T&E for Verifying Technology Development and Maturation

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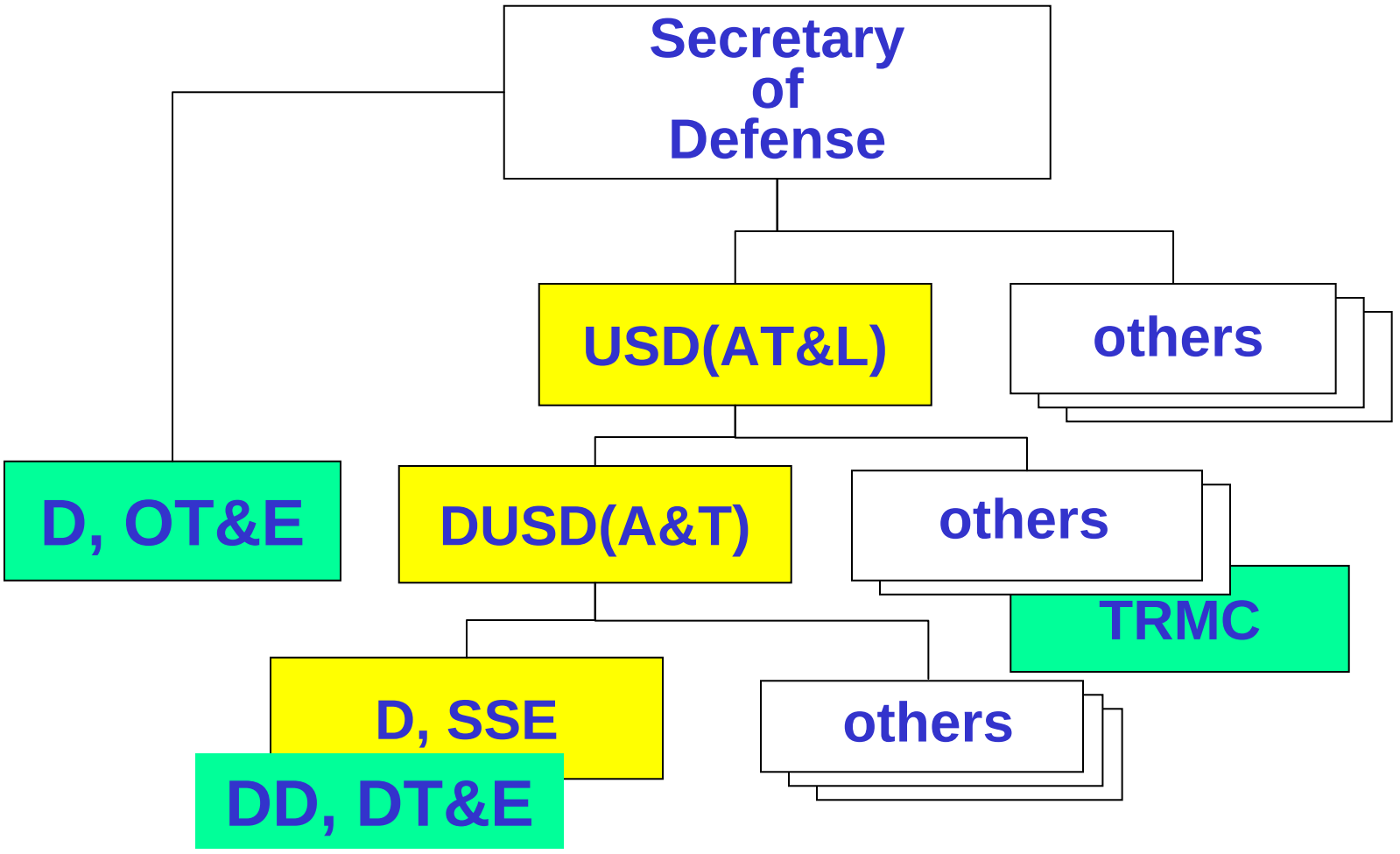
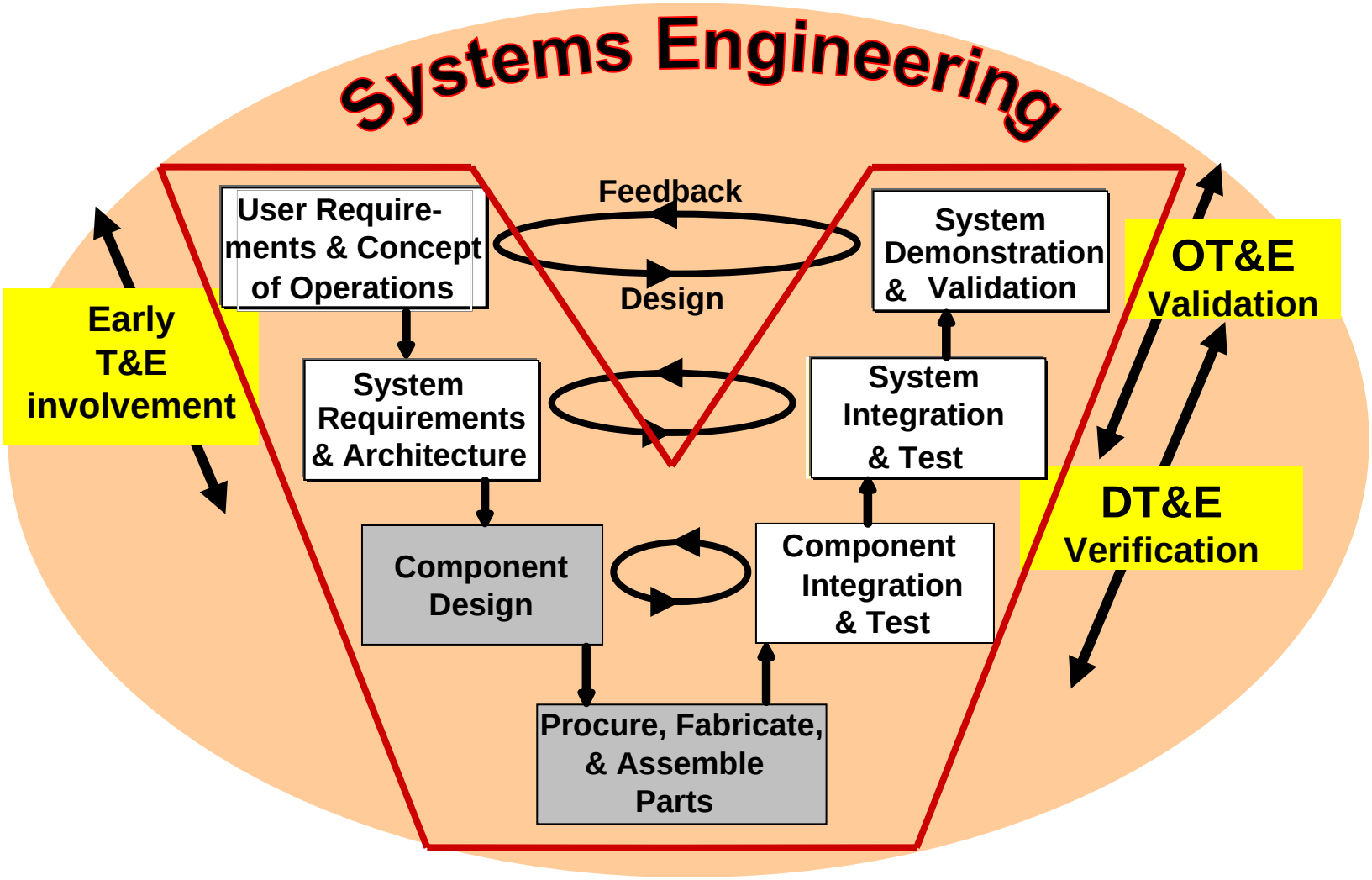
Outline

