



# **Systems Engineering at DoD: Focus on Policy, Standards and Guidance**

**Donald J. Gantzer**

**Systems Engineering Directorate**

**Office of the Director, Defense Research and Engineering**

**Donald.gantzer.CTR@osd.mil**

**INCOSE Chesapeake Chapter**

**April 2010**



# Key DoD Themes



1. Take care of our people
2. Rebalancing the Military
3. Reforming what and how we buy
4. Supporting our troops in the field



***Secretary of Defense***  
***HASC Budget Rollout Brief***  
***February 2010***



# Agenda



- **Recent Changes in DOD Policy re SE**
  - DODI 5000.02 Operation of the Defense Acquisition System
  - Weapon Systems Acquisition Reform Act [WSARA]
- **New DOD SE Organization now in DDR&E**
- **Overview of SE focus & functions**
- **Overview of SE DoD standards & guides activities**



# Upfront Summary of Policy Changes

- **DoD 5000.02 [2008] emphasizes early stages of pre-systems acquisition - prior to Milestone B**
  - Reduce risk before making business commitment
  - Improve likelihood of being able to meet commitments
- **The Weapon Systems Acquisition Reform Act [2009] furthers this emphasis with**
  - additional certification requirements at MS A and B [e.g., technology assessment maturity, integration risk of critical technologies,
  - mandatory competitive prototyping, and
  - system-level Preliminary Design Review [PDR] before MS B for all MDAPs
  - strengthens technical analysis of cost & schedule breaches

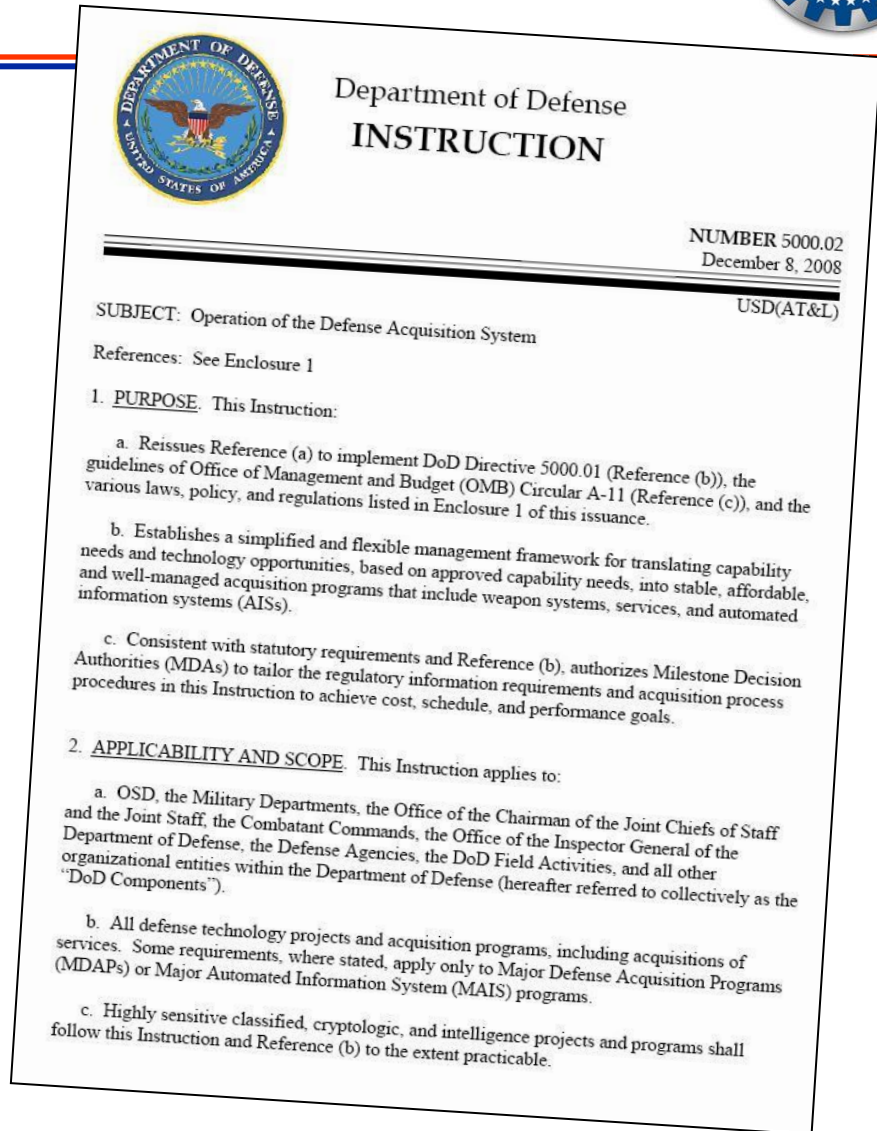
***Knowledge-based Acquisition – Starting Programs Right!***



# DoD Instruction 5000.02 [Dec 2008]



- Mandatory **Materiel Development Decision**
- Mandatory **Milestone A** for all “major weapon systems” requiring technology development
- Mandatory system-level **PDR and CDR** with reports to and assessments by the Milestone Decision Authority (MDA)
- Strengthened MDA **certifications** at Milestones A and B





# New Systems Engineering Enclosure 12

*[of DODI 5000.02]*



- **Codifies three previous SE policy memoranda**
- **Codifies a number of SE-related policies and statutes since 2003:**
  - **Environmental Safety and Occupational Health**
  - **Corrosion Prevention and Control**
  - **Modular Open Systems Approach**
  - **Data Management and Technical Data Rights**
  - **Item Unique Identification**
  - **Spectrum Supportability**
- **Introduces new policy on Configuration Management**



# Support for Change



## Weapon Systems Acquisition Reform Act of 2009 (Public Law 111-23)

- Establishes *Director, Systems Engineering* as principal systems engineering advisor to the SECDEF and the USD(AT&L)
- Requires Congressional reporting on Systems Engineering Capabilities and MDAP achievement of measurable performance criteria
- WSARA signed into law 22 May 2009
- Director, Systems Engineering on board 21 Sep 2009
- Implementing DTM signed by USD(AT&L) 4 Dec 2009; Acquisition Guidance on-line 31 Jan 2010
- DoD Directive formalizing responsibilities of Director, Systems Engineering in development
- First annual WSARA SE / DT&E Joint Report delivered to Congress 31 Mar 2010



President Barack Obama hands a pen to U.S. Rep. Robert Andrews (D-NJ) as he signs the Weapons Systems Acquisition Reform Act in the Rose Garden at the White House Friday, May 22, 2009. Standing from left are: Andrews, Rep. John McHugh (R-NY), Sen. Carl Levin (D-MI), Rep. Ike Skelton (D-MO) and Rep. Mike Conaway (R-TX). Official White House Photo by Samantha Appleton

MDAP- Major Defense Acquisition Program (USC 2430)



# Weapon Systems Acquisition Reform Act of 2009

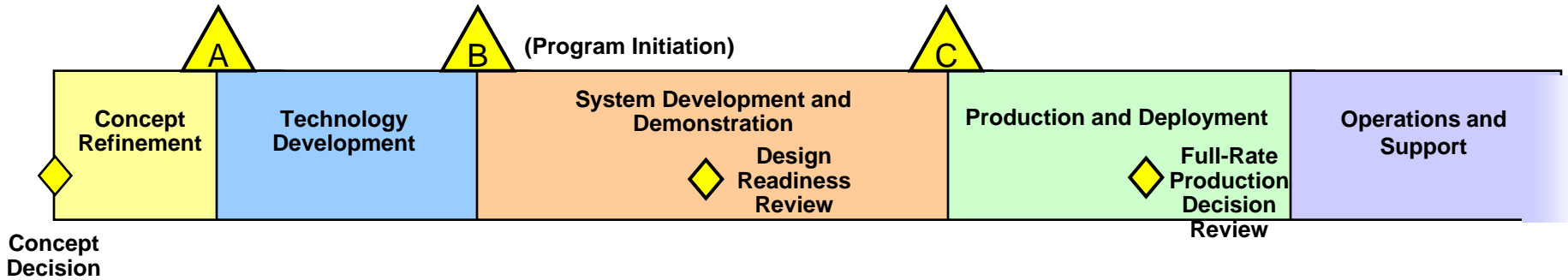


- Establishes Director, Systems Engineering (D, SE) and Director, Developmental Test and Evaluation (D, DT&E) as principal advisors to the Secretary of Defense and the USD(AT&L) on systems engineering and development planning and on developmental T&E, respectively
- Mandates documented **assessment of technological maturity and integration risk** of critical technologies for MDAPs during the Technology Development (TD) phase
- Establishes D, DT&E and D, SE **joint tracking and Congressional reporting** on MDAP achievement of measurable performance criteria
- Mandates **competitive prototyping** and MDA completion of a formal Post-Preliminary Design Review Assessment for all MDAPs before MS B; additional MDA certification to both at MS B
- Strengthens **technical analysis of cost and schedule breaches** during the Technology Development (pre-MS B) and the Engineering and Manufacturing Development (post-MS B) phases

