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12th ANNUAL SYSTEMS ENGINEERING CONFERENCE

"Achieving Acquisition Excellence Via Effective Systems Engineering"

San Diego, CA

26 - 29 October 2009

Agenda

Tuesday, October 27, 2009

PLENARY SESSION 1 - INTRODUCTION & OPENING REMARKS
- Mr. Bob Rassa, Director, Systems Supportability, Raytheon; Chair, Systems Engineering Division, NDIA

KEYNOTE ADDRESS
- Honorable Zachary J. Lemnios, Director, Defense Research and Engineering, Office of the Secretary of Defense (Acquisition, Technology and Logistics)

PLENARY SESSION 2 - SERVICE ACQUISITION EXECUTIVES
VIEW FROM THE TOP: HOW CAN SE SUPPORT PROGRAM EXECUTION?
Moderator: Mr. Terry Jaggers, Principal Deputy, Systems Engineering, Office of the Director, Defense Research and Engineering
- Mr. David G. Ahern, Director, Portfolio Systems Acquisition, Office of the Secretary of Defense (Acquisition, Technology and Logistics)
- Mr. Thomas E. Mullins, Deputy Assistant Secretary for Plans, Programs and Resources (SAAL-ZR), Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology)
- Mr. Christopher A. Miller, PEO for Command, Control, Communications, Computers and Intelligence (C4I), ASNRDA
- Mr. Randall G. Walden, Director, Information Dominance Programs, Office of the Assistant Secretary of the Air Force (Acquisition), AFRCO

LUNCH WITH SPEAKER IN THE REGATTA PAVILION
- Mr. Stephen Welby, Director, Systems Engineering, Office of the Director, Defense Research and Engineering

PLENARY SESSION 3 - TEST & EVALUATION EXECUTIVES
VIEW FROM THE TOP: HOW SE CAN SUPPORT DEVELOPMENTAL TEST AND EVALUATION?
Moderator: Mr. Jim O'Bryon, The O'Bryon Group; Chair, Test and Evaluation Division
- Dr. James N. Streilein, Technical Advisor, HQ Army Test & Evaluation Command
- Ms. Amy Markowich, Deputy DoN T&E Executive
- Colonel Dexter M. Sapinoso, USAF, Chief of Air Force Test and Evaluation Policy and Programs
- Mr. Christopher DiPetto, OUSD(AT&L)/DDR&E/DT&E

PLENARY SESSION 4 - *SE AND ACQUISITIONS REFORM: THE WAY AHEAD*
Moderator: Mrs. Kristen Baldwin, Office of the Director, Defense Research and Engineering
- Mr. Ross Guckert, Office of the Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT))
- Mr. Carl Siel, Office of the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN(RDA)CHSENG)
- Colonel Shawn Shanley, USAF, Chief Systems Engineer, Office of the Assistant Secretary of the Air Force for Acquisition, Science, Technology, and Engineering (SAF/AQR)
- Mr. Nicholas Torelli, Office of the Director, Defense Research and Engineering

WEDNESDAY, OCTOBER 28, CONCURRENT SESSIONS

TRACK 1

Systems Engineering Effectiveness - Bayview III

- 8851 - *Rapid Development and Integration of Remote Weapon Systems to Meet Operational Requirements*, Mr. Joseph Burkart, NSWC Crane, Small Arms Air Platform Integration
- 8893 - *Rapid Development*, Mr. Michael Gaydar, NAVAIR
- 8847 - *Tailoring the SE Process to Effectively Complement the SW Agile Development Process*, Mr. William Lyders, ASSETT Inc.
- 8902 - *Systems Engineering Leading Indicators: Insight into Effective Systems Engineering*, Mr. Gary Roedler, Lockheed Martin Corporation
- 9414 - *Correcting Deficiencies in the Systems Engineering of Tactical Weapons*, Mr. Marvin Ebbert, Raytheon Missile Systems
- 8948 - *Value Engineering Applications in Service Contracts*, Dr. Jay Mandelbaum, Value Engineering Applications in Service Contracts
- 8816 - *Mind the GAPs-a Systems Engineering Implementation of DoDI 5000.02*, Dr. Thomas Christian, U. S. Air Force
- 8990 - *Systems Engineering for Rapid Capability Development*, Mr. Thomas McDermott, Georgia Tech Research Institute
- 8974 - *Transforming Systems and Software Engineering Across an Enterprise*, Mr. Jeffery Wilcox, Lockheed Martin Corporation
- 8863 - *Using Requirements Compliance to Identify Gaps Between the Technical Solution and Requirements*, Mr. Frank Salvatore, High Performance Technologies, Inc.
- 8823 - *Win and Influence Design Engineers---Change Their Affordability DNA*, Mr. Tim Morrill, Raytheon Company

TRACK 2

Early System Engineering - Bayview II

- 8951 - *USAF View of NRC "Pre-A Systems Engineering" Study Committee Recommendations As Addressed By Levin-McCain (P.L. 111-23; "Weapon Systems Acquisition Reform Act of 2009"*), Mr. Jeff Loren, SAF/AQR (Alion Science & Technology)
- 8846 - *Air Force Materiel Command Early Systems Engineering*, Dr. Brian Kowal, USAF
- 9016 - *A Framework for Enhancing Forward-looking Capability Delivery Metrics*, Mr. Leonard Sadauskas, DoD CIO CT&S
- 9082 - *Including Environment, Safety, and Occupational Health (ESOH) Requirements in Joint Capabilities Integration and Development System (JCIDS) Documents*, Mr. Sherman Forbes, U.S. Air Force
- 8835 - *T&E Collaboration and Contributions during Early Program Acquisition*, Mr. Stephen Scukanec, Northrop Grumman Corporation Aerospace Systems
- 8795 - *Mission-based Test and Evaluation Strategy: Creating Linkages between Technology Development and Mission Capability*, Mr. John Beilfuss, U.S. Army Research Laboratory
- Panel Topic: 8924, 8925 , 8933 - *Early Systems Engineering in DoDI 5000.02*, Dr. Judith Dahmann, Ms. Lisa Reuss, Ms. Sharon Vannucci, Systems Engineering Directorate, ODDR&E
- 8949 - *Updated DoD 5000 and CJCS 3170 Policies: A Requirements to Acquisition Gap Analysis*, Mr. John Lohse, Raytheon Company
- 8813 - *Emerging Roles for Systems Engineering in Defense Decision Making; Better Aligning Requirements and Acquisition with the Budget and Security Environments*, Mr. Vincent Roske, Institute for Defense Analyses
- 9026 - *Early SE Determination of Best-Fit System Life Cycle Processes*, Dr. Barry Boehm, USC

TRACK 3 - Technology Maturity - Bayview I

- 8991 - *Systems Engineering for the Science & Technology Community*, Mr. Russell Menko, U. S. Army RDECOM/TARDEC
- 9017 - *Linking Systems Engineering Artifacts with Complex Systems Maturity Assessments*, Dr. Brian Sauser, Stevens Institute of Technology
- 8770 - *Incorporating Maturity Assessment into House of Quality for Improved Decision Support Analysis and Risk Management*, Mr. Pavel Fomin, U.S. Air Force
- 8798 - *The New Technology Readiness Assessment Process*, Dr. Jay Mandelbaum, Institute for Defense Analyses
- 8870 - *S&T Portfolio Maturity & Performance Analysis: The Concept of Critical Research Elements*, Mr. Has Patel, Infologic, Inc.
- 8879 - *TRL Vectors in IPPD-based Portfolio Management*, Mr. Michael Bartmess, General Dynamics/AIS
- 8963 - *Air Force Concept Maturity Assessment*, Mr. George Freeman, U.S. Air Force, Center for Systems Engineering
- 8900 - *DOD's Weapon System Portfolio: Are Results Getting Any Better?*, Mr. Michael Sullivan, U.S. Government
- 8894 - *Air Force Initiative – High Confidence Technology Transition Planning Through the Use of Stage-Gates – Update*, Mr. Randy Bullard, U.S. Air Force Materiel Command
- 8891 - *A comprehensive overview of techniques for measuring system readiness*, Mr. James Bilbro, JB Consulting International

TRACK 4 - Test and Evaluation of SOS - Mission I

- 8825 - *Test and Evaluation in a System of Systems Environment*, Mr. Edwin McDermott, 653 ELSW, Electronic Systems Center
- 8849 - *Joint Integration and Interoperability Lab (JSIIL)*, Mr. Steven Whitehead, SL, J8 Technical Director, USJFCOM
- 8935 - *Systems of Systems Systems Engineering and Test and Evaluation*, Dr. Judith Dahmann, Systems Engineering Directorate, ODDR&E/MITRE

TRACK 4 - Practical Systems Engineering - Mission I

- 9014 - *SAVI: Aerospace Platform Development and Certification Using Modeling and Simulation to "Integrate, then Build"*, Mr. Gregory Pollari, Rockwell Collins
- 8855 - *Certify and Fly Right: Preparing for DO-297 Certification*, Mr. Ketih Custer, Esterline Control Systems-AVISTA
- 8973 - *C-17 Transition to Criteria-based Airworthiness Certification*, Mr. Christian Stillings, USAF 516 AESG

TRACK 4 - Test and Evaluation - Mission I

- 8848 - *Integrated Testing: We Can Do It*, Dr. Beth Wilson, Raytheon Company
- 8882 - *Test & Evaluation Strategy for the Technology Development Phase*, Ms. Darlene Mosser-Kerner, OUSD(AT&L)/DDR&E/DT&E
- 8883 - *Test & Evaluation Products for the Systems Engineering Reviews*, Mr. Woody Eischens, OUSD(AT&L)/DDR&E/DT&E
- 8814 - *Joint Mission Environment Test Capability (JMETC), Lowering technical Risk by Improving Distributed Test Capabilities*, Mr. Chip Ferguson, JMETC
- 8901 - *Review Results of the NDIA/OSD Software Test Summit/Workshop*, Mr. Thomas Wissink, Lockheed Martin IS&GS

TRACK 5 - Human Systems Integration - Mission II

- 8998 - *Human Systems Integration – Ensuring the Human is Considered "Left of A"*, Col Larry Kimm, USAF, U.S Air Force
- 8885 - *Human Systems Integration (HSI) - Integrating Human Concerns into Life Cycle Systems Engineering*, Ms. Cynthia Shewell, Booz Allen

Hamilton

- 9012 - *Human Systems Integration: Defining and Validating a Framework for Enhanced Systems Development,* Dr. Matthew Risser, Pacific Science & Engineering Group
- 8975 - *What is Human Systems Integration (HSI) and why should we do it?,* Mr. Stuart Booth, Systems Engineering Directorate, ODDR&E
- 9042 - *Bounding the Human Within the System,* Mr. Michael Mueller, U.S. Air Force Center for Systems Engineering
- 8829 - *The Army Health Hazard Assessment Program's Medical Cost Avoidance Model,* Dr. Timothy A. Kluchinsky, Department of Army

TRACK 5 - System Safety - ESOH - Mission II

- 9095 - *Using Proposed MIL-STD-882 Change 1 For Hazardous Materials Management,* Ms. Karen Gill, Booz Allen Hamilton
- 8890 - *Building Safer UGVs with Run-time Safety Invariants,* Mr. Michael Wagner, Carnegie Mellon University, NREC
- Sherman Forbes, U.S. Air Force
- 882D - *Overview of Draft MIL-STD-882D With Change 1,* Mr. Bob Smith, Booz Allen Hamilton
- 9070 - *Improving Safety Technology Insertion in DoD Acquisition Programs,* Dr. Elizabeth Rodriguez-Johnson, Systems Engineering Directorate, ODDR&E
- 9094 - *DoD Green Procurement Program Update and Path Forward,* Mr. David Asiello, Office of the Secretary of Defense
- 9091 - *Environment, Safety, and Occupational Health (ESOH) Risk and Technology Requirements Reporting at Acquisition Program Reviews,* Ms. Lucy Rodriguez, Booz Allen Hamilton

TRACK 6 - System of Systems - Mission III

- 8898 - *Designing Collaborative Systems of Systems in support of Multi-sided Markets,* Mr. Philip Boxer, SEI
- 8892 - *SysML Strategies to Characterize and Analyze Systems of Systems,* Dr. Jo Ann Lane, University of Southern California
- 9041 - *On Modeling and Simulation Methods for Capturing Emergent Behaviors for Systems of Systems,* Dr. Jack Zentner, Georgia Tech Research Institute
- 9060 - *M&S Support for SoS SE,* Dr.Joann Lane, USC
- 8776 - *The Modular SOS Paradigm: an Availability Paradox?,* Mr. Peter Gentile, Northrop Grumman Corporation
- 8866 - *Extending FMECA to Systems of Systems,* Mr. Leopoldo Mayoral, Johns Hopkins University/APL
- *NDIA SoS Committee Report,* Dr. Judith Dahman, Systems Engineering Directorate, ODDR&E/MITRE
- 8960 - *A Distillation of Lessons Learned from Complex System of Systems Acquisitions,* Dr. Richard Turner, Stevens Institute
- 8784 - *Establishing a Departmental-Level Systems-of-Systems Engineering Management Construct for the Department of the Navy, Progress Report*, Mr. John Kevin Smith, Asst Sec of the Navy for RD&A, Chief Engineer
- 8942 - DoD Systems of Systems Update, Dr. Judith Dahmann, Systems Engineering Directorate, ODDR&E/MITRE
- 8961 - Engineering Systems of Systems: An Integration Perspective, Dr. Emmett Maddry, NSWCDD

TRACK 7 - Program Management - Palm I

- 8979 - *Boots on the Ground: Tactical Planning at Program Start Up,* Mr. Gerry Becker, Harris Corporation
- 8999 - *Program Signature Measurement,* Mr. James Thompson, Systems Engineering Directorate, ODDR&E
- 9103 - *The Economics of CMMI,* Mr. Geoff Draper, Harris Corporation
- 8995 - *Integrated Systems Engineering and Developmental Test and Evaluation,* Mr. Chris DiPetto, DUSD(A&T)/SSE
- 9021 - *Critical Success Factors for Milestone Review Risk Identification,* Dr. Barry Boehm, USC
- 9030 - *Lessons Learned in Motivating Software Engineering Process Group to Focus on Achieving Business Goals and Not on Just Achieving a Maturity Level,* Mr. Girish Seshagiri, Advanced Information Services Inc.
- 9003 - CMMI® for Executives, Mr. Geoff Draper, Harris Corporation
- 9034 - Sustainment and Continued Institutionalization of Best Practices and CMMI® at SPAWAR, Mr. Michael Kutch, SPAWAR Systems Center Atlantic
- 8791 - Cost and Risk Impacts of the New DOD 5000 Defense Acquisition Framework, Dr. Peter Hantos, The Aerospace Corporation
- 8895 - A Comprehensive Review of Maturity Assessment Approaches for Improved Defense Acquisition, Ms. Nazanin Azizian, The George Washington University

