



Designing For Sustainment with Systems Engineering

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for

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Topics for Discussion

- DoD's approach to addressing sustainment as part of core system development activities
- New high level sustainment requirement for all programs

Evolution of DoD Support Strategies

From Outputs...



To Outcomes...



Next...

Expanding the
Performance Concept

Sustainment KPP Approach

- Enterprise-wide, life cycle focus
- Full System accountability
- Alignment of resources to Outcomes



Early 2000s

Performance Based
Logistics & TLCSM

Partial movement to Outcomes

- PM life cycle focus but ...
- Better System accountability
- Improved alignment of resources & outcomes

1990s

Performance Spec
Functional Transactions

“What”, not “How” emphasized

- Still limited System accountability & life cycle focus
- Resources aligned to discrete outputs

1980s

Mil-Spec Functional
Transactions

“What” & “How” defined at transaction level

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- Little System level accountability
- Resources aligned to discrete outputs





Total Life Cycle Systems Management (TLCSM) Responsibilities

- Under TLCSM, the program manager is responsibility for
 - The overall acquisition management activities and
 - All systems engineering and logistics processes & decisions over the total system life cycle

- TLCSM encompasses the following concepts:
 - Single point of accountability
 - Evolutionary acquisition
 - Supportability and sustainment as key elements of performance
 - Performance-based strategies, including logistics
 - Increased reliability and reduced logistics footprint
 - Continuing reviews of sustainment strategies

