DoD Systems Engineering Policy and Guidance Update

Sharon Vannucci

ODDR&E/Systems Engineering

13th Annual NDIA Systems Engineering Conference
San Diego, CA | October 27, 2010

Why New SE Policy and Guidance?

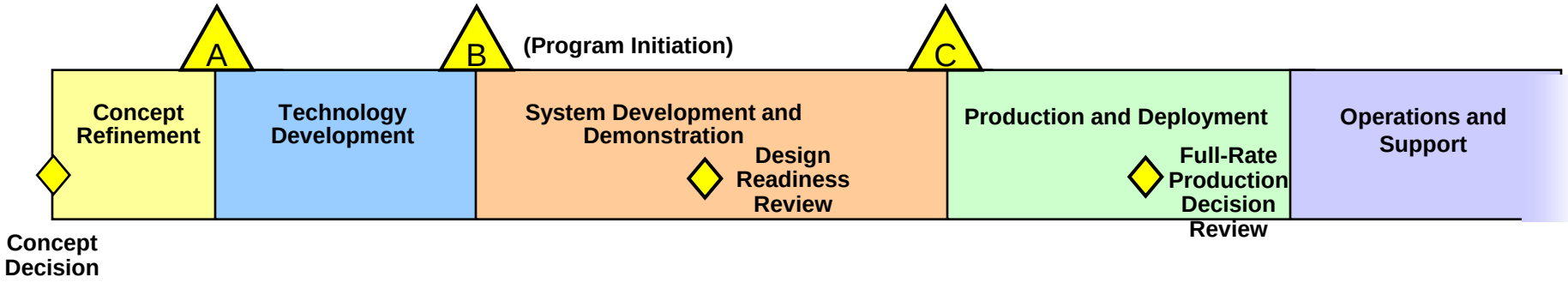
- **DoDI 5000.02 emphasis on early stages of pre-systems acquisition - prior to Milestone B (MS B)**
  - Reduce risk before making business commitment
  - Improve likelihood of being able to meet these commitments
- **Response to statutory direction (PL 111-23 [Weapon Systems Acquisition Reform Act of 2009] and others):**
  - Development planning
  - Additional certification requirements at MS A and B
  - Data Management Strategy
- **USD(AT&L) direction to assess the need for new reliability policy**
- **SecDef-directed efficiency initiative → USD(AT&L) Acquisition Document Streamlining Task Force**
- **Insights from DDR&E/SE acquisition program interaction**
  - Systems Engineering Plan (SEP) reviews
  - Program Support Reviews (PSR)
  - Systemic Root Cause Analysis (SRCA)

Outline

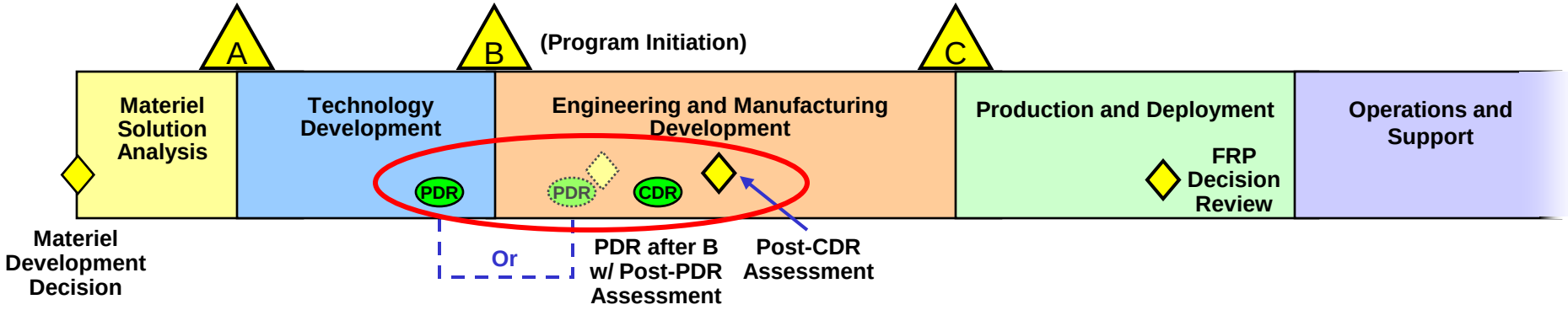
- **Policy Update**
  - Director of Systems Engineering Instruction 5134.dd (policy codification)
  - Development Planning (DTM 10-017) (new)
- **Guidance and Tools Update**
  - Systems Engineering Plan (SEP) Preparation Guide (update)
  - Program Protection Guide (update)
  - Defense Acquisition Guidebook Chapter 4 Systems Engineering (updated)
  - Technical Data Artifact Matrix (new tool)
  - Technical Review Sliderule (updated tool)
  - System Requirements Analysis Guide (new)
  - Technical Review guide (new)
  - Risk Management Guide (updated)
  - Incorporating SE in DoD Acquisition Contracts (planned update)

Acquisition Lifecycle Comparisons –
A Systems Engineering Perspective

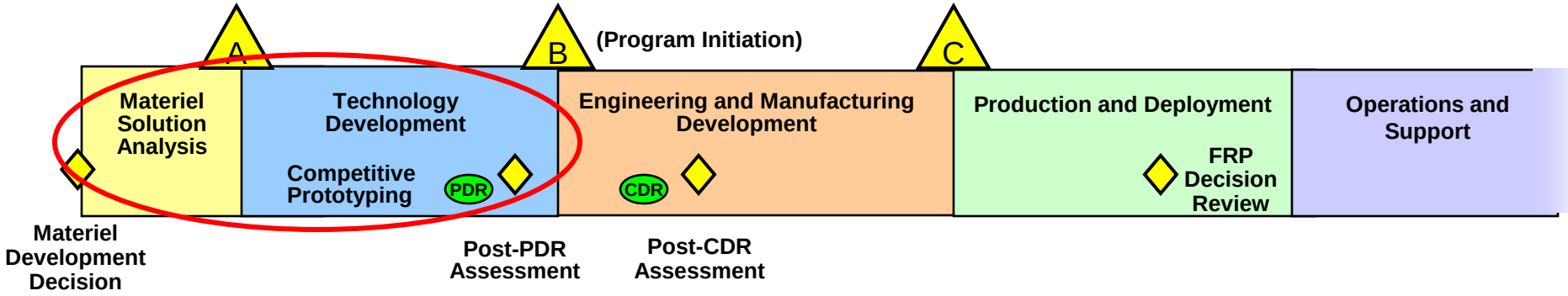
Defense Acquisition Management System, May 12, 2003



