# DoD Systems Engineering Policy, Guidance, and Standardization Update

## Aileen Sedmak

### Office of the Deputy Assistant Secretary of Defense for Systems Engineering

### 20th Annual NDIA Systems Engineering Conference
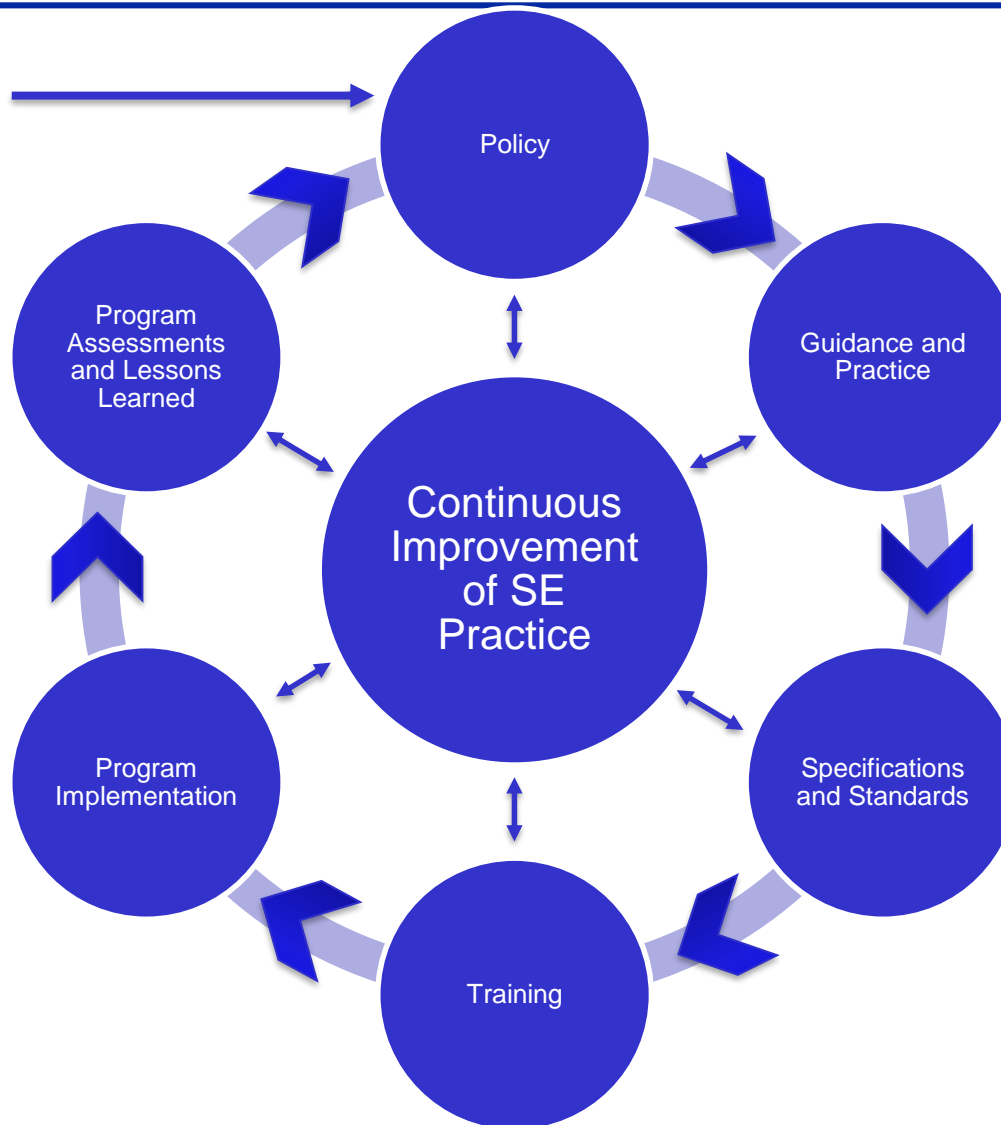
### Springfield, VA | October 25, 2017

# Systems Engineering Policy and Guidance

**Additional Drivers**
- Legislation
- Leadership Initiatives
- Evidence-Based Best Practices

Policy

Guidance and Practice

Specifications and Standards

Training

Program Implementation

Program Assessments and Lessons Learned

Continuous Improvement of SE Practice

# Recent / Emerging Changes to Systems Engineering Practice

➤ **Accomplishments**

- DoDI 5000.02 Operation of the Defense Acquisition System, Change 3, August 10, 2017