TRACK 8 - Net-Centric Operations/Interoperability - Palm II

- 8874 - *The Boeing System of Systems Engineering (SoSE) Process and Its Use in Developing Legacy-Based Net-Centric Systems of Systems,* Mr. John Palmer, The Boeing Company
- 9010 - *Network Enabled Weapons, A System Engineering Approach to Achieve Interoperabilty, Mr. Andrew Lieux*, Naval Air Warfare Center Weapons Division
- 8854 - *Human Interoperability Enterprise and Net Centric Operations,* Mr. Jack Zavin, ASD (NII)
- 8780 - *Net-Centric Best Practices*, Mr. Hiekeun Ko, JPEO-CBD - Software Support Activity
- 8788 - *Data sharing in a Stability Operations Community of Interest: Utilizing a pilot program to prove concepts and develop trust.*, Mr. Gerald Christman, Femme Comp Inc.
- 8853 - *C4I Architecture for Joint ASW*, Mr. Gregory Miller, Naval Postgraduate School
- 8929 - *Extending Net-Centric Quality of Service to Systems of Systems*, Maj Vinod Naga, USAF, Air Force Institute of Technology
- 9081 - *Testing in Service-oriented Environments,* Mr. Soumya Simanta, SEI
- 8913 - *Linking Interoperability and Measures of Effectiveness: A Method for Evaluating Architectures,* Dr. David Jacques, Air Force Institute of Technology

TRACK 8 - Speciality Engineering - Palm II

- 8944 - *DoD's Refocus on Specialty Engineering (Reliability, Availability and Maintainability; Producibility and Quality, Supportability, Safety and Human Systems Integration),* Mr. Chester Bracuto, Systems Engineering Directorate, ODDR&E
- 9043 - *Implementing the Materiel Availability KPP in DoD acquisition programs—balancing life-cycle costs with warfighter needs,* Mr. Grant Schmieder, Systems Engineering Directorate, ODDR&E
- 8873 - *IUID enables streamlined acquisition and system engineering,* Mr. Robert Leibrandt, DoD UID Policy Office
- 8958 - *Security Systems Engineering,* Mrs. Kristen Baldwin, Systems Engineering Directorate, ODDR&E

THURSDAY, OCTOBER 29, CONCURRENT SESSIONS

TRACK 1 - Systems Engineering Effectiveness - Bayview III

- 8887 - *Achieving a Systems Engineering Culture in a Science and Technology Laboratory Environment,* Mr. Robert Rapson, Materials and Manufacturing Directorate, AFRL
- 8920 - *A Methodology for Assessing Systems Engineering Practices,* Ms. Lauren Levy, Johns Hopkins University/APL
- 9097 - *Acquisition ESOH Risk Management-How to Make It Work,* Mr. Bob Smith, Booz Allen Hamilton

TRACK 1 - Architecture - Bayview III

- 8831 - *Human-Centered Design in Systems Engineering: Human View Methodology,* Dr. Robert Smillie, SPAWAR
- 8830 - *Systems Engineering Needs of the DoDAF – Report of the Architecture Frameworks Working Group,* Mr. Joe Kuncel, Northrop Grumman Corporation
- 8824 - *Delivering DoDAF Version 2.0 to Architects and Systems Engineers for IT Systems and Services,* Mr. Walt Okon, Department of Defense, CIO, Enterprise Architecture
- 8971 - *Advancing Systems Engineering Practice using Model Based System Development,* Mr. Sanford Friedenthal, Lockheed Martin Corporation
- 9004 - *Evolving Systems Engineering through Model Driven Functional Analysis,* Dr. Mark Blackburn, Systems and

TRACK 2 - Logistics Systems - Bayview II

- 9063 - *An Integrated RAM Approach to System Design and Support,* Mr. Robert Finlayson, Johns Hopkins University/APL
- 9031 - *Supportability Lessons Learned with Line Replaceable Modules,* Ms. Heity Hsiung, Raytheon Company
- 8908 - *Successful First AESA Deployment through Application of System Engineering,* Mr. Scott Nichols, Raytheon Company
- 9039 - *Applying Systems Engineering to Fielded Weapon Systems and End-Items,* Mr. Michael Ucchino, AF Center for Systems Engineering
- 9008 - *Upgrade Fluid System Filter Element Monitoring To Increase Operational Reliability and Support Condition Based Maintenance Capability,* Mr. Gary Rosenberg, Constellation Technology Corportation
- 8834 - *Tailoring Systems Engineering for Technical Support of Legacy Products,* Mr. Joseph Skandera, BAE Systems
- 9092 - *The role of simulation in tracking mobile assets using RFID technology,* Mr. Swee Leong, National Institute of Standards and Technology

TRACK 3 - Modeling & Simulation - Bayview I

- 8939 - *Understanding the New DoD Instruction 5000.61: "DoD Modeling & Simulation Verification, Validation and Accreditation (VV&A)",* Mr. Michael Truelove, Systems Engineering Directorate, ODDR&E
- 8950 - *Live, Virtual, Constructive Architecture Roadmap: The Quest for Interoperability, Standards, and Reuse,* Dr. Gary Allen, Joint Training Integration & Evaluation Center
- 9048 - *Revisions to the Acquisition Modeling & Simulation Master Plan,* Mr. Stephen Swenson, Systems Engineering Directorate, ODDR&E
- 8759 - *A Systems Engineering Framework for Integrating M&S Development Best Practices,* Dr. Katherine Morse, Johns Hopkins University/APL
- 9052 - Best Practices in Contracting for Models, Simulations, and Associated Data, Mr. Dennis Shea, CNA
- 8947 - *Report on a Study on Management Concepts for Broadly-Needed Modeling and Simulation Tools in the U.S. Department of Defense,* Dr. James Coolahan, Johns Hopkins University/APL
- 8836 - *Producibility Modeling & Simulation Needs for Early Systems Engineering Evaluations of Alternative Design Concepts,* Dr. Al Sanders, Honeywell Aerospace
- 8810 - *Using Simulation to Define and allocate probabilistic Requirements,* Ms. Yvonne Bijan, Lockheed Martin Aeronautics
- 8923 - *Integration of Operational Simulations With Physics-Based Models For Engineering Analysis,* Mr. Stephen Guest, Lockheed Martin Aeronautics

TRACK 4 - Practical Systems Engineering - Mission I

- 8980 - *Using Model-driven Engineering Techniques for Integrated Flight Simulation Development,* Mr. Douglas Fiehler, Raytheon Missile Systems
- 9007 - *Technology Maturation for the Automated Aerial Refueling (AAR) Project,* Ms. Carol Ventresca, SynGenics Corporation
- 8880 - *Naval Postgraduate School Advanced Seabase Enabler Project: A Systems Engineering Case Study,* Mr. Lance Flitter, NSWC, Carderock Division
- 8946 - *Protecting the Mission, Preserving Legacy and Promoting Growth,* Ms. Patti Scaramuzzo, Lockheed Martin Corporation
- 9054 - *A-10 Avionics System Architecture Trade Study and Analysis (AVSATA) Program,* Mr. Richard Sorensen, KIHO Military Acquisition Consulting, Inc.
- 8976 - *A Systems Engineering Model for Roadmap Alignment,* Mr. Si Dok, U. S. Army TARDEC
- 9080 - *Rapid Systems Engineering of the MRAP Gunner Restraint System Saves Lives,* Ms. Michelle Bowen, JPO MRAP
- 9002 - *Key Considerations for Building Highly Available, Mission-Critical Systems,* Mr. Stephen Mills, GoAhead Software

TRACK 5 - Human Systems Integration - Mission II

- 8937 - *Integrating the Human into the system, integrating HSI Tools into Systems Engineering,* Dr. Jennifer Narkevicius, Jenius LLC
- 9064 - *Economics of Human Systems Integration: Early Life Cycle Cost Estimation Using HSI Requirements,* 2ndLt Kevin Liu, USMC, MIT
- *Proccess Management and tool selection to minimize risk of hand-arm vibration syndrome,* Mr. Sherman Forbes, U.S. Air Force

TRACK 5 - Systems Engineering Development Environment - Mission II

- 8945 - *Standards Based Development Environment,* Mr. Christopher Oster, Lockheed Martin Corporation
- 8922 - *The Role of DoD in Systems Engineering Standards and Models,* Mr. Donald Gantzer, Systems Engineering Directorate, ODDR&E
- 8844 - *The Power of the Spec: Understanding the Many Diverse Roles in SE of Good Specifications & Standards.",* Mr. Robert Kuhnen, U.S. Air Force

- 8967 - *Generating Visual and Interactive Output from System Engineering Tools,* Mr. John Schatz, Systems and Proposal Engineering Company
- 9015 - *Challenges and Benefits of applying ISO STEP,* Mr. Stuart Booth, Systems Engineering Directorate, ODDR&E
- 9059 - *Smallsat Conceptual Design Trade and Cost Modeling Tool,* Dr. Deganit Armon, Advatech Pacific, Inc

TRACK 6 - Enterprise Health Management - Mission III

- 8815 - *Applying Systems Engineering to Operational System Improvements,* Ms. Ryanne Gentry, Acquisition Logistics Engineering
- 8842 - *Applications in Integrated Diagnostics,* Mr. Jimmy Simmons, Georgia Tech Research Institute
- 8884 - *Tactical Wheeled Vehicle Integrated Diagnostics,* Mr Lawrence Osentoski, DRIVE Developments, Inc.

TRACK 6 - System of Systems - Mission III

- 8964 - *Software Assurance in a System of Systems World: Interoperability Challenges - Reports from the Field,* Dr. Carol Sledge, SEI
- 8969 - *An Introduction to Influence Maps: Foundations, Construction, and Use,* Mr. James Smith, SEI
- 9024 - *Dynamic Modeling of Programmatic and Systematic,* Dr. Brian Sauser, Purdue University
- 8915 - *System of Systems Challenges and Solutions: Case Study Insights,* Mr. John Colombi, U.S. Air Force Institute of Technology

TRACK 7 - Work Force Development - Palm I

- 8966 - *Improving Systems Engineering Curriculum Using a Competency-Based Assessment Approach,* Ms. Alice Squires, Stevens Institute of Technology
- 9088 - *Enhancing Systems Engineering Competencies in the Enterprise,* Mr. Gary Roedler, Lockheed Martin Corporation
- 8789 - *Achieving Acquisition Excellence via Improving the Systems-Engineering Workforce,* Dr. Kenneth Nidiffer, SEI
- 8926 - *Systems Engineering Workforce Development Update,* Dr. Don Gelosh, Systems Engineering Directorate, ODDR&E
- 9076 - *Assessing Systems Engineering Personnel Competency: Framework and Tool Experience,* Dr. Barry Boehm, University of Southern California
- 8943 - *Team SE Skill Set,* Mr. Charles Garland, U.S. Air Force Center for Systems Engineering
- 8956 - *Systems Engineering Approach to Workforce Development,* Mr. James Miller, U.S. Air Force
- 9046 - *Developing an Introductory Systems Engineering Practitioners Course: "Model-Based Systems Engineering (MBSE) With SysML",* Mr. Joseph Wolfrom, Johns Hopkins University/APL
- 8878 - *Advanced Simulation Course for Army Simulation Management Professionals,* Dr. Gene Paulo, Naval Postgraduate School

TRACK 8 - Software Intensive Systems - Palm II

- 8977 - *Overview of DoD Software Engineering Initiatives,* Mr. Scott Lucero, Systems Engineering Directorate, ODDR&E
- 8820 - *Graduate Software Engineering Reference Curriculum (GSwERC),* Ms. Nicole Hutchison, Analytic Services, Inc.
- 8739 - *Quality Assessment of Software-Intensive System Architectures and their Requirements (QUASAR*), Mr. Donald Firesmith, SEI
- 8812 - *A Systems Engineering Approach to Multi-Level Security in a Service Oriented Architecture,* Mr. Timothy Greer, Lockheed Martin Corporation
- 9104 - *Static Code Analysis: Best Practices for Software Assurance in the Acquisition Life Cycle,* Mr. Paul Croll, CSC
- 8996 - *Engineering Improvement in Software Assurance: A Landscape Framework,* Ms. Lisa Brownsword, SEI
- 8802 - *Open Source Technology for Enterprise Health Management,* Mr. Edward Beck, CSC
- 8901 - *Review Results of the NDIA/OSD Software Test Summit/Workshop,* Mr. Thomas Wissink, Lockheed Martin IS&GS
- 9506 - *Software Acquisition Management Practical Experience,* Mr. James Jones, SSAI

▸ CONFERENCE OVERVIEW

The NDIA Systems Engineering conference is focused on improving acquisition and performance of Defense programs and systems, including net-centric operations and data/information interoperability, system-of-systems engineering and all aspects of system sustainment. Convened in San Diego, CA, October 26-29, 2009, this conference is sponsored by the National Defense Industrial Association, Systems Engineering Division, with technical co-sponsorship by IEEE AES, IEEE Systems Council and the International Council on Systems Engineering, and is supported by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, Office of the Director, Defense Research & Engineering/Systems Engineering.

▸ BACKGROUND

The Department of Defense continues to work to improve the acquisition of military equipment and capability to assist the warfighter in protecting the U.S. and its allies, and help oppressed nations around the world, amidst continuously changing conditions and threats. The DoD seeks to improve the acquisition process and overall program execution of military systems, to provide greater, more effective and reliable warfighting capability, at affordable cost and within reasonable schedules. One of the primary and critically important areas of program acquisition and execution lies in the umbrella discipline of Systems Engineering, which is the overall integrating function in defense programs, from proper requirements definition & flowdown, effective and affordable design that integrates reliability, availability and maintainability considerations into the overall balance of design that emphasizes supportability and usage aspects along with overall performance, cost and schedule. Systems Engineering principles embody strong technical and risk management aspects, for both the acquiring program office as well as the executing defense prime and subcontractors. Strong emphasis on Systems Engineering throughout the life cycle of the program, from concept development through sustainment, is a key enabler of successful programs. The annual Systems Engineering Conference explores the role of Systems Engineering in defense programs from all aspects and perspectives, including the pragmatic, practical and academic viewpoints, and brings key practitioners together to work on effective solutions to achieving a successful warfighting force.

▸ CONFERENCE OBJECTIVES

This conference seeks to create an interactive forum for Program Managers, Systems Engineers, Chief Scientists and Engineers and Managers from the Requirements, Design, Verification, Support, Logistics and Test communities from Government, Academia, and Industry. The conference will provide the opportunity to shape policy and procedures by exchanging innovative tactics and lessons learned.

▸ CONTACTS

Technical Program Co-Chairs:
Mr. Steve Henry,
Manager, Systems Engineering and Program Support, Northrop Grumman Information Systems, stephen.henry@ngc.com, (703) 561-5724

Dr. Tom Christian, ASC/EN, thomas.christian@wpafb.af.mil, (478) 926-2457

Conference Chair:
Mr. Bob Rassa, Director, Systems Supportability, Raytheon; Chair, Systems Engineering Division, NDIA, rcrassa@raytheon.com, (310) 985-4962

Meeting Planner:
Ms. Suzanne Havelis, NDIA, shavelis@ndia.org, (703) 247-2570.

Conference Director:
Mr. Sam Campagna,
NDIA, scampagna@ndia.org, (703) 247-2544

▸ ATTIRE

Appropriate dress for this conference is business casual for civilians and class B uniform for military. During conference registration and check-in, each participant will be issued an identification badge. Please be prepared to present a picture ID. Badges must be worn at all conference functions.

▸ CONFERENCE PROCEEDINGS

Proceedings will be available on the web through the Defense Technical Information Center (DTIC), and will be available one to two weeks after the conference. You will receive notification via e-mail once proceedings are posted and available on the web.

▸ CONTINUING EDUCATION UNIT CREDIT

NDIA is offering CEU credit options for the Systems Engineering Conference. For more information, please contact Ms. Suzanne Havelis at 703.247.2570 or shavelis@ndia.org.