Defense Acquisition Management System, December 8, 2008



Defense Acquisition Management System, May 22, 2009 (post WSARA)



Development Planning
(New)

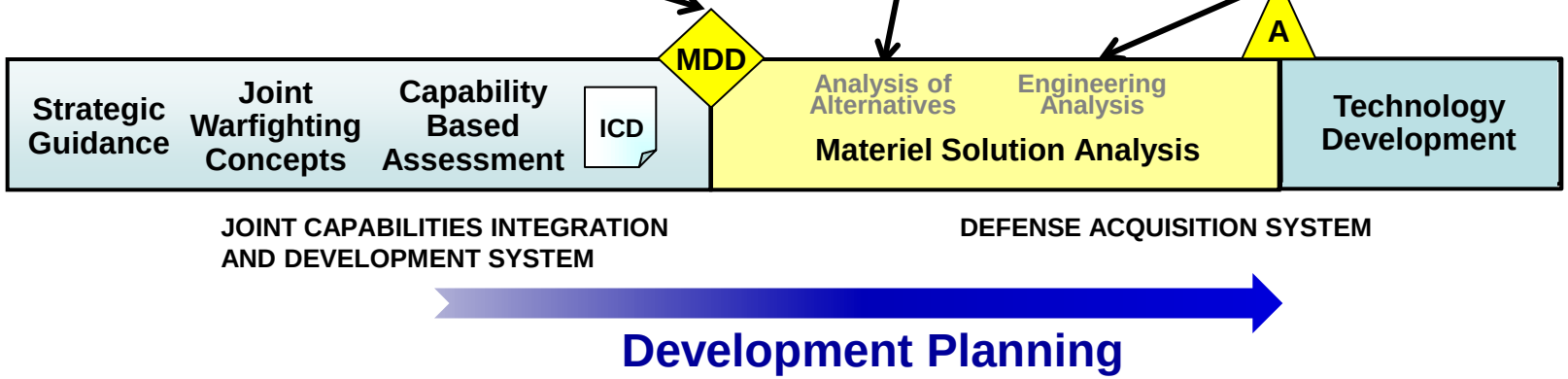
Development Planning Policy*

Oct 2010

- Enhanced technical entrance criteria for MDD
- Requires more complete technical preparation for acquisition entry

- DDR&E Engineering Engagement in the AoA
- Requires more thorough consideration of Systems of Systems impacts and technical risk drivers to cost and schedule in AoA recommendation

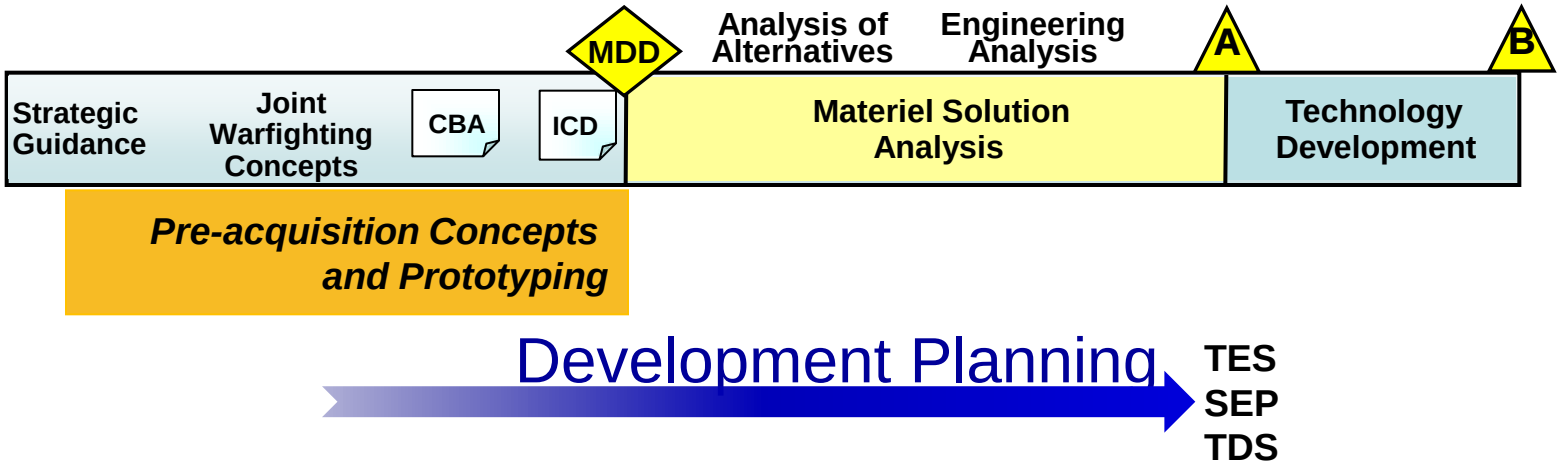
- Pre-Milestone A Engineering Analysis
- Prepares a focused plan for Technology Development risk reduction activities



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

* **OUSD(AT&L) Memorandum of 13 September 2010, Subj: DTM 10-017, Development Planning to Inform Materiel Development Decision (MDD) Reviews and Support Analyses of Alternatives (AoA)**

Development Planning Policy



Mandated policy at MDD:

1. The candidate materiel solution approaches have the potential to effectively address the capability gap(s), desired operational attributes, and associated dependencies.
2. There exists a range of technically feasible solutions generated from across the entire solution space, as demonstrated through early prototypes, models, or data.
3. Consideration has been given to near-term opportunities to provide a more rapid interim response to the capability need.
4. The plan to staff and fund analytic, engineering, and programmatic activities supports the proposed milestone entry requirements as identified in the Defense Acquisition Guidebook (DAG).

