The Role of DoD in Systems Engineering Standards and Models

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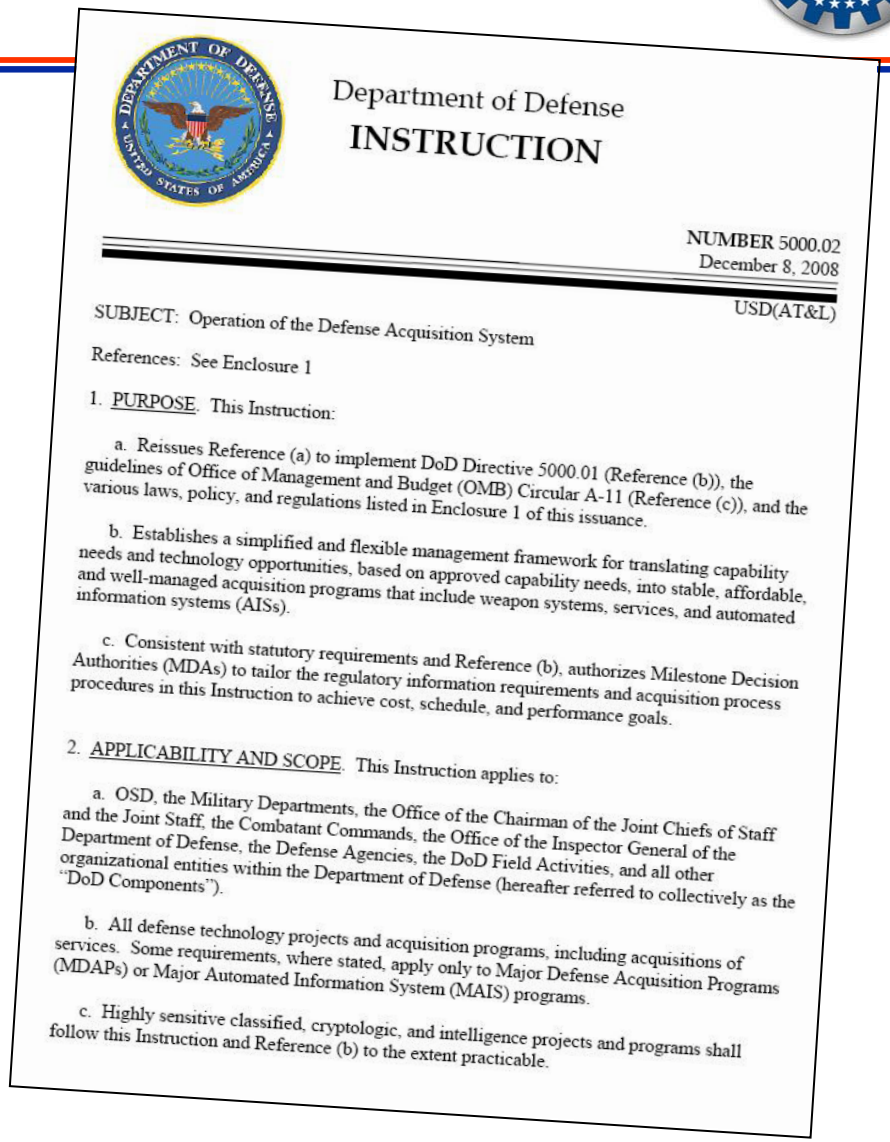
Outline

- New SE Policy and Legislation Implications
- SE Reorganization
- Defense Standards role
- SE standards activities

DoD Instruction 5000.02

- 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



Department of Defense
INSTRUCTION

NUMBER 5000.02
December 8, 2008
USD(AT&L)

SUBJECT: Operation of the Defense Acquisition System

References: See Enclosure 1

1. PURPOSE. This Instruction:

a. Reissues Reference (a) to implement DoD Directive 5000.01 (Reference (b)), the guidelines of Office of Management and Budget (OMB) Circular A-11 (Reference (c)), and the various laws, policy, and regulations listed in Enclosure 1 of this issuance.

b. Establishes a simplified and flexible management framework for translating capability needs and technology opportunities, based on approved capability needs, into stable, affordable, and well-managed acquisition programs that include weapon systems, services, and automated information systems (AISs).

c. Consistent with statutory requirements and Reference (b), authorizes Milestone Decision Authorities (MDAs) to tailor the regulatory information requirements and acquisition process procedures in this Instruction to achieve cost, schedule, and performance goals.