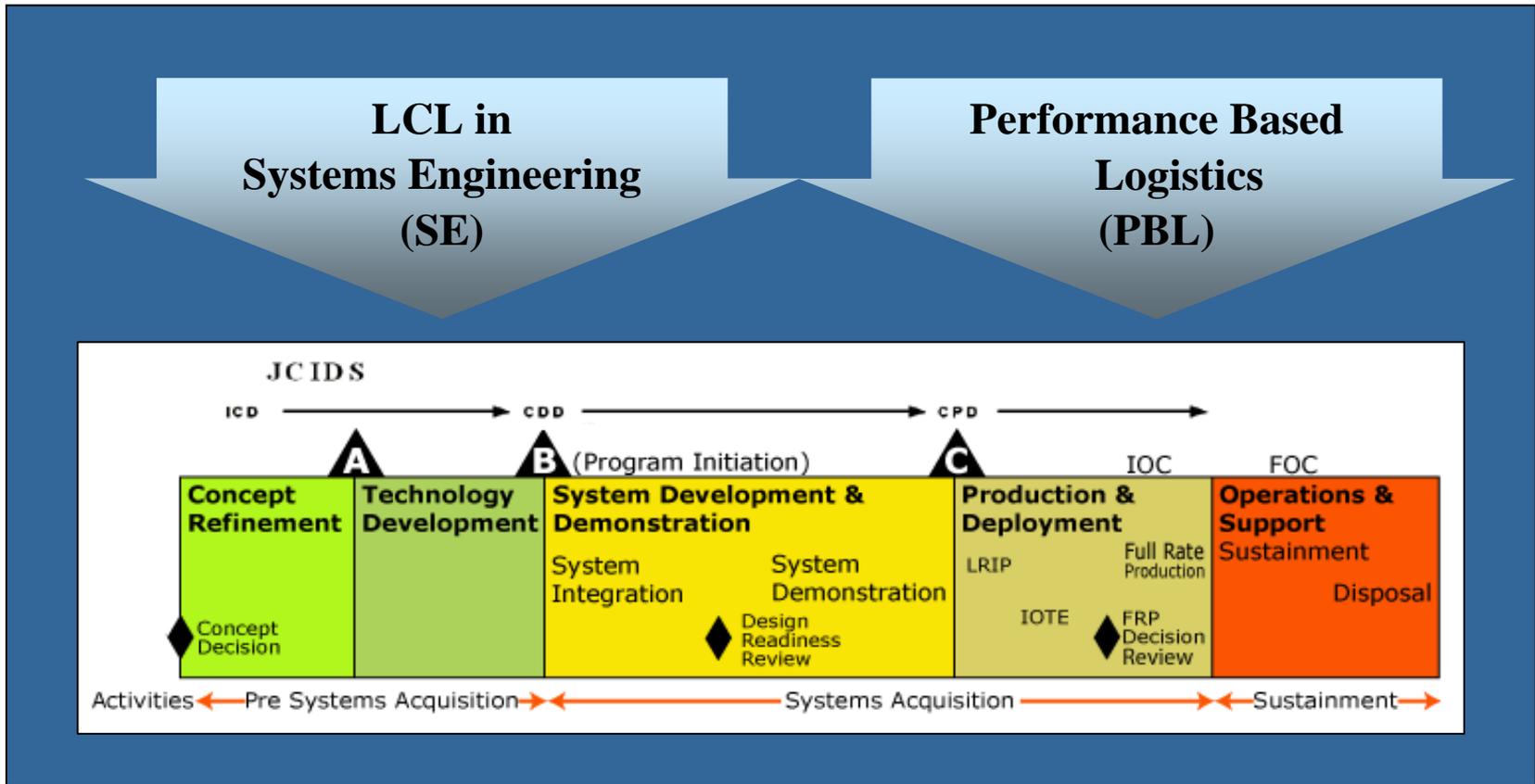
DoD Directive 5000.1

*E1.29. Total Systems Approach. The program manager shall be the **single point of accountability for accomplishing program objectives for total Lifecycle systems management, including sustainment.** The program manager shall apply human systems integration to optimize total system performance (hardware, software, and human), operational effectiveness, and suitability, survivability, safety, and affordability. PMs shall consider supportability, life cycle costs, performance, and schedule comparable in making program decisions. Planning for Operation and Support and the estimation of total ownership costs shall begin as early as possible. Supportability, a key component of performance, shall be considered throughout the system life cycle.*