- Intro to OSD DT&E
- DT&E Priorities
- DT&E Technology Maturity Initiative
- Plan of Action

Where am I in OSD?



T&E Supports Systems Engineering



What's My Role?

Primary

- DT&E Policy & Guidance
- T&E Workforce Education

Secondary

- Acquisition M&S
- Systems Energy Policy
- DoD Acquisition System Safety

A New Vector for DT&E

My Priorities...

- **Support Faster Fielding of Improved Capabilities**
- **Reduce Risk of Immature Technology in Systems Development**
- Revitalize T&E Workforce Education
- Promote Joint T&E in Live-Virtual-Constructive Environments
- Provide Effective Acquisition Policy and Practices for DT&E

Support Faster Fielding of Improved Capabilities

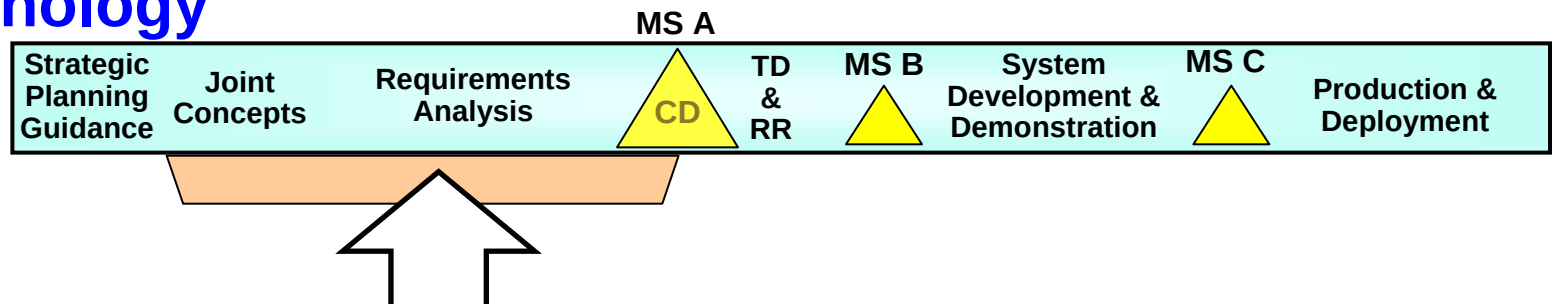
- 2006 QDR: "...a more effective acquisition system and associated set of processes."
- Acquisition goal - cut time in half, from 10+ to 5- years

  (1) reduce technical & programmatic risk, prior to program initiation

  (2) change people's mind-set; focus on trading greater capability for earlier fielding

<u>New approach</u>: evaluate cost, requirements, and technology alternatives - improved Concept Decision for MS A ("Big A")