▸ 2010 CALL FOR PAPERS INFORMATION

The primary objective of the 13th Annual Systems Engineering Conference is to provide insight, information and lessons learned into how we can improve the overall performance of defense programs via a better, more focused application of systems engineering that will lead to more capable, interoperable and supportable weapon systems for the warfighter, with reduced total ownership costs, to help our military meet its current and new mission area and capabilities requirements. Technical and management presentations are a key tactic in achieving this objective. You are invited to submit a short (under 300 word) abstract of a presentation for a session (see topics on the website). Abstracts must fully describe the planned content and how the presentations will advance the objectives of the conference and session. All accepted presentations will be delivered at the conference in electronic format; full papers are optional and are not required.

Abstracts must include the following administrative information: presentation title, author's name, title, e-mail address, phone number, mailing address and organization and the conference session targeted. Abstracts must be submitted no later than Sunday, May 30, 2010 via the following web link:

http://application.ndia.org/abstracts/1870

Abstracts will only be accepted through this web link, and all required information must be completed. Upon completion of the required information, you will receive an e-mail confirmation.

**Conference presenters are not exempt from registration and conference fees.

CONFERENCE AGENDA

SUNDAY, OCTOBER 25, 2009

5:00 pm - 7:00 pm	**REGISTRATION FOR TUTORIALS AND GENERAL CONFERENCE**

MONDAY, OCTOBER 26, 2009

7:00 am - 6:00 pm	**REGISTRATION**
7:00 am - 8:00 am	**CONTINENTAL BREAKFAST (FOR TUTORIAL ATTENDEES ONLY)**
8:00 am - 12:00 pm	**TUTORIAL TRACKS**
9:45 am - 10:15 am	**MORNING BREAK (FOR TUTORIAL ATTENDEES ONLY)**
12:00 pm - 1:00 pm	**LUNCH (FOR TUTORIAL ATTENDEES ONLY)**
1:00 pm - 5:00 pm	**TUTORIAL TRACKS CONTINUED**
2:45 pm - 3:15 pm	**AFTERNOON BREAK (FOR TUTORIAL ATTENDEES ONLY)**
5:00 pm - 6:00 pm	**RECEPTION IN THE REGATTA PAVILION - OPEN TO ALL CONFERENCE ATTENDEES**

TUESDAY, OCTOBER 27, 2009

7:15 am - 7:00 pm — **REGISTRATION**

7:15 am - 8:15 am — **CONTINENTAL BREAKFAST IN THE REGATTA PAVILION**

8:15 am - 8:30 am — **PLENARY SESSION 1 - INTRODUCTION & OPENING REMARKS**

- Mr. Sam Campagna, *Director, Operations, NDIA*
- Mr. Bob Rassa, *Director, Systems Supportability, Raytheon*; *Chair, Systems Engineering Division, NDIA*

8:30 am - 9:30 am — **KEYNOTE**

- Honorable Zachary J. Lemnios, *Director, Defense Research and Engineering, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics)*

9:30 am - 10:00 am — **MORNING BREAK IN THE REGATTA PAVILION**

10:00 am - 12:00 pm — **PLENARY SESSION 2 - ACQUISITION EXECUTIVES PANEL**

View from the Top: How Can SE Support Program Execution?

Moderator: Mr. Terry Jaggers, *Principal Deputy, Systems Engineering, Office of the Director, Defense Research and Engineering*

- Mr. David G. Ahern, *Director, Portfolio Systems Acquisition, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics)*
- Mr. Thomas E. Mullins, *Deputy Assistant Secretary for Plans, Programs, and Resources (SAAL-ZR), Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology)*
- Mr. Christopher A. Miller, *PEO for Command, Control, Communications, Computers and Intelligence (C4I), U.S. Navy*
- Mr. Randall G. Walden, *Director, Information Dominance Programs, Office of the Assistant Secretary of the Air Force (Acquisition)*

12:00 pm - 1:30 pm — **LUNCH WITH SPEAKER IN THE REGATTA PAVILION**

- Mr. Stephen Welby, *Director, Systems Engineering, Office of the Director, Defense Research and Engineering*

TUESDAY, OCTOBER 27, 2009 - CONTINUED

1:30 pm - 3:15 pm **PLENARY SESSION 3 - TEST & EVALUATION EXECUTIVES PANEL**

View from the Top: How SE Can Support Test and Evaluation?

Moderator: Mr. Jim O'Bryon, *The O'Bryon Group; Chair, NDIA Test and Evaluation Division*

- Dr. James N. Streilein, *Technical Advisor, HQ Army Test & Evaluation Command*
- Ms. Amy Markowich, *Deputy DoN T&E Executive*
- Colonel Dexter M. Sapinoso, USAF, *Chief of Air Force Test and Evaluation Policy and Programs*
- Mr. Christopher DiPetto, *Acting Director, DevelopmentalTest and Evaluation, Office of the Director, Defense Research and Engineering*

3:15 pm - 3:30 pm **AFTERNOON BREAK IN THE REGATTA PAVILION**

3:30 pm - 5:15 pm **PLENARY SESSION 4 - SE AND ACQUISITION REFORM: THE WAY AHEAD**

Moderator: Mrs. Kristen Baldwin, *Systems Engineering Directorate, Office of the Director, Defense Research and Engineering*

- Mr. Ross Guckert, *Office of the Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT))*
- Mr. Carl Siel, *Office of the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN(RDA)CHSENG)*
- Colonel Shawn Shanley, USAF, *Chief Systems Engineer, Office of the Assistant Secretary of the Air Force for Acquisition, Science, Technology, and Engineering (SAF/AQR)*
- Mr. Nicholas Torelli, *Systems Engineering Directorate, Office of the Director, Defense Research and Engineering*

5:30 pm - 7:00 pm **RECEPTION IN THE REGATTA PAVILION**

WEDNESDAY, OCTOBER 28, 2009

7:00 am - 5:15 pm **REGISTRATION**

7:00 am - 8:00 am **CONTINENTAL BREAKFAST IN THE REGATTA PAVILION**

8:00 am - 12:00 pm **CONCURRENT SESSIONS -** ***Please refer to the following pages for session schedule***

9:45 am - 10:15 am **MORNING BREAK IN THE REGATTA PAVILION**

12:00 pm - 1:30 pm **AWARDS LUNCH IN THE REGATTA PAVILION**

1:30 pm - 5:15 pm **CONCURRENT SESSIONS -** ***Please refer to the following pages for session schedule***

3:15 pm - 3:30 pm **AFTERNOON BREAK IN THE REGATTA PAVILION**

5:15 pm **WEDNESDAY SESSION ADJOURNS**

THURSDAY, OCTOBER 29, 2009

7:00 am - 3:00 pm **REGISTRATION**

7:00 am - 8:00 am **CONTINENTAL BREAKFAST IN THE REGATTA PAVILION**

8:00 am - 12:00 pm **CONCURRENT SESSIONS -** ***Please refer to the following pages for session schedule***

9:45 am - 10:15 am **MORNING BREAK IN THE REGATTA PAVILION**

12:00 pm - 1:00 pm **LUNCH IN THE REGATTA PAVILION**

1:00 pm - 3:00 pm **CONCURRENT SESSIONS -** ***Please refer to the following pages for session schedule***

3:00 pm **CONFERENCE ADJOURNS**

MONDAY, OCTOBER 26, TUTORIAL SESSIONS

TRACK	8:00 AM SESSION A	10:15 AM SESSION B	1:00 PM SESSION C	3:15 PM SESSION D
TRACK 8 Palm II	8819 - 1A8 - Tutorial: Rethinking Risk Management Ms. Audrey Dorofee, SEI/CMU	8819 - 1B8 - Tutorial: Rethinking Risk Management Ms. Audrey Dorofee, SEI/CMU	8877 - 1C8 - Tutorial: Best Practices in Modeling and Simulation Dr. Gene Paulo, Naval Postgraduate School	8877 - 1D8 - Tutorial: Best Practices in Modeling and Simulation Dr. Gene Paulo, Naval Postgraduate School
TRACK 7 Palm I	8785 - 1A7 - Tutorial: Agile Development in Defense Acquisition Dr. Peter Hantos, The Aerospace Corporation	8785 - 1B7 - Tutorial: Agile Development in Defense Acquisition Dr. Peter Hantos, The Aerospace Corporation	8801 - 1C7 - Tutorial: Integrating SE with Earned Value Management Mr. Paul Soloman, Performance-Based Earned Value	8801 - 1C7 - Tutorial: Integrating SE with Earned Value Management Mr. Paul Soloman, Performance-Based Earned Value
TRACK 6 Mission III	9078 - 1A6 - Tutorial: Organizational Implications of SoS Ms. Suzanne Garcia, SEI/CMU	9078 - 1B6 - Tutorial: Organizational Implications of SoS Ms. Suzanne Garcia, SEI/CMU	8782 - 1C6 - Tutorial: Technology Transition and the Defense Acquisition System Mr. William Decker, DAU	8782 - 1C6 - Tutorial: Technology Transition and the Defense Acquisition System Mr. William Decker, DAU
TRACK 5 Mission II	8984 - 1A5 - Tutorial: How to use Lean SE Processes to Save Time and Money Mr. Tim Olson, Lean Solutions Institute, Inc.	8984 - 1B5 - Tutorial: How to use Lean SE Processes to Save Time and Money Mr. Tim Olson, Lean Solutions Institute, Inc.	9072 - 1C5 - Tutorial: Leveraging the Defense Acq Program Support (DAPS) Methodology to Conduct Program Assessment Mr. Peter Nolte, Systems Engineering Directorate, ODDR&E	9072 - 1D5 - Tutorial: Leveraging the Defense Acq Program Support (DAPS) Methodology to Conduct Program Assessment Mr. Peter Nolte, Systems Engineering Directorate, ODDR&E
TRACK 4 Mission I	9035 - 1A4 - Tutorial: Collaborative Decision Making Dr. Tommer Ender, Georgia Tech Research Institute	9035 - 1B4 - Tutorial: Collaborative Decision Making Dr. Tommer Ender, Georgia Tech Research Institute	8931 - 1C4 - Tutorial: Role of Mentoring in Developing the Sys Eng Workforce Mr. Nicholas Torelli, Systems Engineering Directorate, ODDR&E	8931 - 1D4 - Tutorial: Role of Mentoring in Developing the Sys Eng Workforce Mr. Nicholas Torelli, Systems Engineering Directorate, ODDR&E
TRACK 3 Bayview I	8955 - 1A3 -Tutorial: Early Sys Thinking and Planning in WPN Sys Concept Phase Mr. Jeff Loren, SAF/AQR (Alion Science & Technology)	8955 - 1B3 -Tutorial: Early Sys Thinking and Planning in WPN Sys Concept Phase Mr. Jeff Loren, SAF/AQR (Alion Science & Technology)	9040 - 1C3 - Tutorial: Implementing the Materiel Availability KPP in DoD Acquisition Programs Mr. Grant Schmieder, Systems Engineering Directorate, ODDR&E	9040 - 1D3 - Tutorial: Implementing the Materiel Availability KPP in DoD Acquisition Programs Mr. Grant Schmieder, Systems Engineering Directorate, ODDR&E
TRACK 2 Bayview II	8779 - 1A2 - Tutorial: Mission Based Test and Eval Strategy: Case Study Mr. Christopher Wilcox, U.S. Army Test and Evaluation Command	8779 - 1B2 - Tutorial: Mission Based Test and Eval Strategy: Case Study Mr. Christopher Wilcox, U.S. Army Test and Evaluation Command	8818 - 1C2 - Tutorial: Integrated Testing Enhances SE Dr. Beth Wilson, Raytheon Company	8818 - 1D2 - Tutorial: Integrated Testing Enhances SE Dr. Beth Wilson, Raytheon Company
TRACK 1 Bayview III	8736 -1A1 - Tutorial: Framework of Engineering Architectures Mr. Donald Firesmith, SEI	8736 - 1B1 - Tutorial: Framework of Engineering Architectures Mr. Donald Firesmith, SEI	8992 -1C1 -Tutorial: SoS Quality Attribute Specification and Architecture Evaluation Mr. Michael Gagliardi, SEI	8992 -1D1 -Tutorial: SoS Quality Attribute Specification and Architecture Evaluation Mr. Michael Gagliardi, SEI

WEDNESDAY, OCTOBER 28, CONCURRENT SESSIONS

TRACK	SESSION CHAIR	8:00 AM	8:35 AM	9:10 AM	TRACK	SESSION CHAIR	10:15 AM	10:50 AM	11:25 AM
TRACK 8 Net-Centric Operations/ Interoperability Palm II	**Mr. Jack Zavin,** *ASD (NII)*	8780 - Net-Centric Best Practices Mr. Hiekeun Ko, JPEO-CBD - Software Support Activity	8788 - Data sharing in a Stability Operations Community of Interest: Utilizing a pilot program to prove concepts and develop trust. Mr. Gerald Christman, Femme Comp Inc.	8853 - C4I Architecture for Joint ASW Mr. Gregory Miller, Naval Postgraduate School	TRACK 8 Net-Centric Operations/ Interoperability Palm II	**Mr. Jack Zavin,** *ASD (NII)*	8929 - Extending Net-Centric Quality of Service to Systems of Systems Maj Vinod Naga, USAF, Air Force Institute of Technology	9081 - Testing in Service-oriented Environments Mr. Soumya Simanta, SEI	8913 - Linking Interoperability and Measures of Effectiveness: A Method for Evaluating Architectures Dr. David Jacques, Air Force Institute of Technology
TRACK 7 Program Management Palm I	**Mr. Hal Wilson,** *Northrop Grumman Corporation* and **Ms. Dona Lee,** *Systems Engineering Directorate, ODDR&E*	9003 - CMMI® for Executives Mr. Geoff Draper, Harris Corporation	9034 - Sustainment and Continued Institutionalization of Best Practices and CMMI® at SPAWAR Mr. Michael Kutch, SPAWAR Systems Center Atlantic	9065 - Rapidly Implementing Lean CMMI® Processes That Meet Business Needs Mr. Tim Olson, Lean Solutions Institute, Inc	TRACK 7 Program Management Palm I	**Mr. Hal Wilson,** *Northrop Grumman Corporation* and **Ms. Dona Lee,** *Systems Engineering Directorate, ODDR&E*	8982 - Systemic Root Cause Analysis – Driving Improvements into the Acquisition Process Mr. Peter Nolte, Systems Engineering Directorate, ODDR&EE)	8791 - Cost and Risk Impacts of the New DOD 5000 Defense Acquisition Framework Dr. Peter Hantos, The Aerospace Corporation	8895 - A Comprehensive Review of Maturity Assessment Approaches for Improved Defense Acquisition Ms. Nazanin Azizian, The George Washington University
TRACK 6 System of Systems Mission III	**Dr. Judith Dahman,** *Systems Engineering Directorate, ODDR&E/ MITRE* and **Mr. John Palmer,** *Boeing*	NDIA SoS Committee Report Dr. Judith Dahman, Systems Engineering Directorate, ODDR&E/ MITRE	8960 - A Distillation of Lessons Learned from Complex System of Systems Acquisitions Dr. Richard Turner, Stevens Institute	8784 - Establishing a Departmental-Level Systems-of-Systems Engineering Management Construct for the Department of the Navy, Progress Report Mr. John Kevin Smith, Asst Sec of the Navy for RD&A, Chief Engineer	TRACK 6 System of Systems Mission III	**Dr. Judith Dahman,** *Systems Engineering Directorate, ODDR&E/ MITRE* and **Mr. John Palmer,** *Boeing*	8840 - Naval Systems of Systems Engineering Guidebook Update Ms. Melinda Reed, DoD (ASN RDA CHSENG)	8942 - DoD Systems of Systems Update Dr. Judith Dahmann, Systems Engineering Directorate, ODDR&E/ MITRE	8961 - Engineering Systems of Systems: An Integration Perspective Dr. Emmett Maddry, NSWCDD
TRACK 5 Human Systems Integration Mission II	**Mr. Stuart Booth,** *Systems Engineering Directorate, ODDR&E*	8975 - What is Human Systems Integration (HSI) and why should we do it? Mr. Stuart Booth, Systems Engineering Directorate, ODDR&E	9042 - Bounding the Human Within the System Mr. Michael Mueller, U.S. Air Force Center for Systems Engineering	8829 - The Army Health Hazard Assessment Program's Medical Cost Avoidance Model Dr. Timothy A. Kluchinsky, Department of Army	TRACK 5 System Safety - ESOH Mission II	**Mr. Sherman Forbes,** *U.S. Air Force*	9070 - Improving Safety Technology Insertion in DoD Acquisition Programs Dr. Elizabeth Rodriguez-Johnson, Systems Engineering Directorate, ODDR&E	9094 - DoD Green Procurement Program Update and Path Forward Mr. David Asiello, Office of the Secretary of Defense	9091 - Environment, Safety, and Occupational Health (ESOH) Risk and Technology Requirements Reporting at Acquisition Program Reviews Ms. Lucy Rodriguez, Booz Allen Hamilton

