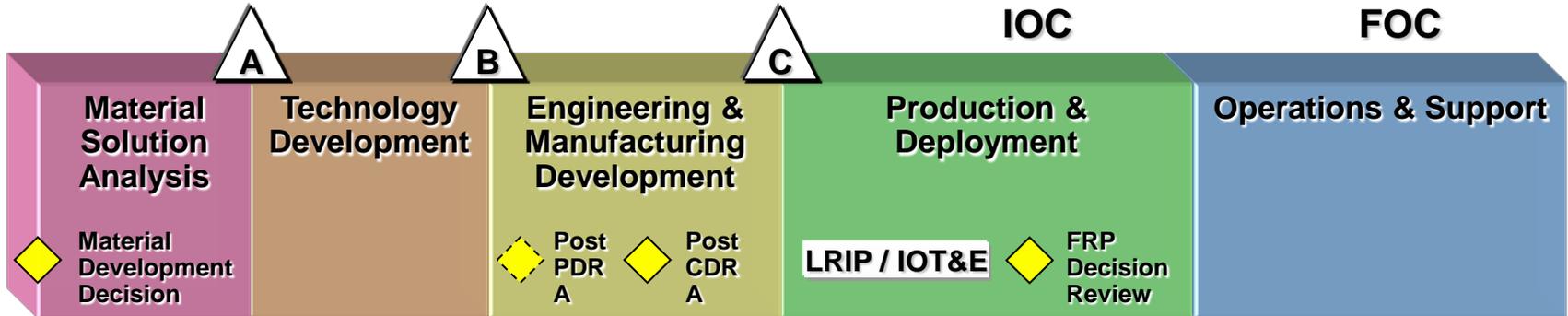
◆ = Decision Point     
 △ = Milestone Review     
 ◆ = Decision Point if PDR is not conducted before Milestone B

**PDR: Preliminary Design Review**  
**CDR: Critical Design Review**  
**LRIP: Low-Rate Initial Production**  
**FPR: Full-Rate Production**



