



***Update:***  
***OSD Systems Engineering***  
***Revitalization Efforts***

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# General Outline

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- What's happening in:
  - Policy
  - Education & Training
  - Guidance
  
- Other Initiatives
  
- Topics for Discussion



# System Engineering Policies

**All programs shall develop a SE Plan (SEP)**

**Each PEO shall have a lead or chief systems engineer who monitors SE implementation within program portfolio**

**Event-driven technical reviews with entry criteria and independent subject matter expert participation**

**OSD shall review program's SEP for major acquisition programs (ACAT ID and IAM)**

**Technical Planning**

**Technical Leadership**

**Technical Execution**

**Technical Excellence**

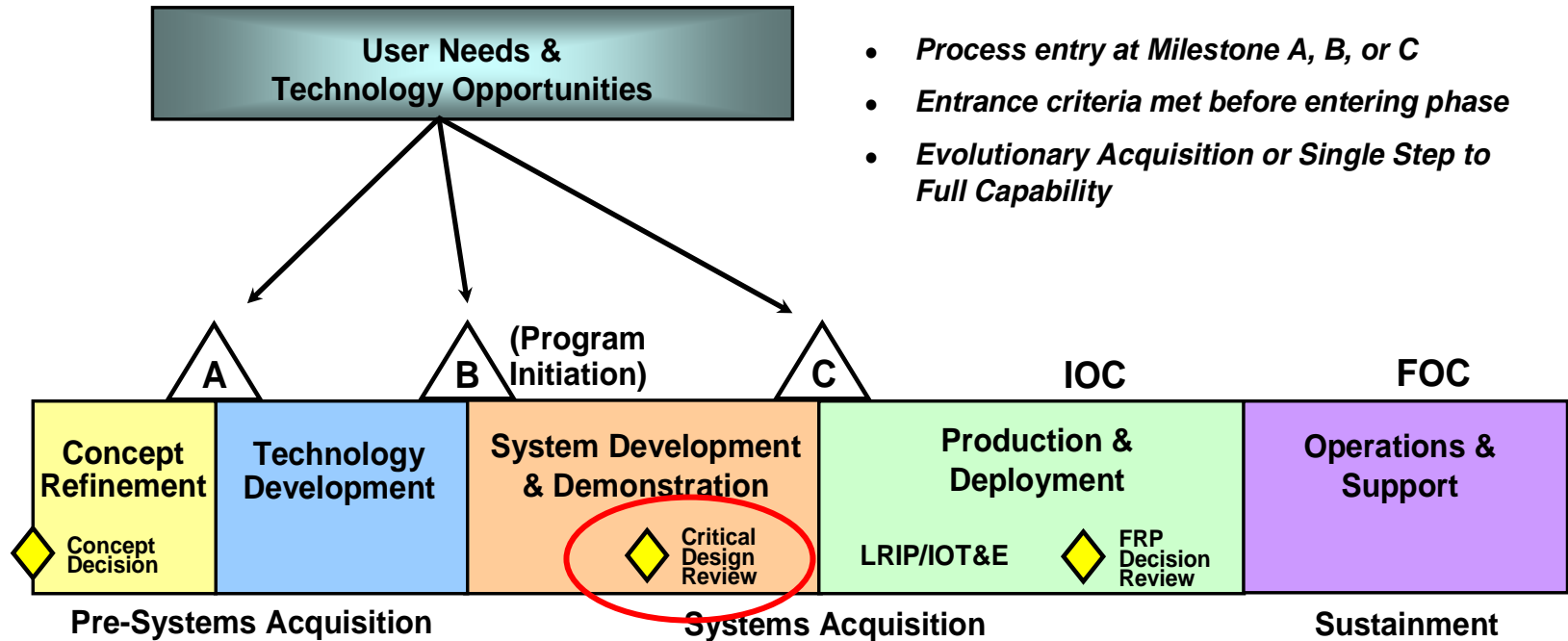
***Technical planning upfront and early***