TRACK 4 **Test and Evaluation** **Mission I**	**Dr. Beth Wilson,** *Raytheon Company*	8848 - Integrated Testing: We Can Do It Dr. Beth Wilson, Raytheon Company	8882 - Test & Evaluation Strategy for the Technology Development Phase Ms. Darlene Mosser-Kerner, OUSD(AT&L)/ DDR&E/DT&E	8883 - Test & Evaluation Products for the Systems Engineering Reviews Mr. Woody Eischens, OUSD(AT&L)/ DDR&E/DT&E	**TRACK 4** **Test and Evaluation** **Mission I**	**Dr. Beth Wilson,** *Raytheon Company*	8814 - Joint Mission Environment Test Capability (JMETC), Lowering technical Risk by Improving Distributed Test Capabilities Mr. Chip Ferguson, JMETC	8901 - Review Results of the NDIA/OSD Software Test Summit/ Workshop Mr. Thomas Wissink, Lockheed Martin IS&GS	
TRACK 3 **Technology Maturity** **Bayview I**	**Mr. Bill Nolte,** *WPAFB* and **Mr. James Malas,** *U.S. Air Force Research Laboratory*	8916 - System Readiness - Assessing Technical Risk Throughout the Lifecycle Mr. James Thompson, Systems Engineering Directorate, ODDR&E	8963 - Air Force Concept Maturity Assessment Mr. George Freeman, U.S. Air Force, Center for Systems Engineering	8900 - DOD's Weapon System Portfolio: Are Results Getting Any Better? Mr. Michael Sullivan, U.S. Government Accountability Office	**TRACK 3** **Technology Maturity** **Bayview I**	**Mr. Bill Nolte,** *WPAFB* and **Mr. James Malas,** *U.S. Air Force Research Laboratory*	8894 - Air Force Initiative – High Confidence Technology Transition Planning Through the Use of Stage-Gates – Update Mr. Randy Bullard, U.S. Air Force Materiel Command	8833 - Communicating Risk: Air Force RI3 Methodology Mr. John Cargill, AF Cost Analysis Agency	8891 - A comprehensive overview of techniques for measuring system readiness Mr. James Bilbro, JB Consulting International
TRACK 2 **Early System Engineering** **Bayview II**	**Mr. John Lohse,** *Raytheon Company* and **Mr. Jeff Loren,** *SAF/AQR (Alion Science & Technology)*	Panel Topic: 8924, 8925 , 8933 - Early Systems Engineering in DoDI 5000.02 Dr. Judith Dahmann, Ms. Lisa Reuss, Systems Engineering Directorate, ODDR&E		Q&A: 8924, 8925 , 8933 - Early Systems Engineering in DoDI 5000.02 Dr. Judith Dahmann, Ms. Lisa Reuss, Systems Engineering Directorate, ODDR&E	**TRACK 2** **Early System Engineering** **Bayview II**	**Mr. John Lohse,** *Raytheon Company* and **Mr. Jeff Loren,** *SAF/AQR (Alion Science & Technology)*	8949 - Updated DoD 5000 and CJCS 3170 Policies: A Requirements to Acquisition Gap Analysis Mr. John Lohse, Raytheon Company	8813 - Emerging Roles for Systems Engineering in Defense Decision Making; Better Aligning Requirements and Acquisition with the Budget and Security Environments Mr. Vincent Roske, Institute for Defense Analyses	9026 - Early SE Determination of Best-Fit System Life Cycle Processes Dr. Barry Boehm, USC
TRACK 1 **Systems Engineering Effectiveness** **Bayview III**	**Mr. Al Brown,** *The Boeing Company*	8816 - Mind the GAPs-a Systems Engineering Implementation of DoDI 5000.02 Dr. Thomas Christian, U. S. Air Force	8990 - Systems Engineering for Rapid Capability Development Mr. Thomas McDermott, Georgia Tech Research Institute	8974 - Transforming Systems and Software Engineering Across an Enterprise Mr. Jeffery Wilcox, Lockheed Martin Corporation	**TRACK 1** **Systems Engineering Effectiveness** **Bayview III**	**Mr. Al Brown,** *The Boeing Company*	8863 - Using Requirements Compliance to Identify Gaps Between the Technical Solution and Requirements Mr. Frank Salvatore, High Performance Technologies, Inc.	8823 - Win and Influence Design Engineers---Change Their Affordability DNA Mr. Tim Morrill, Raytheon Company	8839 - Navy Systems Engineering Technical Review Process Ms. Melinda Reed, DoD (ASN RDA CHSENG)

WEDNESDAY, OCTOBER 28, CONCURRENT SESSIONS

TRACK	SESSION CHAIR	1:30 PM	2:05 PM	2:40 PM	TRACK	SESSION CHAIR	3:30 PM	4:05PM	4:40 PM
TRACK 8 Net-Centric Operations/Interoperability Palm II	**Mr. Jack Zavin,** *ASD (NII)*	8874 - The Boeing System of Systems Engineering (SoSE) Process and Its Use in Developing Legacy-Based Net-Centric Systems of Systems Mr. John Palmer, The Boeing Company	9010 - Network Enabled Weapons, A System Engineering Approach to Achieve Interoperabilty Mr. Andrew Lieux, Naval Air Warfare Center Weapons Division	8854 - Human Interoperability Enterprise and Net Centric Operations **Mr. Jack Zavin,** *ASD (NII)*	TRACK 8 Speciality Engineering Palm II	**Mr. Joel Moorvitch,** *Raytheon Company*	8944 - DoD's Refocus on Specialty Engineering (Reliability, Availability and Maintainability; Producibility and Quality, Supportability, Safety and Human Systems Integration) Mr. Chester Bracuto, Systems Engineering Directorate, ODDR&E	9043 - Implementing the Materiel Availability KPP in DoD acquisition programs—balancing life-cycle costs with warfighter needs Mr. Grant Schmieder, Systems Engineering Directorate, ODDR&E	8873 - IUID enables streamlined acquisition and system engineering Mr. Robert Leibrandt, DoD UID Policy Office 8958 - Security Systems Engineering Mrs. Kristen Baldwin, Systems Engineering Directorate, ODDR&E
TRACK 7 Program Management Palm I	**Mr. Hal Wilson,** *Northrop Grumman Corporation* and ***Ms. Dona Lee,*** *Systems Engineering Directorate, ODDR&E*	8979 - Boots on the Ground: Tactical Planning at Program Start Up Mr. Gerry Becker, Harris Corporation	8999 - Acquisition Program Technical Measurement Mr. James Thompson, Systems Engineering Directorate, ODDR&E	9103 - The Economics of CMMI Mr. Geoff Draper, Harris Corporation	TRACK 7 Program Management Palm I	**Mr. Hal Wilson,** *Northrop Grumman Corporation* and **Ms. Dona Lee,** *Systems Engineering Directorate, ODDR&E*	8995 - Integrated Systems Engineering and Developmental Test and Evaluation Mr. Chris DiPetto, OUSD(AT&L)/ DDR&E/DT&E	9021 - Critical Success Factors for Milestone Review Risk Identification Dr. Barry Boehm, USC	9030 - Lessons Learned in Motivating Software Engineering Process Group to Focus on Achieving Business Goals and Not on Just Achieving a Maturity Level Mr. Girish Seshagiri, Advanced Information Services Inc.
TRACK 6 System of Systems Mission III	**Dr. Judith Dahman,** *Systems Engineering Directorate, ODDR&E/MITRE* and **Mr. John Palmer,** *Boeing*	8898 - Designing Collaborative Systems of Systems in support of Multi-sided Markets Mr. Philip Boxer, SEI	8892 - SysML Strategies to Characterize and Analyze Systems of Systems Dr. Jo Ann Lane, University of Southern California	9041 - On Modeling and Simulation Methods for Capturing Emergent Behaviors for Systems of Systems Dr. Jack Zentner, Georgia Tech Research Institute	TRACK 6 System of Systems Mission III	**Dr. Judith Dahman,** *Systems Engineering Directorate, ODDR&E/MITRE* and **Mr. John Palmer,** *Boeing*	9060 - M&S Support for SoS SE Dr.Joann Lane, USC	8776 - The Modular SOS Paradigm: an Availability Paradox? Mr. Peter Gentile, Northrop Grumman Corporation	8866 - Extending FMECA to Systems of Systems Mr. Leopoldo Mayoral, Johns Hopkins University/APL
TRACK 5 Human Systems Integration Mission II	**Mr. Stuart Booth,** *Systems Engineering Directorate, ODDR&E*	8998 - Human Systems Integration – Ensuring the Human is Considered "Left of A" Col Larry Kimm, USAF, U.S Air Force	8885 - Human Systems Integration (HSI) - Integrating Human Concerns into Life Cycle Systems Engineering Ms. Cynthia Shewell, Booz Allen Hamilton	9012 - Human Systems Integration: Defining and Validating a Framework for Enhanced Systems Development Dr. Matthew Risser, Pacific Science & Engineering Group	TRACK 5 System Safety - ESOH Mission II	**Mr. Sherman Forbes,** *U.S. Air Force*	9095 - Acquisition ESOH Risk Management and HAZMAT Management Part I: Hazardouse Materials Management Plan Ms. Lucy Rodriguez, Booz Allen Hamilton	8890 - Building Safer UGVs with Run-time Safety Invariants Mr. Michael Wagner, Carnegie Mellon University, NREC	882D - Overview of Draft MIL-STD-882D With Change 1 Mr. Bob Smith, Booz Allen Hamilton

TRACK 4 **Test and Evaluation of SoS** **Mission I**	**Dr. Beth Wilson,** *Raytheon Company*	8825 - Test and Evaluation in a System of Systems Environment Mr. Edwin McDermott, 653 ELSW, Electronic Systems Center	8849 - Joint Integration and Interoperability Lab (JSIIL) Mr. Steven Whitehead, SL, J8 Technical Director, USJFCOM	8935 - Systems of Systems Systems Engineering and Test and Evaluation Dr. Judith Dahmann, Systems Engineering Directorate, ODDR&E/ MITRE	**TRACK 4** **Practical Systems Engineering** **Mission I**	**Mr. Dana Peterson,** *DRS Technologies, Inc.*	9014 - SAVI: Aerospace Platform Development and Certification Using Modeling and Simulation to "Integrate, then Build" Mr. Gregory Pollari, Rockwell Collins	8855 - Certify and Fly Right: Preparing for DO-297 Certification Mr. Ketih Custer, Esterline Control Systems-AVISTA	8973 - C-17 Transition to Criteria-based Airworthiness Certification Mr. Christian Stillings, USAF 516 AESG
TRACK 3 **Technology Maturity** **Bayview I**	**Mr. Bill Nolte,** *WPAFB* and **Mr. James Malas,** *U.S. Air Force Research Laboratory*	8991 - Systems Engineering for the Science & Technology Community Mr. Russell Menko, U. S. Army RDECOM/TARDEC	9017 - Linking Systems Engineering Artifacts with Complex Systems Maturity Assessments Dr. Brian Sauser, Stevens Institute of Technology	8770 - Incorporating Maturity Assessment into House of Quality for Improved Decision Support Analysis and Risk Management Mr. Pavel Fomin, U.S. Air Force	**TRACK 3** **Technology Maturity** **Bayview I**	**Mr. Bill Nolte,** *WPAFB* and **Mr. James Malas,** *U.S. Air Force Research Laboratory*	8798 - The New Technology Readiness Assessment Process Dr. Jay Mandelbaum, Institute for Defense Analyses	8870 - S&T Portfolio Maturity & Performance Analysis: The Concept of Critical Research Elements Mr. Has Patel, Infologic, Inc.	8879 - TRL Vectors in IPPD-based Portfolio Management Mr. Michael Bartmess, General Dynamics/AIS
TRACK 2 **Early System Engineering** **Bayview II**	**Mr. John Lohse,** *Raytheon Company* and **Mr. Jeff Loren,** *SAF/AQR (Alion Science & Technology)*	8951 - USAF View of NRC "Pre-A Systems Engineering" Study Committee Recommendations As Addressed By Levin-McCain (P.L. 111-23; "Weapon Systems Acquisition Reform Act of 2009") Mr. Jeff Loren, SAF/AQR (Alion Science & Technology)	8846 - Air Force Materiel Command Early Systems Engineering Dr. Brian Kowal, USAF	9016 - A Framework for Enhancing Forward-looking Capability Delivery Metrics Mr. Leonard Sadauskas, DoD CIO CT&S	**TRACK 2** **Early System Engineering** **Bayview II**	**Mr. John Lohse,** *Raytheon Company* and **Mr. Jeff Loren,** *SAF/AQR (Alion Science & Technology)*	9082 - Including Environment, Safety, and Occupational Health (ESOH) Requirements in Joint Capabilities Integration and Development System (JCIDS) Documents Mr. Sherman Forbes, U.S. Air Force	8835 - T&E Collaboration and Contributions during Early Program Acquisition Mr. Stephen Scukanec, Northrop Grumman Corporation Aerospace Systems	8795 - Mission-based Test and Evaluation Strategy: Creating Linkages between Technology Development and Mission Capability Mr. John Beilfuss, U.S. Army Research Laboratory
TRACK 1 **Systems Engineering Effectiveness** **Bayview III**	**Mr. Al Brown,** *The Boeing Company*	8851 - Rapid Development and Integration of Remote Weapon Systems to Meet Operational Requirements Mr. Joseph Burkart, NSWC Crane, Small Arms Air Platform Integration	8893 - Rapid Development Mr. Michael Gaydar, NAVAIR	8847 - Tailoring the SE Process to Effectively Complement the SW Agile Development Process Mr. William Lyders, ASSETT Inc.	**TRACK 1** **Systems Engineering Effectiveness** **Bayview III**	**Mr. Al Brown,** *The Boeing Company*	8902 - Systems Engineering Leading Indicators: Insight into Effective Systems Engineering Mr. Gary Roedler, Lockheed Martin Corporation	9414 - Correcting Deficiencies in the Systems Engineering of Tactical Weapons Mr. Marvin Ebbert, Raytheon Missile Systems	8948 - Value Engineering Applications in Service Contracts Dr. Jay Mandelbaum, Value Engineering Applications in Service Contracts