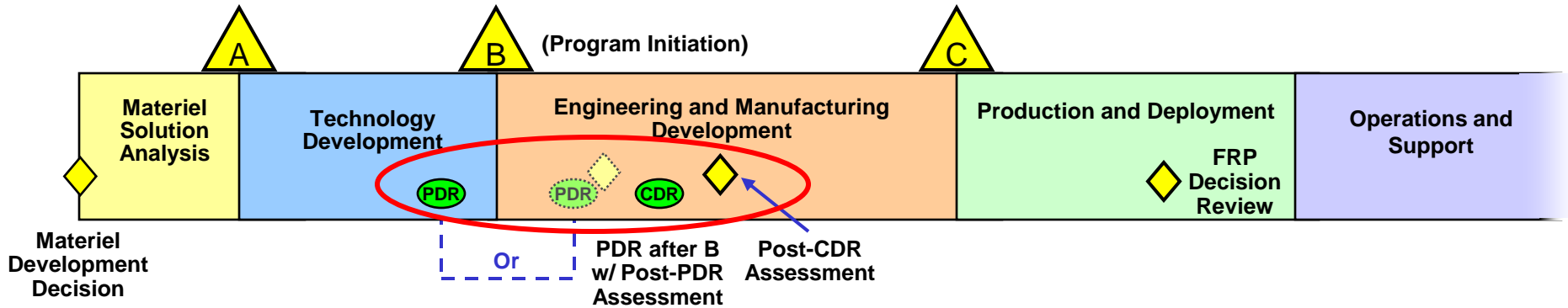


# Acquisition Lifecycle Comparisons

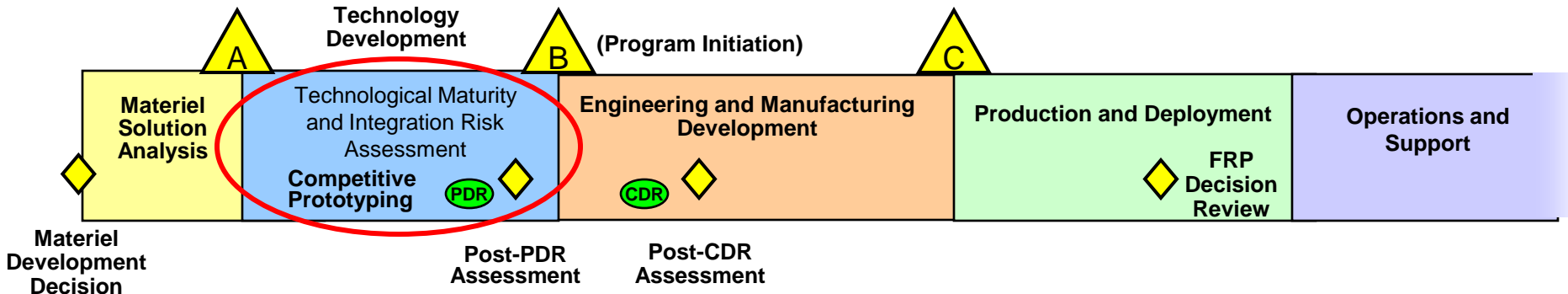
## *Defense Acquisition Management System, May 12, 2003*



## *Defense Acquisition Management System, December 8, 2008*



## *Defense Acquisition Management System, May 22, 2009*





# Acquisition Reform Summary

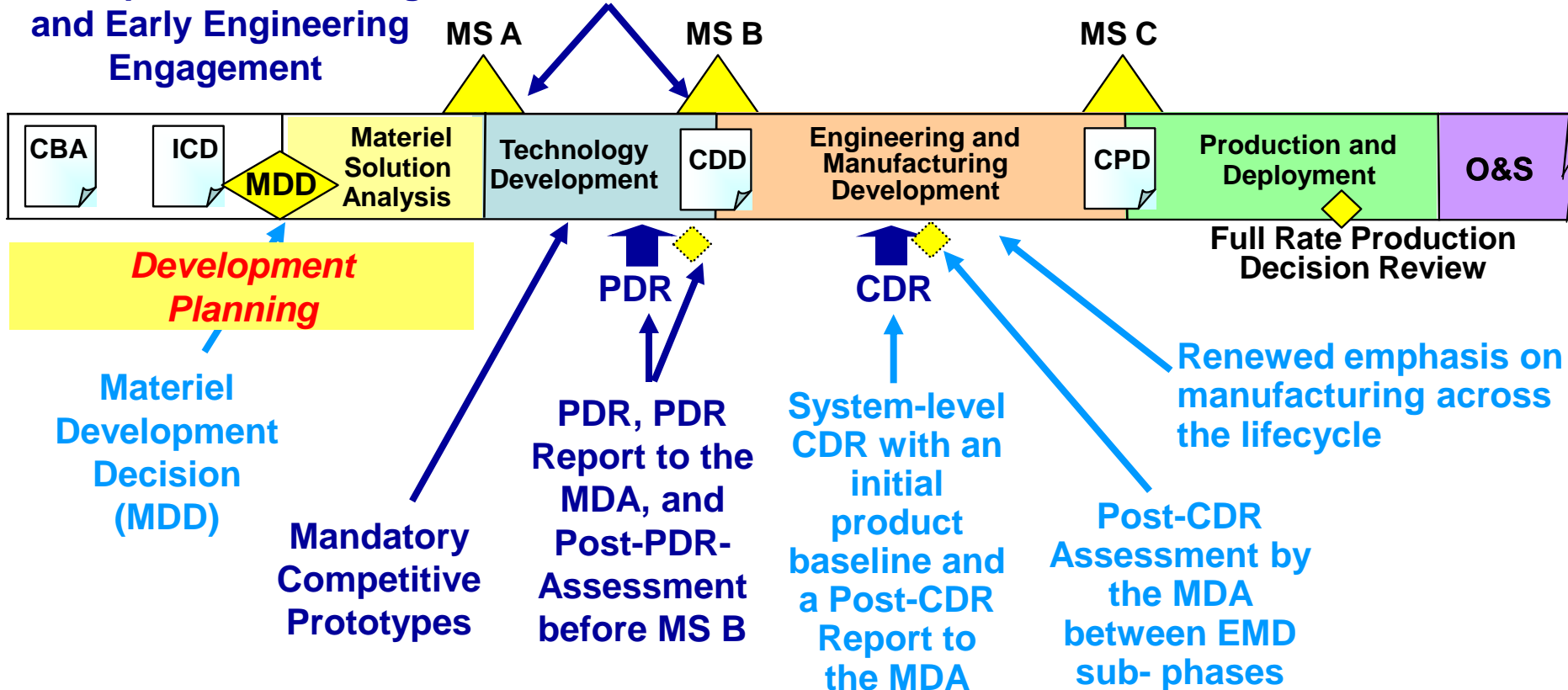
- **New legislation, Public Law 111-23 (WSARA) recognizes the importance of SE to weapon systems acquisition**
- **Heavy focus on starting MDAPs right:**
  - Development and tracking of **measurable performance criteria** as part of SEPs and TESSs / TEMP
  - Requiring completion of **competitive prototypes** for all Major Defense Acquisition Programs (MDAPs)
  - Requiring completion and MDA assessment of a system-level **Preliminary Design Review (PDR)** before MS B
  - Codifying a role for SE in **development planning**, lifecycle management and sustainability
- **Yearly OSD assessment to Congress of Component capabilities for SE, development planning, and DT&E**



# DoD 5000.02 and PL 111-23 – the Changed Acquisition Landscape

**Renewed Emphasis on Developmental Planning and Early Engineering Engagement**

**New 2366a & 2366b Certifications\***



**“Knowledge-based” Decision Making . . .making acquisition decisions when you have solid evidence and acceptable risk**



# What This Means for Systems Engineers



- **Systems engineering is now recognized in law as inherently necessary in requirements definition, development planning, and early acquisition**
- **Need for and focus of *all* engineering in the “pre-acquisition” phases (Materiel Decision Analysis and Technology Development) is dramatically altered:**
  - Earlier engineering involvement (well before Milestone A)
  - More government expertise to plan for and oversee requirements definition, technology maturation, and competitive prototyping leading to fully expressed system design (the allocated baseline) at the system-level Preliminary Design Review