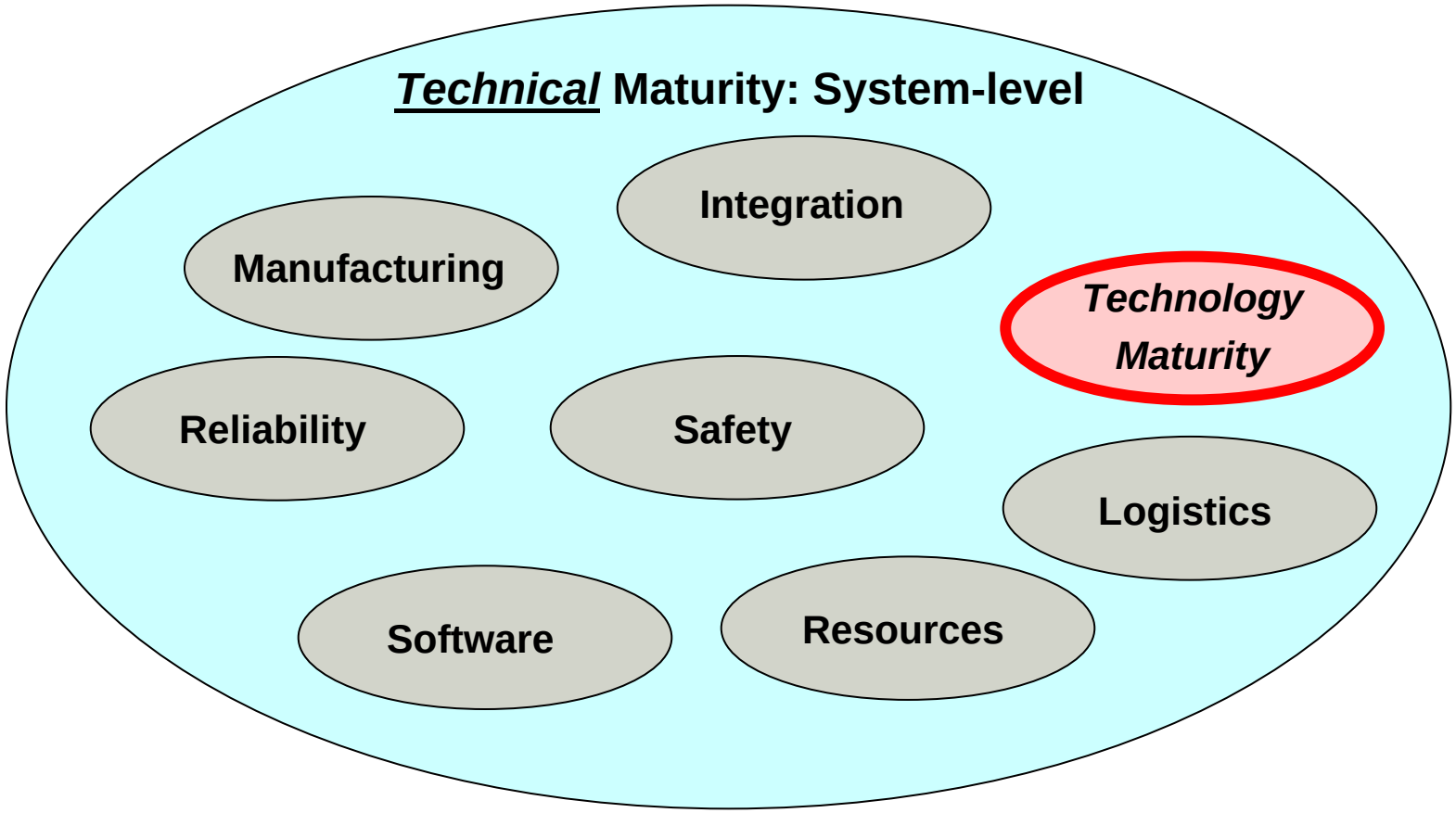
<u>Result</u>: start programs with firm requirements & mature technology



Role for DT&E

- Assure testable requirements in Big “A” Eval of Alt’s / CD
- Include in request for proposal (RFP) T&E implications for System Development and Demonstration
- Fully integrate T&E strategy - CT, DT, OT
- Efficient test data philosophy: collect once, use often
- Not pass-fail; learn, define, understand system’s capabilities and limitations...for fielding at predefined time
- Operational environment and operators in DT, soonest
- Mutually supporting plans:
  - Systems Engineering Plan
  - Test and Evaluation Master Plan
  - System development Statement-of-Work and RFP

Technology vs. Technical Maturity



Technology Maturity is a component- or subsystem-level issue

Reduce Risk of Immature Technology in Systems Development

- Studies find that immature technology is a primary source of cost and schedule risk
  - GAO -- DAPA
  - QDR -- SSE/AS Program Support Reviews

- "Programs that started development with **immature** technologies experienced an average acquisition unit cost increase of nearly **21 percent"** (GAO-05-301, March 2005)

- FY06, PL 109-163, Section 801 requires USD(AT&L) certification, before Milestone B, that *"the technology in the program has been demonstrated in a relevant environment"*
  - Above wording equates to Technology Readiness Level (TRL) 6

OSD Oversight Findings

- PM chose “a software architecture that depends upon COTS middleware that does not yet exist “
  - Although an alternative has been identified, no effort has been expended to pursue this solution
- “Technology maturity growth of critical Engineering Development Models lagging the plan”
  - PSR Recommendation: Initiate development of off-ramps to maximize operational performance
- “Technology Readiness Level (TRL) 6 of major subsystem at Milestone B is unlikely to be achieved; planned testing will not support accurate assessment of true maturity”
- “TRA conducted too late to influence decision process”

Major contributors to poor program performance

DT&E Technology Maturity Initiative

Purpose

- Add Technology Maturity focus into the Systems Engineering and DT&E processes to:
  - Reduce technical, cost, and schedule risk
  - Increase the rigor of SE
  - Plan for alternatives in the event of TM difficulty
  - Verify TRLs during DT&E
  - Updates will complement proposed Risk-Based Source Selection, Time-Defined Acquisition, and Concept Decision (CD) processes