THURSDAY, OCTOBER 29, CONCURRENT SESSIONS

TRACK	SESSION CHAIR	8:00 AM	8:35 AM	9:10 AM	TRACK	SESSION CHAIR	10:15 AM	10:50 AM	11:25 AM
TRACK 8 Software Intensive Systems Palm II	**Mr. Paul Croll,** *CSC* and **Mr. Scott Lucero,** *Systems Engineering Directorate, ODDR&E*	8977 - Overview of DoD Software Engineering Initiatives Mr. Scott Lucero, Systems Engineering Directorate, ODDR&E	8820 - Graduate Software Engineering Reference Curriculum (GSwERC) Ms. Nicole Hutchison, Analytic Services, Inc.	8739 - Quality Assessment of Software-Intensive System Architectures and their Requirements (QUASAR) Mr. Donald Firesmith, SEI	TRACK 8 Software Intensive Systems Palm II	**Mr. Paul Croll,** *CSC* and **Mr. Scott Lucero,** *Systems Engineering Directorate, ODDR&E*	8812 - A Systems Engineering Approach to Multi-Level Security in a Service Oriented Architecture Mr. Timothy Greer, Lockheed Martin Corporation	9104 - Static Code Analysis: Best Practices for Software Assurance in the Acquisition Life Cycle Mr. Paul Croll, CSC	8996 - Engineering Improvement in Software Assurance: A Landscape Framework Ms. Lisa Brownsword, SEI
TRACK 7 Work Force Development Palm I	**Dr. Don Gelosh,** *Systems Engineering Directorate, ODDR&E* and **Mr. Mike Ucchino,** *U.S. Air Force Center for Systems Engineering*	8926 - Systems Engineering Workforce Development Update Dr. Don Gelosh, Systems Engineering Directorate, ODDR&E	9076 - Assessing Systems Engineering Personnel Competency: Framework and Tool Experience Dr. Barry Boehm, University of Southern California	8943 - Team SE Skill Set Mr. Charles Garland, U.S. Air Force Center for Systems Engineering	TRACK 7 Work Force Development Palm I	**Dr. Don Gelosh,** *Systems Engineering Directorate, ODDR&E* and **Mr. Mike Ucchino,** *U.S. Air Force Center for Systems Engineering*	8966 - Improving Systems Engineering Curriculum Using a Competency-Based Assessment Approach Ms. Alice Squires, Stevens Institute of Technology	9088 - Enhancing Systems Engineering Competencies in the Enterprise Mr. Gary Roedler, Lockheed Martin Corporation	8789 - Achieving Acquisition Excellence via Improving the Systems-Engineering Workforce Dr. Kenneth Nidiffer, SEI
TRACK 6 System of Systems Mission III	**Dr. Judith Dahman,** *Systems Engineering Directorate, ODDR&E/ MITRE* and **Mr. John Palmer,** *Boeing*	9083 - Requirements Engineering for Systems of Systems Mr. Soumya Simanta, SEI	8964 - Software Assurance in a System of Systems World: Interoperability Challenges - Reports from the Field Dr. Carol Sledge, SEI	8969 - An Introduction to Influence Maps: Foundations, Construction, and Use Mr. James Smith, SEI	TRACK 6 System of Systems Mission III	**Dr. Judith Dahman,** *Systems Engineering Directorate, ODDR&E/ MITRE* and **Mr. John Palmer,** *Boeing*	9024 - Dynamic Modeling of Programmatic and Systematic Dr. Brian Sauser, Purdue University	8903 - Global Earth Observation System of Systems (GEOSS) Mr. Lawrence McGovern, Northrop Grumman Electronic Systems	8915 - System of Systems Challenges and Solutions: Case Study Insights Mr. John Colombi, U.S. Air Force Institute of Technology
TRACK 5 Human Systems Integration Mission II	**Mr. Stuart Booth,** *Systems Engineering Directorate, ODDR&E*	8937 - Integrating the Human into the system, integrating HSI Tools into Systems Engineering Dr. Jennifer Narkevicius, Jenius LLC	9064 - Economics of Human Systems Integration: Early Life Cycle Cost Estimation Using HSI Requirements 2ndLt Kevin Liu, USMC, MIT	Process management and tool selection to minimize risk of hand-arm vibration syndrome Mr. Sherman Forbes, U.S. Air Force	TRACK 5 Systems Engineering Development Environment Mission II	**Mr. Al Brown,** *The Boeing Company*	8945 - Standards Based Development Environment Mr. Christopher Oster, Lockheed Martin Corporation	8922 - The Role of DoD in Systems Engineering Standards and Models Mr. Donald Gantzer, Systems Engineering Directorate, ODDR&E	8844 - The Power of the Spec: Understanding the Many Diverse Roles in SE of Good Specifications & Standards." Mr. Robert Kuhnen, U.S. Air Force

TRACK 4 Practical Systems Engineering Mission I	**Mr. Dana Peterson,** *DRS Technologies, Inc.*	8875 - Tomahawk Weapon System Development and Integration Mr. Gustavo Rivera, Naval Surface Warfare Center, Dahglren Division	8980 - Using Model-driven Engineering Techniques for Integrated Flight Simulation Development Mr. Douglas Fiehler, Raytheon Missile Systems	9007 - Technology Maturation for the Automated Aerial Refueling (AAR) Project Ms. Carol Ventresca, SynGenics Corporation	TRACK 4 Practical Systems Engineering Mission I	**Mr. Dana Peterson,** *DRS Technologies, Inc.*	8880 - Naval Postgraduate School Advanced Seabase Enabler Project: A Systems Engineering Case Study Mr. Lance Flitter, NSWC, Carderock Division	8946 - Protecting the Mission, Preserving Legacy and Promoting Growth Ms. Patti Scaramuzzo, Lockheed Martin Corporation	9054 - A-10 Avionics System Architecture Trade Study and Analysis (AVSATA) Program Mr. Richard Sorensen, KIHO Military Acquisition Consulting, Inc.
TRACK 3 Modeling & Simulation Bayview I	**Mr. Jim Coolahan, JHU/APL**	8939 - Understanding the New DoD Instruction 5000.61: "DoD Modeling & Simulation Verification, Validation and Accreditation (VV&A)" Mr. Michael Truelove, Systems Engineering Directorate, ODDR&E	8950 - Live, Virtual, Constructive Architecture Roadmap: The Quest for Interoperability, Standards, and Reuse Dr. Gary Allen, Joint Training Integration & Evaluation Center	9048 - Revisions to the Acquisition Modeling & Simulation Master Plan Mr. Stephen Swenson, Systems Engineering Directorate, ODDR&E	TRACK 3 Modeling & Simulation Bayview I	**Mr. Jim Coolahan, JHU/APL**	8759 - A Systems Engineering Framework for Integrating M&S Development Best Practices Dr. Katherine Morse, Johns Hopkins University/APL	9052 - Best Practices in Contracting for Models, Simulations, and Associated Data Mr. Dennis Shea, CNA	8947 - Report on a Study on Management Concepts for Broadly-Needed Modeling and Simulation Tools in the U.S. Department of Defense Dr. James Coolahan, Johns Hopkins University/APL
TRACK 2 Logistics Systems Bayview II	**Mr. Joel Moorvitch,** *Raytheon Company* and **Mr. Anthony Stampone,** *OSD-ATL*	9063 - An Integrated RAM Approach to System Design and Support Mr. Robert Finlayson, Johns Hopkins University/APL	9031 - Supportability Lessons Learned with Line Replaceable Modules Ms. Heity Hsiung, Raytheon Company	8908 - Successful First AESA Deployment through Application of System Engineering Mr. Scott Nichols, Raytheon Company	TRACK 2 Logistics Systems Bayview II	**Mr. Joel Moorvitch,** *Raytheon Company* and **Mr. Anthony Stampone,** *OSD-ATL*	8988 - How to Save Time and Money Using Lean Maintenance Processes Mr. Tim Olson, Lean Solutions Institute, Inc.	9039 - Applying Systems Engineering to Fielded Weapon Systems and End-Items Mr. Michael Ucchino, AF Center for Systems Engineering	9008 - Upgrade Fluid System Filter Element Monitoring To Increase Operational Reliability and Support Condition Based Maintenance Capability Mr. Gary Rosenberg, Constellation Technology Corportation
TRACK 1 Systems Engineering Effectiveness Bayview III	**Mr. Al Brown,** *The Boeing Company*	8887 - Achieving a Systems Engineering Culture in a Science and Technology Laboratory Environment Mr. Robert Rapson, Materials and Manufacturing Directorate, AFRL	8920 - A Methodology for Assessing Systems Engineering Practices Ms. Lauren Levy, Johns Hopkins University/APL	9097 - Acquisition ESOH Risk Management-How to Make It Work Mr. Bob Smith, Booz Allen Hamilton	TRACK 1 Architecture Bayview III	**Mr. Joe Kuncel,** *Northrop Grumman Corporation*	8831 - Human-Centered Design in Systems Engineering: Human View Methodology Dr. Robert Smillie, SPAWAR	8830 - Systems Engineering Needs of the DoDAF – Report of the Architecture Frameworks Working Group Mr. Joe Kuncel, Northrop Grumman Corporation	8824 - Delivering DoDAF Version 2.0 to Architects and Systems engineers for IT Systems and Services Mr. Walt Okon, Department of Defense CIO, Enterprise Architecture

THURSDAY, OCTOBER 29, CONCURRENT SESSIONS

TRACK	SESSION CHAIR	1:00 PM	1:35 PM	2:10 PM
TRACK 8 Software Intensive Systems Palm II	**Mr. Paul Croll,** *CSC* and **Mr. Scott Lucero,** *Systems Engineering Directorate, ODDR&E*	8802 - Open Source Technology for Enterprise Health Management Mr. Edward Beck, CSC	8901 - Review Results of the NDIA/OSD Software Test Summit/Workshop Mr. Thomas Wissink, Lockheed Martin IS&GS	9506 - Software Acquisition Management Practical Experience Mr. James Jones, SSAI 0000 - Implementing CMMI on a COTS Modification Effort Mr. Dave Castellano, U.S. Army
TRACK 7 Work Force Development Palm I	**Dr. Don Gelosh,** *Systems Engineering Directorate, ODDR&E* and **Mr. Mike Ucchino,** *U.S. Air Force Center for Systems Engineering*	8956 - Systems Engineering Approach to Workforce Development Mr. James Miller, U.S. Air Force	9046 - Developing an Introductory Systems Engineering Practitioners Course: "Model-Based Systems Engineering (MBSE) With SysML" Mr. Joseph Wolfrom, Johns Hopkins University/APL	8878 - Advanced Simulation Course for Army Simulation Management Professionals Dr. Gene Paulo, Naval Postgraduate School
TRACK 6 Enterprise Health Management Mission III	**Mr. Howard Savage,** *Savage Consulting* and **Mr. Chris Reisig,** *The Boeing Company*	8815 - Applying Systems Engineering to Operational System Improvements Ms. Ryanne Gentry, Acquisition Logistics Engineering	8842 - Applications in Integrated Diagnostics Mr. Jimmy Simmons, Georgia Tech Research Institute	8884 - Tactical Wheeled Vehicle Integrated Diagnostics Mr Lawrence Osentoski, DRIVE Developments, Inc.
TRACK 5 Systems Engineering Development Environment Mission II	**Mr. Al Brown,** *The Boeing Company*	8967 - Generating Visual and Interactive Output from System Engineering Tools Mr. John Schatz, Systems and Proposal Engineering Company	9015 - Challenges and Benefits of applying ISO STEP Mr. Stuart Booth, Systems Engineering Directorate, ODDR&E	9059 - Smallsat Conceptual Design Trade and Cost Modeling Tool Dr. Deganit Armon, Advatech Pacific, Inc
TRACK 4 Practical Systems Engineering Mission I	**Mr. Dana Peterson,** *DRS Technologies, Inc.*	8976 - A Systems Engineering Model for Roadmap Alignment Mr. Si Dok, U. S. Army TARDEC	9080 - Rapid Systems Engineering of the MRAP Gunner Restraint System Saves Lives Ms. Michelle Bowen, JPO MRAP	9002 - Key Considerations for Building Highly Available, Mission-Critical Systems Mr. Stephen Mills, GoAhead Software
TRACK 3 Modeling & Simulation Bayview I	**Mr. Jim Coolahan,** JHU/APL	8836 - Producibility Modeling & Simulation Needs for Early Systems Engineering Evaluations of Alternative Design Concepts Dr. Al Sanders, Honeywell Aerospace	8810 - Using Simulation to Define and allocate probabilistic Requirements Ms. Yvonne Bijan, Lockheed Martin Aeronautics	8923 - Integration of Operational Simulations With Physics-Based Models For Engineering Analysis Mr. Stephen Guest, Lockheed Martin Aeronautics
TRACK 2 Logistics Systems Bayview II	**Mr. Joel Moorvitch,** *Raytheon Company* and **Mr. Anthony Stampone,** *OSD-ATL*	8834 - Tailoring Systems Engineering for Technical Support of Legacy Products Mr. Joseph Skandera, BAE Systems	8837 - Injecting Requirements into Sustainment: UEWR RDA Mr. Jonathan Casey, Raytheon Integrated Defense Systems	9092 - The role of simulation in tracking mobile assets using RFID technology Mr. Swee Leong, National Institute of Standards and Technology
TRACK 1 Architecture Bayview III	**Mr. Joe Kuncel,** *Northrop Grumman Corporation*	9025 - Defining, Assessing, and Improving Architecture Competence Ms. Suzanne Garcia, Software Engineering Institute	8971 - Advancing Systems Engineering Practice using Model Based System Development Mr. Sanford Friedenthal, Lockheed Martin Corporation	9004 - Evolving Systems Engineering through Model Driven Functional Analysis Dr. Mark Blackburn, Systems and Software Consortium

2009 LT GEN THOMAS R. FERGUSON, JR. SYSTEMS ENGINEERING EXCELLENCE AWARD

The National Defense Industrial Association's Systems Engineering Excellence Awards were established in 2003 to honor the memory of Lt Gen Thomas R. Ferguson, Jr., USAF, whose leadership embodied the highest ideals in Defense Systems development and deployment.

The awards are given to an individual and to a group demonstrating outstanding achievement in the practical application of Systems Engineering principles, promotion of robust systems engineering principles throughout the organization, or effective systems engineering process development during the previous year. Their systems engineering contributions should have demonstrably helped achieve significant cost savings due to new or enhanced processes procedures and/or concepts, increased mission capabilities, or substantially increased performance. The 2009 awardees are:

- Systems Engineering Individual Leadership Award: *Mr. Brian Wells*
- Systems Engineering Group Award: *Center for Advanced Life Cycle Engineering*

PAST AWARD WINNERS:

2003:
- Systems Engineering Individual Leadership Award: *Mr. Robert Rassa*

2004:
- Systems Engineering Individual Leadership Award: *Honorable Mike Wynne*

2005:
- Systems Engineering Individual Leadership Award: *Mr. Mark Schaeffer*

2006:
- Systems Engineering Individual Leadership Award: *Mr. Kelly Miller*
- Systems Engineering Individual Practitioner Award: *Mr. David Strimling*
- Systems Engineering Group Award: *NUWC Division Newport Critical Transducer Program Staff*

2007:
- Systems Engineering Individual Leadership Award: *Mr. Robert Skalamera*
- Systems Engineering Group Award: *Submarine Warfare Federated Tactical System Team*

2008:
- Systems Engineering Individual Leadership Award: *Honorable James Finley*
- Systems Engineering Group Award: *Tactical Direction Agent Team for LCS Mission Package Project*

DEPARTMENT OF DEFENSE AND THE NATIONAL DEFENSE INDUSTRIAL ASSOCIATION 2008 TOP 5 DEPARTMENT OF DEFENSE PROGRAM AWARDS

The Department of Defense Executive Agent for Systems Engineering and the Systems Engineering Division of the National Defense Industrial Association are pleased to announce the selections of the 2008 Top 5 Department of Defense Program Awards. The 2008 Program awardees are:

- *Wideband Global SATCOM: U.S. Air Force PM; Boeing Company Space & Intelligence Systems Group*
- *Joint Light Tactical Vehicle: U.S. Army/USMC PMs; BAE Systems Land & Armaments; General Tactical Vehicles; Lockheed Martin Systems Integration*
- *STRYKER Modernization: U.S. Army PM; General Dynamics Land Systems*
- *Broad Area Maritime Surveillance Unmanned Aircraft: U.S. Navy PM; Northrop Grumman Corporation*
- *Aviation Maintenance Training Continuum System: U.S. Navy PM; Raytheon Company; Paladin Data Systems Corporation*

The Awards are presented to both the DoD project office and the industry prime contractor in recognition of total program performance in a DoD/industry team effort.