# Director, Defense Research & Engineering (DDR&E)



DDR&E is the principal staff advisor to the USD (AT&L) and to the SecDef for research and engineering matters. DDR&E serves as the CTO for the DoD



**Director, Defense Research and Engineering (DDR&E)**  
**Honorable Zachary J. Lemnios**

**Principal Deputy**  
**Mr. Alan R. Shaffer**

**Defense Advanced Research Projects Agency (DARPA)**  
**Dr. Regina Dugan**

**Defense Technical Information Center (DTIC)**  
**Mr. Paul Ryan**

**Director, Research**  
**Dr. David Honey**  
**Principal Deputy**  
**Dr. André van Tilborg**

**Director, Systems Engineering**  
**Mr. Stephen Welby**  
**Principal Deputy**  
**Mr. Terry Jagers**

**Director, Rapid Fielding**  
**Mr. Earl Wyatt**  
**Principal Deputy**  
**Mr. Ben Riley**

**Director, Developmental Test & Evaluation (DT&E)**  
**Mr. Edward Greer**  
**Principal Deputy**  
**Mr. Chris DiPetto**



# DDR&E Imperatives

1. Accelerate delivery of technical capabilities to win the current fight
  - SE Focus: Support the current fight, **manage risk** with discipline
  
2. Prepare for an uncertain future
  - SE Focus: Grow engineering **capabilities** to address emerging challenges
  
3. Reduce the cost, acquisition time and risk of our Major Defense Acquisition Programs
  - SE Focus: Champion **Systems Engineering** as a **tool** to improve acquisition quality
  
4. Develop World Class Science, Technology, Engineering and Mathematics capabilities for the DoD and the Nation
  - SE Focus: Develop future **technical leaders** across the acquisition enterprise



# Systems Engineering Mission



We execute substantive technical engagement throughout the acquisition life cycle with major and selected acquisition efforts across DoD.

We apply best engineering practices to:

- Help program managers identify and **mitigate risks**
- Shape **technical planning** and management
- **Support and advocate** for DoD Component initiatives
- Provide **insight** to OSD stakeholders
- Identify **systemic issues** for resolution above the program level

We are the “E” in **DDR&E**





# Director, Systems Engineering



Director, Systems Engineering  
 Stephen Welby

Terry Jagers, Principal Deputy

**Systems Analysis**  
 Kristen Baldwin

**Major Program Support**  
 James Thompson

**Mission Assurance**  
 Nicholas Torelli

**Addressing Emerging Challenges  
 on the Frontiers of  
 Systems Engineering**

- Analysis of Complex Systems/Systems of Systems
- Development Planning/Early SE
- Program Protection/Acquisition Cyber Security
- University and Industrial Engineering Research

**Supporting USD(AT&L) Decisions  
 with Independent  
 Engineering Expertise**

- Engineering Assessment / Mentoring of Major Defense Programs
- Program Support Reviews
- OIPT / DAB / ITAB Support
- Systems Engineering Plans
- Systemic Root Cause Analysis

**Leading Systems Engineering  
 Practice in DoD and Industry**

- Systems Engineering Policy, Guidance, and Standards
- Specialty Engineering (System Safety, Reliability / Availability / Maintainability, Quality, Manufacturing, Producibility, Human Systems Integration (HSI))
- Technical Workforce Development

Providing technical support and systems engineering leadership and oversight to USD(AT&L) in support of planned and ongoing acquisition programs





# Multi-Level Engagement

## System Engineering

### Policy & Guidance

- *Systems Engineering*
- *Software Engineering*

### Program Support

- *Program Support Reviews*
- *OIPT and SE WIPTs*
- *Post-PDR/CDR Review & Assessment*

### Workforce Planning

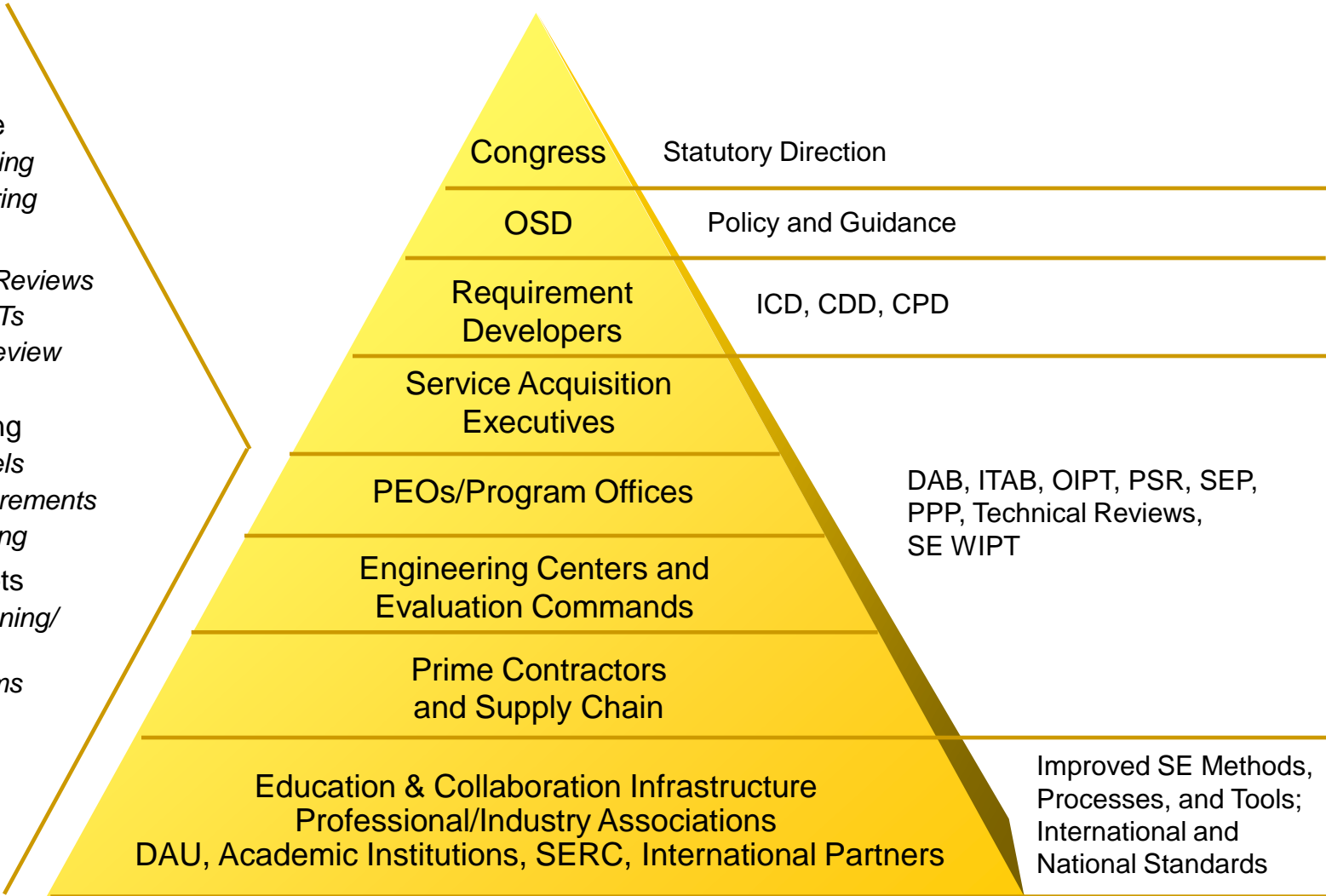
- *Competency Models*
- *Certification Requirements*
- *Education & Training*