Scope

- Leverage existing acquisition review structure
- Use existing DDR&E Technology Readiness Assessment (TRA) methodology

Technology Maturity Across System Lifecycle (as-is)

Technical Review	Decision	TRL (min)	
Initial Technical Review	CD	1*	
Alternative System Review	MS A	4*	
System Requirements Review	MS B	6	← Statute, per Sec 801
Systems Verification Review/ Production Readiness Review	MS C	7*	

* Guidance, not statute

Technology Maturity should be tracked between Milestones in Technical Reviews

Time-Certain Acquisition *Demands* Higher Technology Maturity

Technical Review Opportunities	Decision	TRL (min)	
Evaluation of Alternatives	EOA	4-5*	Compressed/ Merged
Alternative System Review (ASR)	CD	4-5*	
Systems Requirements Review	MS B	6 ←	Statute, per Sec 801
Systems Verification Review/ Production Readiness Review	MS C	7*	

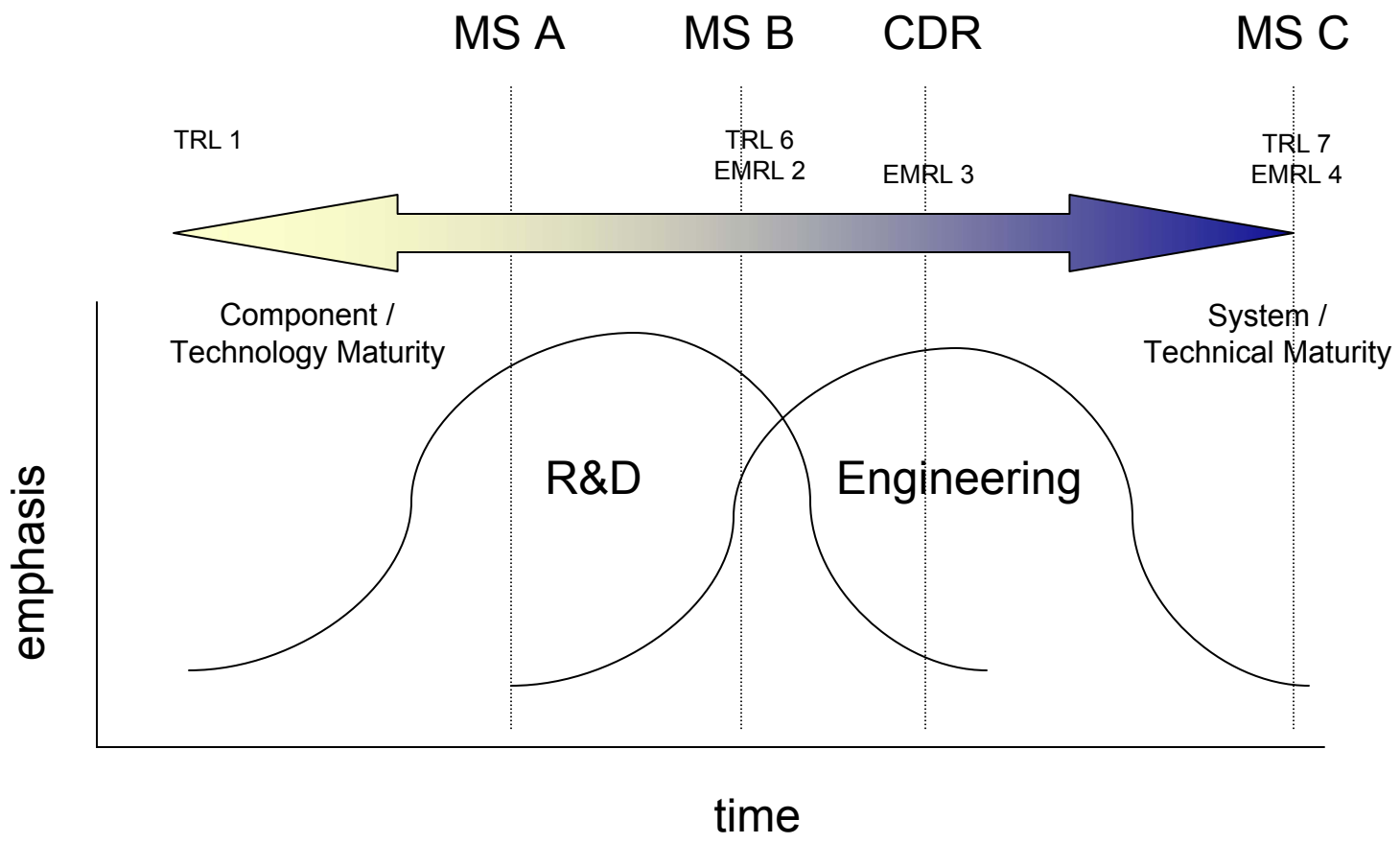
* Guidance, not statute

Plan of Action

- Changes in next update to Defense Acquisition Guidebook
  - SE and T&E Chapters
- Incorporate TM in recommended formats of
  - SEP, TES, TEMP
- Increase TM emphasis in OSD Oversight
  - PSRs, AOTRs
- Add emphasis on TM to DAU SE and T&E curriculum
  - CLM on TM planning
- Publicize renewed TM emphasis to DoD, Service, and Industry organizations