2. APPLICABILITY AND SCOPE. This Instruction applies to:

a. OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the Department of Defense (hereafter referred to collectively as the "DoD Components").

b. All defense technology projects and acquisition programs, including acquisitions of services. Some requirements, where stated, apply only to Major Defense Acquisition Programs (MDAPs) or Major Automated Information System (MAIS) programs.

c. Highly sensitive classified, cryptologic, and intelligence projects and programs shall follow this Instruction and Reference (b) to the extent practicable.

Summary of Legislation

The Weapon Systems Acquisition Reform Act of 2009 contains provisions that will:

- **Address problems with unreasonable performance requirements by requiring DoD to reestablish systems engineering organizations and developmental testing capabilities; make trade-offs between cost, schedule and performance early in the program cycle; and conduct preliminary design reviews before giving approval to new acquisition programs;**

- **Address problems with unreasonable cost and schedule estimates by establishing a new, independent director of cost assessment to ensure that unbiased data is available for senior DoD managers;**

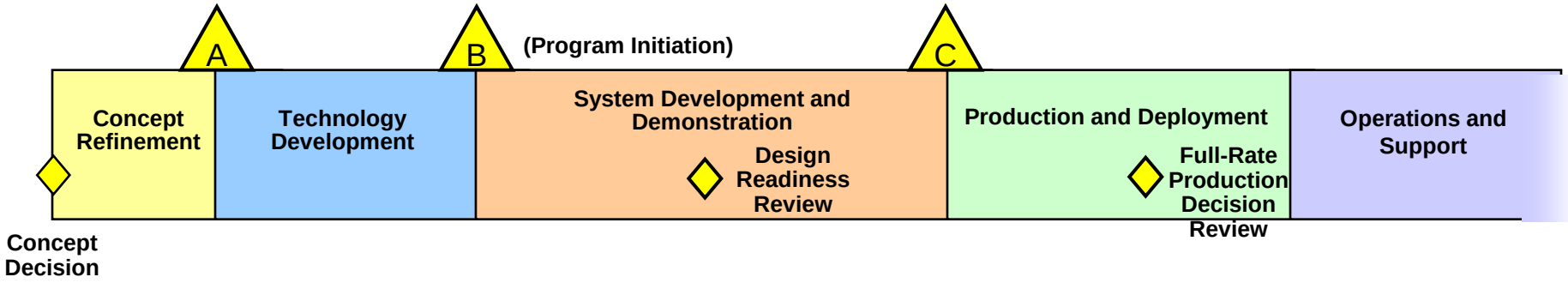
- **Address problems with the use of immature technologies by requiring the Director of Defense Research and Engineering to periodically review and assess the maturity of critical technologies and by directing the Department to make greater use of prototypes, including competitive prototypes, to prove that new technologies work before trying to produce them; and**

- **Address problems with costly changes in the middle of a program by tightening the so-called "Nunn-McCurdy" requirements for underperforming programs.**

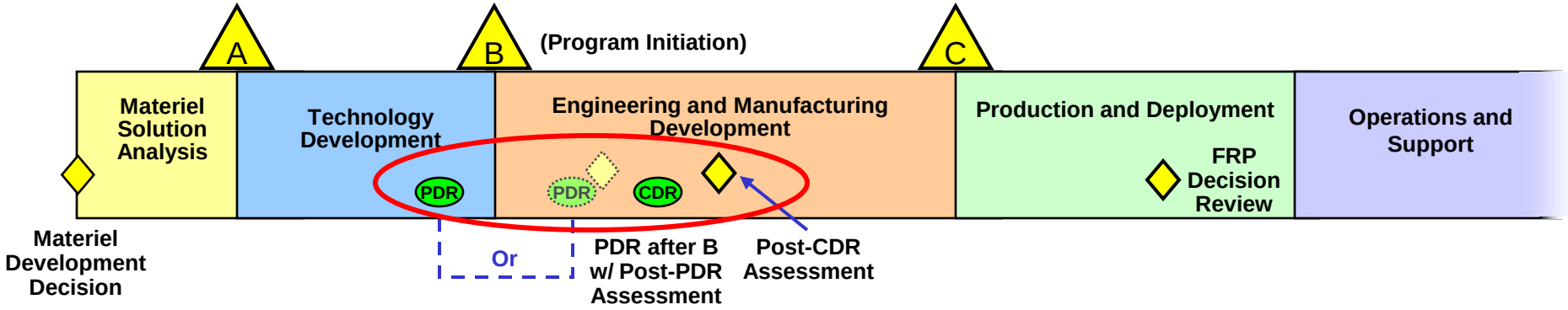
Excerpts from Bill Signing Ceremony Press Release – May 22, 2009