PAST AWARD WINNERS:

2005 Top 5 Department of Defense Programs:

- *Centaur*
- *Integrated Exploitation Capability*
- *P-8A Multi Mission Maritime Aircraft*
- *Mission INtegration & Development*
- *Tomahawk Weapons System Program PMA-280*

2006 Top 5 Department of Defense Programs:

- *Advanced Extremely High Frequency Mission Control System*
- *Advanced Field Artillery Tactical Data System*
- *DDG 1000 MK57 Vertical Landing System*
- *Portable Excalibur FCS*

2007 Top 5 Department of Defense Programs:

- *Effects Management Tool*
- *MH-60 R/S Link 16*
- *Mortar Fire Control System - Dismounted*

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Still guided by this idea, University of Phoenix has helped transform the landscape of higher education in widely recognized ways.

Many of the conveniences that 21st-century students now take for granted—evening classes, flexible scheduling, continuous enrollment, a student-centered environment, practitioner faculty, online classes, online library, ebooks, computer simulations—were pioneered or made acceptable through University of Phoenix's efforts.
Configuration Management Data Management Coursework

This program exposes students to the most important principles concerning configuration management history, configuration identification, configuration change management, and data management. Courses are available over the internet through our Online Learning System (OLS) or, in small classes at select classroom locations as available.

To learn more contact University of Phoenix – Center for Professional Development at 1 (800) 325-1509 or via email – prodev@phoenix.edu.

LEAN SOLUTIONS INSTITUTE, Inc.

LEAN SOLUTIONS™ FOR YOUR ORGANIZATION

Lean Solutions Institute, Inc. (LSI) specializes in helping organizations to rapidly achieve measurable results by using benchmarking and Lean SolutionsTM (e.g., best practices to implement CMMI® in a lean way) to successfully improve client products and services. LSI helps organizations to measurably:

- Achieve ROI (e.g., 7:1)
- Increase productivity, performance and quality
- Reduce cycle time/schedule
- Reduce defects (e.g., post-release defects), rework and costs of poor quality
- Achieve world-class results (e.g., 70-90% defect removal efficiency or defects removed before test)

Systems engineering and software engineering have become more and more complex over the years. With this growing complexity, processes and procedures have become larger and more complex. Based on surveys, most organizations do not like their processes and procedures (e.g., including CMMI® Maturity Level 3-5 organizations) and they can have some of the following lean problems:

- Too large and complex (i.e., not lean or agile)
- Have non-value added activities
- Lack of visualization (e.g., pictures, diagrams, tables, charts, etc.)
- Difficult to use (e.g., poor usability)
- Lack of "chunking" which is a best practice for usability (7 plus or minus 2 principle)
- Lack of innovation
- Lack of "good metrics", not the right metrics, or not lean metrics

LSI has a patent pending approach for defining systems engineering and software engineering processes (e.g., CMMI® compliant processes) in a lean (e.g., short, usable, visual) way. Although this approach can be simple, it also scales up to handle complex processes (e.g., NASA processes). LSI uses "good diagrams" (i.e., process models) for putting the 5 W's (who, what, where, when, why) on one page. These visual one-page diagrams along with a page of support text typically replace about 25-30 pages of text. For example, lean CMMI® processes are typically about 20-25% of the size of a typical CMMI® implementation, and take half the time to implement (e.g., 1 year). In several CMMI® success stories (independently verified) using the LSI approach, organizations estimate that processes are about 20% of the size of sister business units with a similar CMMI® rated processes, and have achieved CMMI maturity levels half the time (or less).

LSI can help your organization achieve measurable results, reduce size and complexity, and improve processes and metrics to become much more lean, "value added", visual, and usable. LSI also uses an ISO/Baldrige approach to implementing CMMI®. LSI only does improvement and uses independent Authorized SEI Lead Appraisers to objectively verify LSI Lean SolutionsTM for CMMI®.

CMMI is a registered trademark of the U.S. Patent and Trademark Office by Carnegie Mellon University.

ADDITIONAL AUTHORS

Abstract ID	Abstract Title	Additional Authors
8736	The Method Framework for Engineering System Architectures (MFESA)	Mr. Donald Firesmith
8739	QUality Assessment of Software-Intensive System Architectures and their Requirements (QUASAR)	Mr. Donald Firesmith
8759	A Systems Engineering Framework for Integrating M&S Development Best Practices	Mr. Robert Lutz Shon Vick Nathaniel Horner
8770	Incorporating Maturity Assessment into House of Quality for Improved Decision Support Analysis and Risk Management	Mr. Pavel Fomin Dr. Shahram Sarkani Dr. Thomas Mazzuchi
8776	The Modular SOS Paradigm: an Availability Paradox?	Mr. Richard Volkert
8780	Net-Centric Best Practices	Mr. Higgin Ko
8789	Achieving Acquisition Excellence via Improving the Systems-Engineering Workforce	Dr. Kenneth Nidiffer
8791	Cost and Risk Impacts of the New DOD 5000 Defense Acquisition Framework	Ms. Nancy Kern
8795	Mission-based Test and Evaluation Strategy: Creating Linkages between Technology Development and Mission Capability	Mr. Christophre Wilcox
8801	Integrating Systems Engineering with Earned Value Management	Mr. Paul Solomon
8810	Using Simulation to Define and allocate probabilistic Requirements	Dr. Henson Graves
8814	Joint Mission Environment Test Capability (JMETC), Lowering technical Risk by Improving Distributed Test Capabilities	Mr. Ryan Norman
8815	Applying Systems Engineering to Operational System Improvements	Mr. Charles Coogan
8816	MIND THE GAPs-a Systems Engineering Implementation of DoDI 5000.02	Ms. Janet Jackson Mr. William Mejias Mr. Ccharles Fabian
8818	Integrated Testing enhances System Engineering. Presentation topics address the conference objectives of “Interoperability & System Integration” and “SE Effectiveness”; and the Topic Session of “T&E	Ms. Darlene Mosser-Kerner
8819	Rethinking Risk Management	Mr. Christopher Alberts
8820	Graduate Software Engineering Reference Curriculum (GSwERC)	Dr. Arthur Pyster Dr. Richard Turner Ms. Kahina Lasfer
8823	Win and Influence Design Engineers---Change Their Affordability DNA	Ms. Diane Patane
8825	Test and Evaluation in a System of Systems Environment	Dr. Shahram Sarkani Dr. Thomas Mazzuchi
8831	Human-Centered Design in Systems Engineering: Human View Methodology	Dr. Holly Handley
8833	Communicating Risk: Air Force RI3 Methodology	Mr. Gregory Barnette
8834	Tailoring Systems Engineering for Technical Support of Legacy Products	Mrs. Virginia Doyle Mr. Derrick Min
8837	Injecting Requirements into Sustainment: UEWR RDA	Noah Van Fossan
8839	Navy Systems Engineering Technical Review Process	Ms. Susan Lashomb
8842	Applications in Integrated Diagnostics	Mr. Tim Palmer
8849	Joint Integration and Interoperability Lab (JSIIL)	Mr. Martin Westphal Mrs. Margery Frisby Mr. Randy Coonts

8853	C4I Architecture for Joint ASW	Baasit Saijid Matt LeTourneau Bill Traganza
8854	Human Interoperability Enterprise and Net-Centric Operations	Dr. S. Brown Dr. Beverly Knapp
8855	Certify and Fly Right: Preparing for DO-297 Certification	Mr. Keith Custer
8863	Using Requirements Compliance to Identify Gaps Between the Technical Solution and Requirements	Mr. Richard Swanson Mr. Edward Dooley
8866	Extending FMECA to Systems of Systems	Mr. Clayton Smith
8874	The Boeing System of Systems Engineering (SoSE) Process and Its Use in Developing Legacy-Based Net-Centric Systems of Systems	Ms. Alaka Shivananda Mr. Dennis Schwarz Mr. Marion Butterfield
8875	Tomahawk Weapon System Development and Integration	Mr. Tim Patrick
8878	Advanced Simulation Course for Army Simulation Management Professionals	Stephanie Few
8880	Naval Postgraduate School Advanced Seabase Enabler Project: A Systems Engineering Case Study	Mr. Robert Brooks Mr. Steven Schroeder Mr. Paul Rakow
8885	Human Systems Integration (HSI) - Integrating Human Concerns into Life Cycle Systems Engineering	Colonel Larry Kimm
8887	Achieving a Systems Engineering Culture in a Science and Technology Laboratory Environment	Dr. James Malas Mr. Bryan DeHoff Ms. Carol Ventresca
8890	Building Safer UGVs with Run-time Safety Invariants	Dr. Phil Koopman Dr. John Bares Mr. Chris Ostrowski
8892	SysML Strategies to Characterize and Analyze Systems of Systems	Mr. Tim Bohn
8894	Air Force Initiative – High Confidence Technology Transition Planning Through the Use of Stage-Gates – Update	Dr. Claudia Kropas-Hughes Ms. Sharon Fields
8895	A Comprehensive Review of Maturity Assessment Approaches for Improved Defense Acquisition	Dr. Shahram Sarkani Dr. Thomas Mazzuchi
8898	Designing Collaborative Systems of Systems in support of Multi-sided Markets	Dr. Nicholas Whittall
8900	DOD's Weapon System Portfolio: Are Results Getting Any Better?	Ms. Cheryl Andrew
8901	Review Results of the NDIA/OSD Software Test Summit/Workshop	Elizabteh Wilson
8902	Systems Engineering Leading Indicators: Insight into Effective Systems Engineering	Mr. Gary Roedler
8908	Successful First AESA Deployment through Application of System Engineering	Mr. Christopher Moore
8913	Linking Interoperability and Measures of Effectiveness: A Method for Evaluating Architectures	Dr. John Colombi
8915	System of Systems Challenges and Solutions: Case Study Insights	Dr. David Jacques
8916	System Readiness - assessing technical risk throughout the lifecycle	Mr. Jim Thompson
8920	A Methodology for Assessing Systems Engineering Practices	Mr. David McDonnell
8923	Integration of Operational Simulations With Physics-Based Models For Engineering Analysis	Dr. William Graves
8924	Key Early Systems Engineering Activities and Products Under the New DoDI 5000.02	Dr. Don Gelosh
8929	Extending Net-Centric Quality of Service to Systems of Systems	Dr. John Colombi Dr. Kenneth Hopkinson Dr. Michael Grimaila
8931	The Role of Mentoring in Developing the Systems Engineering Workforce	Dr. Don Gelosh

8933	Early Systems Engineering Planning: Milestone A Systems Engineering Plan	Dr. Judith Dahmann
8935	Systems of Systems Systems Engineering and Test and Evaluation	Mr. John Palmer Dr. JoAnn Lane Mr. George Rebovich
8942	DoD Systems of Systems Update	Dr. William Asrat
8946	Protecting the Mission, Preserving Legacy and Promoting Growth	Kerri Van Horne
8947	Report on a Study on Management Concepts for Broadly-Needed Modeling and Simulation Tools in the U.S. Department of Defense	Dr. Katherine Morse Mr. Randy Saunders
8950	Live, Virtual, Constructive Architecture Roadmap: The Quest for Interoperability, Standards, and Reuse	Dr. Amy Henninger
8955	TUTORIAL: Early Systems Thinking and Technical Planning in Weapon System Concept Development (HALF DAY)	Ms. Robin Wright
8960	A Distillation of Lessons Learned from Complex System of Systems Acquisitions	Arthur Pyster Kenneth Kepchar Ann Teford Mark Weitekamp
8963	Air Force Concept Maturity Assessment	Mr. Jeff Loren
8966	Improving Systems Engineering Curriculum Using a Competency-Based Assessment Approach	Dr. Wiley Larson
8967	Generating Visual and Interactive Output from System Engineering Tools	Steven Dam Chris Ritter
8973	C-17 Transition to Criteria-based Airworthiness Certification	Mr. Michael McKinney
8974	Transforming Systems and Software Engineering Across an Enterprise	Mr. Timothy Chaill
8976	A Systems Engineering Model for Roadmap Alignment	Mr. John Fitch Ms. Harsh Desai
8980	Using Simulink and Model-driven Engineering Techniques for Integrated Flight Simulation Development	Brett Collins Jesse Carlaftes
8982	Systemic Root Cause Analysis – Driving Improvements into the Acquisition Process	Mr. Jim Thompson Mrs. Laura Dwinnell
8990	Systems Engineering for Rapid Capability Development	Ms. Kathleen Harger
8992	1/2 Day Tutorial: System of Systems (SoS) Quality Attribute Specification and Architecture Evaluation	Mr. William Wood Mr. Timothy Morrow Mr. John Klein
8996	Engineering Improvement in Software Assurance: A Landscape Framework	Dr. Carol Woody Christopher Alberts Andrew Moore
8998	Human Systems Integration – Ensuring the Human is Considered “Left of A”	Ms. Bridget Simpkiss
8999	Program Signature Measurement	Mr. Gordon Kranz Mr. Christopher Miller Mr. Gerald Tarasek
9003	CMMI for Executives	Mr. Wendell Mullison
9004	Evolving Systems Engineering through Model Driven Functional Analysis	Mr. Sharad Kumar
9007	Technology Maturation for the Automated Aerial Refueling (AAR) Project	Mr. Jacob Hinchman Mr. Daniel Schreiter Mr. Ba Nguyen Mr. Jordan Adams
9010	Network Enabled Weapons, A System Engineering Approach to Achieve Interoperabilty	Mr. Wyane Willhite