Design the Sustainment & Sustain the Design



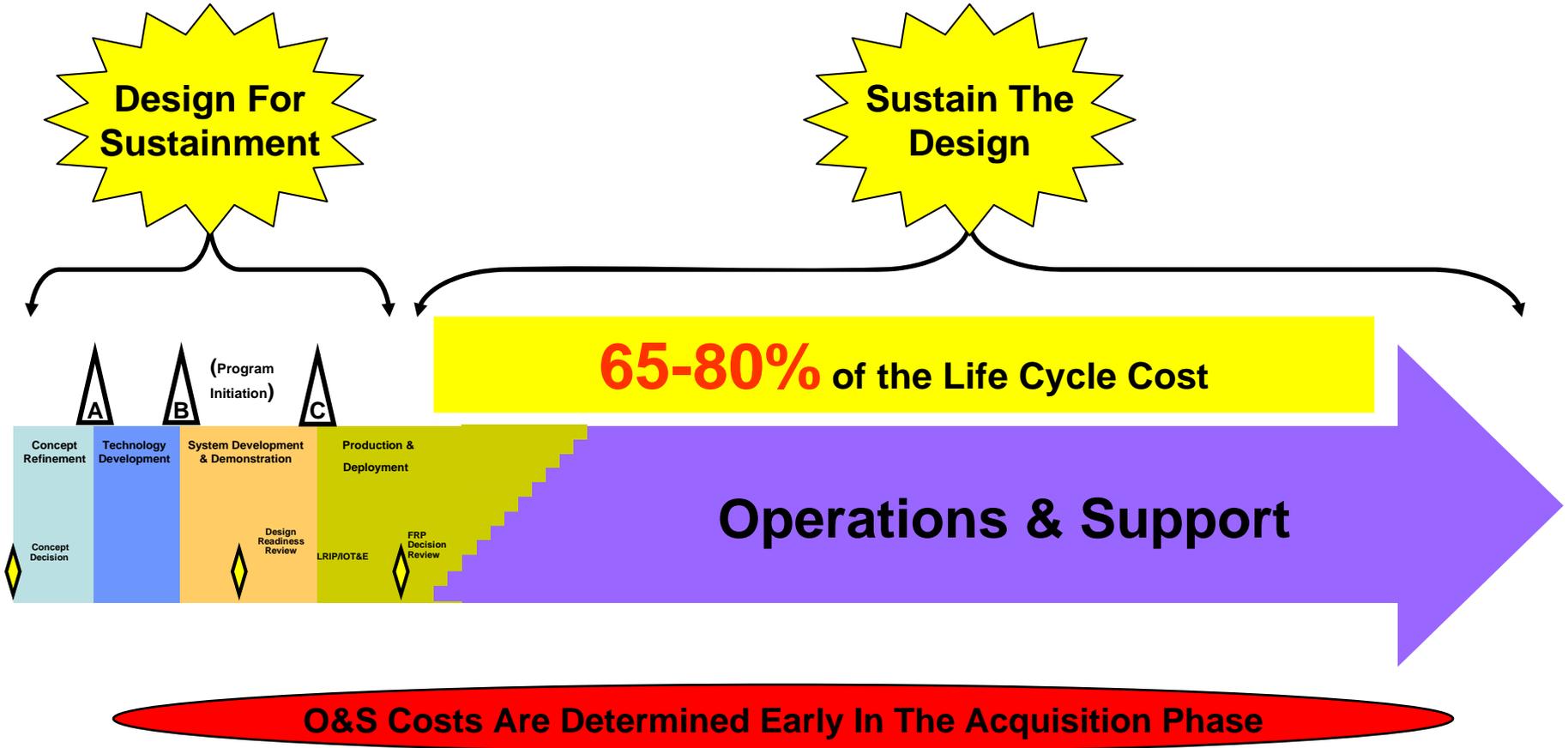
Life Cycle Logistics



Under TLCSM, the PM is responsible for Life Cycle Logistics including Performance Based Logistics



