DoD Systems Engineering

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Director, Major Program Support
Office of the Deputy Assistant Secretary of Defense for Systems Engineering

NDIA SE Division Meeting
April 18, 2012
Develop and grow the Systems Engineering capability of the Department of Defense – through engineering policy, continuous engagement with component Systems Engineering organizations and through substantive technical engagement throughout the acquisition life cycle with major and selected acquisition programs.

A Robust Systems Engineering Capability Across the Department Requires Attention to Policy, People and Practice

We apply best engineering practices to:

- Support and advocate for DoD Component initiatives
- Help program managers identify and mitigate risks
- Shape technical planning and management
- Provide technical insight to OSD stakeholders
- Identify systemic issues for resolution above the program level
Providing technical support and systems engineering leadership and oversight to USD(AT&L) in support of planned and ongoing acquisition programs.
Selected Topics

- Acquisition Program Engagement
- Standardization
- Systems Engineering Plans
- Risk
- Metrics
- Development Planning
- Program Protection
DASD(SE) Top-Level FY12 Goals

Strengthen our *program engagement*, across full product spectrum, using expert technical teams to support informed, affordable decisions
- Increase early engagement in AoA’s and RFPs
- Increase use of quantitative data (new SEP format) in program oversight
- Meet commitment to USD(AT&L) to comprehensively support PDR and CDR
- Maintain program support review tempo and quality while using less resources

Implement comprehensive *program protection planning*
- As a part of the trusted defense systems strategy

Implement clear, effective *reliability and manufacturing policy*
- Establish and promulgate guidance and support for these specialty disciplines

Conduct detailed review/update of *SPRDE curriculum*
- Dovetail into DAU statutory requirement to review Acquisition Curriculum

Assess and Strengthen *Workforce Systems Engineering Competencies*

Measure and improve Department-wide *Systems Engineering performance*
- Establish collection of performance metrics, benchmarking

Lead S&T priority to “*Engineered Resilient Systems*”
- Ensure a successful Systems 2020 program start in FY13
**Systems Engineering Roles**

- **DASD(SE) established:**
  - Drive SE back into programs
  - Instill credibility in the acquisition process

- **Program Support Reviews:**
  - Help Program Managers identify and mitigate risks
  - Shape technical planning and management
  - Provide insight to OSD stakeholders
  - Identify systemic issues requiring resolution above program

PSRs are a risk management tool. Prevent problems through early recognition of risks

- **Program Touchpoints:**
  - Program Support Reviews (PSR), SE Working Integrated Product Teams (WIPT), Technical Reviews, SEP Reviews, PDR/CDR Assessments
  - Integrating IPT (IIPT), Overarching IPT (OIPT)
  - Defense Acquisition Board (DAB), Defense Acquisition Executive Summary (DAES), Technical Reviews
Acquisition Process Engagement

SE has a role in all major acquisition program milestone decisions and oversees and executes critical acquisition risk management processes to reduce program cost, acquisition time and risk.

Continuous Engagement

Pre-acquisition
Concepts, Experimentation and Prototyping

Materiel Solution Analysis

AOA

Technology Development

PDR

CDR

Developmental Testing

Developmental Testing

Engineering and Manufacturing Development

ICD

MDD

A

CDD

B

Continuous Engagement (Mentoring, Workforce, Assessment) by Systems Engineering and Developmental Test

Development Planning

Continuous Technical Emphasis on Reliability and Producibility

SEP – Systems Engineering Plan
TES – Test and Evaluation Strategy
TEMP – Test and Evaluation Master Plan
TDS – Technology Development Strategy
PPP – Program Protection Plan
AOA – Analysis of Alternatives
PDR – Preliminary Design Review
ICD – Critical Design Review
CDD – Capability Development Document
CPD – Capabilities Production Document
MDD – Material Development Decision
FRP – Full Rate Production Decision

Cross-Cutting Efforts: Acquisition Workforce Management, Engineering Policy and Guidance, Advocacy for Service Competencies and Initiatives, STEM Initiatives

SEP
TEMP
PPP
TRA

Post-PDR Assessment for 2366b Certification

SEP
TES
PDR

CDR

Developmental Testing

OT&E

FRP

Post-PDR Assessment for 2366b Certification

SEP
TEMP
PPP
Major Program Support Activity

Fiscal Year 2011

- Program Support Reviews: 13
- Nunn-McCurdy Certification: 5
- CDRs and PDRs: 29
- DPAP Peer Reviews: 5
Recognition of significance and value of rigorous Technical Reviews