9012	Human Systems Integration: Defining and Validating a Framework for Enhanced Systems Development	Alisha Belk Dr. Robert Smillie Major Andrew Gepp, USMC
9014	SAVI: Aerospace Platform Development and Certification Using Modeling and Simulation to "Integrate, then Build"	Dr. Don Ward
9015	Challenges and Benefits of applying ISO STEP	Mr. Charlie Stirk
9017	Linking Systems Engineering Artifacts with Complex Systems Maturity Assessments	Mr. Kenneth Michaud Mr. Richard Volkert Mr. Eric Forbes Dr. Joes Ramirez-Marquez
9021	Critical Success Factors for Milestone Review Risk Identification	Dr. Jo Ann Lane
9023	Department of Energy Office of Environmental Management's Technology Readiness Assessment (TRA)/Technology Maturation Plan (TMP) Process Guide and Plans for TRA Training	Dr. Stevem Krahn Mr. Kurt Gerdes Dr. Herbert Sutter
9024	Dynamic Modeling of Programmatic and Systematic Interdependence for System of Systems Acquisition	Dr. Brian Sauser Dr. Muharrem Mane Mr. Alex Gorod
9025	Defining, Assessing, and Improving Architecture Competence	Len Bass Paul Clements Suzanne Garcia Rick Kazman
9026	Early SE Determination of Best-Fit System Life Cycle Processes	Dr. Jo Ann Lane
9027	Department of Energy Office of Environmental Management's Technology Readiness Assessment (TRA) Process	Mr. Kurt Gerdes Dr. Steven Krahn Dr. Herbert Sutter
9031	Supportability Lessons Learned with Line Replaceable Modules	Mr. Joel Moorvitch
9034	SUSTAINMENT AND CONTINUED INSTITUTIONALIZATION OF BEST PRACTICES AND CMMI® AT SPAWAR	Mr. Michael Knox
9035	Enabling Collaborative Decision Making: A Process for Integrating Novel Systems Engineering Tools and Methods for Renewable Energy Portfolio Analysis	Mr. Thomas McDermott
9041	On Modeling and Simulation Methods for Capturing Emergent Behaviors for Systems of Systems	Dr. Tommer Ender Dr. Santiago Ballestrini-Robinson
9043	Implementing the Materiel Availability KPP in DoD acquisition programs—balancing life-cycle costs with warfighter needs	Mr. Pete Nolte Mr. John Quackenbush
9046	Developing an Introductory Systems Engineering Practitioners Course: "Model-Based Systems Engineering (MBSE) With SysML"	Mr. Michael Pafford
9054	A-10 Avionics System Architecture Trade Study and Analysis (AVSATA) Program	Mr. Adam Grimm Mr. Jerry Coates
9059	Smallsat Conceptual Design Trade and Cost Modeling Tool	Mr. John Carsten Mrs. Dana Sherrell Mr. Mike Paisner Mr. Mark Sutton
9060	Modeling and Simulation Support for the Systems Engineering of Systems of Systems (short title "M&S Support for SoS SE")	Dr. William Asrat
9064	Economics of Human Systems Integration: Early Life Cycle Cost Estimation Using HSI Requirements	Dr. Ricardo Valerdi
9065	Rapidly Implementing Lean CMMI Processes That Meet Business Needs	Mr. Tim Olson
9072	1/2 Day Tutorial - Leveraging the Defense Acquisition Program Support (DAPS) Methodology for Program Success	Mr. Peter Nolte

9076	Assessing Systems Engineering Personnel Competency: Framework and Tool Experience	Mr. Dan Ingold Dr. Paul Componation Dr. Richard Turner Ingold Dan
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9083	Requirements Engineering for Systems of Systems	Mr. Edwin Morris Dr. Dennis Smith Grace Lewis Mr. Patrick Place
9094	DoD Green Procurement Program Update and Path Forward	Ms. Sandy Ross Ms. Christina Graven
9095	Acquisition ESOH Risk Management and HAZMAT Management Part I: Hazardouse Materials Management Plan	Mr. Sherman Forbes
9097	Acquisition ESOH Risk Management-How to Make It Work	Mr. Sherman Forbes
9103	The Economics of CMMI	Mr. Mike Campo
9104	Static Code Analysis: Best Practices for Software Assurance in the Acquisition Life Cycle	Mr. Paul Croll

Defense Research and Engineering: The Path Ahead

The Honorable Zachary J. Lemnios

Director, Defense Research and Engineering

12th Annual NDIA Systems Engineering Conference

October 27, 2009

Our Guidance

- **Defense Budget Recommendation Statement**
  Secretary of Defense Robert M. Gates, April 06, 2009
  - ***reaffirm our commitment to take care of the all-volunteer force***
  - ***rebalance this Department's programs***
  - ***institutionalize and enhance our capabilities to fight the wars we are in today and the scenarios we are most likely to face in the years ahead***
  - ***provide a hedge against other risks and contingencies***
  - ***fundamental overhaul of our approach to procurement, acquisition, and contracting***
- **Economic Club of Chicago**
  Secretary of Defense Robert M. Gates, July 16, 2009
  - ***What is needed is a portfolio of military capabilities with maximum versatility across the widest possible spectrum of conflict***

Weapon Systems Acquisition Reform Act of 2009

- **Establishes Director, Systems Engineering (SE) and Director, Developmental Test & Evaluation (DT&E) as principal advisors to the SECDEF and the USD(AT&L)**
- **Mandates documented assessment and competitive prototyping**
- **Strengthens technical analysis of cost and schedule breaches during development**

President Barack Obama signing the Weapons Systems Acquisition Reform Act in the Rose Garden at the White House Friday, May 22, 2009.

Official White House Photo by Samantha Appleton

DDR&E Imperatives

1. Accelerate delivery of technical capabilities to win the current fight.
2. Prepare for an uncertain future.
3. Reduce the cost, acquisition time and risk of our major defense acquisition programs.
4. Develop world class science, technology, engineering, and mathematics capabilities for the DoD and the Nation.

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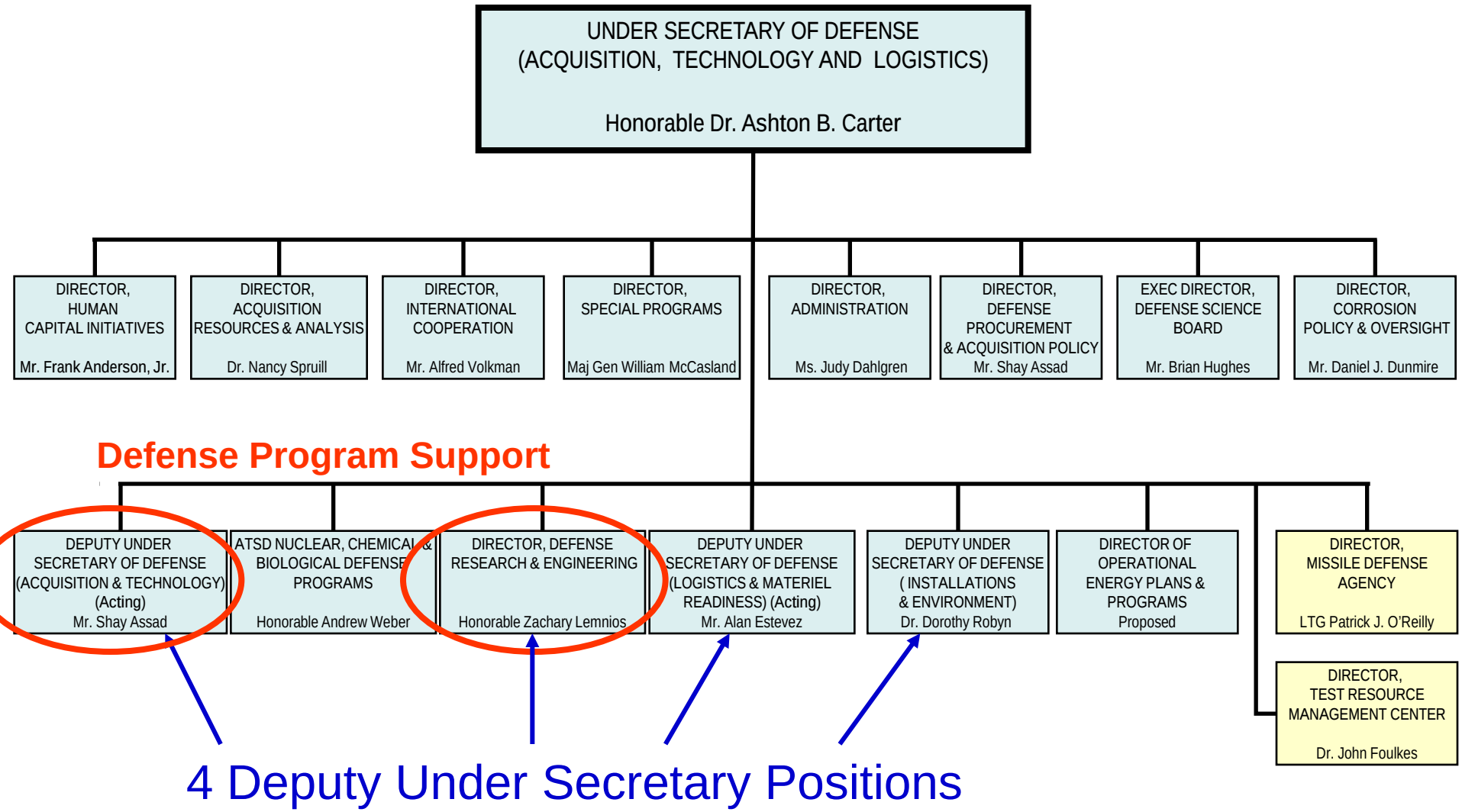
Defense Program Support within the AT&L Organization



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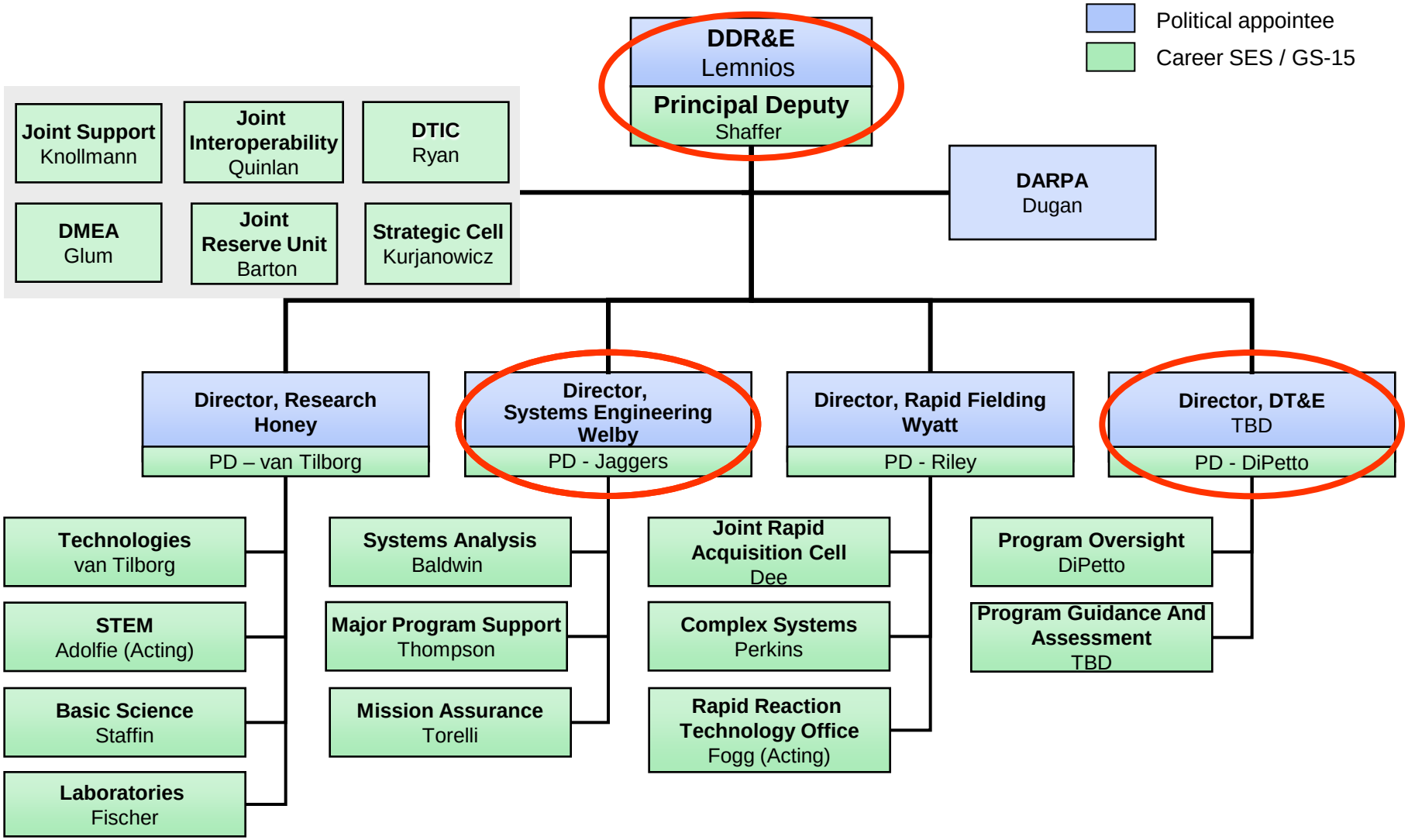
DDR&E Organization



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New Coordinates

Innovation

Speed

Agility

UNCLASSIFIED

Comments from COCOMs

"We need to detect IEDs at range… I am willing to test technologies in the field… We need persistent communications on the move…"

"I need the 70% solution today, rather than the 100% solution in 5-8 years…"

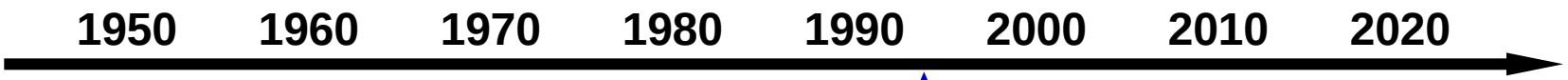
"…we are concerned about our technological edge against a near peer competitor…"

"It took us 10 years to get to the Moon, we are 8 years into our research efforts for defeating IEDs…we need to find a solution to reliably detect and defeat IEDs at range…

"I like the 1-year acquisition cycle rather than the standard 5- to 8- year cycle, get the prototypes into the hands of the warfighters, turn the feedback into a quick redesign and deliver relevant capability now…"

"Often times we fail due to shortage of imagination…"

Perspective for the Next Decade



National Security Challenges

Cold War

Vietnam War

Desert Storm

Collapse of Soviet Union

Bosnia

Kosovo

OIF

OEF

Irregular/Hybrid Warfare

Defense Capabilities

ICBM

Satellite comms

C4ISR

Precision Strike

UAV

LGB's

GPS

Stealth

Robotics

Nuclear propulsion

Night Vision

Human Terrain
Ubiquitous Observation
Contextual Exploitation
Scaleable Action

Enabling Technologies

Transistor

Composite Materials

MEMS

Solid state laser

Superconductors

Space tracking

Web protocols

VHSIC

MIMIC

Digital computing

IR Sensors

High Performance Computing

- Advanced Electronics, Photonics Algorithms, MEMS
- Nano; Meta; & New Materials
- Cognitive Computing
- Bio-Revolution

