Revitalizing SE: Our Path Forward

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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, Production Quality and Manufacturing, Software
- Systemic Root Cause Analysis
- “Discipline” Expertise
  - Risk
  - Reliability
  - Architectures
  - Test/Eval
  - CMMI
  - Software
  - Energy
  - Safety
  - Modeling/Simulation
  - Configuration Management
  - Data Management
  - System of Systems
Revitalizing DoD SE

- Issued DoD-wide SE policy – focused effort on up front, sound technical planning
- Issued guidance on SE, test and evaluation (T&E) and software
- Revised SE & T&E curricula at Defense Acquisition University
- Established SE Forum—senior-level focus across DoD
- Instituted system-level assessments in support of OSD major acquisition program oversight role
- Integrated, software, system assurance, energy, M&S and system of systems into SE revitalization efforts
- Established closer working relationships with industry and academia

Prescribing Good Practices Is Not Enough…
Subtle, But Substantial Changes

**Old Life Cycle**

- User Needs & Technology Opportunities
- Process entry at Milestones A, B, or C
- Entrance criteria met before entering phase
- Evolutionary Acquisition or Single Step to Full Capability

**New Life Cycle**

- User Needs
- Technology Opportunities & Resources
- The Materiel Development Decision precedes entry into any phase of the acquisition framework
- Entrance criteria met before entering phase
- Evolutionary Acquisition or Single Step to Full Capability

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**Decision Points**

- Concept Refinement
- Technology Development
- System Development & Demonstration
- Production & Deployment
- Operations & Support

**Milestones**

- IOC
- FOC

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= Decision Point
△ = Milestone Review
Overview of 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

- 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 a Post-CDR Report to the MDA
- Post-CDR Assessment by the MDA between EMDD sub phases

Coordination Draft, DoDI 5000.02
What’s relevant: • Mandatory Materiel Development Decision
  • Mandatory Milestone A for all “major weapon systems”
  • MS B after system-level PDR* and a PDR Report to the MDA*

Pre-MDD “SE Touch Points”
• Initial Capabilities Document (ICD)
• Analysis of Alternatives study plan

Pre-Milestone A “SE Touch Points”
• Systems Engineering Plan
• Technology Development Strategy
• Test and Evaluation Strategy
• Analysis of Alternatives

* PDR – Preliminary Design Review  * CDR – Critical Design Review  * MDA - Milestone Decision Authority
"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. Prototypes shall be employed to reduce technical risk, validate designs and cost estimates, evaluate manufacturing processes, and refine requirements. . . ."
**SE Focus: Technology Development**

**Technology Development**

- **JCIDS**
- **Execute Tech Maturation**
  - CTE Risk Reduction
  - CTE Prototyping
- **Initial TRA**
- **Develop Feasible System Design (FD)**
- **FD**
- **Draft System Level Spec**
- **Sys Spec**
- **Requirements to Preliminary Design**
- **PDR(s)**
- **SRR**
- **Design Prototyping**
- **Update SEP**
- **Update SEP**
- **PDR Report**
- **Final System Spec SEP**
- **Final AS**
- **TEMP**
- **CARD/ICE**
- **CCE**
- **APB**

**Other Program Activities**

- **Draft RFP for Initial Sys Dev**
- **Update RFP**
- **Update AS TEMP CARD/ICE CCE APB**
- **Key SE input**

- **Typically executed by PMO SE Staff**
- **Typically executed by Industry**
- **Delivered Product**
- **Mandated Preliminary Design Review**
- **Technical Review**
- **Technical Assessment**

**Grey Areas depending on PMO SE input**

- **Leads to**
- **Informs**

**Actions Depending on SE input**

- **Prototyping for CTE and for design may be independent efforts**

- **May vary with contracting strategy (e.g., multiple designs)**
New Systems Engineering Enclosure

- 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
Enclosure 12. Systems Engineering

E12.1. **Systems Engineering Across the Acquisition Lifecycle.**

E12.2. **Systems Engineering Plan (SEP).**
   E12.2.1. PMs shall prepare a SEP for each milestone review, beginning with Milestone A. At Milestone A, the SEP shall support the TDS; at Milestone B or later, the SEP shall support the Acquisition Strategy.
   E12.2.2. The DUSD (A&T) shall be the SEP approval authority for programs that will be reviewed by the DAB/ITAB.

E12.3. **Systems Engineering Leadership.** Each PEO, or equivalent, shall have a lead or chief systems engineer on his or her staff responsible to the PEO for systems engineering across the PEO’s portfolio of programs. … and shall:
   E12.3.1. Review assigned programs’ SEPs and oversee their implementation.
   E12.3.2. Assess performance of subordinate lead or chief system engineers …

E12.4. **Technical Reviews.** Technical reviews shall be event driven, conducted when documented entrance criteria are met, and include participation by subject matter experts who are independent of the program.
E12.5. **Configuration Management.** The PM shall use a configuration management approach to establish and control product attributes and the technical baseline across the total system life cycle. This approach shall identify, document, audit, and control the functional and physical characteristics of the system design; track any changes; provide an audit trail of program design decisions and design modifications; and be integrated with the SEP and technical planning. **At completion of the system level Critical Design Review, the PM shall assume control of the initial product baseline for all Class 1 configuration changes.**

E12.6. **Environment, Safety, and Occupational Health (ESOH).** The PM shall use the methodology in MIL-STD-882D to assess ESOH risk, eliminate ESOH hazards where possible, manage the risks that cannot be eliminated, and report on the status of ESOH risk at technical reviews.