Development Planning Policy (con't)

Post-MDD DDR&E Engagement

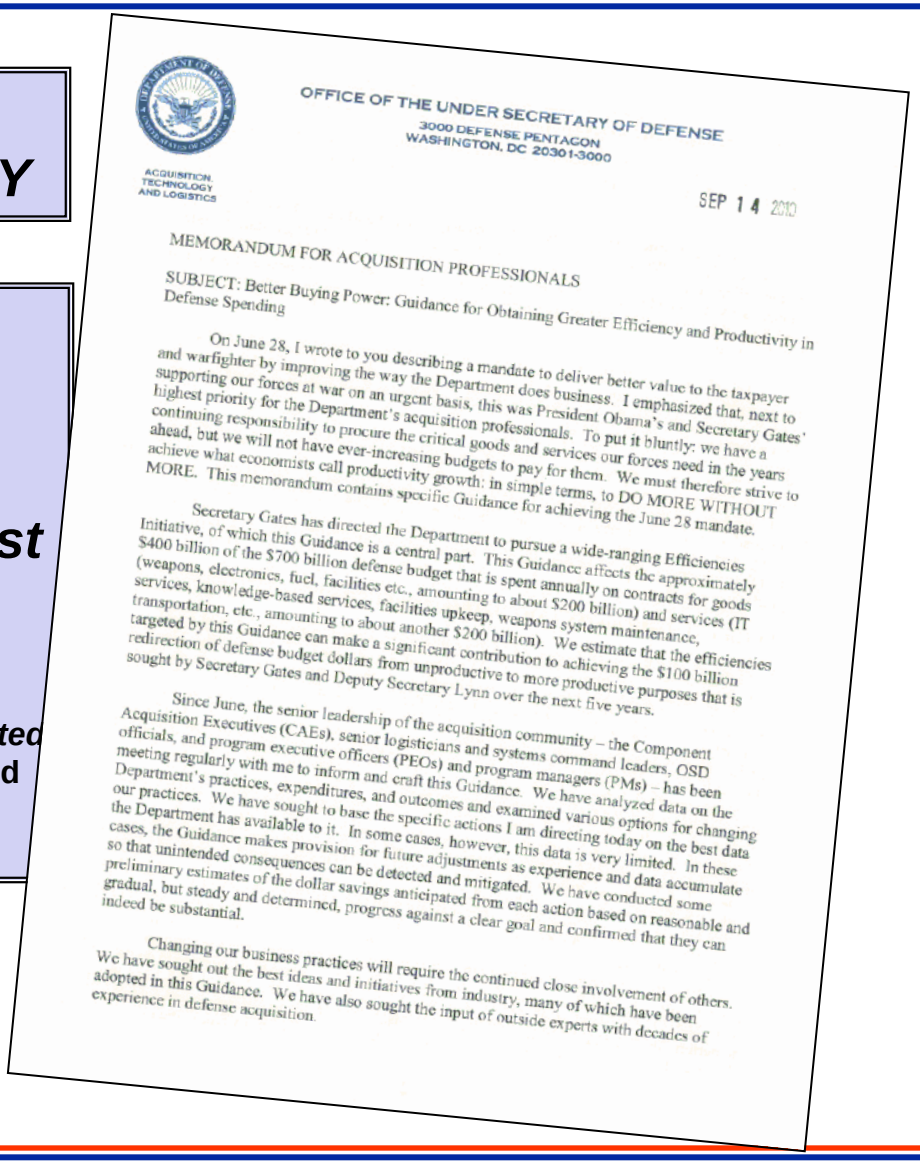
- **Cooperate with the Director, Cost Assessment and Program Evaluation, and, as agreed upon with that organization, serve as a standing participant and technical advisor in the development of AoA Study Guidance and on the AoA Study Advisory Group for potential programs under USD(AT&L) oversight to facilitate the consideration of technology and engineering risks for the alternatives under consideration.**

- **Monitor and review the effectiveness of the policy in this DTM and develop additional development planning guidance as needed for incorporation into acquisition policy and the Defense Acquisition Guidebook.**

Acquisition Documentation Streamlining: USD(AT&L) Direction of September 14, 2010

REDUCE NON-PRODUCTIVE PROCESSES AND BUREAUCRACY

- ***Review DAB documentation requirements to eliminate non-relevant content***
- ***Reduce by half, the volume and cost of internal and congressional reports***
  - ***… conduct a bottom-up review of all internally-generated reporting requirements .. by 1 March 2011*…*** **[required by DoD Instruction 5000.02] (Direction to Dir. ARA)**



OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION, TECHNOLOGY AND LOGISTICS

SEP 14 2010

MEMORANDUM FOR ACQUISITION PROFESSIONALS

SUBJECT: Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending

On June 28, I wrote to you describing a mandate to deliver better value to the taxpayer and warfighter by improving the way the Department does business. I emphasized that, next to supporting our forces at war on an urgent basis, this was President Obama's and Secretary Gates' highest priority for the Department's acquisition professionals. To put it bluntly: we have a continuing responsibility to procure the critical goods and services our forces need in the years ahead, but we will not have ever-increasing budgets to pay for them. We must therefore strive to achieve what economists call productivity growth: in simple terms, to DO MORE WITHOUT MORE. This memorandum contains specific Guidance for achieving the June 28 mandate.

Secretary Gates has directed the Department to pursue a wide-ranging Efficiencies Initiative, of which this Guidance is a central part. This Guidance affects the approximately $400 billion of the $700 billion defense budget that is spent annually on contracts for goods (weapons, electronics, fuel, facilities etc., amounting to about $200 billion) and services (IT services, knowledge-based services, facilities upkeep, weapons system maintenance, transportation, etc., amounting to about another $200 billion). We estimate that the efficiencies targeted by this Guidance can make a significant contribution to achieving the $100 billion redirection of defense budget dollars from unproductive to more productive purposes that is sought by Secretary Gates and Deputy Secretary Lynn over the next five years.

Since June, the senior leadership of the acquisition community – the Component Acquisition Executives (CAEs), senior logisticians and systems command leaders, OSD officials, and program executive officers (PEOs) and program managers (PMs) – has been meeting regularly with me to inform and craft this Guidance. We have analyzed data on the Department's practices, expenditures, and outcomes and examined various options for changing our practices. We have sought to base the specific actions I am directing today on the best data the Department has available to it. In some cases, however, this data is very limited. In these cases, the Guidance makes provision for future adjustments as experience and data accumulate so that unintended consequences can be detected and mitigated. We have conducted some preliminary estimates of the dollar savings anticipated from each action based on reasonable and gradual, but steady and determined, progress against a clear goal and confirmed that they can indeed be substantial.