# New SE Policy in *Draft DoDI 5000.2*, Operation of the Defense Acquisition System

## 3.0 PROCEDURES

3.1. Defense Acquisition Management Framework. Figure 1 depicts the Defense Acquisition Management Framework.





# New SE Policy in Draft DoDI 5000.2

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- § 3.6.5. “systems engineering planning shall support” the Technology Development phase
- § 3.7.8. “System Design [first phase of SDD] shall include the establishment of the functional, allocated, and product baselines for all configuration items. The CDD [Capability Development Document] and Systems Engineering Plan [SEP] shall guide this effort.”
- § 3.7.9. “Critical Design Review (CDR). The system-level CDR provides an opportunity to assess design maturity as evidenced by measures such as successful completion of subsystem CDRs; the percentage of hardware and software product build-to specifications and drawings completed and under configuration management; planned corrective actions to hardware/software deficiencies; adequate developmental testing; an assessment of environment, safety and occupational health risks; a completed failure modes and effects analysis; the identification of key system characteristics and critical manufacturing processes; and an estimate of system reliability based on demonstrated reliability rates, etc.”



# New SE Policy in Draft DoDI 5000.2

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§ 3.7.9.1. “The PM shall provide a **CDR Report** to the MDA that provides an overall assessment of design maturity and a summary of the system-level CDR results which shall include, but not be limited to:

§ 3.7.9.1.1. The names, organizations, and areas of expertise of independent subject matter expert participants and CDR chair;

§ 3.7.9.1.2. A description of the product baseline for the system and the percentage of build-to packages completed for this baseline;

§ 3.7.9.1.3. A summary of the issues and actions identified at the review together with their closure plans;

§ 3.7.9.1.4. An assessment of risk by the participants against the exit criteria for the SDD phase; and

§ 3.7.9.1.5. Identification of those issues/risks that could result in a breach to the program baseline or substantively impact cost, schedule or performance.”

§ 3.7.9.2. “The MDA shall review the CDR Report and the PM’s resolution/mitigation plans and determine whether additional action is necessary to satisfy SDD phase exit criteria and to achieve the program outcomes specified in the APB.”



# New SE Policy in Draft DoDI 5000.2

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§ 3.10.6. “**Program Support Review** (PSR). The Office of the USD(AT&L)/ Systems and Software Engineering shall conduct PSRs for MDAPs to assess the application of technical planning and management processes and assist the program office in identifying and mitigating cost, schedule, and performance risk. PSRs shall be conducted prior to each milestone event, before approval of the SDD acquisition strategy, and at other times as directed by the USD(AT&L). The results of a PSR shall inform the OIPT and be provided to the MDA. PSRs on MAIS programs shall be conducted when requested by the MDA.”

Enclosure 3. Table E3.T2: **SEP mandated at milestones A, B, and C**

Enclosure 5. § E5.7.2. “The Office of the USD(AT&L)/ Systems and Software Engineering shall conduct an independent **Assessment of Operational Test Readiness** (AOTR) for all ACAT ID and special interest programs designated by the USD(AT&L). Each AOTR shall consider the risks associated with the system’s ability to meet operational suitability and effectiveness goals. This assessment shall be based on capabilities demonstrated in DT&E and OAs and criteria described in the TEMP. The AOTR report shall be provided to the USD(AT&L), DOT&E, and CAE.”

§ E5.7.3. “The CAE shall consider the results of the AOTR prior to making a determination of materiel system readiness for IOT&E.”



# New SE Policy in Draft DoDI 5000.2

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## **Enclosure 12. Systems Engineering.**

E12.1. Systems Engineering Across the Acquisition Lifecycle.

E12.2. Systems Engineering Plan (SEP).

E12.2.1. "Program managers shall prepare a SEP for each milestone review, beginning with A."

E12.2.2. "The MDA shall be the approval authority for the SEP."

E12.3. Systems Engineering Leadership. Each Program Executive Officer 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. Documented in the SEP, the configuration management approach shall identify, document, audit, and control the functional and physical characteristics of the system design, track any changes, and provide an audit trail of program design decisions and design modifications.





# New SE Policy in Draft DoDI 5000.2

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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 all ACAT I and II programs shall assess their long-term technical data needs and document them in a Data Management Strategy which shall be approved in the context of the acquisition strategy prior to issuing a contract solicitation.