- Inform Development Process
  - Establish solid foundation for programmatic and investment decisions
  - Inform the trade space early in development
  - Control cost and schedule
  - Expedite delivery of capability
  - Design understanding expectation management

- Inform Decisions and Reporting
  - OIPT, DAB Milestone Reviews
  - IPRs and Pre-EMD reviews
  - 2366b certifications
  - Annual Report to Congress
PDR Governing Language

**Statutory**

*Public Law 111-23 (WSARA)* - Requires the MDA to “conducted a formal post-preliminary design review assessment, and certifies on the basis of such assessment that the program demonstrates a high likelihood of accomplishing its intended mission”

**Regulatory**

*DoDI 5000.02* - “The MDA shall conduct a formal program assessment & consider the results of the PDR and the PM's assessment in the PDR Report, and determine whether remedial action is necessary to achieve APB objectives.”

*DTM 09-027* - “Post-PDR assessments will be conducted in association with MS B preparations and will be “formally considered by the MDA at the MS B certification review.”

– Provides sound SE basis for investment decisions.

**Guidance**

Additional Guidance available at

– http://www.acq.osd.mil/se/ or
– https://dag.dau.mil/

“Technical reviews shall be event-driven and conducted when review entrance criteria, as documented in the SEP, is met. They shall include participation by subject matter experts who are independent of the program (i.e., peer review).”

DoDI 5000.02, Enclosure 12
DoDI 5000.02 - “The MDA shall conduct a formal program assessment following system-level CDR”

“Determine whether additional action is necessary to satisfy EMD Phase exit criteria and to achieve the program outcomes specified in the APB”

PD USD(AT&L) Memo of Feb 24, 2011 - Eliminates the Program Manager's reporting responsibility for the CDR Report

– DASD(SE) will participate in all MDAP CDRs and prepare a brief assessment of the program's design maturity and technical risks which may require Milestone Decision Authority (MDA) attention

– PMs of Major Defense Acquisition Programs shall be required to invite DASD(SE) engineers to their system-level CDRs and make available CDR artifacts

Additional Guidance available at

– http://www.acq.osd.mil/se/ or

– https://dag.dau.mil/
Reinvigorating Defense Standardization

- USD(AT&L) appointed the Deputy Assistant Secretary of Defense, Systems Engineering as the Defense Standardization Executive
  - Standards, DMSMS, GIDEH, Interagency Coordination
- Opportunity for SE to advocate for and coordinate Service efforts
- Service product centers are currently pursuing independent efforts to reinvigorate standards processes

Opportunity to leverage our standardization processes and products as a key engineering tool in promoting acquisition excellence
Standards

- Defense Standardization Council (DSC) recognized that enterprise-wide approaches were needed for certain systems engineering disciplines

- Working groups formed to assess technical information gaps related to:
  - Systems Engineering and Technical Reviews and Audits
  - Configuration Management
  - Manufacturing and Quality
  - Logistics Support Analysis
SEP Streamlining Methodology

- SEP should define minimum core content and set of data-driven products required for successful program execution.

- Contents from the Acquisition Strategy, including Modular Open Systems Approach (MOSA), Environmental Safety and Occupational Health (ESOH), Corrosion Prevention and Control Plan, and Human Systems Integration (HSI) Summaries, are replaced by table entries with links to affiliated plans.
Risk Management

• Technology Risk
  - Maturity of critical technologies (HW/SW)

• Engineering Risk
  - Technical and management risk of a system throughout the life cycle

• Integration Risk
  - Technology, component, platform, SoS integration

• Risk Assessment
  - Identification
  - Recommendations
  - Mitigation/risk burndown
  - Root Cause Analysis

• Program Support Reviews
  - Approved methodology
  - Rigorous/phased-based criteria

• Metrics
  - Manufacturing
  - Software
  - Reliability
  - Integration
  - Technical Management

• PDR/CDR Assessments
Common Risk Pitfalls

• **Programs lack properly documented risk management activities**
  – Lack of formal documented risk mitigation plans
  – Lack of off-ramps for major program risks
  – Lack of mitigation plans for all medium / high risks
  – Mitigation tasks do not have resources assigned nor due dates nor the status of the task

• **Programs lack a mature risk management program**
  – Risk avoidance lessons learned are not addressed within risk management approach
  – Risk management by PMO lacks maturity, discipline, effectiveness

• **Tools and methodology supporting risk management are not sufficient**
  – Lack of evidence of linkage between TPMs/EVM/Risk Management/WBS/IMS to effectively employ them as management tools that enable risk reduction
  – Risk tool does not map risks to applicable WBS element