Back-up

Transition of Emphasis

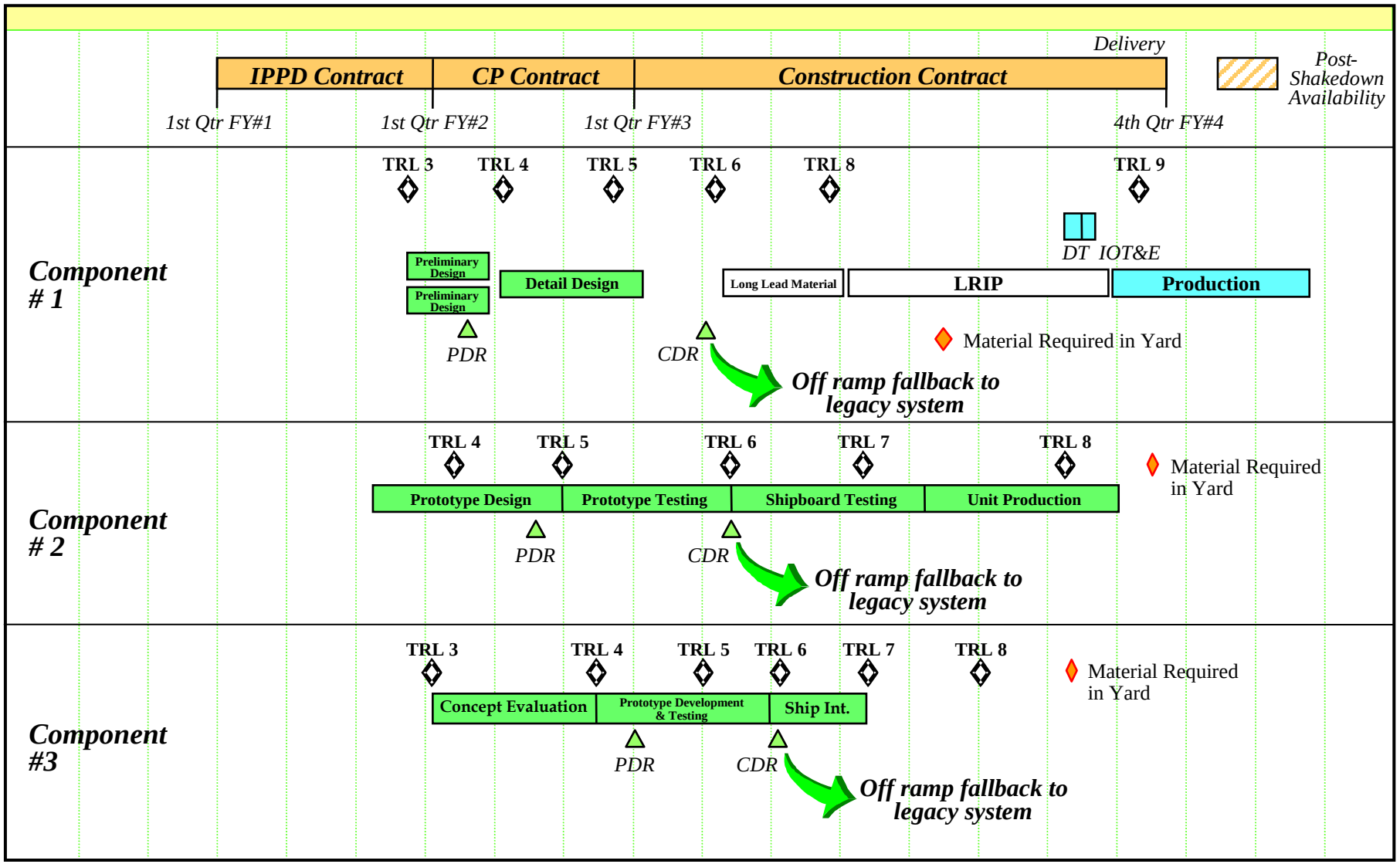


Hardware TRL Definitions

Decision:		
CD*	1.	Basic principles observed and reported
	2.	Technology concept and/or application formulated
	3.	Analytical and experimental critical function and/or characteristic proof of concept
MS A*	4.	Component and/or breadboard validation in a laboratory environment
	5.	Component and/or breadboard validation in a relevant environment
MS B	6.	System/subsystem model or prototype demonstration in a relevant environment
MS C*	7.	System prototype demonstration in an operational environment
	8.	Actual system completed and qualified through test and demonstration
	9.	Actual system proven through successful mission operations