Life Cycle Management

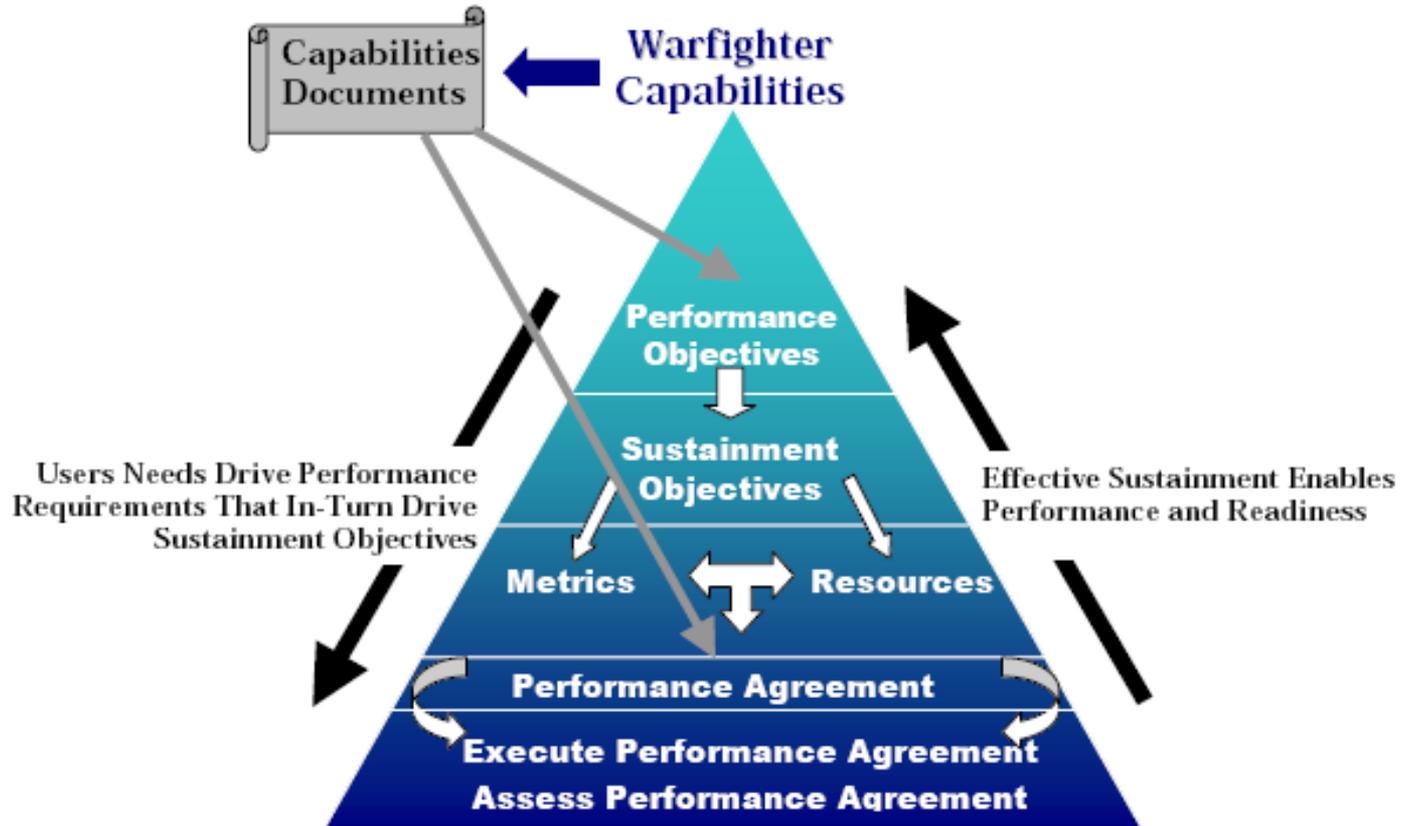


USD(AT&L) FY 07 Strategic Goals (#4)

Emphasize Sustainment Outcomes Throughout The Life Cycle Management Process