### Emerging Concepts

- *Development Planning/ Early SE*
- *Systems of Systems*
- *SE Research*

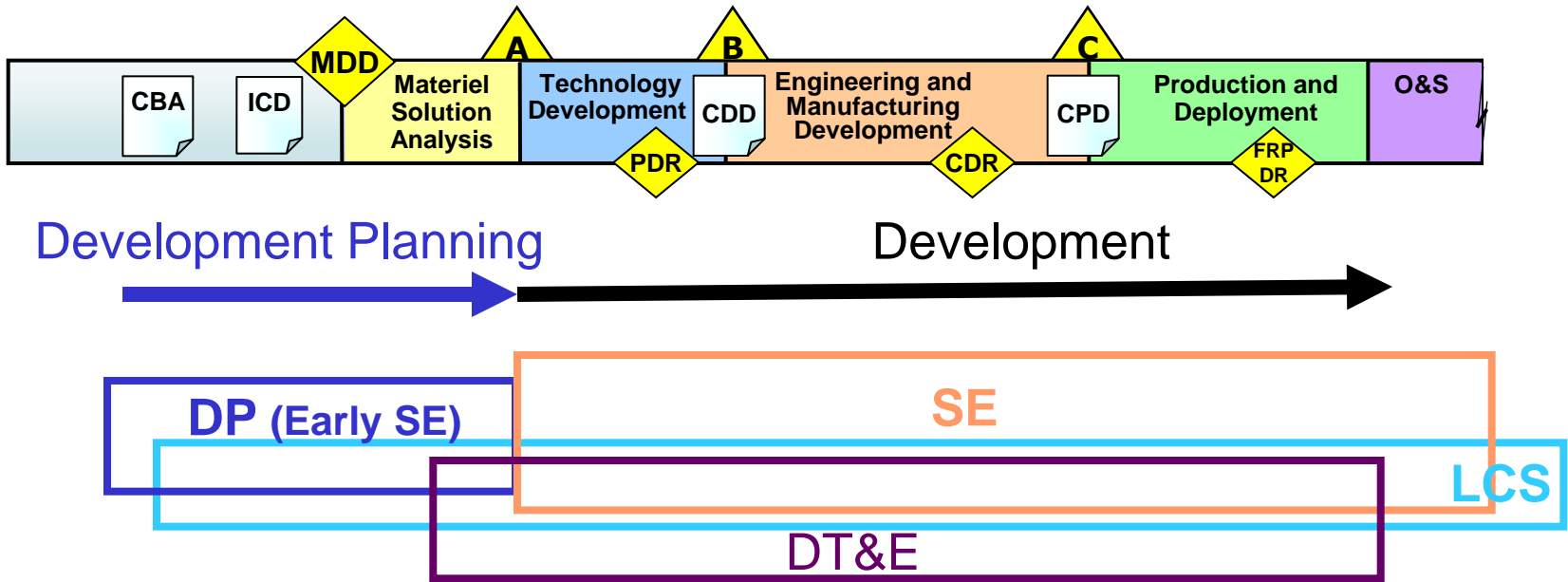
### Outreach

- *SE Forum*
- *Engagement Strategy*





# DP, SE and DT&E Framework

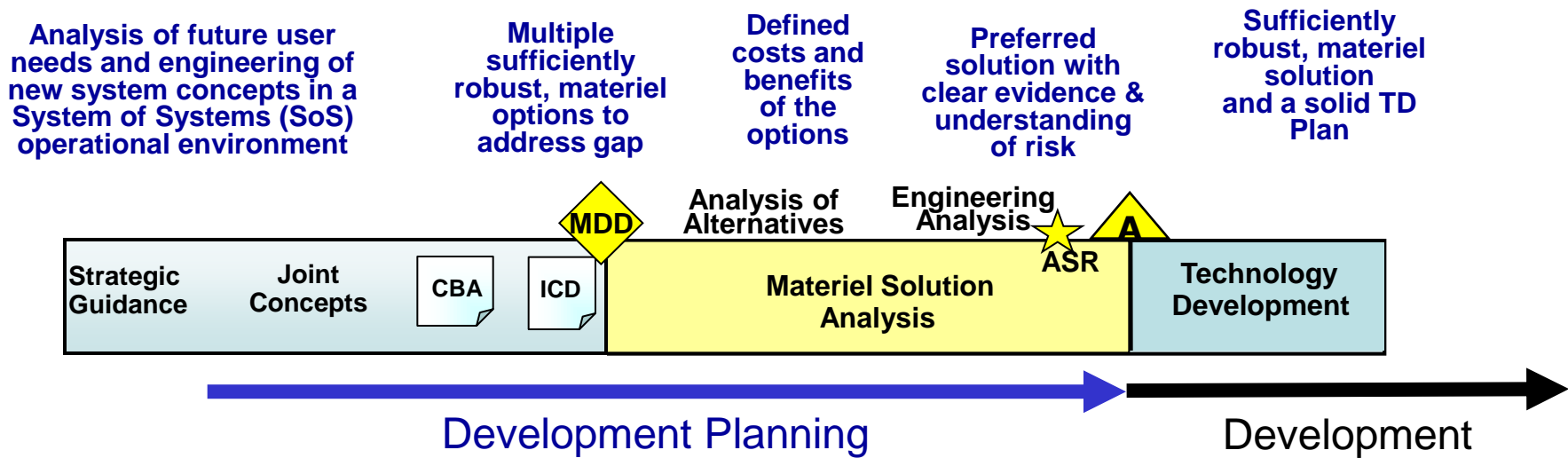


**DP: Development Planning**  
**DT&E: Developmental Test and Evaluation**  
**LCS: Life Cycle Sustainment**  
**SE: System Engineering**  
**CBA: Capabilities Based Assessment**  
**CDD: Capability Development Document**  
**CPD: Capability Production Document**  
**ICD: Initial Capabilities Document**  
**MDD: Materiel Development Decision**



# Development Planning

- Development Planning is a new requirement established by WSARA
  - The D, SE shall oversee Development Planning activities of major defense acquisition programs, and periodically assess Component Development Planning capabilities*



**Development Planning is the upfront technical preparation to ensure successful selection and development of a materiel solution**



# DAG 4.2 Implementation of Lifecycle Processes for Engineering a System



## Project (Technical Management) Processes

Decision Analysis

Technical Planning

Technical Assessment

Requirements Management

Risk Management

**Configuration Management**

**Technical Data Management**

Interface Management

## Technical Processes

Stakeholder Requirements Definition

Requirements Analysis

**Architecture Design**

Integration

Verification

Validation

Implementation

Transition

\* Revision per ISO/IEC 15288



# DAG 4.4. Systems Engineering Design Considerations



- 4.4.1. Accessibility
- 4.4.2. Commercial Off-the-Shelf (COTS)
- 4.4.3. Corrosion Prevention and Control
- 4.4.4. Critical Safety Items (CSIs)
- 4.4.5. Disposal and Demilitarization
- 4.4.6. Diminishing Manufacturing Sources and Material Shortages (DMSMS)
- 4.4.7. Environment, Safety, and Occupational Health (ESOH)
- 4.4.8. Human Systems Integration (HSI)
- 4.4.9. Insensitive Munitions (IM)
- 4.4.10. Interoperability
- 4.4.11. Open Systems Design
- 4.4.12. Parts Management
- 4.4.13. Program Protection & System Assurance
- 4.4.14. Quality and Producibility
- 4.4.15. Reliability, Availability, and Maintainability
- 4.4.16. Software
- 4.4.17. Spectrum Management
- 4.4.18. Standardization
- 4.4.19. Supportability
- 4.4.20. Survivability and Susceptibility
- 4.4.21. Unique Identification of Items



# DAG 4.5. Key Systems Engineering Tools and Techniques



**4.5.1. Systems Engineering Plan (SEP)**

**4.5.2. Integrated Master Plan (IMP)**

**4.5.3. Integrated Master Schedule (IMS)**

**4.5.4. Earned Value Management (EVM) and Work Breakdown Structure (WBS)**

**4.5.5. Value Engineering (VE)**

**4.5.6. Types of Technical Assessments**

**4.5.6.1. Technical Performance Measurements (TPMs) and Critical Technical Parameters (CTPs)**

**4.5.6.2. Program Support Review (PSR)**

**4.5.6.3. Assessment of Operational Test Readiness (AOTR)**

**4.5.7. Trade Studies**

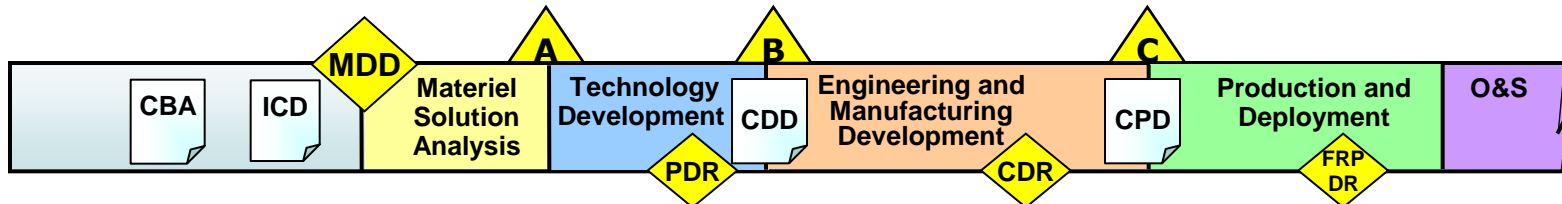
**4.5.8. Modeling and Simulation (M&S)**

**4.5.9. Summary of Technical Reviews**



# Critical SE Activities

What are the critical SE activities that occur between initial design to IOT&E?