   E12.6.1. **Programmatic ESOH Evaluation (PESHE).** The PM for all programs, regardless of ACAT level, shall prepare a PESHE and summarize it in the acquisition strategy.

   E12.5.2. **NEPA/EO 12114.** The PM shall conduct and document NEPA/EO 12114 analyses, to be approved by the CAE, for which the PM is the action proponent.

   E12.6.3. **Mishap Investigation Support.** The PM will support system-related Class A and B mishap investigations.
E12.7. **Corrosion Prevention and Control.** Each ACAT I program shall document its strategy in a Corrosion Prevention Control Plan at Milestones B and C.

E12.8. **Modular Open Systems Approach (MOSA).** Program managers shall employ MOSA.

E12.9. **Data Management and Technical Data Rights.** Program Managers for ACAT I and II programs, regardless of planned sustainment approach, shall assess the long-term technical data needs of their systems and reflect that assessment in a Data Management Strategy (DMS).

E12.10. **Item Unique Identification (IUID).** To enhance life-cycle management of assets in systems acquisition and sustainment, and to provide more accurate asset valuation, all PMs shall plan for and implement IUID to identify and track applicable major end items, configuration-controlled items, and Government-furnished property. IUID planning and implementation shall be documented in an IUID Implementation Plan and summarized in the program's Systems Engineering Plan (Reference (al) and DoD Instruction 8320.04,

E12.11. **Reliability, Availability, and Maintainability (RAM).** PMs for all programs shall formulate 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 SEP and LCSP, and assessed during technical reviews, T&E, and PSRs.
Initiatives Supported by OSD/SSE

- **DM Guidebook**
  - Provides the “how”, “what”, and “what data” to support services/agencies on DM.

- **DI-MGMT-81024- Systems Engineering Management Plan (SEMP)**
  - DID Update
  - Focus is to Government and Contractor technical planning using the Systems Engineering Plan (SEP) as a basis.

- **Draft MIL-HNBK-132 – DoD Handbook on Acquisition Management**
  - Submitted for formal review

- **MIL-DTL-3000 Tech Data Package Update**
  - Working group has just been formed to revise and modernize the approach to Tech Data Packages.

- **ISO 1303 STandard for the Exchange of Product (STEP)**
  - Model Data
  - Application Protocol (AP) – 233 for Systems Engineering is in the final approval process
Key Challenges

- Effectively communicating the value of “data”
  - Recognition propagated to other disciplines within the life cycle development process
- Systems and Software process integration
Thank You
### STEP for the DoD Acquisition Cycle

#### Pre-System's Acquisition
- **Concept Refinement**
  - Concept Decision

#### Systems Acquisition
- **Technology Development**
  - Explicit drafting
  - Associative drafting
  - Configuration controlled design
- **System Development & Demonstration**
  - Design and manufacturing of cast parts
  - Machining features for process planning
  - Computer numerical controllers
  - Process plans for machined parts

#### Production & Deployment
- **Design Readiness Review**
  - LRIP/IOT&E

#### Operations & Support
- **FRP Decision Review**

### AP 233 – Systems Engineering Data Representation

#### Design
- AP 201 – Explicit drafting
- AP 202 – Associative drafting
- AP 203 – Configuration controlled design
- AP 204 – Sheet metal die planning & design
- AP 207 – Sheet metal die planning & design
- AP 210 – Sheet metal die planning & design
- AP 216 – Ship structural design
- AP 226 – Ship structural design
- AP 227 – Ship structural design
- AP 228 – Plant spatial configuration
- HVAC systems
- Cable trays
- Piping systems
- Mechanical systems

#### Analysis
- AP 209 – Composite & metal structural analysis

#### Manufacturing
- AP 219 – Dimensional inspection for parts
- AP 223 – Design & manufacturing of cast parts
- AP 224 – Machining features for process planning
- AP 238 – Design and manufacturing of forged parts

#### Data Management
- AP 214 – PDM Schema
- AP 232 – Technical data packaging
- AP 239 – Product lifecycle support

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![Diagram of the DoD Acquisition Cycle](image)
Configuration Steering Boards (CSB). The Acquisition Executive of each DoD Component shall establish a CSB with broad executive membership including senior representatives from the Office of the USD(AT&L) and the Joint Staff.

- The CSB shall review all requirements changes and any significant technical configuration changes for ACAT I and IA programs in development which have the potential to result in cost and schedule impacts to the program. Such changes will generally be rejected, deferring them to future blocks or increments. Changes shall not be approved unless funds are identified and schedule impacts mitigated.

- Program Managers shall, on a roughly annual basis, identify and propose a set of descoping options to the CSB that reduce program cost or moderate requirements. The CSB shall recommend to the MDA (if an ACAT ID or IAM program) which of these options should be implemented. Final decisions on de-scoping option implementation shall be coordinated with the Joint Staff and military department requirements officials.