# Education & Training

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## ➤ What's available

- On-line Continuous Learning Modules (CLMs):
  - Reliability and Maintainability
  - Technical Reviews
  - Technical Planning
  - MOSA (**new**)
  - Trade Studies (**new**)
- On-line introductory course SYS 101
- On-line intermediate course SYS 202
- Intermediate classroom course SYS 203
- Advanced classroom course SYS 302
- New “SPRDE/Program Systems Engineer” track
- “Core Plus” career guidance (**new**)

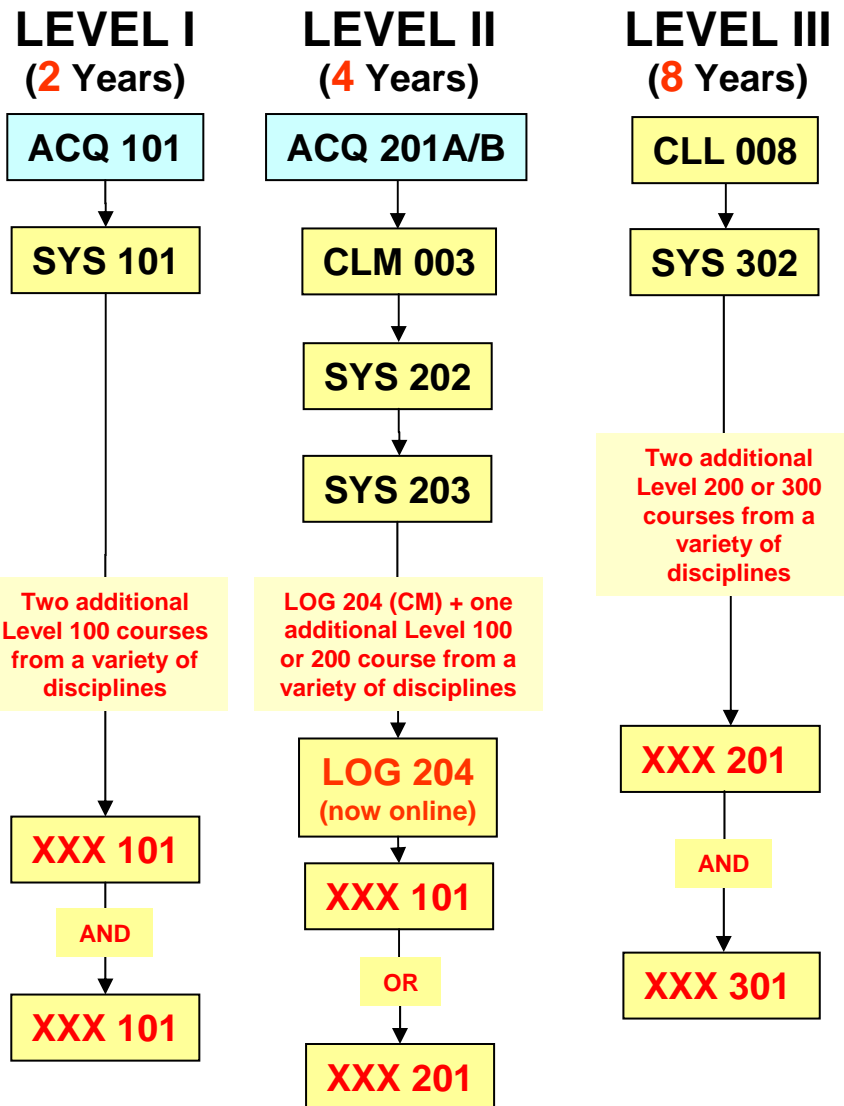
## ➤ What's Coming

- Data Management CLM
- ECP CLM

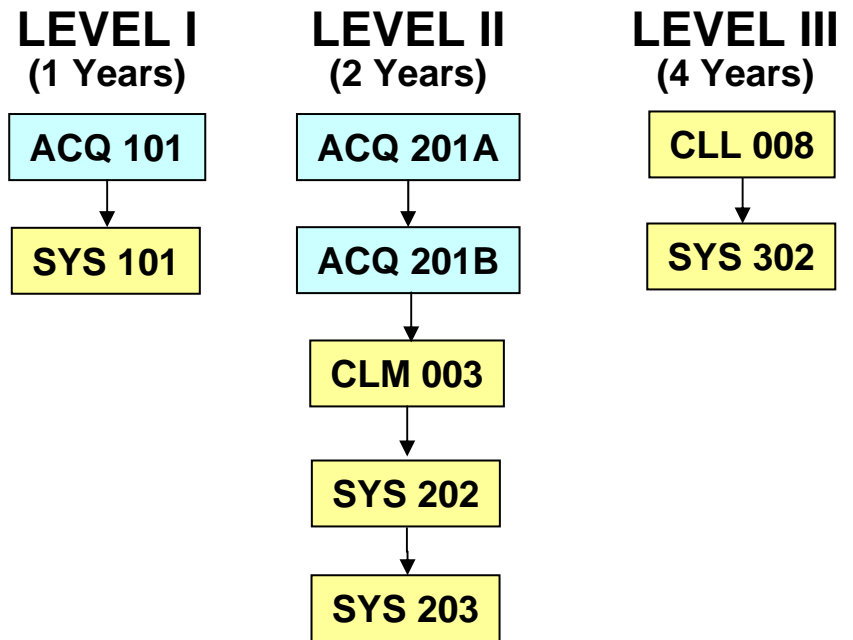


# New SPRDE/PSE & SE Career Path Certification Criteria

## SPRDE-Program Systems Engineer



## SPRDE-Systems Engineering



**Legend:**

- Existing (light blue box)
- New (yellow box)
- Additional (yellow box with red text)



# Education & Training

## New SPRDE Key Tenets

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- *Personnel*: those currently certified SPRDE-SE retain their certification
- *Positions*: those currently coded as “S” (SPRDE-SE) retain that designation—subsequently, Components shall review positions to determine if they should remain coded as SPRDE-SE (“S”) or if they should be recoded as SPRDE-PSE (“Code TBD”)



# Guidance

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- What's available:

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

- What's coming:

- Systems of Systems SE Guide
- Update to Defense Acquisition Guidebook
  - Chapter 4 -- Systems Engineering
  - Chapter 9 -- Test and Evaluation



# Updated SEP Prep Guide

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- Includes sections by program phase:
  - MS A/Technology Development
  - MS B/System Development & Demonstration
  - MS C/Production & Deployment and Operations & Support
  
- Each section provides more “food for thought” relative to the technical planning focus areas for that phase
  - Program Requirements
  - Technical Staffing
  - Technical Baseline Management
  - Technical Review Planning
  - Integration with Overall Management of the Program



# Vision: SE Plan Unification

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- Acquirer/Supplier-developed technical plan for SE implementation
- Acquirer/Supplier shared roles and responsibilities in SE effort
- Acquirer/Supplier conducted event driven technical reviews
- Acquirer/Supplier teaming on linkage with other program plans