Linkage Between Performance and Sustainment

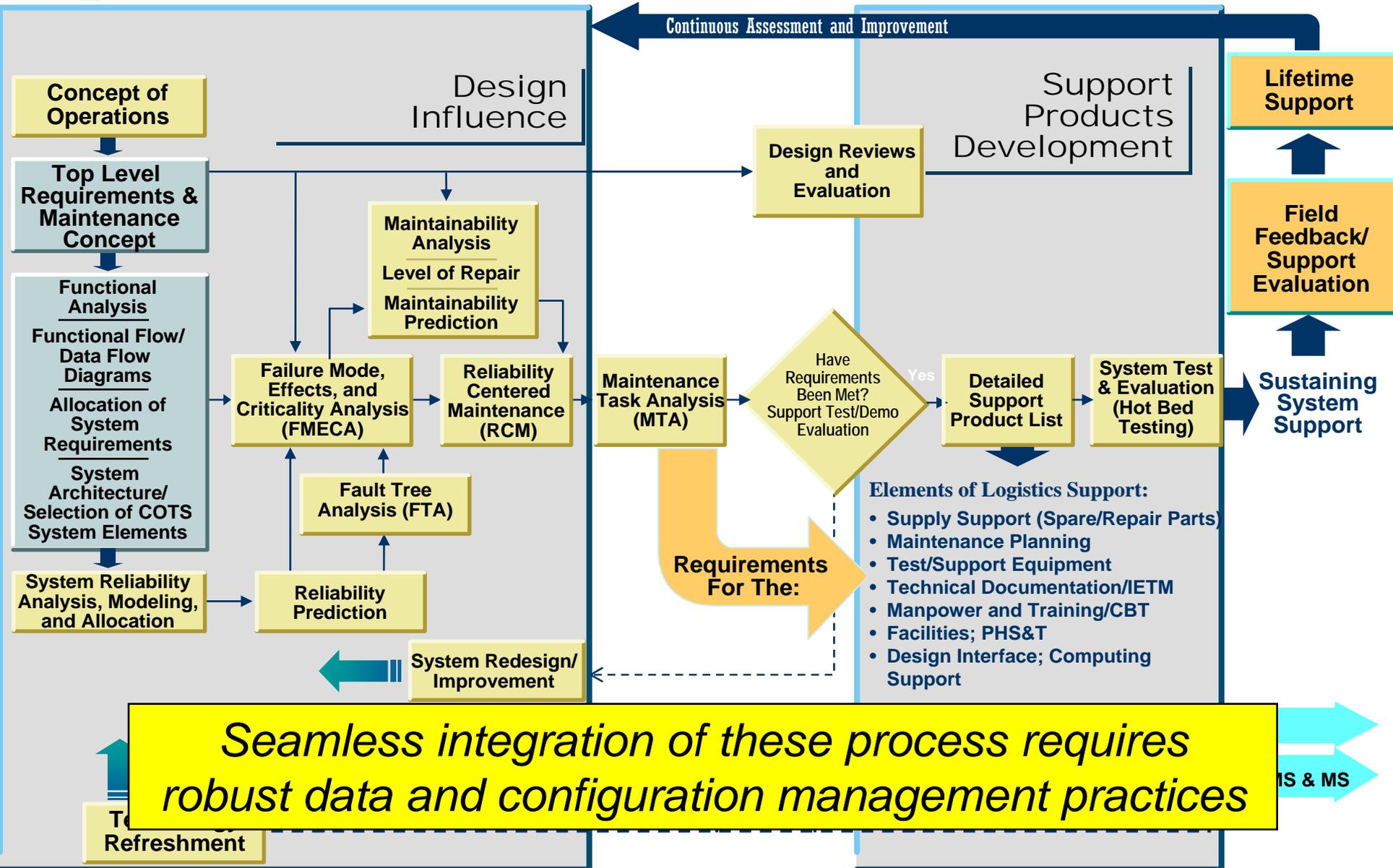


Source: Designing and Assessing Supportability in DOD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint, OCT 03

