Systems Engineering and Parts Management

Systems and Software Engineering
Office of the Deputy Under Secretary of Defense (A&T)
PSMC Conference 28 October 2008
Briefing Outline

• OSD Systems Engineering Organization and Responsibilities
• Current Issues/Changes
• Parts Management/Logistics
Acquisition program excellence through sound systems and software engineering
SSE Functions

• Acquisition Program Support
  - Decision Support to Senior DoD Leadership
  - Mentoring Acquisition Programs
  - Technical Reviews of Key Program Documentation

• Policy, Guidance, Best Practices

• Acquisition Workforce Education and Training
  - SE, Test, and Production, Quality and Manufacturing

• Systemic Root Cause Analysis

• “Discipline” Expertise
  - Risk
  - Reliability
  - Architectures
  - Test/Eval
  - CMMI
  - Software
  - Energy
  - Safety
  - Modeling/Simulation
  - Assurance/Cyber
  - Comm/Networking
  - System of Systems
Elements of SE Policy, Education and Training, Guidance and Assessment

Policy
- DoDD 5000.1
- DoDI 5000.2

Supplemental Guides
(select topics e.g., SEP, Risk, SoS)

Guidance
- Related Industry Standards

Assessment
- DAPS
- Tech Review Checklist

E&T resources
- SPRDE Courses
- CLE CLMs

Related Industry Standards
Policy
Subtle, But Substantial Changes

Old Life Cycle

User Needs & Technology Opportunities

A: Concept Refinement
   - Concept Decision
   - Pre-Systems Acquisition

B: Technology Development
   - Design Readiness Review
   - Systems Acquisition

C: System Development & Demonstration
   - Post-CDR Assessment
   - Production & Deployment

IOC: LRIP/OT&E
   - FRP Decision Review

FOC: Operations & Support

New Life Cycle

User Needs

Technology Opportunities & Resources

A: Materiel Solution Analysis
   - Materiel Development Decision
   - Pre-Systems Acquisition

B: Technology Development
   - Engineering and Manufacturing Development & Demonstration
   - Systems Acquisition

C: Engineering & Manufacturing Development & Demonstration
   - Post-CDR Assessment
   - Production & Deployment

IOC: LRIP/OT&E
   - FRP Decision Review

FOC: Operations & Support

Diamond = Decision Point
Triangle = Milestone Review
Draft Acquisition Policy Changes

Mandatory Materiel Development Decision (MDD)

Mandatory competing prototypes before MS B

Mandatory PDR and a report to the MDA before MS B *(moves MS B to the right)*

Configuration Steering Boards at Component level to review all requirements changes

- Renewed emphasis on manufacturing during system development:
  - Re-titles SDD phase to EMDD with two sub phases: Integrated System Design and System Capability and Manufacturing Process Demonstration
  - Establishes consideration of manufacturing maturity at key decision points

- Mandatory system-level CDR with an initial product baseline and followed by
When the ICD demonstrates the need for a materiel solution, the JROC will recommend that the MDA consider potential materiel solutions. The MDA, working with appropriate stakeholders, shall determine whether it is appropriate to proceed with a Materiel Development Decision. . . . If the MDA decides that additional analysis is required, a designated office shall prepare, and the MDA shall approve, study guidance to ensure that necessary information is available to support the decision. . . . The Materiel Solution Analysis Phase begins with the Materiel Development Decision (MDD). The MDD is the formal entry point into the acquisition process and shall be mandatory for all programs. . . . At the MDD Review, the Joint Staff shall present the JROC recommendations and the DoD Component shall present the ICD including: the preliminary concept of operations, a description of the needed capability, the operational risk, and the basis for determining that non-materiel approaches will not sufficiently mitigate the capability gap. The Director, PA&E, shall propose study guidance for the AoA. . . . The MDA shall approve the AoA study guidance; determine the acquisition phase of entry; identify the initial review milestone; and designate the lead DoD Component(s). The MDA decisions shall be documented in an Acquisition Decision Memorandum (ADM).
FY08 National Defense Authorization Act

- Mandates Milestone A approval prior to technology development for a major weapon system
- Requires MDA Certification prior to Milestone A for MDAPs
- Changed Milestone B Certification Requirements
- Mandates reporting and notification of program cost changes

SEC. 943. REQUIREMENT FOR CERTIFICATION OF MAJOR SYSTEMS PRIOR TO TECHNOLOGY DEVELOPMENT.

(a) REQUIREMENT FOR CERTIFICATION.—

(1) IN GENERAL.—Chapter 139 of title 10, United States Code, is amended by inserting after section 2366a the following new section:

“§ 2366b. Major defense acquisition programs: certification required before Milestone A or Key Decision Point A approval

“(a) CERTIFICATION.—A major defense acquisition program may not receive Milestone A approval, or Key Decision Point A approval in the case of a space program, until the Milestone Decision Authority certifies, after consultation with the Joint Requirements Oversight Council on matters related to program requirements and military needs—

“(1) that the system fulfills an approved initial capabilities document;

“(2) that the system is being executed by an entity with a relevant core competency as identified by the Secretary of Defense under section 1186 of this title;

“(3) if the system duplicates a capability already provided by an existing system, the duplication provided by such system is necessary and appropriate; and

“(4) that a cost estimate for the system has been submitted and that the level of resources required to develop and procure the system is consistent with the priority level assigned by the Joint Requirements Oversight Council.”
Prototyping and Competition

“Evolutionary acquisition requires . . . Technology development preceding initiation of an increment shall continue until the required level of maturity is achieved, prototypes of the system or key system elements are produced, and a preliminary design is completed. . . .”