- Defense Acquisition Guidebook (DAG) Chapter 3, Systems Engineering

- Best Practices for Using SE Standards on Contracts for DoD Acquisition Programs

- Additional SE Guidance efforts

• **Current Initiatives**

- Prototyping and Rapid Fielding Policy (NDAA FY16 Section 804 and NDAA FY17 Section 806)

- MIL-HDBK-61A, "Configuration Management Guidance"

- Systems of Systems (SoS) ISO Non-government Standards (NGS)

• **Upcoming Drivers**

- National Defense Authorization Act for Fiscal Year 2017 (NDAA FY17)

  o Sections 805 – 809 "Acquisition agility act"

  o Section 855 "Mission integration management"

  o Section 875 "Use of commercial or non-Government standards in lieu of military specifications and standards"

# DoDI 5000.02
## SE-Related Updates & Items of Note

- **Core Instruction - Operation of the Defense Acquisition System**

- **Enclosures**

  1. **Acquisition Program Categories and Compliance Requirements**
  2. **Program Management**
  3. **Systems Engineering**
  4. Developmental Test and Evaluation (DT&E)
  5. Operational and Live Fire Test and Evaluation (OT&E and LFT&E)
  6. Life-Cycle Sustainment
  7. Human Systems Integration (HSI)
  8. Affordability Analysis and Investment Constraints
  9. Analysis of Alternatives (AoA)
  10. Cost Estimating and Reporting
  11. Requirements Applicable to All Programs Containing Information Technology (IT)
  12. ~~Acquisition of Defense Business Systems (DBS)~~
  13. Urgent Capabilities Acquisition ~~Rapid Fielding of Capabilities~~
  14. Cybersecurity in the Defense Acquisition System

**Change 1 to DoDI 5000.02 (January 26, 2017)**

- Approval authority for SEPs assigned to the Milestone Decision Authority (MDA)
- Software assurance best practices for implementation of tools and risk-based remediation
- "Modular Open Systems Approach" replaces "Open Systems Architecture"
- DASD(SE) required to advise on incorporation of best practices for SE from across the Department
- Specific risk mitigation techniques required to be considered
- Removed congressional notification requirement for competitive prototyping waiver
- Broaden MDA Waiver for any 2366b Certification requirements

**Change 2 to DoDI 5000.02 (February 2, 2017)**

- Removed Enclosure 12 and referenced new DoDI 5000.75, "Business Systems Requirements and Acquisition," February 2, 2017
- Cancelled DTM 17-001, "Cybersecurity in the Defense Acquisition System," January 11, 2017 and incorporated into Enclosure 14

**Change 3 to DoDI 5000.02 (August 10, 2017)**

- Administrative edits only

# Universal Update to the DAG

**February 2017 – Published and posted on the new DAU website**

- **Improve guidance to fully reflect current policy and DoD initiatives**

- **Address recommendations from Better Buying Power 3.0** *Streamline documentation requirements and staff reviews*

- **Incorporate recognized Department-wide best practices**

- **Update formatting and structure of the document to align to new DAG standardization guidelines**

# New DAG Website



**DEFENSE ACQUISITION GUIDEBOOK**

ASSOCIATED REFERENCES

CJCSI 3170.01
JCIDS Manual
DoDD 5000.01
DoDI 5000.02
DoDI 5000.74
DoDI 5000.75

FOREWORD

1 PROGRAM MANAGEMENT

2 ANALYSIS OF ALTERNATIVES, COST ESTIMATING & REPORTING

3 SYSTEMS ENGINEERING

4 LIFE CYCLE SUSTAINMENT

5 MANPOWER PLANNING & HUMAN SYSTEMS INTEGRATION

6 INFORMATION TECHNOLOGY & BUSINESS SYSTEMS

7 INTELLIGENCE SUPPORT & ACQUISITION

8 TEST & EVALUATION

9 PROGRAM PROTECTION

10 ACQUISITION OF SERVICES

## The new DAG website enables:

– Access through multiple devices (computer, tablet, cell phone, etc.)