Changing our business practices will require the continued close involvement of others. We have sought out the best ideas and initiatives from industry, many of which have been adopted in this Guidance. We have also sought the input of outside experts with decades of experience in defense acquisition.

SEP Preparation Guide
(Update)

- **Why the update**
  - **Impacts from Public Law 111-23 and Directive-Type Memorandum (DTM) 09-027 – *Implementation of Weapon Systems Acquisition Reform Act of 2009* (Dec. 4, 2009)**
  - **Impacts from DoDI 5000.02**
  - **Lessons Learned from Major Defense Acquisition Program (MDAP) and Major Acquisition Information System (MAIS) Program**
    - **SEP reviews**
    - **Program Support Reviews (PSR)**
    - **Systemic Root Cause Analyses (SRCA)**
- **To be streamlined as a key milestone deliverable**

SEP Prep Guide:
PL 111-23 Impact on MDAPs

- **DSE shall review and approve each SEP (MDAPs = ACAT ID and IC programs)**
- **Develop and track measurable performance criteria as part of SEPs**
- **Complete competitive prototypes**
- **Complete system-level PDR before MS B; provide report for MDA assessment**
- **SE role in development planning, lifecycle management, and sustainability**

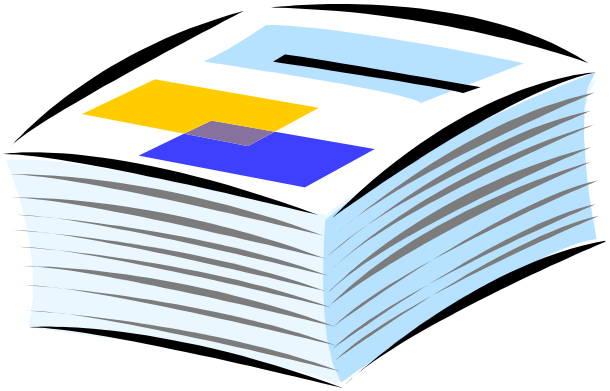
SEP Prep Guide:
DoDI 5000.02 Impact

- PDR and CDR are mandated with Post-review reports and MDA assessments
- "At completion of the system level [CDR], the PM shall assume control of the initial product baseline for all Class 1 configuration changes."
- "RAM shall be integrated within the [SE] processes, documented in the … SEP."
- IUID Implementation Plan
  - Summarized in MS A SEP
  - Included as an Annex to MS B and C SEPs

Program Protection Plan (PPP)
(Streamlining Goals)

- **To provide one-stop shopping for program protection related acquisition documents**
  - PPP reviews provide a mechanism for communication, integration, and synchronization of protection activities throughout the DoD – from protecting technology investments during foreign military sales and international cooperation to preventing cyber attacks through secure designs and supply chain risk mitigation
- **To ensure that programs protect the US lead in technology AND prevent cyber attacks (supply chain and battlefield) on weapon systems**
  - Each have different purposes and threats, yet countermeasures for both are designed into the weapon system and often the same weapon system component so protection for both needs to be closely coordinated within the systems engineering process
  - Information Assurance, COMSEC, and Anti-Tamper are just a few of many **technology countermeasures** that should be layered in to the system design
  - Supply Chain Risk Mitigation are **acquisition activities** that the mitigate the risk to the system design including blind buys and preventing procurement of counterfeit components
- **To ensure that CPI is horizontally identified and protected across the Component Acquisition Executives**

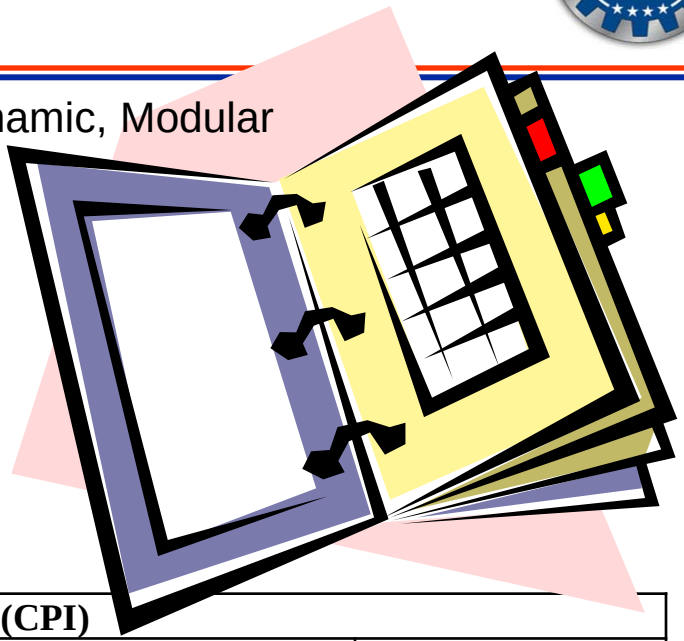
PPP Bulleted, Tabular Format



Verbose, Static, Essay

PPP Guide

Concise, Dynamic, Modular



Critical Program Information (CPI)				
Critical Program Information	*Impact of Loss* *(Low, Med, High)*	*Reason (for each change in status)*	*List Locations* *(Lab(s), PMO, Contractor Name(s), Test Site(s))*	*Status Dates (watch, new, removed)*
GPS		New: Critical warfighting component	PMO, Contractor X	New 6/2006
Radar FPGA		New: Target for hackers	PMO, Prime, Subcontractor Z	Watch 6/2007
Communication Card		Watch: US lead in technology Removed: No longer leading edge technology	N/A	New 4/1998 Removed 4/2007

DAG Systems Engineering (Updated)

DAG Section	Change
4.0.3 DoD Policy and Guidance on Systems Engineering	Director, Systems Engineering (DSE) approves all SEPs for DAB/ITAB programs and SEPs for ACAT IACs. SEPs due to DSE NLT 45 days prior milestone review
4.2.3.1.2 Technical Planning	Addressed technical scope of work, integrated plan, schedule, participants, and resources
4.2.3.1.3 Technical Assessment	Added technical reviews, measurements, and reporting requirements (EVM, DAES, and PDR Report)
4.2.3.1.5 Risk Assessment	Expanded discussion on five key activities (identification, analysis, mitigation implementation, and tracking) and added risk cube key activities
4.3.2.4.2.3 Preliminary Design Review	Updated to included WSARA language and additional clarification