“The TDS and associated funding shall provide for two or more competing teams producing prototypes of the system and/or key system elements prior to, or through, Milestone B.”
### CHARACTERISTICS
MS B moved “to the right” to allow contractor preliminary design to inform requirements, estimated costs, and schedule.

### PROCESS
Technology Development extended through formal Preliminary Design Review (PDR). Preliminary design based on DRAFT CDD to facilitate trades before JROC approval. Competitive environment sustained up to and perhaps through MS B. MDA conducts MS B review as described in current policy.

### SUPPORTING INFORMATION
- PDR Report from PM.
- Current statutory and regulatory information

### BENEFITS
- Ties program decision to event-based (product-based) technical review
- Most derived requirements surfaced
- Better understanding of cost, schedule, and performance risk when the APB is approved and SAR reporting begins
- Opportunity for MDA to defer (in coordination with requirements authority) unachievable requirements to next increment
- Final requirements informed by detailed design
- Early indicator of manufacturing and production issues
- Allows integration of DOD/MDA unique capabilities
New Systems Engineering
Enclosure 12

❖ Codifies three previous SE policy memoranda
❖ Codifies a number of SE-related policies and Statutes since 2003:
  ▪ Environment, Safety, and Occupational Health
  ▪ Corrosion Prevention and Control
  ▪ Modular Open Systems Approach
  ▪ Data Management and Technical Data Rights
  ▪ Item Unique Identification
  ▪ Reliability, Availability, and Maintainability

❖ Introduces new policy on Configuration Management
Guidance
Systems and Software Engineering Guidance

- What’s available:
  - Systems Engineering Plan (SEP) Preparation Guide, V2
  - Guide to Integrating SE into DoD Acquisition Contracts
  - Risk Management Guide for DoD Acquisition
  - Risk Assessment Technical Review Checklists
  - DoD Guide for Achieving Reliability, Availability, and Maintainability
  - Integrated Master Plan/Integrated Master Schedule (IMP/IMS) Guide
  - Understanding and Leveraging a Supplier’s CMMI Efforts: A Guidebook for Acquirers
  - Systems of Systems SE Guide

- What’s coming:
  - Update to Defense Acquisition Guidebook
  - Software Assurance Guide

SSE Website:  http://www.acq.osd.mil/sse/
Defense Acquisition Guide Update

Ongoing
• Chapter Authors Revise DAG Based on Most Current Draft of DoDI 5000.02
• Drafts of Each Chapter Coordinated “Internally and Externally”
• SD-106 Coordination of 5000.02 Complete
• Finalized Draft DAG Chapters Sent to DPAP For Comment/Coordination

Need to Complete
• New 5000.02 Signed and Delivered to DAU for Posting in .pdf Format on Existing Guidebook Application Website
• Initiate and Complete Formal Coordination of Entire DAG
• Final DAG Approved and Sent to DAU for Posting in .pdf Format on Existing Guidebook Application Website
• DAU Completes Interactive Version of All Documents on New ACC Website
• Final On-line Review
DAG Chapter 4 Changes

• Overall Structure of the Chapter is Unchanged

• Incorporate Changes from DoDI 5000.02 Policy

• Promote Early/Enhanced Systems Engineering

• Fix Corrections, Omissions and Gain Currency

• Seek Consistency with Other DAG Chapters
DAG Chapter 4 Changes

• 4.1 Systems Engineering in DoD Acquisition
  - Provided overview information on SE leadership, support to PMs, and SE Working-level IPT

• 4.2 Systems Engineering Processes: How Systems Engineering is Conducted
  - Aligned to incorporate relevant updates to ISO/IEC Standard 15288 Systems and software engineering - system life cycle processes

• 4.3 Systems Engineering Activities in the System Life Cycle
  - Materiel Solution Analysis Phase
  - Technology Development Phase (PDR Report)
  - Engineering and Manufacturing Development and Demonstration Phase (CDR Report)

• 4.4 Systems Engineering Execution: Key Systems Engineering Tools and Techniques
  - Updated ‘Design Considerations’ and added Parts Management, DMSMS, Program Protection and System Assurance
Education and Training
SE/PQM Education and Training

• Re-coding of program level engineering specialty positions to Program Systems Engineer (PSE) is in progress across the Services.
  - Added additional training and experience requirements
    • Focus on enhancing SE in the early phases of acquisition
    • Broaden the competency set to include other career fields (e.g., PM, Logistics, Contracting)
      • Double the years of experience required for each DAWIA certification level
• Assisting on DAU’s "Requirements Manager" training curriculum for Joint Staff/Services personnel who develop and manage requirements
• Conducting Systems Engineering Competency Assessment in late 2008/early 2009 for SE and PQM
Parts Management/Logistics
DAG Chapter 4 Proposed Changes to Address Parts Management