MS A and MS B SEPs define SE organization and plans for each MDAP

Systems Engineering Plan <sup>1</sup>	Prepare a SEP for each Milestone Review
	Support the Technical Development Strategy (TDS)
	SEP supports Technical Reviews
	SE Implemented as Prescribed in SEP
Systems Engineering Leadership <sup>1</sup>	Each PEO has a Chief Systems Engineer
	Provisions for SE on Contracts/RFPs
Technical Reviews <sup>1</sup>	Event-Driven; Conducted in Accordance with the SEP
	PDR and Post-PDR Assessment Report
	Critical Design Review (CDR) and Post-CDR Report
RAM <sup>2</sup>	SE Principles Applied to Enhance RAM
	RAM Requirements Included in RFPs
	Robust Program for RAM Improvement
	RAM Requirements are Identified in JCIDS
Lifecycle Management & Sustainability <sup>2</sup>	Sustainment metrics outlined in SEP
	PBL strategy outlined in SEP
	Enable effective sustainment governance

<sup>1</sup>5000.02 Enclosure 12

<sup>2</sup>Weapon Systems Acquisition Reform Act



# DAG 4.5.1 Systems Engineering Plan (SEP) Changes for PMO



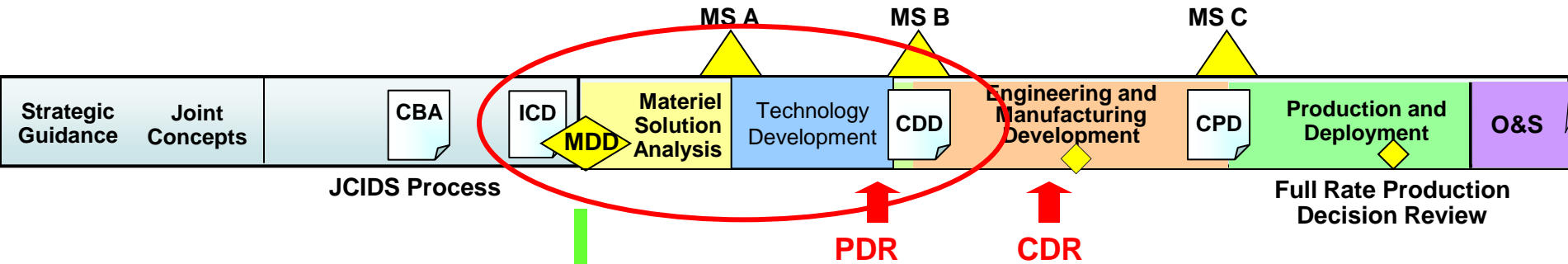
- **Explicit technical planning for the Technology Development phase at Milestone A including:**
  - Technology maturation
  - Competitive prototyping
  - Manufacturing maturity
  - Critical Program Information in design
  - Item Unique Identification (IUID)
- **Mandatory system-level PDR with rationale for its placement before or after Milestone B (unless MDAP)**
  - PDR Report to the MDA either side of MS B
  - Post-PDR Assessment by the MDA with ADM if after MS B
- **Mandatory system-level CDR**
  - Post-CDR Report to and Assessment by the MDA followed by an ADM
- **IUID Implementation Plan as SEP Annex at MS B and C**





# Summary: Systems Engineering – Starting Programs Right

- What's relevant:**
- **Mandatory Materiel Development Decision**
  - **Mandatory Milestone A** for all “major weapon systems” requiring technology development
  - **Mandatory PDR\*** and **CDR\*** with reports to the **MDA\***



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

- 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



# Summary of SE and Technology Development Phase



**Documents / activities / data requiring technical input from the Systems Engineer BEFORE Milestone A:**

- **Analysis of Alternatives**
- **Technology Development Strategy**
  - **Critical Program Information**
  - **Technology maturation plans**
  - **Competitive Prototyping plans**
  - **Net-Centric Data Strategy**
  - **Market Research**
  - **Data Management Strategy**
- **Component Cost Estimate**
- **Systems Engineering Plan**
- **Test and Evaluation Plan**

**The Systems Engineer's Challenge: Where to find the data!?**



# DOD Standardization Executive Realignment



- **Transferred from OSD Logistics to OSD Systems Engineering**
- **Why? – Weapon Systems Acquisition Reform Act of 2009 codifies Director of Systems Engineering**
  - Provide systems engineering principles and best practices e.g., to enhance reliability, availability, and maintainability of defense systems
    - Specifications and standards are key systems engineering process inputs to define requirements
    - Specifications and standards are key systems engineering process outputs to establish product baselines and measure compliance
- **Benefits of transfer – Director, Systems Engineering will set DoD-wide strategic direction for standards**
  - Standards are a key foundation of systems engineering
  - Standards reduce risk and cost in programs
  - Standards document and communicate lessons learned, interoperability, and technologies across entire sectors to form a common understanding



# Defense Standardization Program



## Standardization Policy:\*

DoD policy is to promote standardization of materiel, facilities, and **engineering practices** to improve military operational readiness, and reduce total ownership costs and acquisition cycle time. It is also DoD policy to state requirements in performance terms, wherever practical, and to make maximum use of non-Government standards and commercial technologies, products, and practices. To pursue these policies, there is a single, integrated Defense Standardization Program and a uniform series of specifications, standards, and related documents.

\*Find out more by selecting the Policy link on the DSP web site: <http://www.dsp.dla.mil/>



# ASSIST- Online: Acquisition Streamlining and Standardization Information System



- Provides access to current information associated with military and federal handbooks, specifications and standards in the management of the Defense Standardization Program
- Includes reporting features and an exhaustive collection of both digital and warehoused documents
- Is the official source of DoD specifications and standards
- Includes international and US commercial standards and guides as deemed applicable by the DoD community

*Register at <http://assist.daps.dla.mil/online/start/>*



# SE Standards Revitalization



## Background:

SE is DoD gatekeeper/manager for SE [ including SW & specialty Engineering] standards, specifications, handbooks, and non-DoD standards in the ASSIST data base and a participant in international and national standards organizations for development, revision, coordination, and adoption of these documents

## Objective:

Update and maintain the SE portions of ASSIST; support efficient **adoption** of new and revised Industry/commercial documents

## Plan:

Define SE role in SE and SW standards; develop and publish processes for standards activities (development, revision, coordination, adoption, posting in ASSIST)



# SE's Role in SE Standards\*



- **Gatekeeper for Functional category /area: SE Standards and Specifications (SESS)**
  - ~365 active documents in SESS
  - 25+ involve SE participation as the 'preparing agency'
- **National and International SE related Standards:**
  - Participate in standards bodies, as appropriate, to develop/revise
  - Coordinate review of new drafts/revisions to support DoD vote
  - Coordinate for **adoption** within DoD and placement in ASSIST
  - ISO/SC7/WG7, TechAmerica [GEIA/EIA], IEEE, AIA, INCOSE...
- **DoD Standards [related to SE]:**
  - Participate, as appropriate, in development/revision of DoD documents
  - Coordinate DoD drafts for acceptance and ASSIST placement
  - Coordinate Component-nominated documents for acceptance as a DoD spec/standard in ASSIST



# SE Standards & Guidance

## Recent Activities



- **Adopted ISO/IEC Standards into ASSIST**
  - 15288 [SE], 16085 [Risk], 15939 [Measurement], 26702 [IEEE 1220:2005]
- **ISO [JTC1/SC7 - Systems & Software Engineering] activity**
  - 24748-1,2,3 guides for Life cycle management and guides to 15288, 12207
  - 29148 [Requirements engineering], in final
  - 15026-parts 1-4 System & SW Assurance, in process
  - 10303 STEP – Standard for exchange of product, in process
- **GEIA/EIA [TechAmerica/SE] activity**
  - EIA-649 STD and HDBK [CM] revision in final
  - GEIA-STD-0009 [Reliability Program Standard for System Design & Manufacturing; adopted]
  - GEIA-STD-0007 [Logistics Product Data]; handbook to follow
  - GEIA-STD-859A [DM; adopted]
  - EIA-632 [SE processes], major revision in early draft
- **DOD Under development in SESS\* [DDRE/SE approves]**
  - MIL-STD-189A Reliability Growth Management
  - MIL-STD-31000D Technical Data Package
  - MIL-STD-520 System Requirements Documentation [AF]; to be revised for all services
  - SEMP DID updated
  - MIL-HDBK-189 [Reliability Growth Management] in development