DAG Systems Engineering
(Updated con't)

DAG Section	Change
4.2.3.1.3 Technical Assessment and Control	Added IAW ISO 15288
4.2.3.1.9 Measurement	Emphasizes renewed effort for metrics collection, analysis, and assessment
4.2.3.1.6 Configuration Management	Provides clarification to policy and update
4.2.3.1.7 Technical Data Management	Characterizes data types and technical review artifacts
4.3.2.4.2.3 Preliminary Design Review	Mandated for MDAPs with PDR Report to MDA and an MDA Assessment (new 2366b certification)
4.4.8 Human Systems Integration	Provides updates and clarifications
4.4.12 Parts Management, Materials and Processes	Includes mitigation for components made with lead-free solder
4.4.15 Reliability, Availability, and Maintainability	Update guidance to address new R&M policy

Technical Data Artifact Matrix
(New Tool)

Maps availability of and defines technical data for the Data Management Strategy and other uses by technical reviews and key events

Data Types

1.0 System/Product Definition

- 1.1 Technical Requirements
- 1.2 Design
- 1.3 Manufacturing

2.0 System/Product Operation

- 2.1 Logistics Management
- 2.2 Material In-Service

3.0 Associated Information

- 3.1 Verification
- 3.2 Configuration Control
- 3.3 Other Associated Information

4.0 Software Maintenance and Support

5.0 Intelligence Mission

Technical Reviews/Events

- **SFR: System Functional Review**
- **PDR: Preliminary Design Review**
- **CDR: Critical Design Review**
- **TRR: Test Readiness Review**
- **SVR: System Verification Review**
- **FCA: Functional Configuration Audit**
- **PCA: Physical Configuration Audit**
- **FRPDR: Full Rate Production Decision Review**
- **IOC: Initial Operational Capability**
- **FOC: Full Operational Capability**

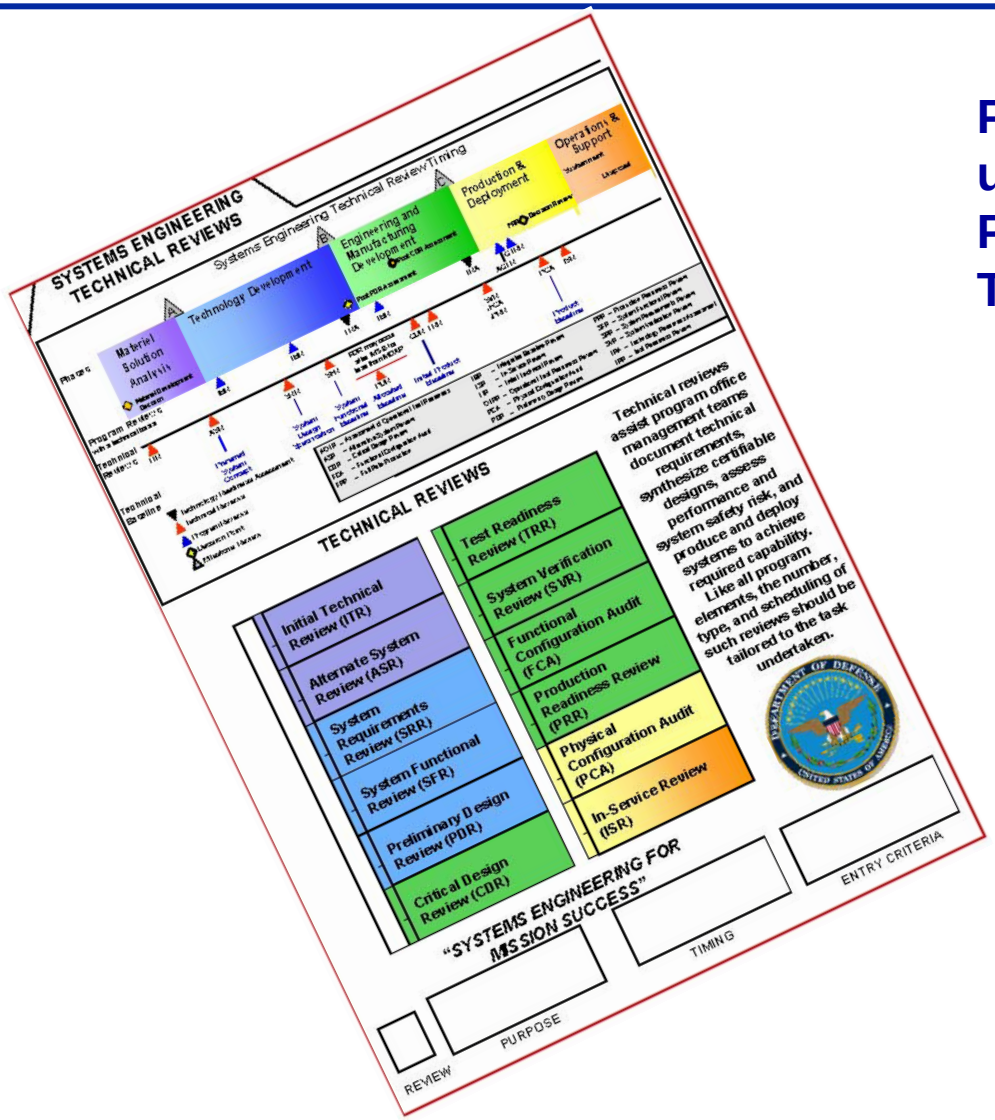
Technical Data Artifact Matrix
(New Tool con't)

Data Types **Technical Reviews/Events**

(X) Represents when technical data will be available by the system-level technica									
Acquisition Milestones	MS A		MS B				MS C	FRP	DR
Data Management Strategy Data Types/ Technical Reviews	SFR	PDR*	CDR	TRR	SVR	FCA	PCA**	IOC	FOC
1.0 System/Product Definition Information									
1.1 Technical Requirements									
System Specification	X	X	X	X	X	X	X	X	X
Configuration Item (CI) Specifications		X	X	X	X	X	X	X	X
Interface Control Documents		X	X	X	X	X	X	X	X
Computer Software Configuration Item Specifications (CSCI)		X	X	X	X	X	X	X	X
Software Interface Requirements Specifications		X	X	X	X	X	X	X	X