• An overview of the goals of Part Management
  - Reduce logistics footprint and lower total life cycle costs
  - Mitigate parts obsolescence due to DMSMS

• What a part is and its relationship to other system elements and CI’s

• Discussion of parts management strategy
  - Consideration over the entire life cycle of a system
  - Based on the fundamental SE technical and technical management processes
    • Configuration management, technical assessment, decision analysis, design solution, implementation, verification and evaluation at technical reviews
  - A Parts Management Plan should be documented in the SE Plan

• Parts selection should be based on trade-offs and cost-benefit analysis

• References MIL-STD-3018, SD-19 and industry guides for additional implementation details
Parts Management Considerations for the Updated Defense Acquisition System

• Updated system has a more disciplined AoA process as part of the Materiel Solution Analysis
  - To what extent should there be parts management considerations in the early systems engineering effort?
  - Should parts management be called out in the AoA study plan?

• Updated system has formal competitive prototyping in Technology Development to demonstrate mature technology and performance
  - What is the appropriate parts management role for a technology demonstration? For a prototype? How does it differ?
  - To what extent do parts management considerations differ between a sub-system prototype and a full-system prototype?

• Configuration management responsibilities not fully defined in a competitive prototyping environment
  - How does this affect parts management?
Reliability

Background

• DUSD(A&T) Memo, 15 Feb 08 requested CAEs establish a Reliability Improvement Working Group (RIWG) to:
  - Ensure programs are formulated to execute a viable systems engineering strategy from the beginning, including a RAM growth program, as an integral part of design and development.
  - Ensure government organizations reconstitute a cadre of experienced T&E and RAM personnel
  - Implement mandated integrated DT and OT, including the sharing and access to all appropriate contractor and government data and the use of operationally representative environments in early testing.

• Final Report of the DSB Task Force on Development Test and Evaluation, 27 May 08
  - Recommended that RAM, including a robust reliability program with an established reliability growth approach, be a mandatory contractual requirement and be addressed at every major program review.
Reliability

USD(AT&L) Memo to SAEs, 21 July 08

• Directed Components to establish a reliability improvement acquisition policy; and report back in 30 days

• Component Policy shall:
  - Ensure effective collaboration between the requirements and acquisition communities in the establishment of RAM requirements that balance funding and schedule while ensuring system suitability and effectiveness in the anticipated operating environment.
  - Ensure development contracts and acquisition plans evaluate RAM during system design.
  - Evaluate the maturation of RAM through each phase of the acquisition life cycle.
  - Evaluate the appropriate use of contract incentives to achieve RAM objectives.

• Established DoD policy:
  - Programs execute a viable RAM strategy that includes a reliability growth program as an integral part of design and development.
  - RAM shall be integrated within the Systems Engineering processes, documented in the program's Systems Engineering Plan and Life Cycle Sustainment Plan, and assessed during technical reviews, test and evaluation, and Program Support Reviews.
Reliability

RIWG Report

• Ensure programs are formulated to execute a viable systems engineering strategy from the beginning, including a RAM growth program, as an integral part of design and development.
  - Establish Reliability Improvement Policy
  - Develop Sample Reliability Language for Acquisition Contracts
  - Guidance for Early RAM Planning
  - Define Standard Criteria to Evaluate a Reliability Program
  - Designate Reliability Champions Across DoD

• Ensure government organizations reconstitute a cadre of experienced T&E and RAM Personnel
  - Establish policy to enable RAM and T&E workforce reconstitution
  - Assure current Training and Education for the workforce

• Implement mandated integrated DT and OT, including the sharing and access to all appropriate contractor and government data and the use of operationally representative environments in early testing.
  - Guide on Incorporating T&E in Acquisition Contracts
  - Draft DAG Chapter 9 Integrated Testing content and TEMP update complete
  - RIWG Chairs requested formal response to Integrated Test efforts
Initiatives to Improve Reliability, Maintainability, and Availability

- DOT&E on JCIDS Functional Control Boards
- GEIA Standard 009, RFP and Contract Language, Investment Model
- Reliability Growth in design phase
- RAM growth monitoring for incentives, Young/Bolton memos
- RAM program Evaluation and Standards, testing KPP
- RAM field data collection, feedback
Product Support Assessment Team

- Team Stood Up in Early October 08

- Will Identify Areas to Recommend What Initiatives That L&MR Should Be Focusing On

- Goal is to Provide Direction to Incoming AT&L
Summary

• Many initiatives are flowing down from OSD
• SSE working to ensure Parts Management becomes properly integrated with systems engineering and acquisition program oversight
  - Incorporation into Systems Engineering chapter of Defense Acquisition Guide
  - Incorporation as consideration in Technical Planning
  - Participation on various documents to assist the acquisition community to better address Parts Management (i.e. Risk Checklists, MIL-STD-3018, CLM, SD-19)