– Ease in publishing changes to chapter content

**Systems Engineer is now Chapter 3 vice Chapter 4**

## https://www.dau.mil/tools/dag

# DAG Chapter 3 Outline

**CH 3 – 1.0 Purpose**

**CH 3 – 2.0 Background**

    **2.1 Systems Engineering Policy and Guidance**

    **2.2 Systems Engineering Plan**

    **2.3 Systems Level Considerations**

        **2.3.1 Software**

    **2.4 Tools, Techniques, and Lessons Learned**

        **2.4.1 Modular Open Systems Approach**

        **2.4.2 Modeling and Simulation**

        **2.4.3 Sustainability Analysis**

        **2.4.4 Value Engineering**

        **2.4.5 Lessons Learned, Best Practices, and Case Studies**

    **2.5 Engineering Resources**

    **2.6 Certifications**

    **2.7 Systems Engineering Role in Contracting**

**CH 3 – 3.0 Business Practices: Systems Engineering Activities in the Life Cycle**

    **3.1 Life-Cycle Expectations**

        **3.1.1 Systems Engineering in Defense Acquisition Program Models**

        **3.1.2 Systems of Systems**

    **3.2 Systems Engineering Activities in Life-Cycle Phases (includes 6 subsections, one for each life-cycle phase)**

    **3.3 Technical Reviews and Audits (includes 8 subsections, one for each technical review and audit)**

**CH 3 – 4.0 Additional Planning Considerations**

    **4.1 Technical Management Processes (includes 8 subsections, one for each technical management process)**

    **4.2 Technical Processes (includes 8 subsections, one for each technical process)**

    **4.3 Design Considerations (includes 24 subsections, one for each design consideration)**

# New DAG Chapter 3 Major Content Changes

## Version 0 (February 2017)

- **Emphasizes *Modular Open Systems Approach* in accordance with NDAA FY15 Section 801 (CH 3-2.4.1)**

- **Updates *SEP approval authority* based on NDAA FY16 Section 832 (CH 3-2.2)**

- **Addresses the key SE considerations for the *defense acquisition models* and life-cycle phases defined in the DoDI 5000.02, January 7, 2015 (CH 3-3.1, CH 3-3.2, and CH 3-3.3)**

- **Incorporates key tenets of the new *DoD Risk, Issue, and Opportunity Management Guide* developed in accordance with BBP 3.0 *Improve our leaders' ability to understand and mitigate technical risk* (CH 3-4.1.5)**

- **References recently *DoD-adopted Non-Government Standards* (IEEE/ISO/IEC15288, IEEE 15288.1, and IEEE 15288.2; EIA 649-1; AS 6500)**

- **Incorporates *Department-wide best practices* for software (CH 3-2.3.1), technical performance measures (CH 3-4.1.3 & CH 3-4.1.3.1), and technical planning process (CH 3-4.1.1)**

- **Enhanced Design Considerations in CH 3-4.3:**
  - Affordability -- SE Tradeoff Analyses; Anti-Counterfeiting; Corrosion Prevention and Control (CPC); Environment, Safety, and Occupational Health (ESOH); Intelligence (Life-cycle Mission Data Plan); Modular Design; and System Security Engineering

- **Removed obsolete information (e.g. In-Service Review (ISR))**

# DAG Chapter 3 Recent Updates

## Version 1 (May 2017)

- **Incorporating Change 1 and Change 2 to DoDI 5000.02**
  - Sec 2.3.1 Software
    - Updated references for Model 3: Incrementally Deployed Software Intensive Program to the new DoDI 5000.75
  - Sec 3.1.1 SE in the Defense Acquisition Program Models
    - Updated references for Model 3: Incrementally Deployed Software Intensive Program to the new DoDI 5000.75
    - Updated terminology for Model 4: Accelerated Acquisition Program «Rapid Fielding of Capabilities» to «Urgent Capability Acquisition»
  - Sec 3.2 SE in the Activities in Life-Cycle Phases (Multiple Sub-sections)
    - Addressed updates to prototyping policy (e.g., congressional waiver requirement for not conducting competitive prototyping removed)
  - Sec 4.1.5 Risk Management
    - Minor edits to address risk management techniques consistent with 10 U.S.C. 2431b

- **Addressed User Feedback**
  - Clarifying the Systems Engineer's responsibility in the Program Office
  - Replacing the System Threat Assessment Report (STAR) with the Validated On-line Life-cycle Threat (VOLT) report
  - Other administrative changes

## Constantly maintaining the currency of the DAG

- **DAG CH 1-3.4 provides guidance on integrated acquisition planning and execution**

  - Describes the IMP/IMS for planning, scheduling, and execution expectations

  - Emphasizes that the program-level IMP/IMS depends upon the development and integration of inputs from all functional areas.