# TRR Checklist

**“Systems Engineering for Mission Success”**

**Test Readiness Review  
Program Risk Assessment Checklist** (17 May 2007 version)

**OVERVIEW:** Although the checklist can be printed and completed as a “hard copy”, it is designed to be completed electronically as an Excel spreadsheet. When viewed electronically, the small number buttons in the upper left corner of the screen are used to select the level of indenture for the questions in the checklist. A left mouse click on a number button will expand or collapse the entire checklist to the desired level. A left click on the “+” symbol in the left margin of the spreadsheet will expand the level of indenture for that section. A left click on the “-” symbol in the left margin of the spreadsheet will collapse the level of indenture for that section. The buttons in Row 11 run specific macros. The buttons in Column A allow a user to designate and sort specific questions as “Special Interest” (i.e., High Priority, Flagged, Question). The colored buttons in Row 11, Column C allow the user to sort questions by Technical Discipline, to provide a Level 1 roll-up of the risk characters assigned, or to hide specific information. For example selecting the “Logistics” button results in the display of all Level 1 Logistics-related questions and assigned information. All other questions will be hidden.

**COMPLETING THE CHECKLIST:**

- In the upper right corner of the checklist, enter the name of the program being reviewed, the date(s) of the review, along with the name, technical specialty of the person(s) completing the checklist.
- A “Risk Character” (i.e., R / Y / G / U / NA) should be assigned for each question by direct entry or left clicking in each box to activate the “down” menu. The assigned Risk Characters will automatically total and display in the Level 1 (and Level 2, as applicable) row(s). Select a summary tab (Excel “Sheet”) at the bottom of the checklist will provide a summary of all questions assigned a particular risk character (e.g. the RED tab will display all questions assigned a RED risk character). To delete a “Risk Character” from a box, in the box and press the “f” button on the keyboard.
- Any question requiring further attention (Special Interest) should be similarly marked in Column A as “High Priority”, “Flagged”, or “Question” to facilitate follow-up.

**CAUTION:** Entries, changes, deletions or comments should only be made on the checklist. Any entries entered directly on the summary pages will not be recorded within the checklist and will disable linkage between the checklist and summary pages.