Acquisition Lifecycle Comparisons

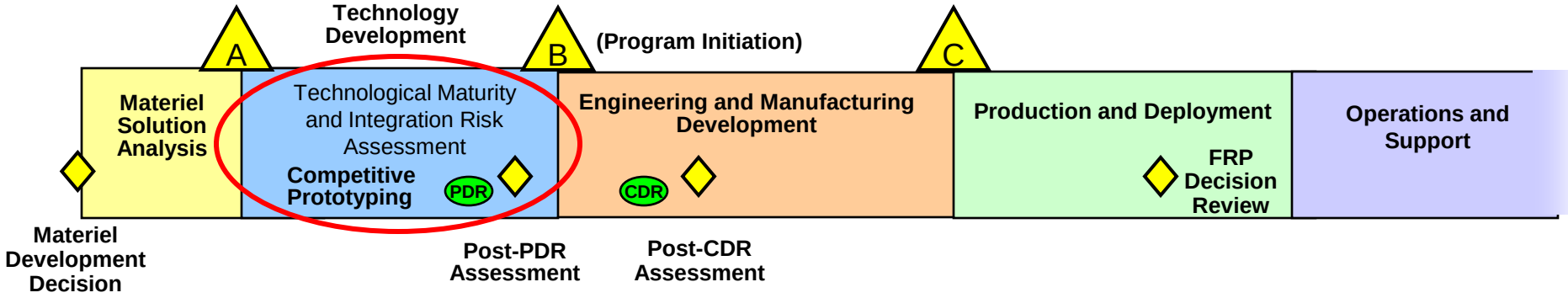
Defense Acquisition Management System, May 12, 2003



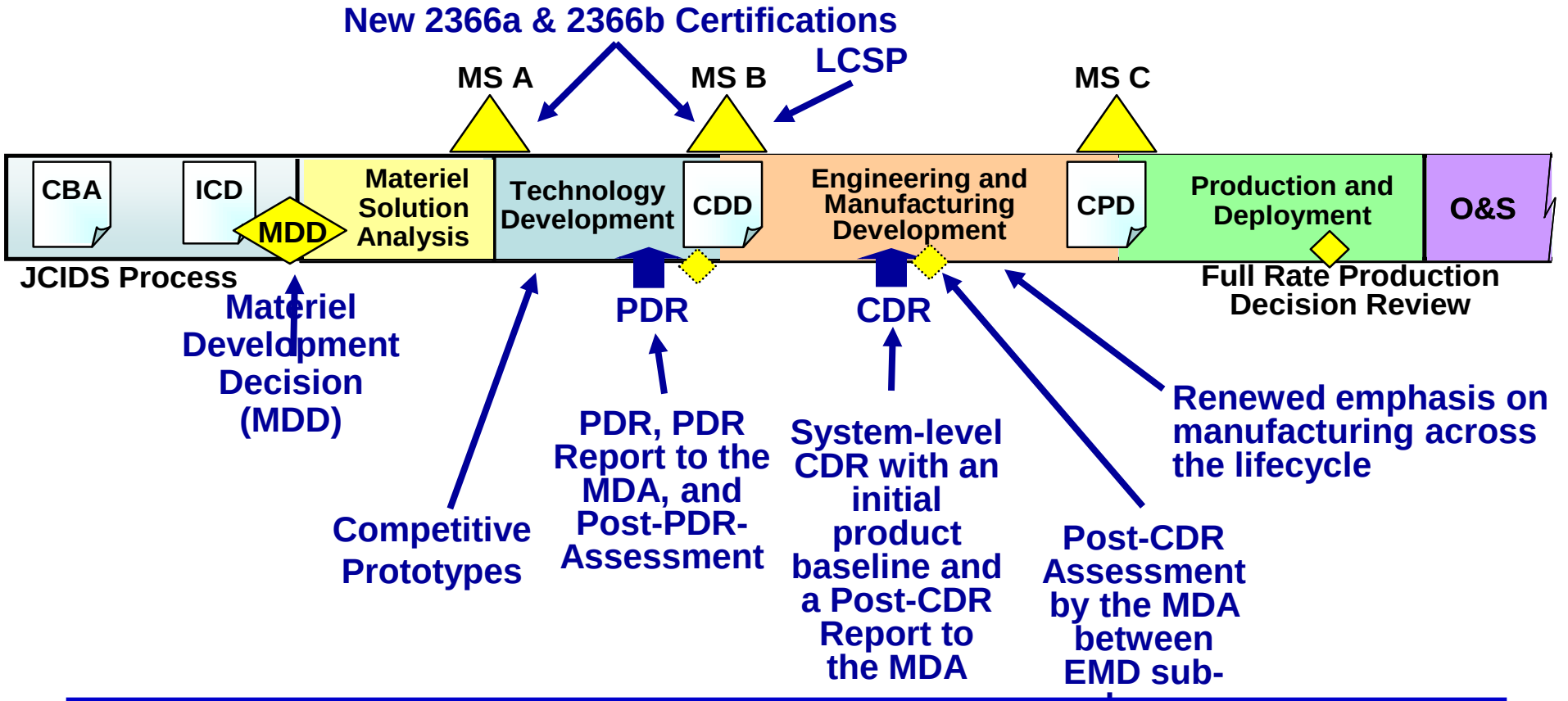
Defense Acquisition Management System, December 8, 2008