Sustainment Not Just Cost Consideration

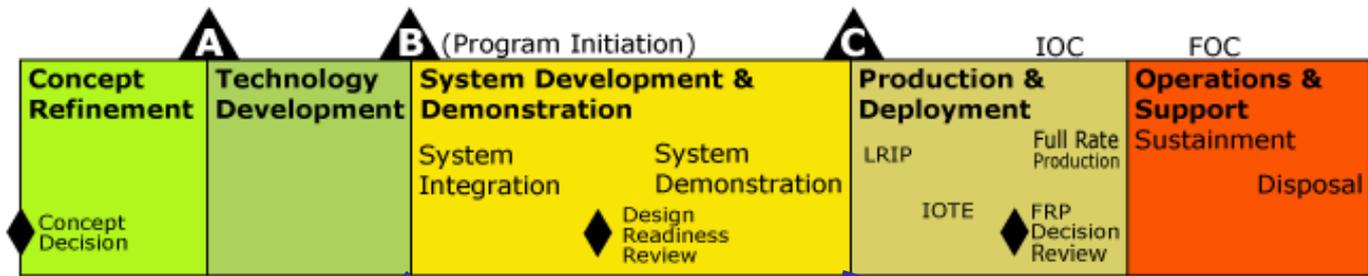


System Operational Effectiveness Life Cycle Framework

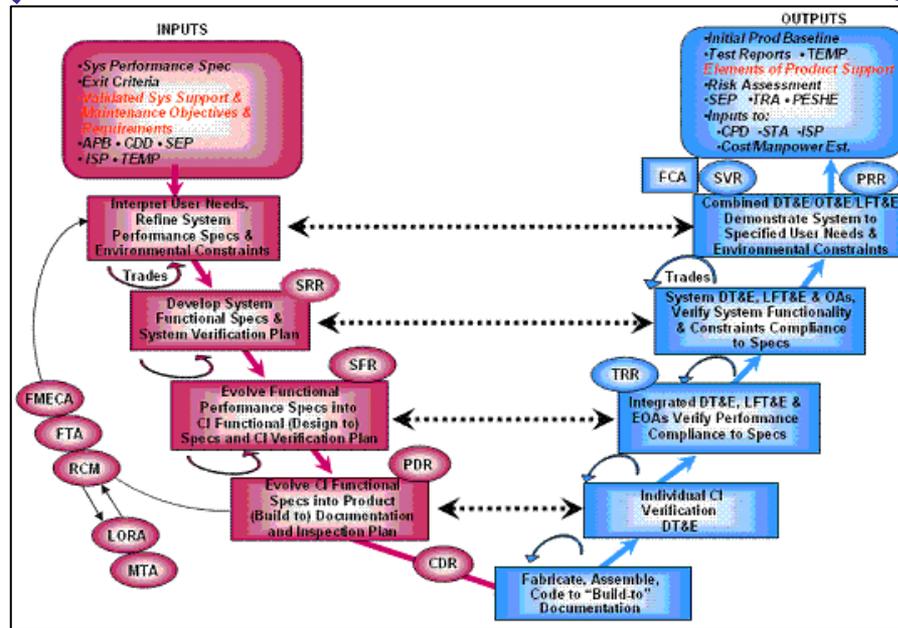




Integration of Acquisition Logistics with Systems Engineering



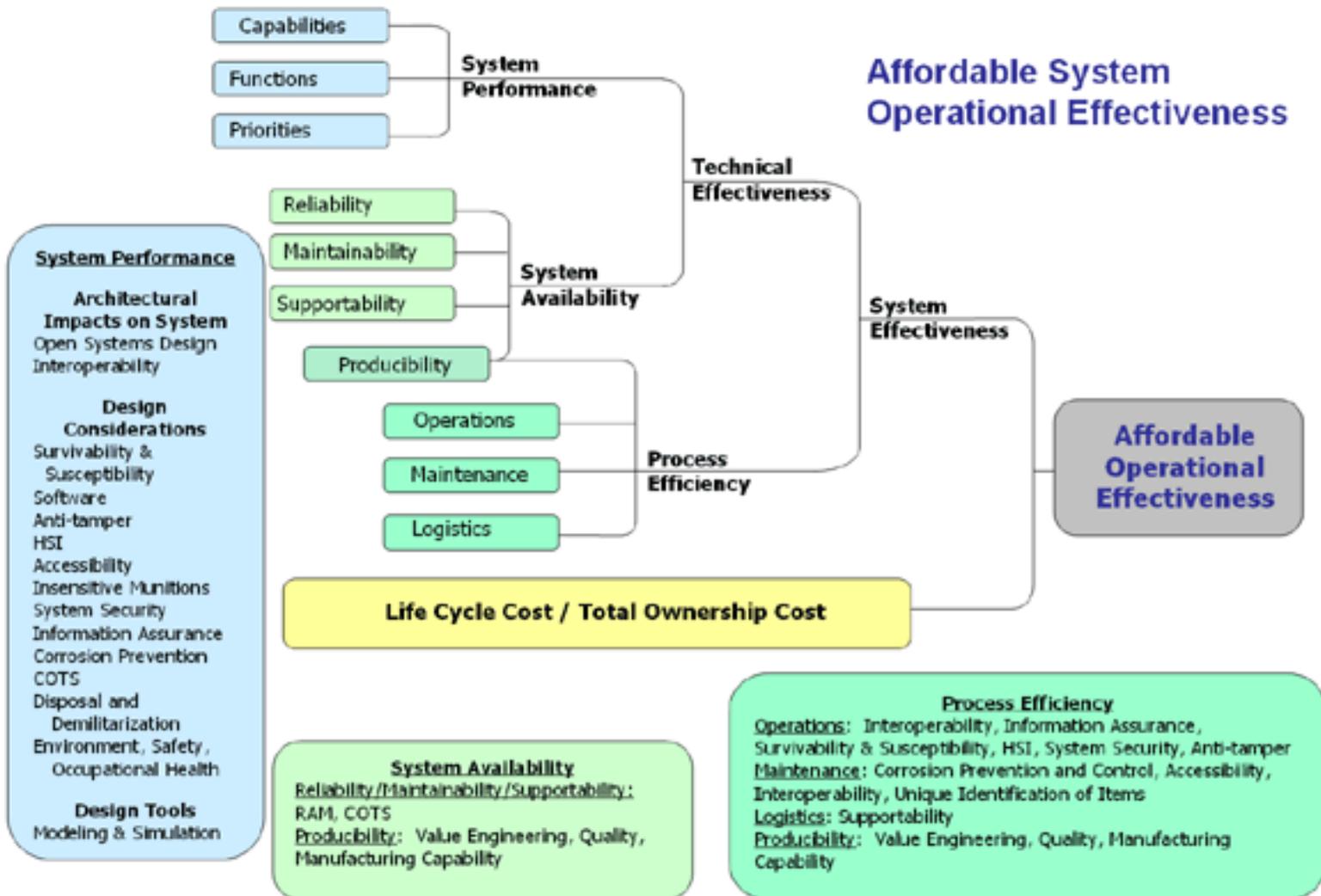
System support implications in the System Development and Demonstration Phase
DOD 5000 Acquisition Framework



Sustainment analyses and trade-offs must be conducted with other design considerations



Systems Engineering Decisions: Important Design Considerations



M&S and value driven design techniques should assist in evaluating solution options against technical performance measures (TPMs)