# SEMP DID DI-SESS-81785



- **DID supersedes DI-MGMT-81024**
- **The SEMP describes the contractor's technical approach and proposed plan for the conduct, management, and control of the integrated systems engineering effort. It shall be consistent with the government Systems Engineering Plan (SEP), if available.**
- **This Data Item Description (DID) contains content preparation instructions for the data product generated by the specific and discrete task requirements as delineated in the contract**

## DATA ITEM DESCRIPTION

Title: Systems Engineering Management Plan (SEMP)

Number: DI-SESS-81785  
AMSC Number: D9101  
DTIC Applicable: No  
Preparing Activity: SE  
Applicable Forms: N/A

Approval Date: 20091014  
Limitation: None  
GIDEP Applicable: No

**Use/relationship:** The SEMP describes the contractor's technical approach and proposed plan for the conduct, management, and control of the integrated systems engineering effort. It shall be consistent with the government Systems Engineering Plan (SEP), if available.

The SEMP content may be tailored depending on the scope, purpose, and the acquisition phase of the program. The contractor's SEMP shall contain the annotated mapping between contractor and government SE processes. The government SE processes may be noted in the SEP. The SEMP shall also show alignment of contractor and subcontractor SE processes.

This Data Item Description (DID) contains content preparation instructions for the data product generated by the specific and discrete task requirements as delineated in the contract.

This DID supersedes DI-MGMT-81024.

### Requirements:

1. Reference documents. OSD's SEP Preparation Guide.
2. Format. The SEMP format shall be selected by the contractor.
3. Content. The SEMP shall describe the contractor's planned systems engineering approach to meeting the program's contract, objectives, and overall technical and management approach. The SEMP shall describe the contractor's detailed operational plan for executing systems engineering. It shall be consistent with the content of the government SEP.
4. In the absence of a government SEP, the SEMP topics should address, at a minimum, those in the Office of the Secretary of Defense [Systems Engineering Plan Preparation Guide](#) active at the time of the Request for Proposal. The SEMP shall also include:
  - a. Technical solution activities:
    - 1) Development, documentation, maintenance, and communication of detailed system architectures (functional and physical) and detailed interfaces – both internal and external
    - 2) Performance of trade studies for critical design decisions



# SE Challenges Ahead



- **Create the tools to enable Rapid Capability Delivery**
  - Shorten the time to deliver life-saving and war-winning technologies – without compromising SE integrity
- **Expand the aperture of SE to address 21st century technical challenges**
  - Security, software-intensive, etc...
- **Embrace complexity**
  - Systems of Systems / Complex Adaptive Systems / Emergent behaviors
- **Expand the SE human capital resource base**
  - Reflect new insights in the curriculum to grow the next “crop” of SE



# Questions?



**Don Gantzer**  
**703-412-3668**

**Senior Systems Engineer**  
**Systems Engineering Support Office [SESO-SAIC]**  
**gantzerd@syseng-so.com**

**OUSD(AT&L)/DDR&E/SE**  
**Mission Assurance**  
**SE Policy, Guidance, & Standards**  
**Lead (acting) Standardization Authority [LSA] for SESS in DoD's**  
**ASSIST**  
**Donald.Gantzer.ctr@osd.mil**

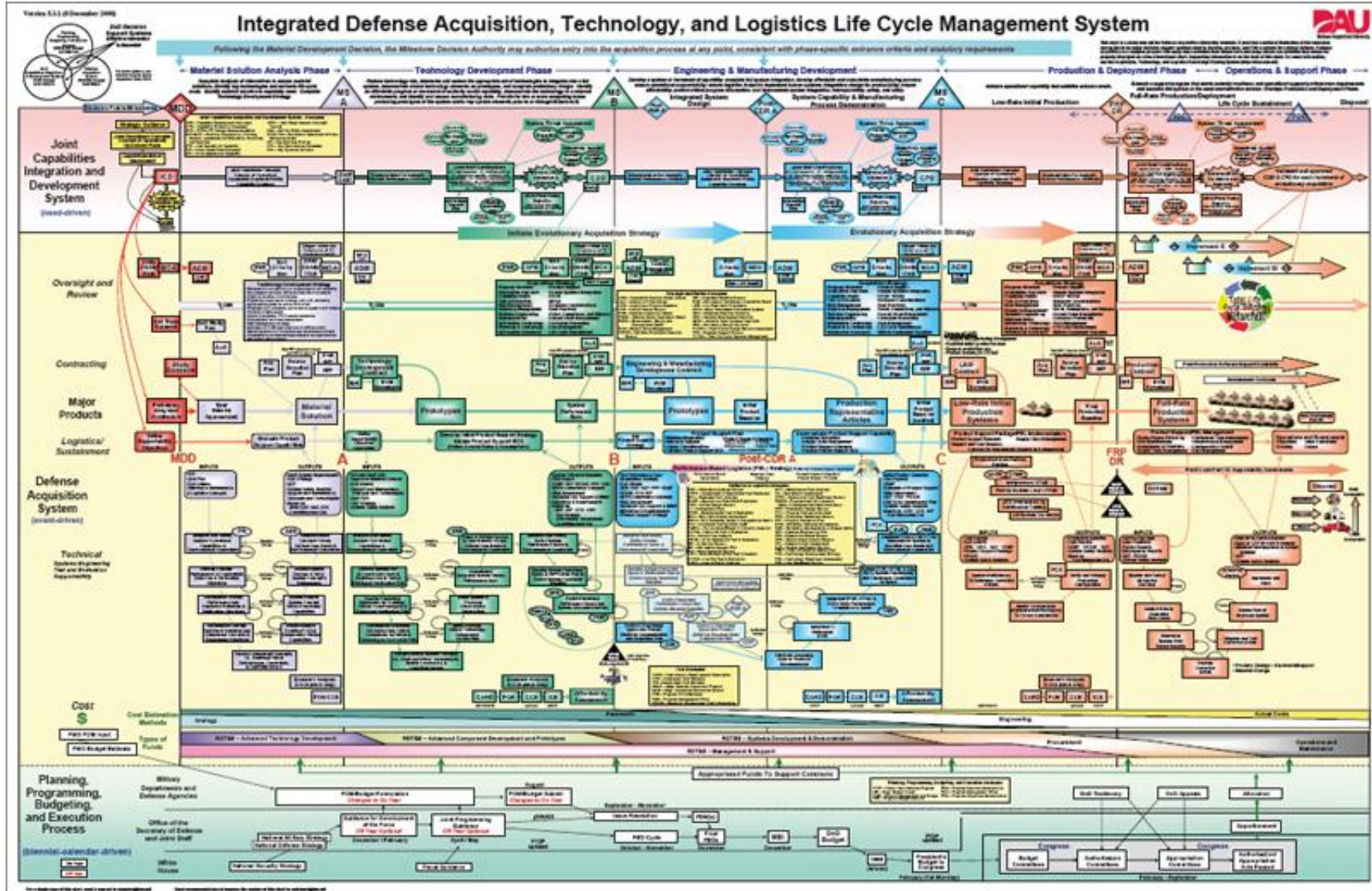


# Backups





# The DoD 5000.02 Process





# Systems Engineering Contributions to Acquisition

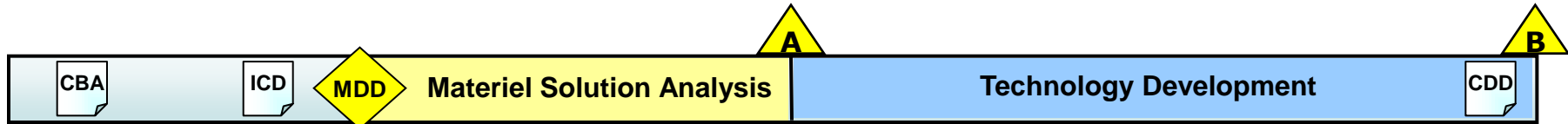


- **Systems-level technical leadership**
- **Risk identification and management**
- **Interface management**
- **Life cycle focus**
- **Robust exploration of the need**
- **Achievable system design**
- **Integration of technical disciplines**