**SAVING THE CHECKLIST:** Save the completed checklist in a new file with a unique name such as “UAV TRR 8Feb07ajo”.

High Priority

Flagged

Question

Show All

Level 1

Programmatic

Production

Interoperability

Technology

Software

Risk

Logistics

Training

EVM

T&E

HSI

Hide TD

Unhide TD

Hide NA

Unhide NA

**Risk Character**

R = Red, Y = Yellow, G = Green, U = Unknown / Unavailable, NA = Not Applicable

Special Interest	Technical Discipline	6. Management Metrics Relevant to Planned Test	Legend:	Item	Comments / Mitigation
	Level 1, software, programmatic, T&E, logistics, network		R Y G U NA	6	
			0 0 0 0 0		

TRR
Red
Yellow
Unknown
NA
Level 1

NUM







# TRR Checklist

	A	B	C	D	E	F	G	H	I	J	L	M	
	High Priorit Flagge Questio	Show All Level 1	Programmatic Production Interoperability Technology Software Risk Logistics Training EVM T&E HSI Hide TD Unhide TD Hide NA Unhide NA										
11													
12													
13													
14	Special Interest	Technical Discipline	Legend: R = Red, Y = Yellow, G = Green, U = Unknown / Unavailable, NA = Not Applicable					Risk Character					
				R	Y	G	U	NA	Item	Comments / Mitigation			
108		Level 1, software, programmatic, T&E, logistics, technology, risk.	<b>6. Management Metrics Relevant to Planned Test</b>						6				
			0	0	0	0	0	0					
123		Level 1, T&E, risk, programmatic	<b>7. Test Program Risk Assessment</b>						7				
			0	0	0	0	0	0					
124		programmatic, T&E, risk	a. Risk Impacts						7.a				
			0	0	0	0	0	0					
125		programmatic, T&E, risk	(1) Have all test related risks been identified, and are they being tracked on a continuous basis including updates to the mitigation approaches?						7.a(1)				
126		programmatic, T&E, risk	(2) Have all test related risks been determined to be of an acceptable level to enter testing?						7.a(2)				
127		programmatic, T&E, risk	b. Are mitigation approaches in place for all "yellow" and "red" test related risks, and are test risk mitigations resourced?						7.b				
128		programmatic, T&E, risk	c. Risk Process					0	0	0	0	0	0
129		programmatic, T&E, risk	(1) Does the program have an overall Risk Management Plan (RMP)?						7.c(1)				
130		programmatic, T&E, risk	(2) Is there a defined program level risk management process, and is the RMP up to date and being used?						7.c(2)				
131		programmatic, T&E, risk	(3) Is the risk management process shared by the Government and contractor team?						7.c(3)				
		programmatic, T&E, risk	(4) Have all applicable test related risks for the system under test been included in the program level risk management process?						7.c(4)				





# Corrosion

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- Overarching strategy: transcend traditional control methods, organizations, management and funding approaches
- Attack corrosion early in acquisition or construction
- Focus life-cycle corrosion research and development efforts on four primary areas
  - Materials and manufacturing processes that prevent or reduce the incidence and effects of corrosion
  - Detection of corrosion in fielded systems and facilities and prognosis of the expected growth, potential impact and predicted effects
  - Coatings, treatments and other applications to prevent, arrest or retard corrosion
  - Repair processes that restore materials to an acceptable level of structural integrity and functionality
- Publish direction and guidance regarding corrosion prevention and mitigation policies and strategies at all DoD and Service levels



# SE Research

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- Recognizes need to advance the practice of systems engineering within DoD
  - Conduct innovative research into new SE methods, processes, and tools (MPTs) to address recurring problems in the acquisition of systems and services.
  
- Currently investigating stand-up of an SE research University Affiliated Research Center (SER UARC) to help accomplish this
  
- SE UARC mission: to research and analyze advanced and emerging systems engineering practices and relevant technologies to address the full spectrum of DoD systems across the Department,
  - From capability areas, enterprise systems, systems of systems, and interoperability down to subsystems and configuration items
  - Goal is to ensure consistency and SE excellence throughout acquisition life cycle
  
- Bottom line:
  - We've made great strides, but much still to do to change root cause behaviors on programs.
  - SE research will:
    - Inform the current state of SE practice on programs
    - Provide a means to explore and exploit concepts to enable design and development of complex systems
    - Underpin effective integration of program/business processes with technical management MPTs throughout the acquisition life cycle.