- **Includes typical functional inputs for:**

  - Systems Engineering

  - Product Support

  - Contracting

  - Test & Evaluation

  - Budget

  - Production

  - International Acquisition & Exportability

## DAG CH 1 – Figure 12: SE Considerations
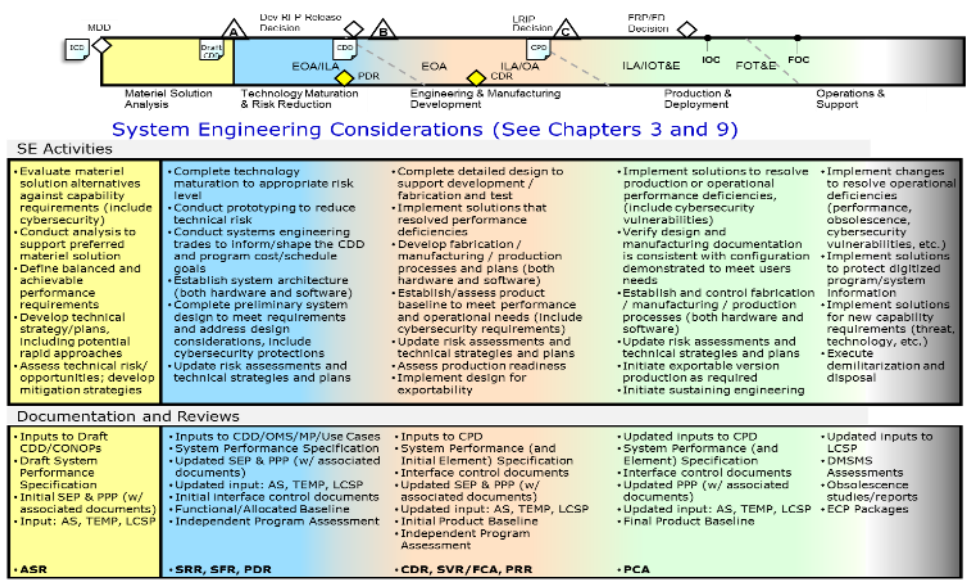


shortcut.dau.mil/DAG/CH01.03.04.03.01

## SE influence in DAG Chapter 1 – Program Management

- **UPDATED Acquisition Program Technical Certifications Summary**

  – Lists a non-exhaustive set of program and system-level certifications

  – Supplements DAG CH 3-2.6 Certifications

  – Provides a starting point to program managers and systems engineers for identifying applicable certification requirements

  – Posted on the DASD(SE) Guidance webpage:

  http://www.acq.osd.mil/se/pg/guidance.html



DAG CH 3-2.6 Certifications



**Acquisition Program Technical Certification Summary**

# DAG CH3 - Supplemental Guidance
## Design Considerations Standards Summary

- **NEW DAG Chapter 3 Design Considerations Standards Summary**
    - Identifies standards relevant to the design considerations discussed in the DAG CH 3-4.3 Design Considerations
    - Supplements Table 42, which lists the relevant statutes, policy, and guidance for each design consideration
    - Provides program managers and systems engineers appropriate standards they may incorporate into acquisition contracts
    - Posted on the DASD(SE) Guidance webpage:

        https://www.acq.osd.mil/se/docs/2017-DAG3-Std.pdf



**DAG CH 3-4.3 Design Considerations, Table 42**



**Design Considerations Standards Summary**

# IEEE 15288.1 & 15288.2
# NDIA Utilization Guidance
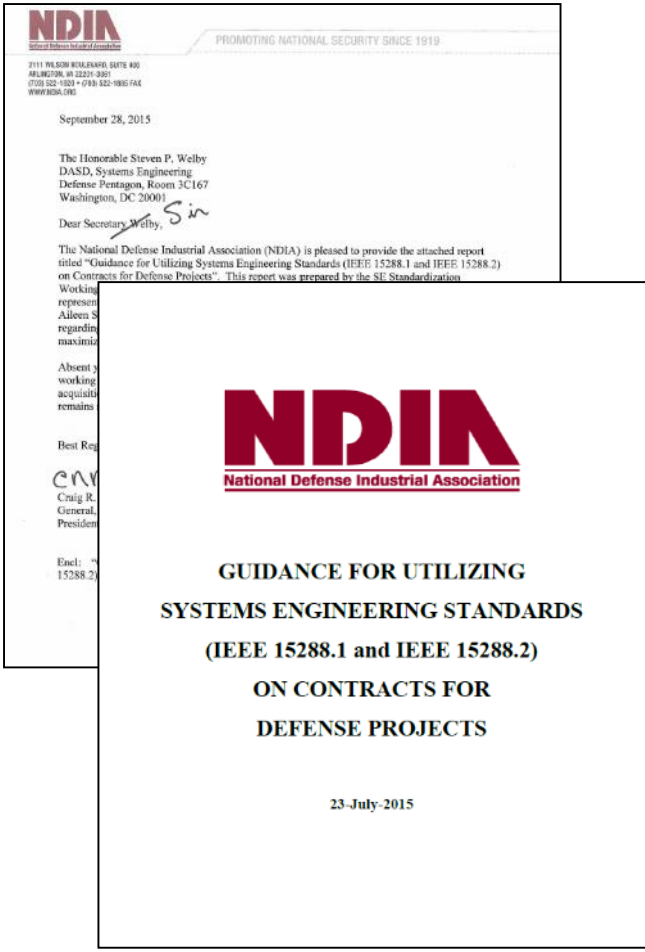


- **At an NDIA SE Division meeting, industry partners expressed concern over the number of normative requirements in the new standards**
  - 750+ normative requirements in 15288.1
  - 1600+ normative requirements in 15288.2

- **NDIA initiated SE Standardization Working Group to develop recommended guidance for effectively and efficiently using the new SE standards on contract**

- **NDIA, in collaboration with DoD representatives, drafted guidance for using 15288.1 and 15288.2 on contract**

- **NDIA provided the guidance as recommendations to DoD, which represented industry's perspective and is aimed at maximizing value to both Government and industry**

**Without appropriate tailoring of the SE Standards, assessing compliance could add significant burden and cost on both the Government and industry**

# DoD Best Practices for Using SE Standards on Contracts for DoD Acquisition Programs Implementation Guidance

- ## Collaborated with key DoD stakeholders:
  - Army, Navy, Air Force, DCMA, DPAP, DAU, and Defense Standardization Program Office (DSPO)

- ## The DoD Implementation Guide:
  - Incorporates relevant DoD statute, policies, and procedures
  - Addresses ISO/IEC/IEEE 15288 as it establishes the common SE framework that is the basis for the two companion standards (IEEE 15288.1 and 15288.2)
  - Provides tailoring template that the Government can use to efficiently convey the specific set of requirements to industry

http://www.acq.osd.mil/se/docs/15288-Guide-2017.pdf

**Best Practices for Using**

**Systems Engineering Standards**

**(ISO/IEC/IEEE 15288, IEEE 15288.1, and IEEE 15288.2) on**

**Contracts for Department of Defense Acquisition Programs**

April 2017

Prepared by:
Office of the Deputy Assistant Secretary of Defense for Systems Engineering

Office of the Under Secretary of Defense for
Acquisition, Technology, and Logistics

## DoD leveraged the NDIA recommended guidance

# Other New SE Guidance, White Papers and Publications

- *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* (Jan 2017)

- *Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report Outline Guidance* (Feb 2017)

- "Model-Based Systems Engineering: Enabling the Digital Engineering Practice in the Department of Defense," Kristen Baldwin, Getting It Right 7(3), February 27, 2017: 1, 3.

- *Digital Model-based Engineering: Expectations, Prerequisites, and Challenges of Infusion* (Mar 2017), developed by the Model-Based Systems Engineering (MBSE) Infusion Task Team

- *Guidebook for Acquiring Engineering Technical Services (ETS) Best Practices & Lessons Learned Version 2.0* (Apr 2017)

**These documents can be found at
http://www.acq.osd.mil/se/pg/guidance.html &
http://www.acq.osd.mil/se/pubs/index.html**

# Recent / Emerging Changes to Systems Engineering Practice

✓ **Accomplishments**

- DoDI 5000.02 Operation of the Defense Acquisition System, Change 3, August 10, 2017

- Defense Acquisition Guidebook (DAG) Chapter 3, Systems Engineering

- Best Practices for Using SE Standards on Contracts for DoD Acquisition Programs

- Additional SE Guidance efforts

➤ **Current Initiatives**

- Prototyping and Rapid Fielding Policy (NDAA FY16 Section 804 and NDAA FY17 Section 806)