Linking Design Decisions to Desired Outcomes

Technical Measurement

INCOSE-TP-2003-020-01

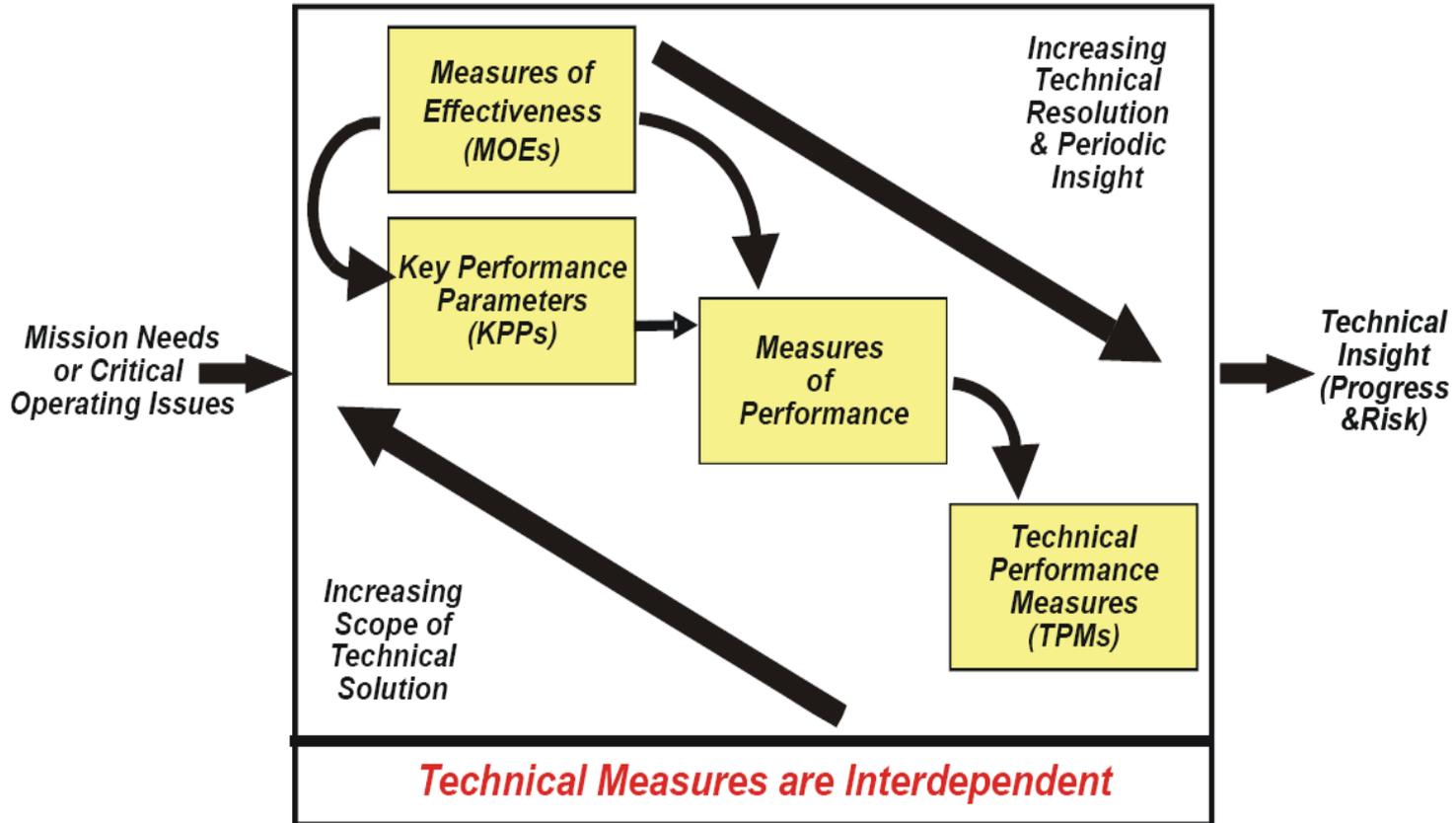
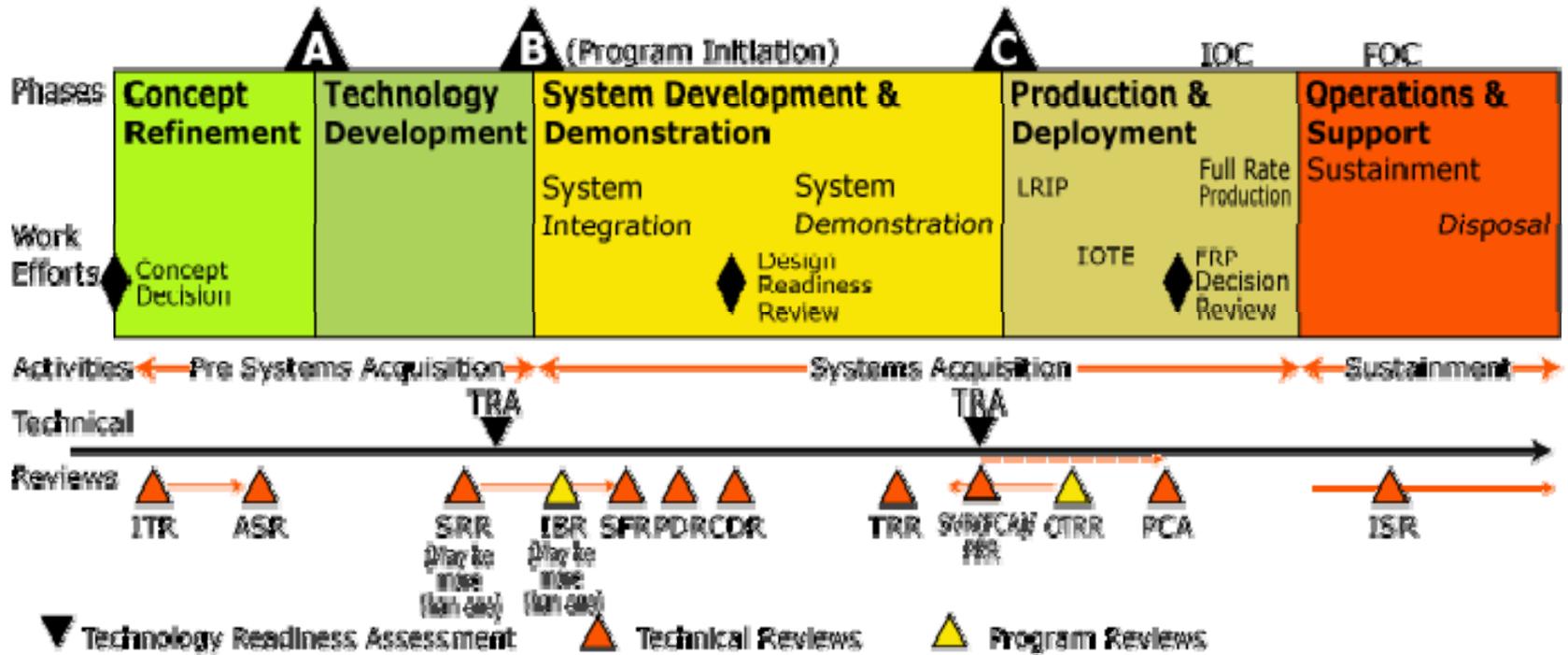