# Topics for Discussion

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## ➤ What are your thoughts on:

- The “help” you are getting from OSD (policy, guidance, Education & Training, Programs Support Reviews, SEP reviews, etc.)
  - Have the SE policy memos of 2004 caused you to do anything different?
- What it takes to deploy effective SE across all programs
- The availability of resources you have to put on SE, and ability to train them
- The need for independent chair at technical reviews outside of the program
- Mandating development of the SEP prior to RFP release
- A unified acquirer/supplier SEP



# Topics for Discussion

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## ➤ Other questions to consider:

- How are technical reviews conducted and when are they held? Are they schedule driven or event-based?
- Do you have “technical baselines”? What process do you use to track and manage them?
- Who does your planning (e.g. writes your SEP and Risk Plan)? Are these plans used and are they value added?
- How do the SEP, Risk Plan, TEMP and other technical documents integrate with the acquisition strategy?



# Way ahead

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## Taking SE to the next level – Expand institutionalization...

- Change culture, both vertically and horizontally, across Government and DoD contractor workforce
  - Expand outreach effort to the product centers, program offices, and key industry partners
  - Continue to leverage collaboration with DAU and academia to further develop the workforce



# SE links

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Systems and Software Engineering  
(**updated website**):

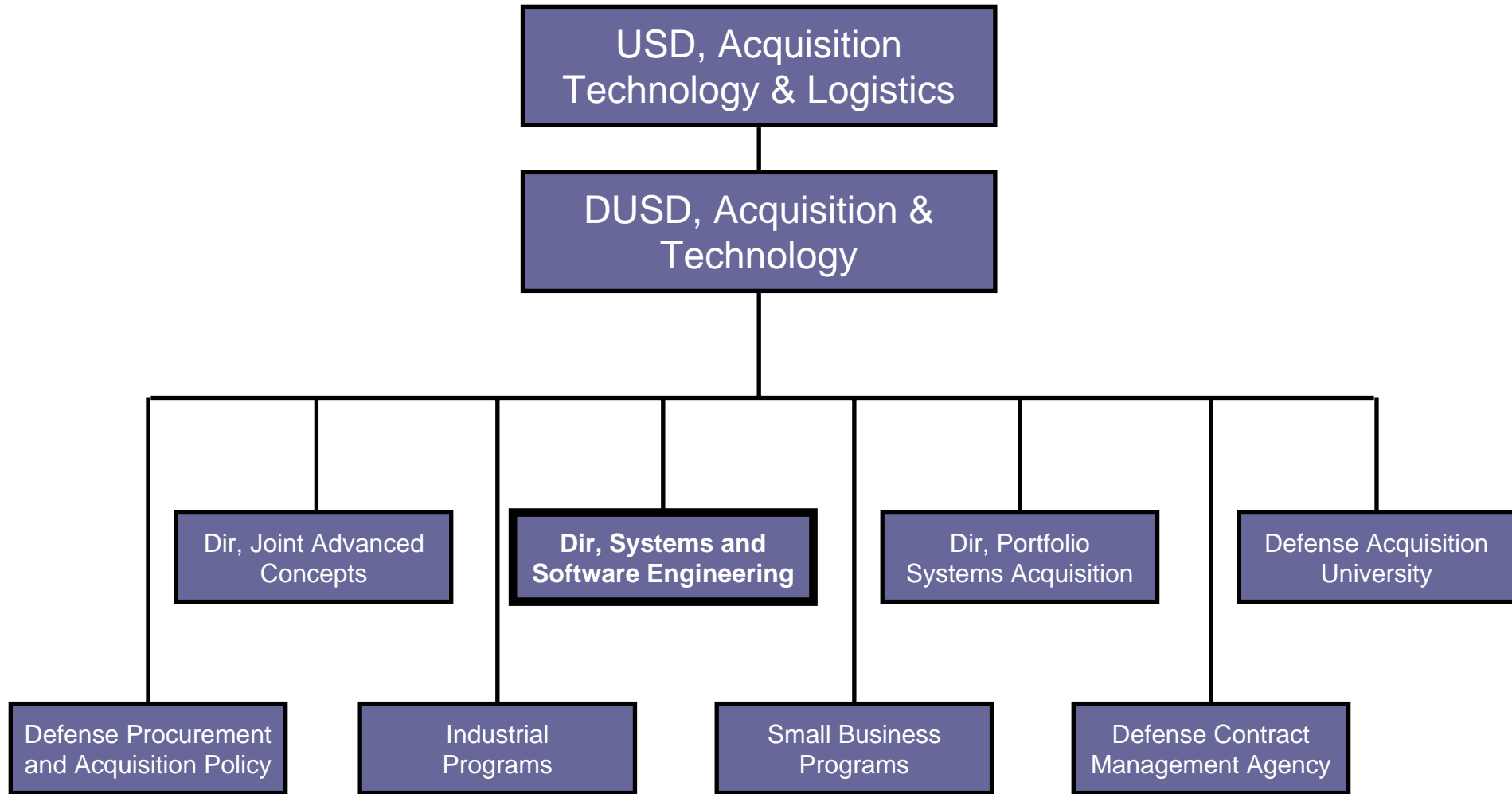
<http://www.acq.osd.mil/sse>

DAU:

<http://www.dau.mil/basedocs/trainingcourses.asp>



# OUSD (AT&L) Organization







# Systems and Software Engineering Organizational Core Competencies

**Director, Systems & Software Engineering**

Mark Schaeffer SES

**Deputy Director  
Enterprise Development**

Col Rich Hoeferkamp (Acting)

**CORE COMPETENCIES**

- SE Policy
- SE Guidance
  - SE in *Defense Acquisition Guidebook*
- Technical Planning
- Risk Management
- Reliability/Maintainability
- Integrating SE into Systems Acq contracting
- SoS SE Guide
- SE Education and Training
  - DAU SE Curriculum
  - SPRDE Certification Rqmt
- Corrosion
- R-TOC
- Value Engineering

**Deputy Director  
Developmental Test & Evaluation**

Chris DiPetto SES

**CORE COMPETENCIES**

- DT&E Policy
- DT&E Guidance
  - T&E in *Defense Acquisition Guidebook*