# Systems Engineering (SE)

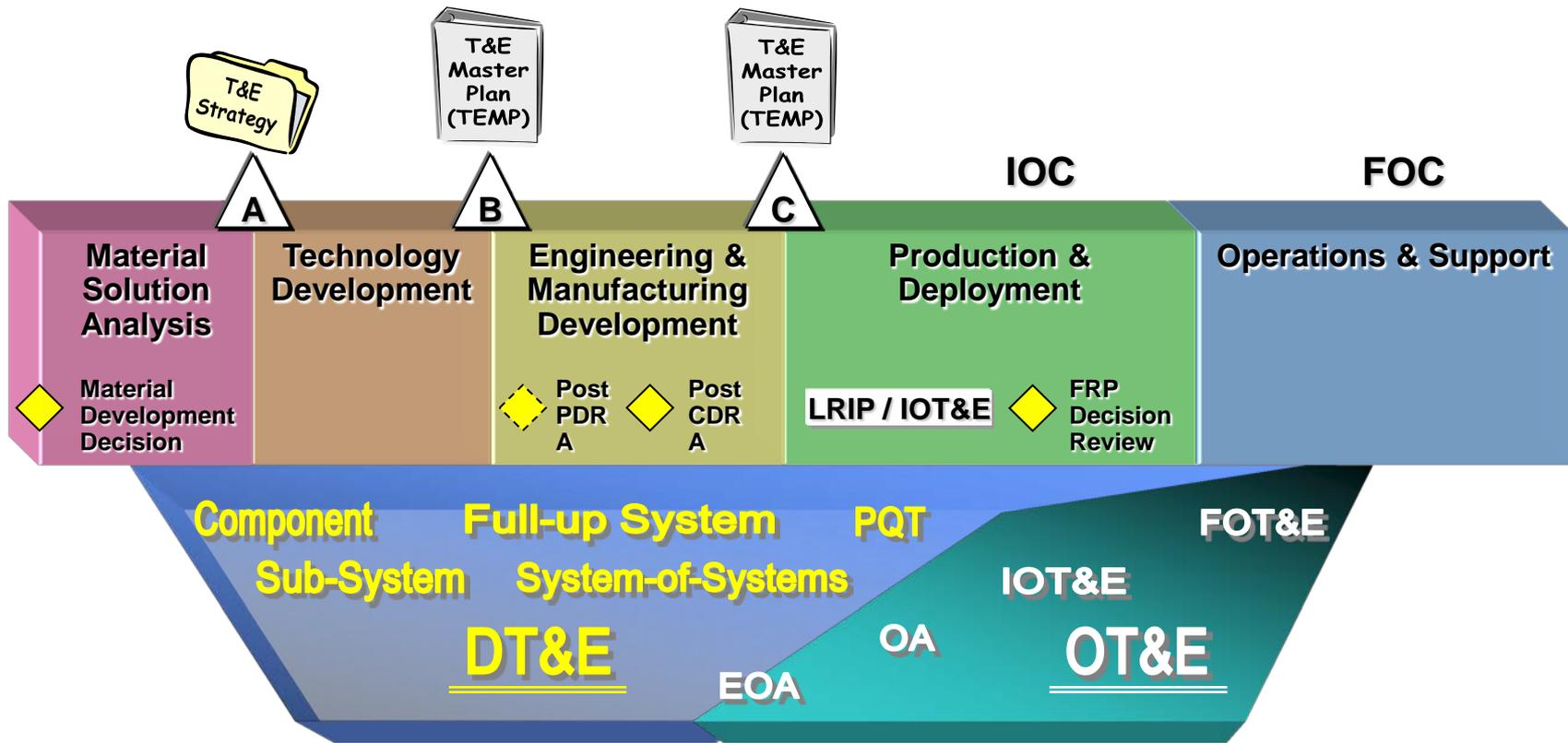
Scope: *Enable systems engineering across acquisition life cycle*



**"V&V Occurs throughout the SE Process"**



# T&E Life Cycle (TES/TEMP)



**Early T&E involvement in technical planning is critical**



# Relationship between SE and T&E

## (Defense Acquisition Guidebook)



- Systems engineering is a process to transform required operational and sustainment capabilities into a system design solution
- As the design solution evolves, a verification component of the systems engineering process must provide confidence that the design solution properly addresses the desired capabilities, as intended
- T&E is the mechanism for accomplishing the verification loop in the systems engineering process and characterizing technical risk of achieving a proper final design solution



# DoD T&E Best Practices



- **Recognize T&E value:**
  - Use T&E to understand risk and identify problems early
  - Provides V&V for system design and development
- **Embed T&E in Acquisition Strategy:**
  - T&E Strategy must be part of the acquisition strategy
- **Develop a sound T&E strategy and plan:**
  - Ensure both contain realistic schedules and adequate resources
- **Employ event-driven T&E planning and execution:**
  - Use event-driven T&E plan to reduce technical risk
  - Do not sacrifice testing to meet schedules



# DoD T&E Best Practices (Cont.)



- **Ensure early involvement by all stakeholders in T&E planning and execution**
- **Integrate T&E in contracts:**
  - Develop T&E strategy along with RFP development
  - Ensure key requirements can be tested and evaluated
  - Use T&E as a source selection criteria
  - Ensure Government has access to all test data
  - Ensure Government can conduct an independent evaluation and assessment
- **Focused early testing — Identify biggest risks and test them first**
- **"Build-a-Little — Test-a-Little"**
- **Evaluation is the key to successful testing**
  - Provide feedback to the system designer and developer



# Summary



- T&E can reduce cost, schedule and technical risk
- T&E results figure prominently in the decisions reached at design and milestone reviews
- The fact that T&E results are required does not presuppose the results will be favorable
- Only the decision-makers can determine the weight and importance of a system's diverse capabilities and shortcomings — the degree of risk they are willing to accept
- Good T&E information enables informed decisions