• **Program management does not have a portfolio view of risk management**
  – Enterprises do not have a portfolio view of risk management to prevent one program from being adversely impacted by other acquisition programs or enterprise-wide challenges
Program Insight
Metrics, Measures, and Trends

Assessments
Performance
Cost
Schedule
Management
Technical

Special Interest Areas
- Tailored by phase -
Metrics Framework

- **OSD/Services**
  - Oversight and Insight

- **PM**
  - Oversight & Insight, Management

- **Integrators (System Engineers)**
  - Oversight & Insight, Technical Management

- **Suppliers**
  - Technical Management

**Trade space**
- SE Process
- Relationships
- Margins (i.e. robustness)
- Risk, mitigations
- Issues
- Estimation
- Test Articles

**Sr Mgt Decision Makers**

**Chief Engineers/Engineers Information Providers**

**Technical Engineering Metrics (Leading and Status)**

- Govt Model
- Analogous Industry Model
Focus on Program Objectives

Metrics / Measures

- Tailored for program objectives
- Combined with relevant context
- Transformed into useful decision aids to enhance program and Acquisition execution

Program Objectives

Product Realization
- Requirements
- Design maturity
- Manufacturability

Operational Effectiveness
- Performance
- Interoperability
- Integration

Operational Suitability
- RAM
- Training
- Green operations

Cost

Schedule

feasible region

Program Touchpoints

Bench marking

Systemic Analysis

Metrics
# FY11 Development Planning Program Support

## ICD Reviews for DP Equities
- 5th Generation Fighter Modernization
- Amphibious Combat Vehicle
- Airborne ISR to SOF
- Army Aircraft Survivability
- Army Operational Energy
- Forensics Support Across the RoMO
- Joint Cyber Situational Awareness
- USMC SCI Communications Enterprise
- USMC Aerial Delivery
- Low Slow Airborne Threat Response (LSATR) Capability
- Tactical Air Control Party Modernization
- Cyber Attack
- USMC Expeditionary Energy, Water and Waste
- Personnel Recovery
- Dock Landing Ship (LSD(X))
- Submarine Communications
- Navy Networking
- Army Unmanned Systems (Air, Ground, Maritime)
- Multimission Unmanned Ground Vehicle (MMUGV)
- Navy Unmanned Carrier Launched Aerial Strike and Surveillance (UCLASS)
- AF Long Range Strike
- IFPC-2
- Maritime ISR Support to SOF (for MMRUAS)

## ICDs Reviewed: 23

## MDDs Reviewed: 21

## AoAs Supported: 10

## MS A TDS/AS Reviewed: 5

## MS A SEPs Reviewed: 6

## DP Support to MDD DAB
- F-22A
- HFDS
- LRSO
- MMRUAS
- AIM-9X
- IFPC2-I
- T-AO(X)
- OASuW
- JMS
- LSD(X)
- UCLASS
- NIK
- MMUGV
- DCGS-N
- CVM
- ACV
- B-61 LEP
- EPS
- JPALS Inc 2
- DWSS
- AMPV

## DP Support to AoA
- OASuW
- TAOX
- APT
- LRSO
- MMRUAS
- IFPC2-I
- UCLASS
- DCGS-N Inc 2
- JC2
- GCV Dynamic AoA Update

## TDS/AS Reviews
- B-61 LEP
- MGUE
- GCV
- B-2 DMS
- T-AO(X)

## SEP Reviews
- B-61 LEP
- MGUE
- GCV
- B-2 DMS
- T-AO(X)
- CIRCM

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**Fiscal Year 2011**

- ICDs Reviewed: 23
- MDDs Supported: 21
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Materiel Development Decision (MDD)

- Defined in DoDI 5000.02 as “the formal entry point into the acquisition process and mandatory for all programs”

MDD Entry Criteria:

- JROC approved ICD
- CAPE approved AoA Study Guidance
- DoD component presents approved ICD, 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

Gap:

- Technical risk, opportunity, feasibility analysis of MDD proposal

DTM 10-017 policy memo developed to interpret and implement Development Planning activities at the MDD.
MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS 
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: Document Streamlining – Program Protection Plan (PPP)

The September 14, 2010, Better Buying Power memorandum directed a review of the 
documentation required by Department of Defense Instruction (DoDI) 5000.02 in support of the 
acquisition process. This is the second in a series of document streamlining memoranda, 
following my April 20, 2011, direction on the streamlined Technology Development 
Strategy/Acquisition Strategy (TDS/AS) and Systems Engineering Plan outlines. I am directing 
the following actions for the PPP:

Document Streamlining: The PPP will be streamlined consistent with the attached 
amended outline. The outline is designed to integrate both program protection management 
and document preparation. It increases emphasis on early-phase planning activity and is specifically focused on information central to the purpose of the document. The new PPP reflects the 
integration of the Acquisition Information Assurance (AIA) Strategy and recognizes Program 
Protection as the Department’s holistic approach for delivering trusted systems.