Defense Acquisition Management System, May 22, 2009



DoD 5000.02 and PL 111-23 Change the Early Acquisition Landscape



What are the implications of these changes for programs and SEs?
How can systems engineering enable the program during this early phase?
How can standards, handbooks/guides assist the programs?

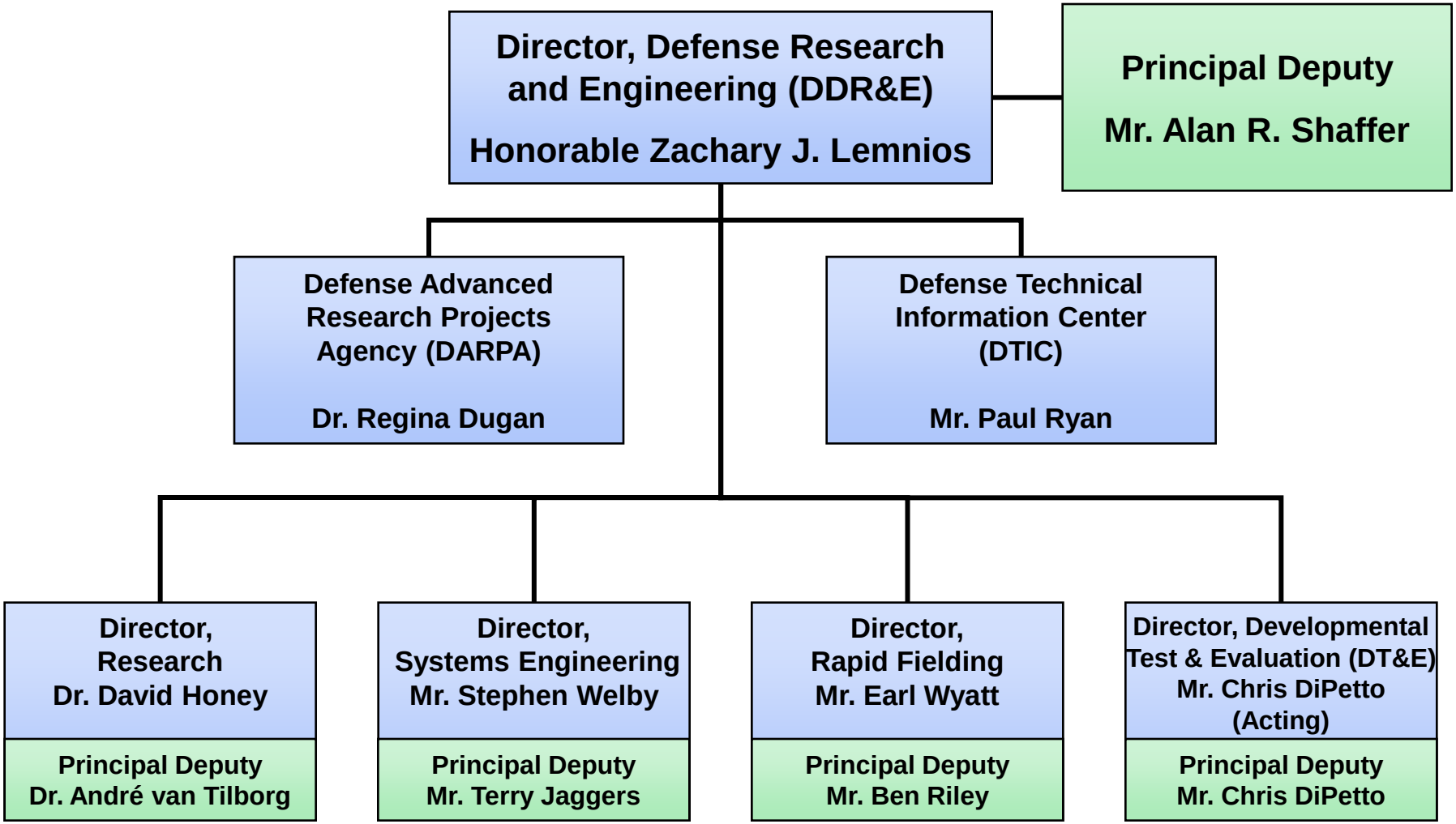
What This Means for Systems Engineers

- **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**

New Challenges for Programs

- Need for Program Office formation and PM skill-sets after MDD and prior to MS A
- Increased importance of the Technology Development Strategy (TDS) (as a surrogate Acquisition Strategy) at MS A
- Schedule and funding shifts – EMD into TD
- Earlier engagement with industry and different contracting strategies for technology maturation, competitive prototyping, data rights, PDR before MS B, etc.
- Explicit need for earlier, formal SE process application (e.g., data, configuration, and risk management)

DDR&E Organization



Director, Systems Engineering (DDR&E SE)

Director, Systems Engineering
Steve Welby

Principal Deputy
Terry J. Jaggers

System Analysis

- Red teaming
- System trades
- System complexity analysis
- Modeling & Simulation Coordination Office
- Developmental planning
- System of Systems SE
- Program Protection Plan Policy & Guidance/Acquisition Cyber Security
- SE Research Center

Major Program Support

- Program Support Reviews
- System Engineering Plans
- Program Auditing functions
- OIPT/DAB/DSAB Support
- DAES Database Analysis and Support
- Measurements and Analysis
- T&E Oversight List

Mission Assurance

- **SE and SW Policy and Guidance**
- Specialty Engineering
- ***DoD Standardization Program Office****
- Workforce Development
- Mission Assurance Assessment
- Acquisition Reform Planning and Reporting for SE

Responsible to provide technical support, systems engineering (SE) oversight, program development and mission assurance certification to USD(AT&L) in support of planned and ongoing acquisition programs

DOD Standardization Executive Realignment

- **Transfer from OSD Logistics to OSD Systems Engineering**