Figure 1-1 Relationship of the Technical Measures

Trade-Offs and decisions must be based on TPMs that are derived from and traceable to KPPs and desired outcomes



Program Technical Reviews



DoD's perspectives on Life Cycle Management and Sustainment

- Focus on outcomes, rather than specific processes used
- Conduct these analyses as integral part of systems engineering process
- Review during program technical reviews

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Life Cycle Sustainment Outcome (Materiel Readiness)



- **Materiel Availability (KPP*)**
 - A Key Data Element Used In Maintenance and Logistics Planning
 - Different From Operational Availability
- **Materiel Reliability (KSA*)**
 - Provides A Measure Of How Often The System Fails/Requires Maintenance
 - Another Key Data Element In Forecasting Maintenance/Logistics Needs
- **Mean Downtime**
 - A Measure Of How Long A System Will Be Unavailable After A Failure
 - Another Key Piece Used In The Maintenance/Logistics Planning Process
- **Ownership Cost (KSA*)**
 - Focused On The Sustainment Aspects Of The System (Not The Operations)
 - An Essential Metric For Sustainment Planning And Execution
 - Useful For Trend Analyses – Supports Design Improvements/Modifications
- **Other Sustainment Outcome Metrics May Be Critical To Specific Systems, And Should Be Added As Appropriate**
 - * Sustainment KPP & KSAs Included In Revised Draft CJCSM 3170

**Goals Determined
By Warfighter
Needs**

These 4 Life Cycle Sustainment Outcome Metrics Are Universal Across All Programs And Are Essential To Effective Sustainment Planning



Summary

- Systems engineering processes support 'design for sustainment' and are already in place
- New high level sustainment requirements will trigger systems engineering processes and ensure balanced trade-offs with other design considerations
- Data and configuration management processes are critical in the flow down of requirements and informing evaluations, assessments, reviews and decisions
- Modeling and simulation technologies are becoming more robust and pervasive and should help improve concurrent activities and balanced decisions



References and Resources

- Designing and Assessing Supportability in DOD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint, OCT 03 available on the SSE website: <http://www.acq.osd.mil/sse>
- DAU Continuous Learning Module available at <http://www.dau.mil>: CLL 008 Designing for Supportability