# Development Planning and Early SE Critical Activities



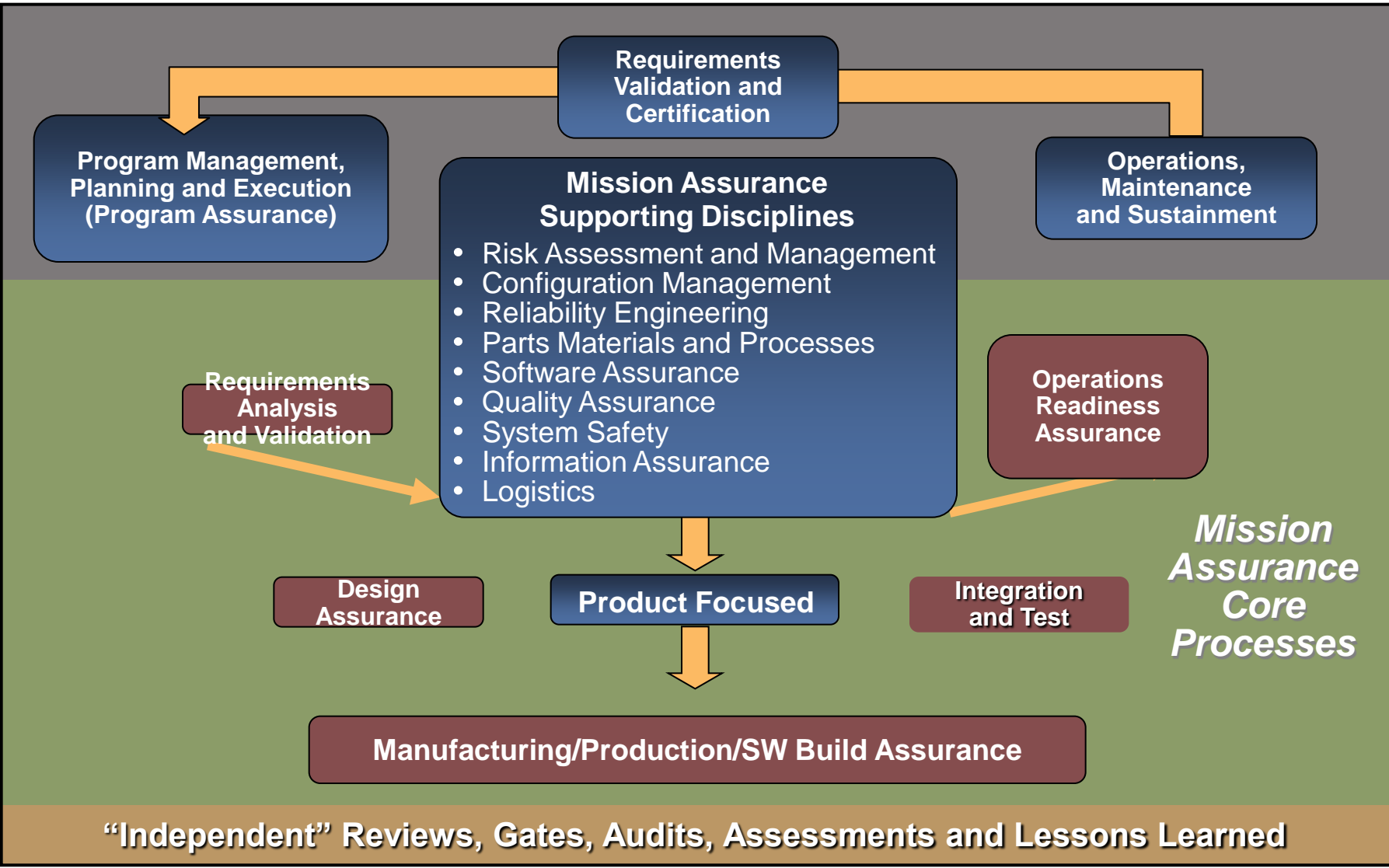
<b>SE Input to MDD</b>	CONOPS
	Awareness of Strategic Context
	Engagement with S&T
	Engagement with JCIDS
<b>Engagement in AoA</b>	Guidance
	Plan
	Analysis Activity
<b>Engineering Analysis</b>	Report
	Consideration of SOS/Interdependency, Interoperability Context
	SEP for Milestone A
	Input to TDS (CTE, CPI), TES, CCE
	SE in TD Contract Requirements
	Tech Reviews (ASR, Early SE Requirements)

<b>Prototyping &amp; Risk Reduction</b>	Prototyping (Technology and Design)
	CTE TRL Maturation
	Trade Studies
	SE Support for Technology Risk Reduction
	Oversight of Competitive Designs
<b>Input to Acquisition/ Planning, CARD, Budget &amp; Other</b>	Risk Assessment
	SE in Contract Requirements
<b>Evidence of Strong SE Activity</b>	SE into the PDR Report to MDA, Acquisition Strategy, TEMP, CARD, and ICE
	PDR and PDR Report and Assessment
	Technical Reviews up to and including PDR
	Systems Engineering Plan
<b>Inputs to Requirements</b>	Strong Reliability, Availability and Maintainability (RAM)
	System Requirements Definition
	RAM and Sustainability
	Requirements Traceability Matrices
	Translation of Requirements to Contract
	Capability Development Document (CDD)

\*Reference DAG Sections 4.3.1 and 4.3..2



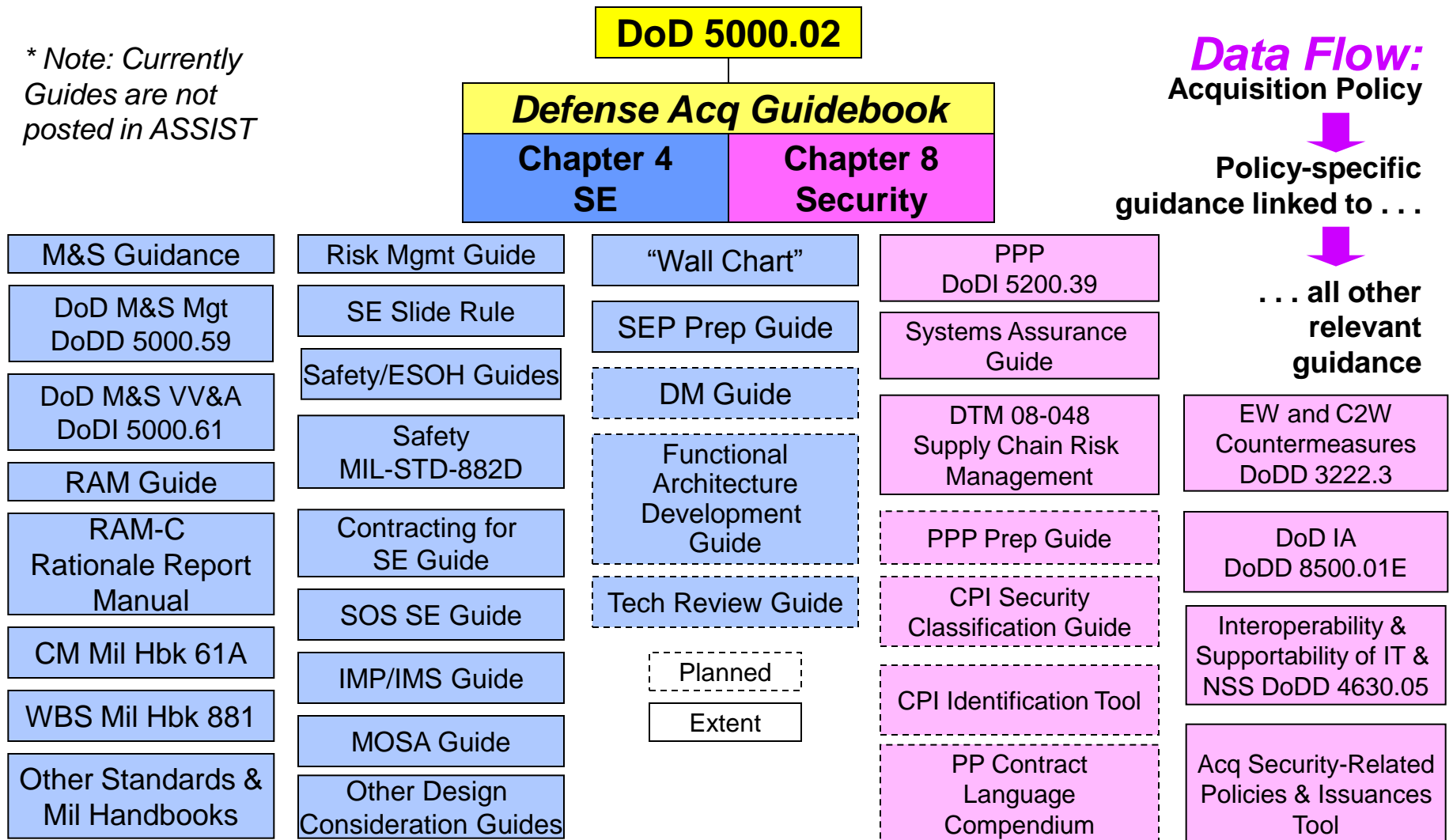
# Specialty Engineering, Systems Engineering and Mission Assurance