Technical Data Artifacts Mapped by Technical Review

Technical Review Sliderule
(Updated Tool)

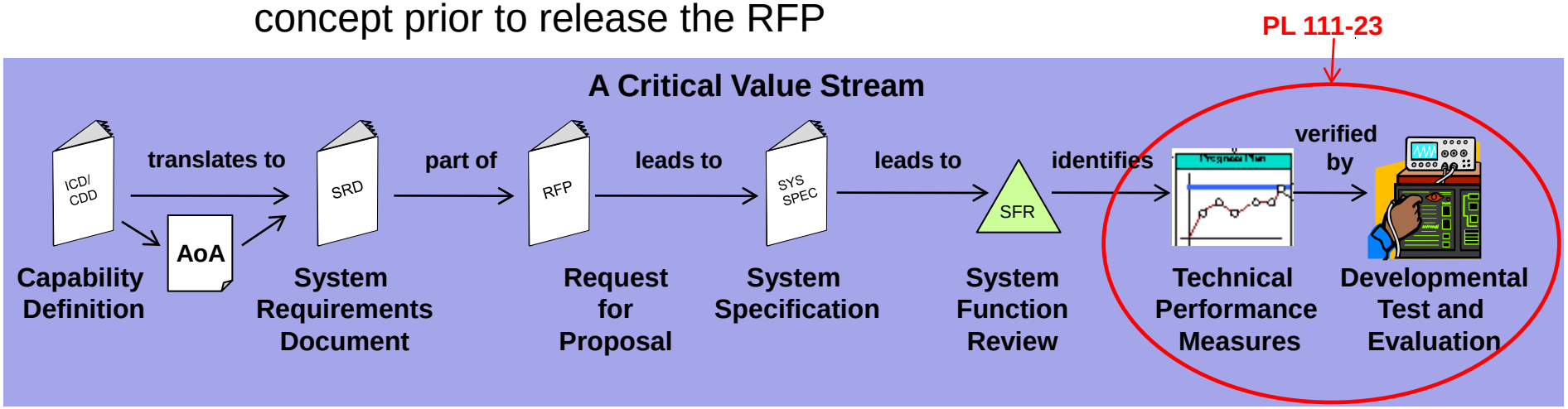


Popular quick reference tool, now updated to reflect DoDI 5000.02 and PL 111-23; describes the Purpose, Timing, and Entry Criteria for:

- **ITR: Initial Technical Review**
- **ASR: Alternate System Review**
- **SRR: System Requirements Review**
- **SFR: System Functional Review**
- **PDR: Preliminary Design Review**
- **CDR: Critical Design Review**
- **TRR: Test Readiness Review**
- **SVR: System Verification Review**
- **FCA: Functional Configuration Audit**
- **PRR: Production Readiness Review**
- **PCA: Physical Configuration Audit**
- **ISR: In-Service Review**

System Requirements Analysis Guide (New)

- **What is System Requirements Analysis (SRA)?**
  - Structured approach to translating the user's need into a technical definition of the system
- **Why renewed emphasis in DoD System Requirements Analysis?**
  - Establish rigorous approach to translating user capabilities to technical requirements (System Requirements Document)
  - Expose as many risks and issues as possible to a preferred system concept prior to release the RFP



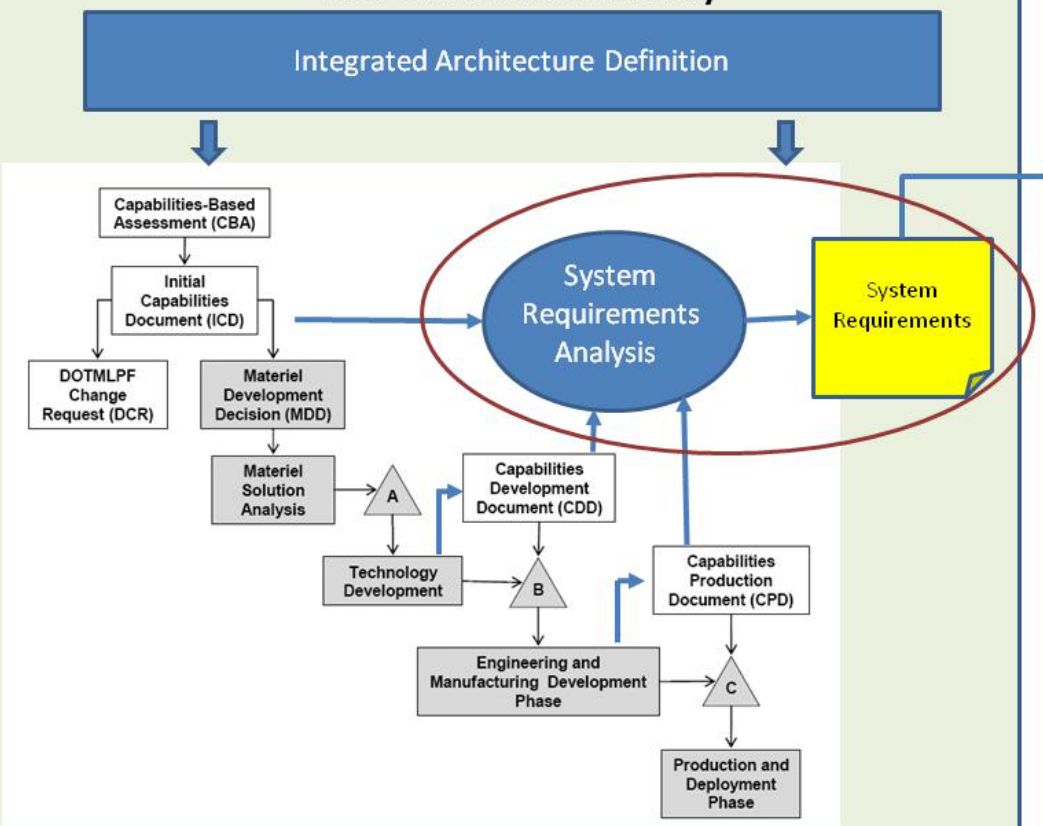
System Requirements Analysis Guide (New)

Objectives:

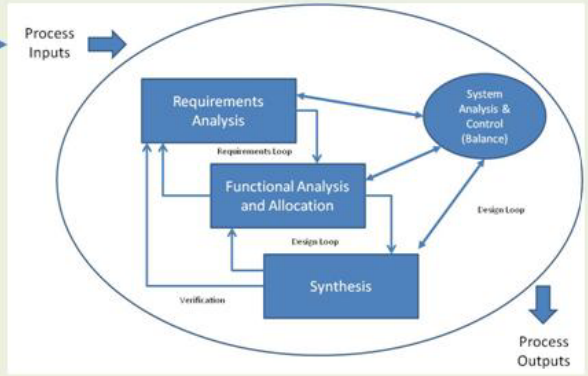
- Provide guidance to Government SEs in planning and executing the development of system requirements throughout the acquisition lifecycle
- Clarify the technical data expectations that supports technical baseline definition through (MS C) Initial Product Baseline
- Describe methods and techniques on how to "transform" requirements:
  - Capabilities ➡ System Requirements
  - System Requirements ➡ Subsystems Requirements
- Provide insights and references on "how" to develop a functional and physical architecture to support requirements definition and trade studies

SRA Guide: Translation of Capabilities to Requirements

DoD JCIDS and System Requirements Analysis "The Translation Activity"



Contractor Notional SE Process



Specifications

Sys Spec | Subsys Specs | Comp Specs | SRS

Technical Review Guide
(New)

- **Preferred practices for conducting event-based technical reviews**
  - **Entry criteria**
  - **Role of Technical Authority (Chairing and Technical Review Boards)**
  - **Capture/management of action items**
- **Technical Review alignment with, and support of, key program activities and decision points (milestone decisions, competitive prototyping, source selection)**

➡ **Expected release, 2nd Quarter FY11**

Risk Management Guide
(Updated)

- **Improved readability**
- **Improved risk example carried through the Risk Management processes**
- **Strengthened tie of Risk Mitigation Planning/Execution to IMP, IMS, and EVM**
- **Retains focus on Risk (vice Opportunity) management, as Risk Management continues to be a problem area noted in Program Support Reviews**

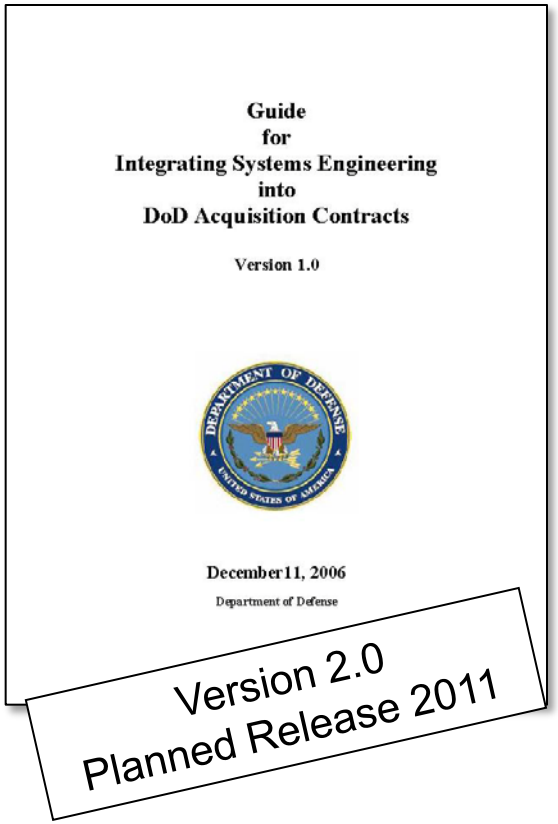
➡ **Expected release, 1st Quarter FY11**

Incorporating SE in DoD Acquisition Contracts (Update)

- WSARA Direction
- Latest Policy Updates inc. DoDI 5000.02
- Other DoD Focus Areas (e.g., R&M, M&S, MOSA)
- Lessons Learned from the Field

Approach

- Identify current guide areas impacted by WSARA and policy updates
- Capture feedback and lessons learned on utility of the current guide from DoD and industry stakeholders (program managers, contracting officers, systems engineers)
- Analyze RFPs developed since 2007 and identify usage trends
- Draft updates to guide
- Request feedback on draft from stakeholders
- Resolve comments and update draft
- Publish guide and execute outreach plan



To Learn More…

- **Development Planning (#10944)**
  Mike Duffey
  Wednesday, Oct 27, 8AM
  TRACK 4 Early Systems Engineering, Mission I

- **Systems Requirements Analysis Guide (#10812)**
  Sharon Vannucci
  Thursday, Oct 28, 9:10AM
  TRACK 1 Systems Engineering Effectiveness, Bayview I

- **Panel on SE Standards (#11107)**
  Sharon Vannucci, Moderator
  Thursday, October 28, 1:30PM
  TRACK 1 Systems Engineering Effectiveness, Bayview I