- **Why? - Weapon Systems Acquisition Reform Act of 2009 codifies Director of Systems Engineering**
  - Provide systems engineering principles & best practices to enhance reliability, availability, & maintainability of defense systems
    - Specifications & standards are key systems engineering process inputs to define requirements
    - Specifications & 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 & 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 [and integration with SW Engineering] standards, specifications, and non-DoD guides in the ASSIST data base and a participant in international and national standards organizations for development, revision, coordination, and adoption of these documents

[Note: a large category of IT items in another functional area not addressed here]

Objective:

Update and maintain the SE and SWE portions of ASSIST; support efficient adoption of new and revised 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)**
  - ~360 active documents in SESS
  - 20+ involve SE participation as '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
- **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

**also includes Specifications, Handbooks, DIDs*

SESS Lead Standards Authority [LSA] Responsibilities

- Approves project #s from services requesting to adopt, update, develop new, or cancel standards / DIDs / handbooks / specs
- Coordinates review of such and mitigates issues
- Selects other documents to adopt, update, develop, etc.
- Ensures appropriate persons are involved
- Determines if certain items belong in SESS or elsewhere

List of Key SE Standards Bodies

- **ISO/IEC – International Standards Organization/ International Electrotechnical Commission [particularly the Systems & SW Engineering committee]**
- **TechAmerica – new [merger of GEIA, ITAA, +…]**
  - WGs of particular interest to DOD/SE are SE, CM/DM, Logistics, Safety, HIS, Enterprise Information Management & Interoperability [new]
- **IEEE – Institute of Electronics and Electrical Engineers**
- **ANSI – American National Standards Institute (a US standards accrediting agency and a source to purchase ISO/IEC standards); discounts**
- **NATO**
- **Others [e.g., AIA, AIAA, INCOSE]**