- MIL-HDBK-61A, "Configuration Management Guidance"

- Systems of Systems (SoS) ISO Non-government Standards (NGS)

• **Upcoming Drivers**

- National Defense Authorization Act for Fiscal Year 2017 (NDAA FY17)

  o Sections 805 – 809 "Acquisition agility act"

  o Section 855 "Mission integration management"

  o Section 875 "Use of commercial or non-Government standards in lieu of military specifications and standards"

# Prototyping and Rapid Fielding Policy

## NDAA FY16 Sec 804 and NDAA FY17 Sec 806 established new authorities for Prototyping and Rapid Fielding

- **NDAA FY16 Section 804:**
  - **Objective:** <u>Accelerate</u> our speed of <u>innovation</u>, maintain DoD's <u>lethality</u>, and <u>rapidly deliver</u> warfighting capabilities within a two to five year period
  - **Rapid Prototyping:** Use <u>innovative technologies</u> to rapidly develop fieldable prototypes that can be successfully demonstrated in an operational environment and provide for a residual operational capability
  - **Rapid Fielding:** Use <u>proven technologies</u> or off-the-shelf capability to field production quantities of new or upgraded systems with minimal development required
- **NDAA FY17 Section 806:**
  - **Objective:** To mature and demonstrate <u>high risk components/technologies</u> separate from a program of record
- **DoD Policy will:**
  - Address broad, overarching DoD prototyping practices
  - Include rapid prototyping and rapid fielding as two potential methods
  - Allow the Services to develop and implement Service unique prototyping policy aligned with statute

# MIL-HDBK-61A Revision

- **Update MIL-HDBK-61A, "Configuration Management Guidance" to provide overarching guidance for Configuration Management (CM) on DoD programs**
  - Retain guidance but remove implementation-level information, focusing on the "inherently government" functions for CM
  - Incorporating tailoring guidance and providing relationship to SAE/EIA-649, SAE/EIA 649-1, and GEIA HB-649A

- **Additional areas to be addressed:**
  - CM of electronic data models
    - State of the art for systems design and development has evolved over time
    - Use of non-digital documentation has migrated to use of digital artifacts
  - CM of software elements versus hardware elements
    - Prevalence of ever greater reliance on software/firmware in DoD systems

- **MIL-HDBK-61A revision ongoing**
  - Initiated in October 2015
  - Air Force leading a tri-Service Working Group
  - Draft update estimated to be complete in early 2018

# Systems of Systems Engineering (SoSE) Standardization

**ISO/IEC JTC 1/SC1
SoSE Study Group Report**



**ISO/IEC/IEEE 21839 Committee Draft**

- **Three new Systems of Systems standards in development based on recommendation of 2016 ISO Study Group on SoS Standards**

- **ISO/IEC/IEEE 21839**

  **Systems and software engineering -- System of systems considerations in life cycle stages of a system**

  – Based on TTCP Best Practices Guide

  – CD released in May 2017; 270 comments received and resolved; next version slated for October 2017

- **ISO/IEC 21841**

  **Taxonomies of SoS Types**

  – Elaboration of ISO/IEC 15288 Annex G

  – Initial CD now complete and will be released for comment this fall

- **ISO/IEC 21840**

  **Application of SE Processes for SoSE across the life cycle**

  – Elaboration of ISO/IEC 15288 Annex G

  – Draft in work

# Recent / Emerging Changes to Systems Engineering Practice

✓ **Accomplishments**

– DoDI 5000.02 Operation of the Defense Acquisition System, Change 3, August 10, 2017

– Defense Acquisition Guidebook (DAG) Chapter 3, Systems Engineering

– Best Practices for Using SE Standards on Contracts for DoD Acquisition Programs

– Additional SE Guidance efforts

✓ **Current Initiatives**

– Prototyping and Rapid Fielding Policy (NDAA FY16 Section 804 and NDAA FY17 Section 806)

– MIL-HDBK-61A, "Configuration Management Guidance"

– Systems of Systems (SoS) ISO Non-government Standards (NGS)

➢ **Upcoming Drivers**

– National Defense Authorization Act for Fiscal Year 2017 (NDAA FY17)

  o Sections 805 – 809 "Acquisition agility act"

  o Section 855 "Mission integration management"

  o Section 875 "Use of commercial or non-Government standards in lieu of military specifications and standards"