For Additional Information

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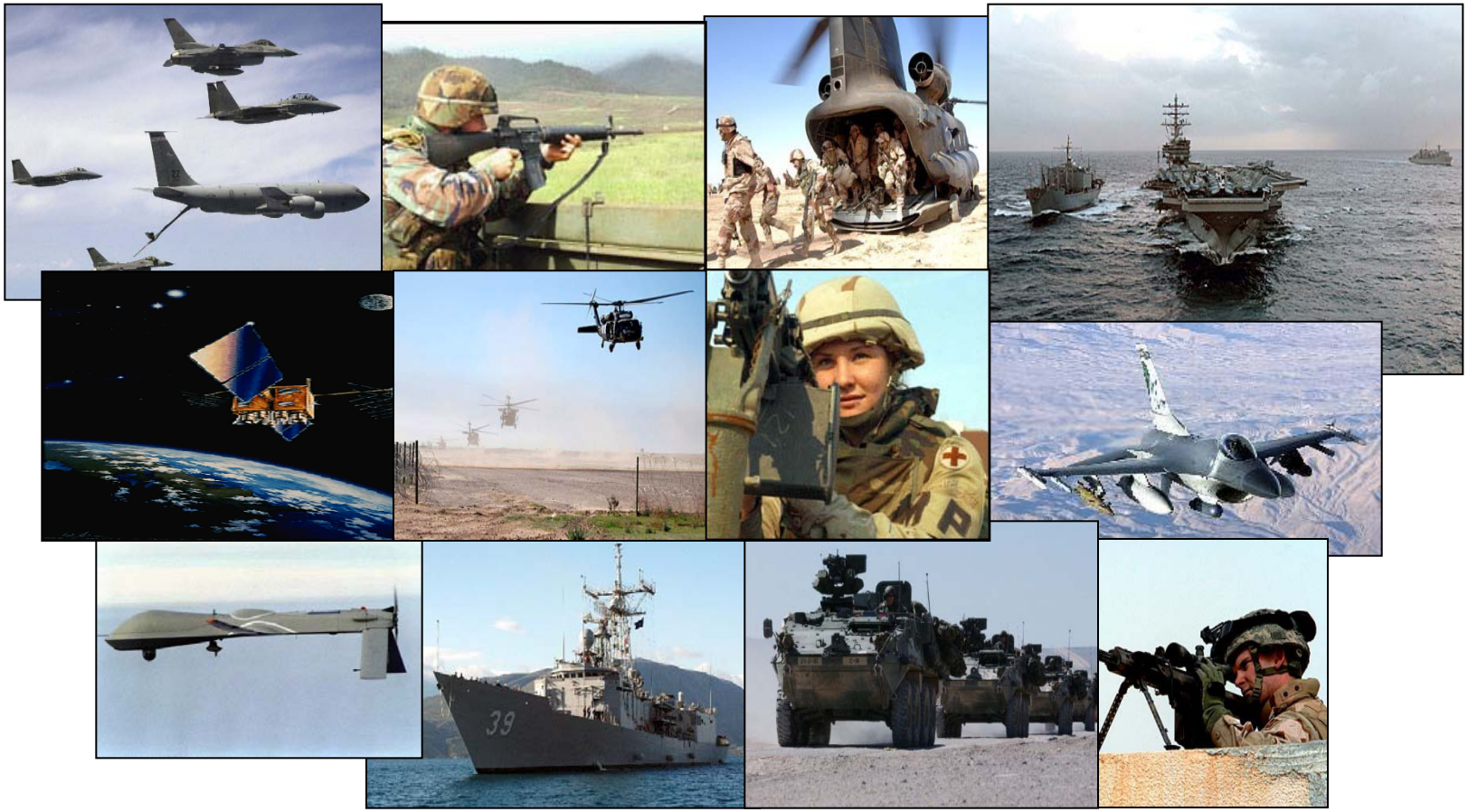
Systems Engineering: Critical to Program Success



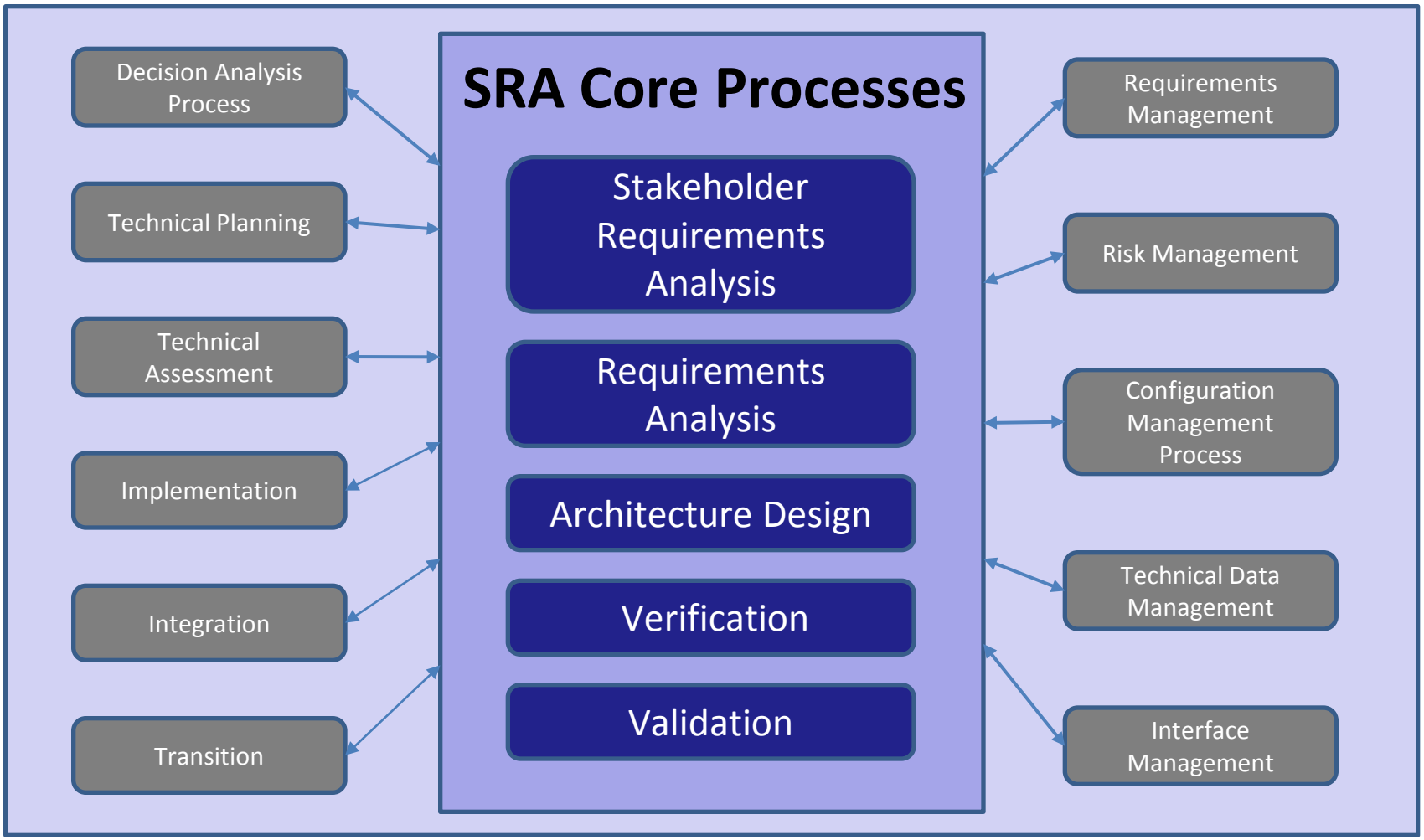
Innovation, Speed, and Agility

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

Implications for Systems Engineering

- **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 Solution 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**

SRA Guide: Overview and Key Thoughts



SRA core processes that provide the greatest influence in requirements definition