SE Policy & Guidance Recent Activities

- **Adopted ISO/IEC Standards into ASSIST**
  - 15288 [SE], 12207 [SWE, in progress], 16085 [Risk], 15939 [Measurement], 26702 [IEEE 1220:2005]
- **Reviewed ISO drafts** [in JTC1/SC7 for Systems & Software Engineering]
  - 24748-1,2,3 guide for Life cycle management and guides to 15288, 12207
  - 29148 [Requirements engineering],
  - 15026-parts 1-4 System & SW assurance
  - 10303 STEP – Standard for exchange of product, in process
- **GEIA/EIA [TechAmerica] activity**
  - EIA-649 STD and HDBK [CM] revision in draft
  - GEIA-Std-927 [A Common Data Schema for Complex Systems] in draft
  - GEIA-Std-0009 [Reliability Program Standard for System Design & Manufacturing; adopted]
  - GEIA-Std-0007 [Logistics Product Data]; handbook to follow
  - Mil-Std-973 [CM - although cancelled - now points to EIA-649]
  - GEIA-859 [DM; adopted]
- **Under development in SESS*** [DDRE/SE approves]
  - MIL-STD-189A Reliability Growth Management
  - Mil-Std-31000D Technical Data Package
  - Mil-Hdbk-? Acquisition Data Management – in revision
  - SEMP DiD updated

OSD Participation in U.S. Technical Advisory Group (TAG)

- **TAG to International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) Subcommittee 7, *Software and Systems Engineering*, Working Group 7 (WG7), *Life Cycle Management***
  - Sharon Vannucci, OSD/SE Primary rep
  - Eddie Bauer, Army, DoD alternate representative
  - Karen Richter, Institute for Defense Analyses primary representative
- **Participation in standards meetings**
  - Two U.S. TAG meetings: Portland in April 2009 and Pittsburgh in August 2009
  - As part of U.S. national body delegation to WG7 Interim meeting in Nanning, China in Nov 2008
  - ISO/IEC 15026 Editors meeting in Osaka, Japan in August 2009
  - Next WG7 Interim Meeting in Peru in November 2009
- **Nomination by the U. S. National body as co-editors**
  - Karen Richter of all 4 parts of ISO/IEC 15026
  - Eddie Bauer for all 3 parts of ISO/IEC 24748

SE Policy and Guidance Structure

** Note: Currently Guides are not posted in ASSIST*

DoD 5000.02

Defense Acq Guidebook

Chapter 4 SE | **Chapter 8 Security**

Data Flow:
Acquisition Policy
↓
Policy-specific guidance linked to . . .
↓
. . . all other relevant guidance

- M&S Guidance
- DoD M&S Mgt DoDD 5000.59
- DoD M&S VV&A DoDI 5000.61
- RAM Guide
- RAM-C Rationale Report Manual
- CM Mil Hbk 61A
- WBS Mil Hbk 881
- Other Standards & Mil Handbooks

- Risk Mgmt Guide
- SE Slide Rule
- Safety/ESOH Guides
- Safety MIL-STD-882D
- Contracting for SE Guide
- SOS SE Guide
- IMP/IMS Guide
- MOSA Guide
- Other Design Consideration Guides

- "Wall Chart"
- SEP Prep Guide
- DM Guide
- Functional Architecture Development Guide
- Tech Review Guide

Planned

Extent

- PPP DoDI 5200.39
- Systems Assurance Guide
- DTM 08-048 Supply Chain Risk Management
- PPP Prep Guide
- CPI Security Classification Guide
- CPI Identification Tool
- PP Contract Language Compendium

- EW and C2W Countermeasures DoDD 3222.3
- DoD IA DoDD 8500.01E
- Interoperability & Supportability of IT & NSS DoDD 4630.05
- Acq Security-Related Policies & Issuances Tool

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

Systems Engineering Policy, Guidance and Standards - - Initial *Focus Plan of Work*

Address issues and update for WSARA and DoDI 5000.02*:

* And also recent NDIA-SE report on DOD/SE Systemic Root Cause Analyses findings and associated actions

Director, SE Directive	**Coordinate and obtain USD(AT&L) approval**
Contracting for SE	**Expand beyond current Milestone B focus**
Data Management	**Provide guidance to DoD data managers**
New Guidance	**Fill in policy implementation voids**
SEP Prep Guide	**Reduce internal and external redundancy; update**
DAG Chapter 4	**Update for WSARA**
SE Standards	**Revitalize SE involvement**