# Sections 805 – 809
## "Acquisition Agility Act"

- **Requires major defense acquisition programs (MDAPs) to be more flexible**
  - Provides warfighter capabilities more quickly but with flexible, open-system architectures that allow components to evolve with technologies and threats.
  - Requires use of modular open system approaches (MOSA), to maximum extent practicable, in MDAP design and development i.e. more flexibility to incorporate weapon system components
  - SECDEF establishes MDAP cost and fielding targets
  - Requires Independent Technical Risk Assessments (ITRA) to assess technology and manufacturing risks to inform milestone decision points
  - Amends technical data rights for major system interfaces
- **Calls for weapon system components and their underlying technologies be matured through a separate, dedicated development path**
  - Matured in parallel with the large acquisition program of record
  - Identified prototyping as one method to separately mature technology

## Goal: Improve the DoD's ability to field and evolve weapon systems

# Section 855
## "Mission Integration Management"

**Goal: Improve critical Joint military capabilities that need close technical and operational coupling and integration across many systems**

## Key Points from Legislation on Mission Integration Management (MIM)

**SEC. 855. MISSION INTEGRATION MANAGEMENT.**

(a) IN GENERAL.—The Secretary of Defense shall establish mission integration management activities for each mission area specified in subsection (b).

(b) COVERED MISSION AREAS.—The mission areas specified in this subsection are mission areas that involve multiple Armed Forces and multiple programs and, at a minimum, include the following:

(1) Close air support.
(2) Air defense and offensive and defensive counter-air.
(3) Interdiction.
(4) Intelligence, surveillance, and reconnaissance.
(5) Any other overlapping mission area of significance, as jointly designated by the Deputy Secretary of Defense and the Vice Chairman of the Joint Chiefs of Staff for purposes of this subsection.

(c) QUALIFICATIONS.—Mission integration management activities shall be performed by qualified personnel from the acquisition and operational communities.

(d) RESPONSIBILITIES.—The mission integration management activities for a mission area under this section shall include—

(1) development of technical infrastructure for engineering, analysis, and test, including data, modeling, analytic tools, and simulations;

(2) the conduct of tests, demonstrations, exercises, and focused experiments for compelling challenges and opportunities;

(3) overseeing the implementation of section 2446c of title 10, United States Code;

(4) sponsoring and overseeing research on and development of (including tests and demonstrations) automated tools for composing systems of systems on demand;

(5) developing mission-based inputs for the requirements process, assessment of concepts, prototypes, design options, budgeting and resource allocation, and program and portfolio management; and

(6) coordinating with commanders of the combatant commands on the development of concepts of operation and operational plans.

**Four recommended mission areas with options for additional areas**

**Six 'responsibility' areas**

# Section 875
## "Use of commercial or non-Government standards in lieu of military specifications and standards."

**The majority of the requirements have been accomplished in response to Acquisition Reform**

- **Changes to <u>DFARS</u> to encourage contractors to propose commercial or non-Government standards and industry-wide practices was approved by the DAR Council and is awaiting publication in the Federal Register for public comment**

- **Seeking relief on the <u>waiver requirement</u> for the use of military specifications; the current process of controlling development, revision, etc. of military specifications and standards is more effective**

- **Working with the DoD Components to develop plans for <u>negotiating licenses</u> for standards to be used across the Department of Defense**

# Conclusion

- **SE is a continually evolving practice.**

- **Policy, guidance, and standards are constantly being revised to reflect the current state of SE.**

- **We will continue to keep the SE practitioner and acquisition community informed of new and emerging updates.**

# Systems Engineering:
# Critical to Defense Acquisition



## *Defense Innovation Marketplace*
### *http://www.defenseinnovationmarketplace.mil*
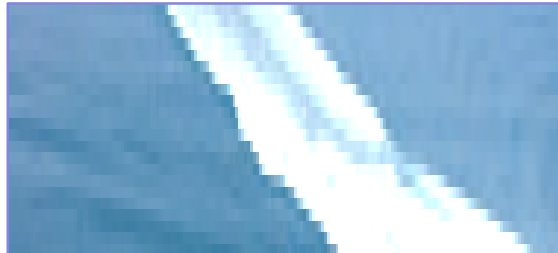
## *DASD, Systems Engineering*
### *http://www.acq.osd.mil/se*

# For Additional Information

**Aileen Sedmak**

**ODASD, Systems Engineering**
**703-695-6364 |**
**aileen.g.sedmak.civ@mail.mil**