# SE Policy and Guidance Structure

\* Note: Currently Guides are not posted in ASSIST



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



# Systems Engineering Research Center (SERC) DoD University Affiliated Research Center



- **Systems engineering, as currently practiced, is less capable of handling the complexity, criticality and pace required of today's systems**
  - Increasingly considered a barrier to success rather than an enabler
- **SERC provides a critical mass of researchers from 20 universities to address these challenges**
  - Provide methods, processes and tool to advance the state of the practice
  - Grow our nation's engineering competencies
  - Provide robust and agile solutions to urgent and changing needs





# SE Research Needs



- **Flexible system design**
  - Agile systems/products/architectures
  - Flexible systems engineering processes and methods
  - Capture agility, adaptability, responsiveness as design attributes
- **Education and Workforce accelerants: at individual, corporate and national levels**
- **Early systems engineering and development planning**
  - Melding of ops requirements with early systems engineering to highlight promising technical solutions – “art of the possible”
- **Engineering System of Systems**
  - Addressing the challenge of complexity

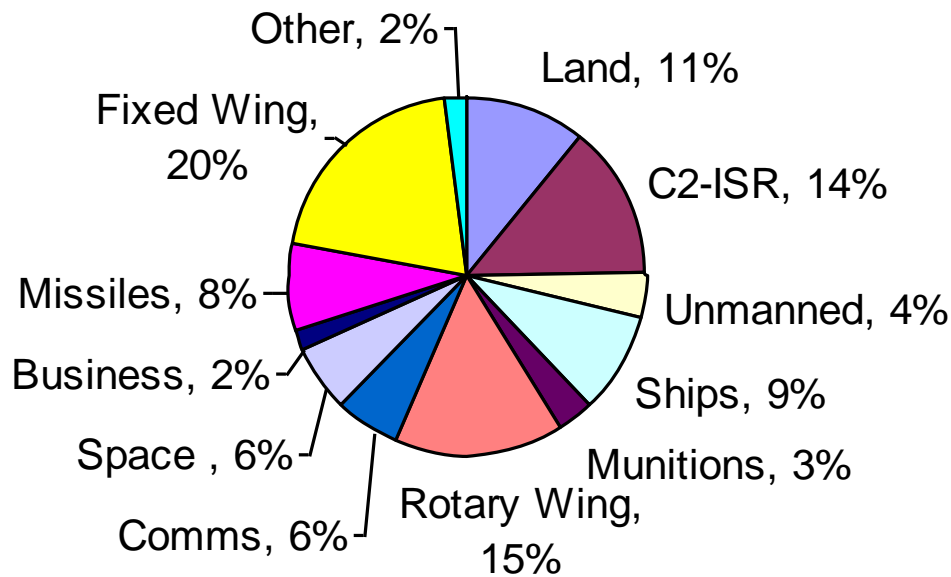


# Scope of DDR&E Acquisition Program Oversight Efforts\*



Program Category	Increasing cost/risk	# of Progs
ACAT ID**	\$\$\$ MDA = AT&L	93
ACAT IC**	\$\$\$ MDA = CAE	52
Special Interest**	Any \$s Risk	19
MAIS, ACAT IA	\$-\$\$\$ , AIS	30
Pre-MDAP	\$\$\$ pre-MS B	53
Pre-MAIS	\$-\$\$\$ , AIS pre-MS B	10
ACAT II	\$\$ < ACAT I	8
ACAT III	\$ < ACAT II	9
<b>Total</b>		<b>274</b>

## % Distribution of MDAPs by Domain



\*Based on 2009 T&E Oversight List (Jan 5, 2009)

\*\*Major Defense Acquisition Program (MDAP)

+Major Automated Information System (MAIS)

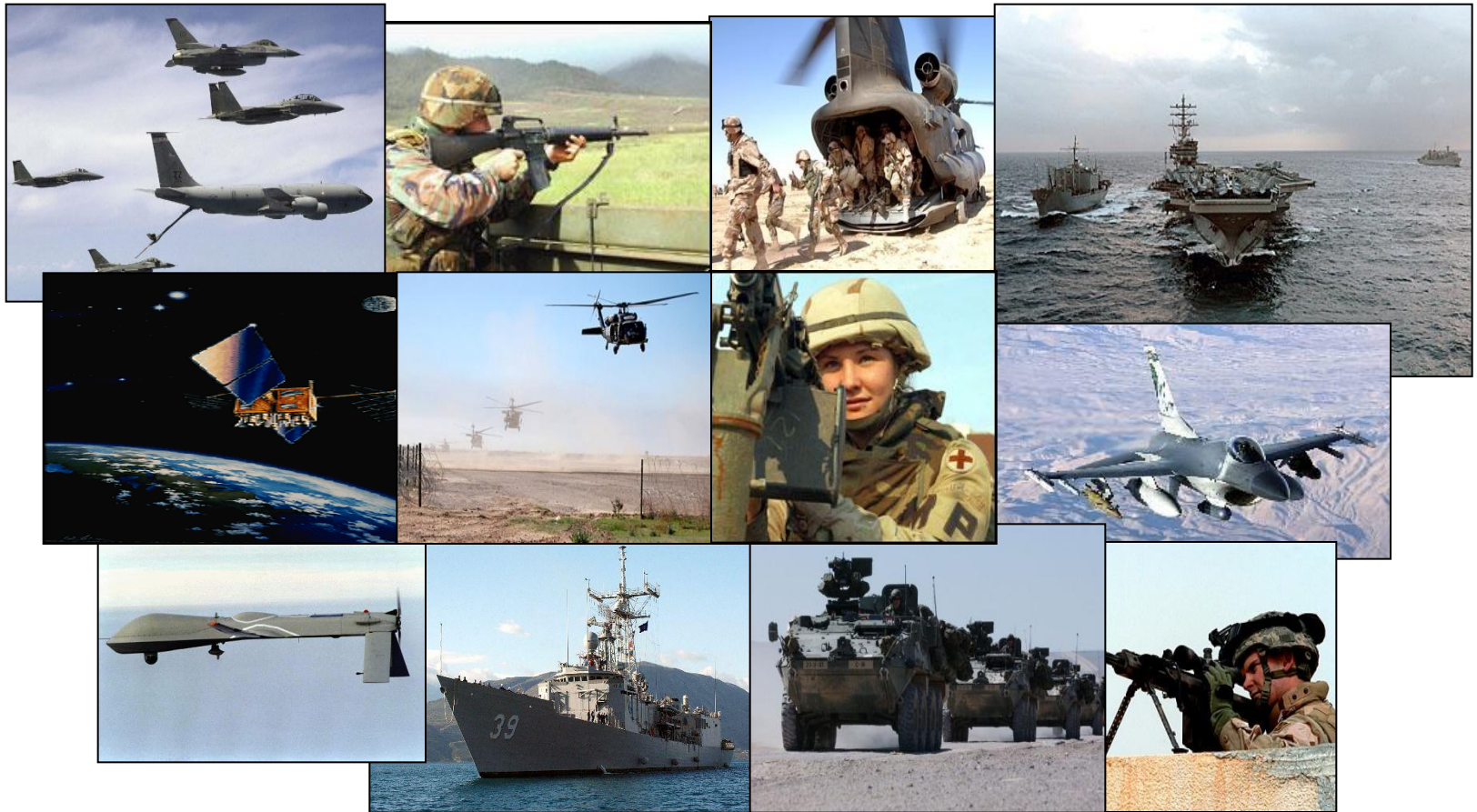
MDA – Milestone Decision Authority

TMA – Technology Maturity Assessment

CAE – Component Acquisition Executive



# Systems Engineering: Critical to Program Success



*Innovation, Speed and Agility*