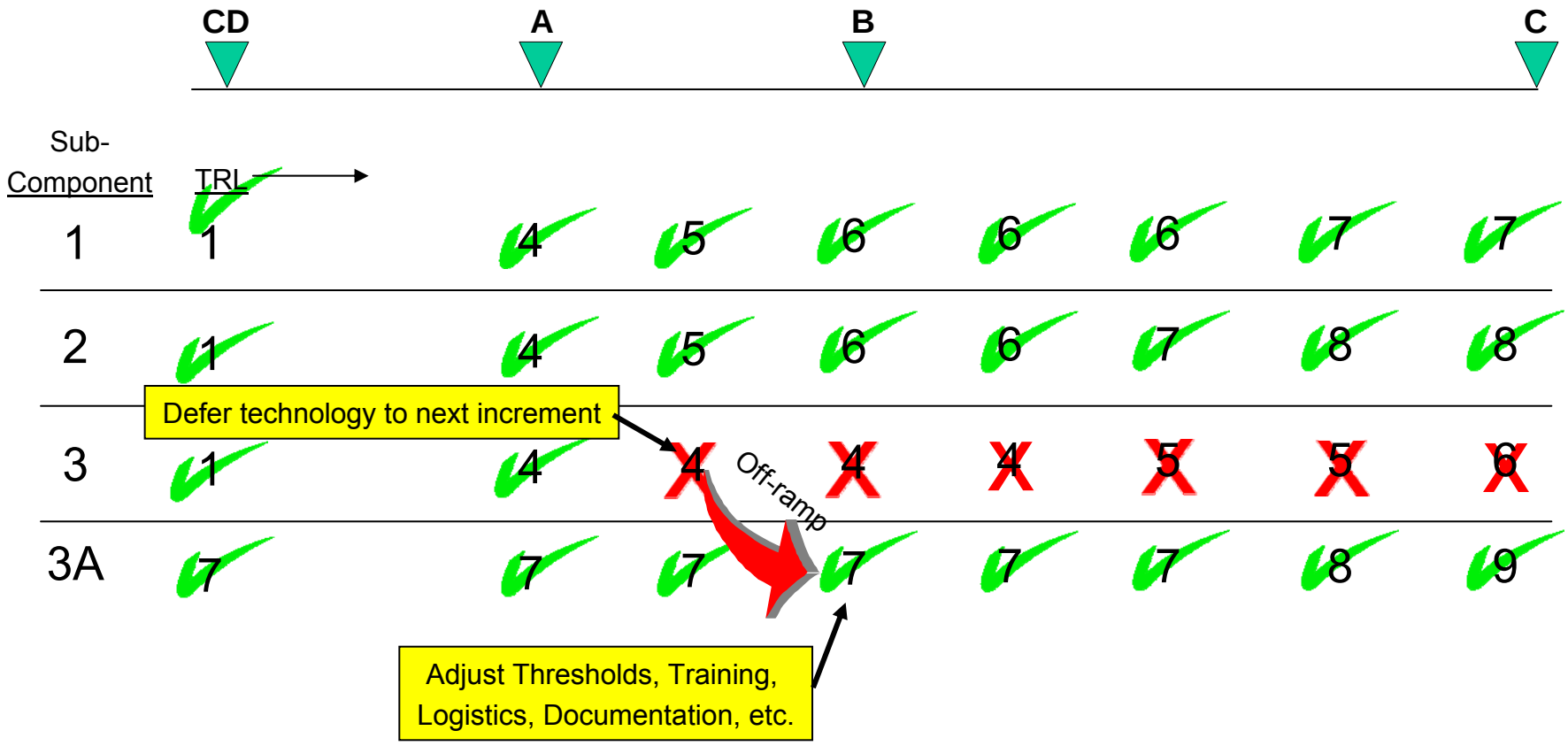
* Guidance, not statute

Critical Technology “Off-Ramps”



TRL Impact on SE

Example of Pre-planned "Off-ramp"



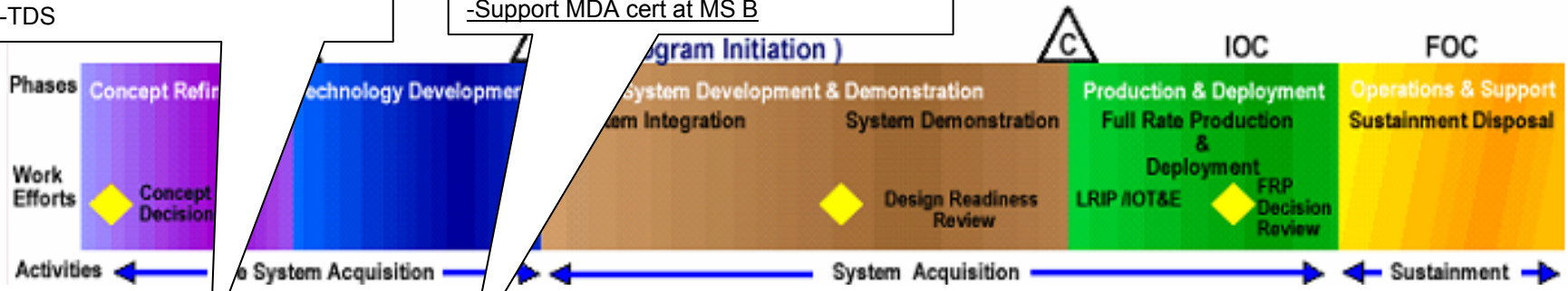
Sub-component "3" does not mature at required rate. Off-ramp to mature sub-component "3A" is chosen before MS B.

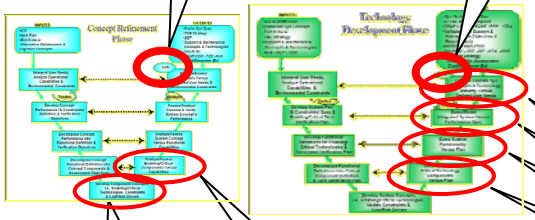
TM Activities in SE Process

ASR:
-ID immature critical technologies w/ maturation plans
-ID mature alternatives w/ performance/other trades
-TDS

SRR:
-All critical technologies (or alternatives) ≥ TRL-6
-Acceptable performance, balanced vs capability need, cost, schedule, etc.
-Support MDA cert at MS B

Technical Review Exit Criteria





-ID immature critical technologies
-ID mature alternatives

-Assess performance w/ critical technologies
-Assess performance w/ mature alternatives

-Demo/Assess performance
-Verify TRLs
-Track TM progress vs plan
-Take Off-ramp (if req'd)

DT&E Role, in Preps for Technical Reviews