PPP Review and Approval: Every acquisition program shall submit a PPP for Milestone 
Decision Authority review and approval at Milestone A and shall update the PPP at each 
subsequent milestone and the Full-Rate Production decision. While some programs may not 
have Critical Program Information, every program, including those with special access content, 
shall address mission-critical functions and components requiring risk management to protect 
warfighting capabilities. Per the TDS/AS outline described above, Program Protection 
information is no longer included in the TDS. The Acquisition AIA Strategy shall continue to be 
reviewed and approved in accordance with DoDI 5000.1 and shall be included as an appendix to 
the PPP.

These actions constitute expected business practice and are effective immediately. 
The revised outline will be documented in the Defense Acquisition Guidebook and referenced in 
the next update to DoDI 5000.02. My point of contact is the Mr. Stephen Welby, Deputy 
Assistant Secretary of Defense for Systems Engineering, at 703-695-7417.

cc: All CAEs 
DCMA 
DCAA 
DCMO 
DAED(PBA) 
ARQ 
DRAM

http://www.acq.osd.mil/se/pg/index.html#PPP
What Are We Protecting?

**Program Protection Planning**
*DoDI 5000.02 Update*

<table>
<thead>
<tr>
<th>Technology</th>
<th>Components</th>
<th>Information*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What:</strong> Leading-edge research and technology</td>
<td><strong>What:</strong> Mission-critical elements and components</td>
<td><strong>What:</strong> Information about applications, processes, capabilities and end-items</td>
</tr>
<tr>
<td><strong>Who Identifies:</strong> Technologists, System Engineers</td>
<td><strong>Who Identifies:</strong> System Engineers, Logisticians</td>
<td><strong>Who Identifies:</strong> All</td>
</tr>
<tr>
<td><strong>ID Process:</strong> CPI Identification</td>
<td><strong>ID Process:</strong> Criticality Analysis</td>
<td><strong>ID Process:</strong> Various</td>
</tr>
<tr>
<td><strong>Threat Assessment:</strong> TTRA, M/D-CITA</td>
<td><strong>Threat Assessment:</strong> DIA SCRM TAC</td>
<td><strong>Threat Assessment:</strong> Various</td>
</tr>
<tr>
<td><strong>Countermeasures:</strong> AT, Classification, Export Controls, Security, etc.</td>
<td><strong>Countermeasures:</strong> SCRM, SSE, Anti-counterfeits, software assurance, Trusted Foundry, etc.</td>
<td><strong>Countermeasures:</strong> Information Assurance, Classification, Export Controls, Security, etc.</td>
</tr>
<tr>
<td><strong>Focus:</strong> “Keep secret stuff in” by protecting any form of technology</td>
<td><strong>Focus:</strong> “Keep malicious stuff out” by protecting key mission components</td>
<td><strong>Focus:</strong> Keep critical information from getting out by protecting data</td>
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*Program Protection Planning Includes DoDI 8500 series*
Opportunities

- Strong Systems Engineering is critical to program success
  - Systems Engineering toolkit focused on identifying and managing risk – in development, production and life-cycle supportability

- Our development processes need to evolve to provide faster product cycles, more adaptable products and address emerging technical challenges

- Future US Defense capabilities depend on a capable US engineering workforce in and out of government
  - Need to create opportunities to grow future “Engineering Heroes”
Systems Engineering: Critical to Program Success

Innovation, Speed, and Agility

http://www.acq.osd.mil/se
SRCA Results

- Trends from program reviews
- Perform correlation of focus area results to metrics results
  - Software
  - Reliability
  - Staffing
  - Schedule
  - Manufacturing
  - Integration
- Develop recommendations focused on acquisition-wide solution

Ability to analyze SRCA “focus areas” and compare to metrics analysis results

Reliability - Related Systemic Issues

- A reliability test program is needed: 14%
- A reliability growth program is not in place: 16%
- Reliability is not progressing as planned or has failed to achieve requirements: 19%

Staffing - Related Systemic Issues

- Program office has suffered from instability in key positions: 10%
- Difficult to retain and bring in high quality personnel: 11%
- Program offices have a lack of acquisition or specialized expertise: 18%
- Marginal program office and contractor staffing levels: 39%

% of Program Reviews Showing Evidence of the Issue