  - TEMP Development Process
- DT&E Education and Training
  - DAU DT&E Curriculum
  - DT&E Certification Rqmt
- Joint Testing, Capabilities & Infrastructure
- Targets Oversight
- Acq Modeling & Simulation
- Energy
- DSOC/Acq Tech Task Force

**Deputy Director  
Software Engineering & System Assurance**

Kristen Baldwin SES

**CORE COMPETENCIES**

- SWE and SA Policy
- SWE and SA Guidance
  - SoS, SA Guides
- SWE and SA Education and Training
  - DAU SW Acq Curriculum
  - Continuous Learning Modules for SWE, SoS, SA
- Software Engineering
  - Acquisition Support
  - Software Engineering Institute (SEI)
- Process Improvement
  - CMMI Sponsor
- DoD/National Software Investment Strategy

**Deputy Director  
Assessments & Support**

Dave Castellano SES

**CORE COMPETENCIES**

- Support of ACAT I and Other Special Interest Programs (MDAP, MAIS)
- Assessment Methodology (Program Support Reviews - PSRs)
- T&E Oversight and Assessment of Operational Test Readiness (AOTR)
- Systems Engineering and Developmental Test Planning and Support
- Lean/6-Sigma Training/Cert

*Acquisition program excellence through sound systems and software engineering*



# Potential SE Research Focus Areas

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- Better integration of SE processes, methodologies, and tools
  - Consideration of toolsets to full system life cycle (CONOPS analysis through sustainment)
  - Extensibility of modeling languages and tools to SE and program artifacts
  - Technical Baseline management tools
  - Data standards alignment with other domains (logistics, test, ops analysis)
  - Enabling EVM, Risk Management, cost estimating, etc
- Alignment of systems engineering and software standards (15288, 12207, 632, 1220, etc)
- SE considerations in complex Systems of Systems environment
  - Large systems, distributed systems, software intensive systems, net-centric ops
- Enterprise-wide SE considerations
- Linking of architectures with SE products/technical baselines



# Potential SE Research Focus Areas

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- SE's Return on Investment (ROI)
  - Relationship of investment in SE effort to reduction in life cycle costs/program predictability
  - Metrics that support technical decisions and ROI
- Knowledge management SE repositories
  - Mechanisms to advance and share the state-of-the-practice
- Lean Six Sigma opportunities on SE processes
- SE application on services contracts
- Graduate/Continuing Education SE education needs
- SE for governance and strategic choices (investment)
  - Advanced training concepts