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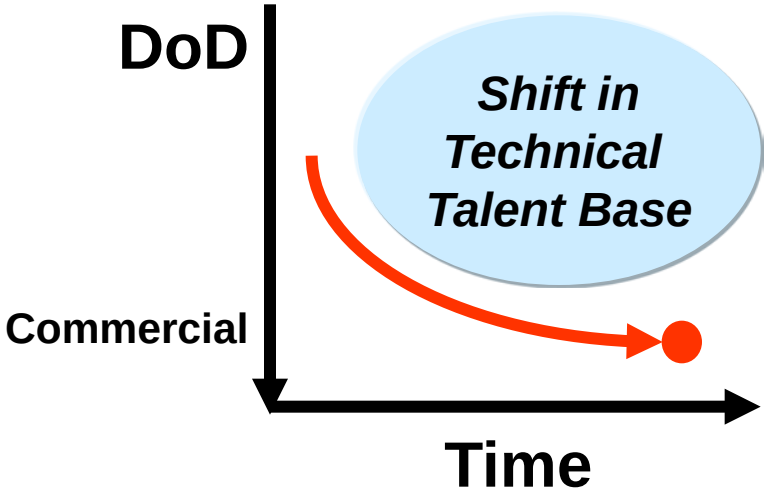
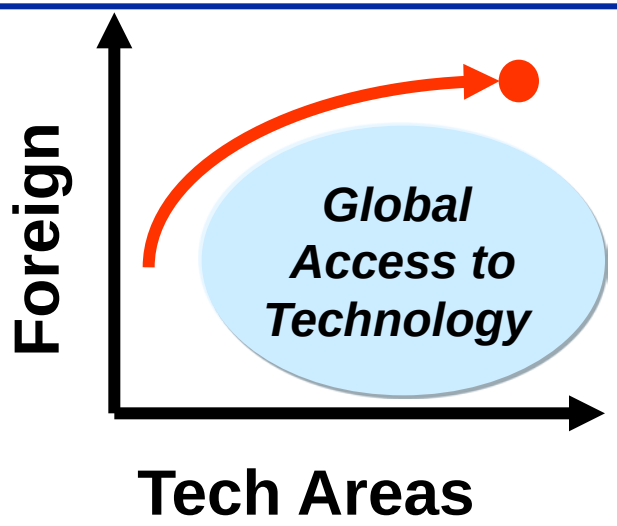
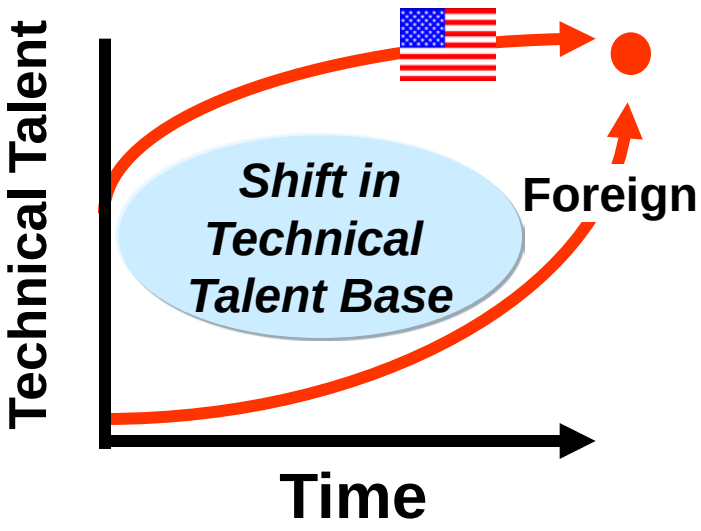
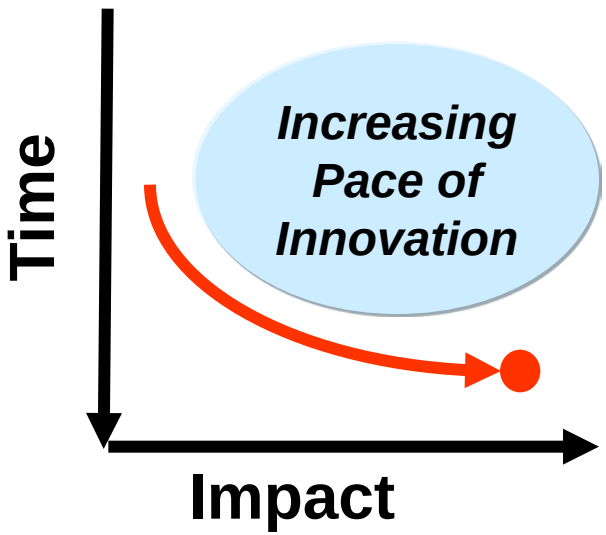
Four Key Challenges to our Technical Base









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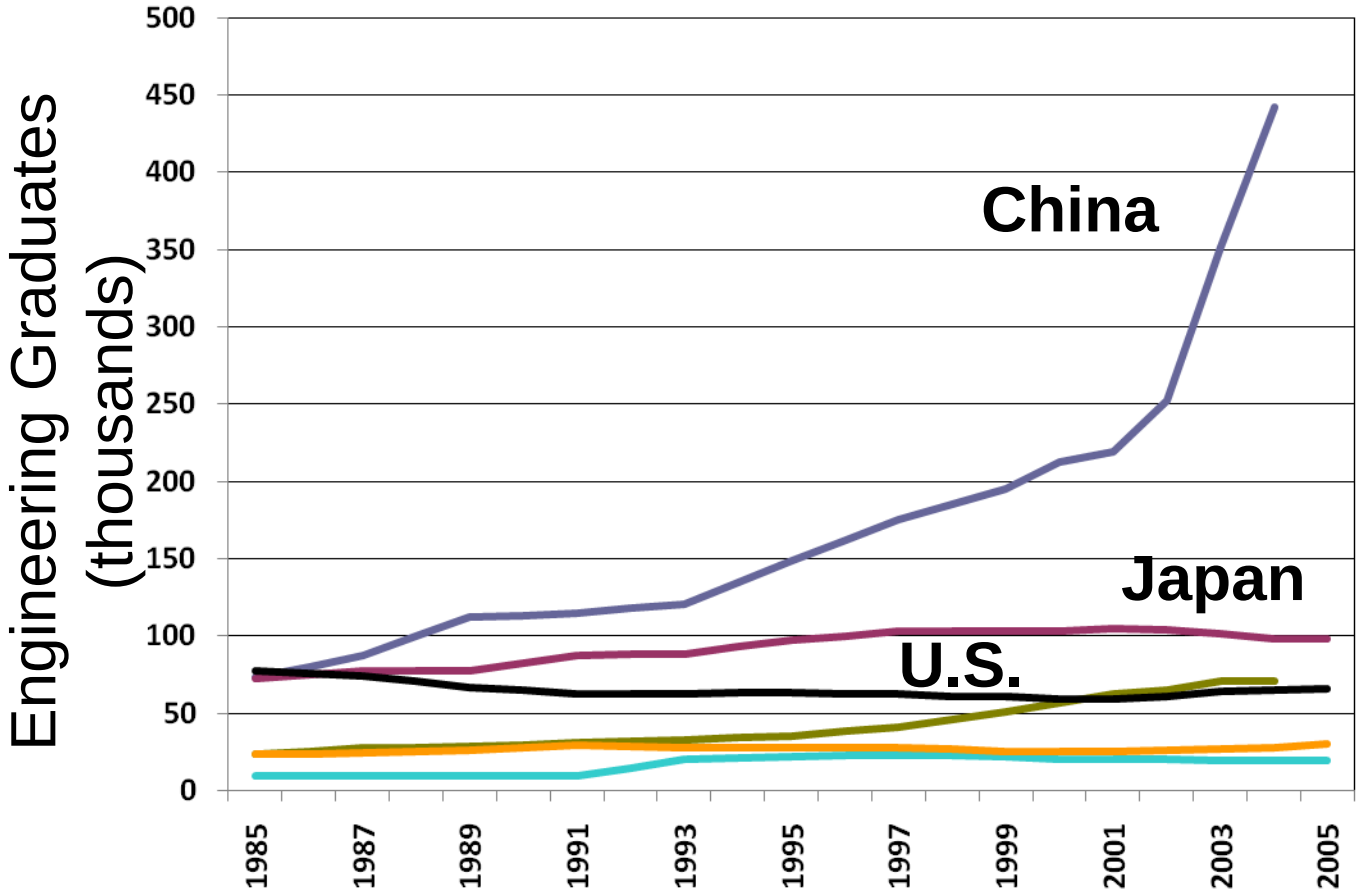
We are in Competition for the Best and Brightest



S&E Indicators, 2008

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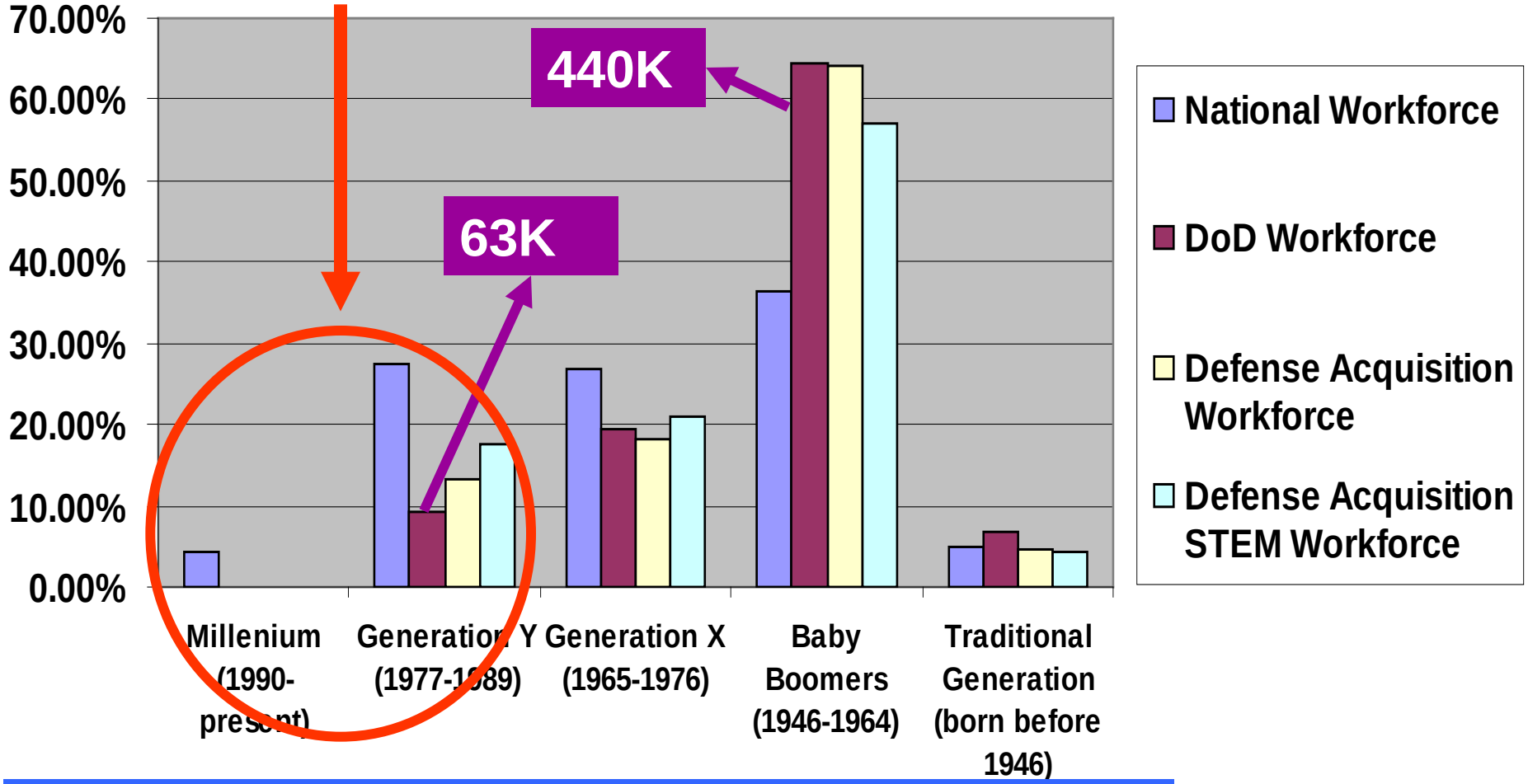
The STEM Workforce Challenge

Future Workforce



Totals:	6.6M	42.8M	41.8M	56.7M	7.4M

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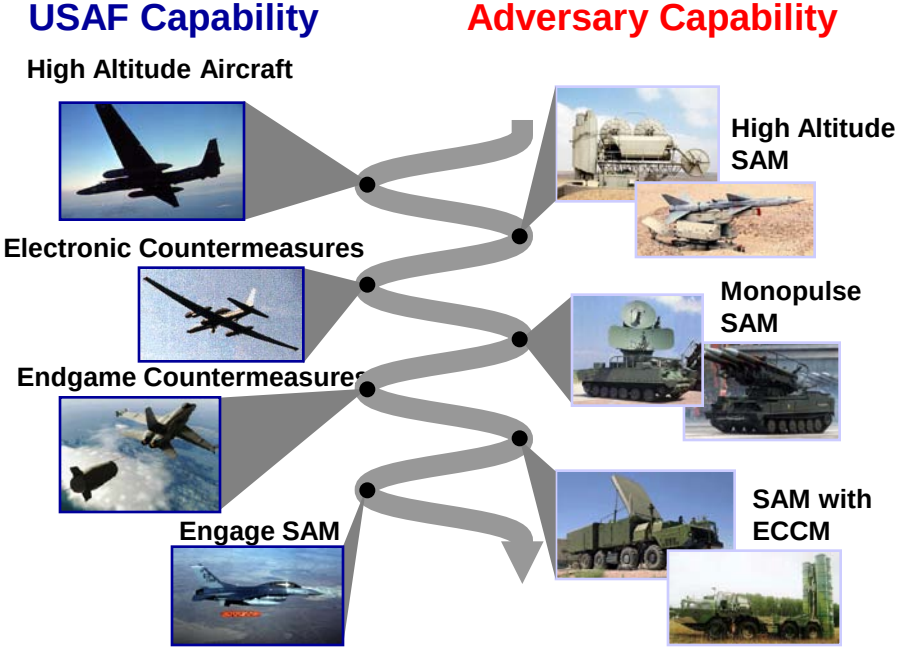
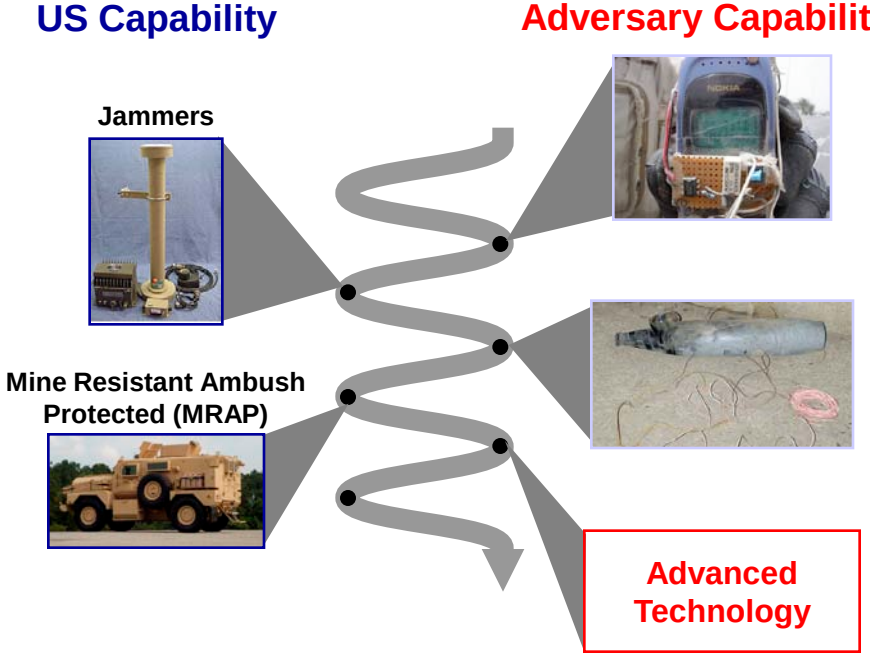
The Timeline has Collapsed!

Conventional Warfare



Response loop measured in years

Counter-Insurgency Warfare



Response loop measured in months or weeks

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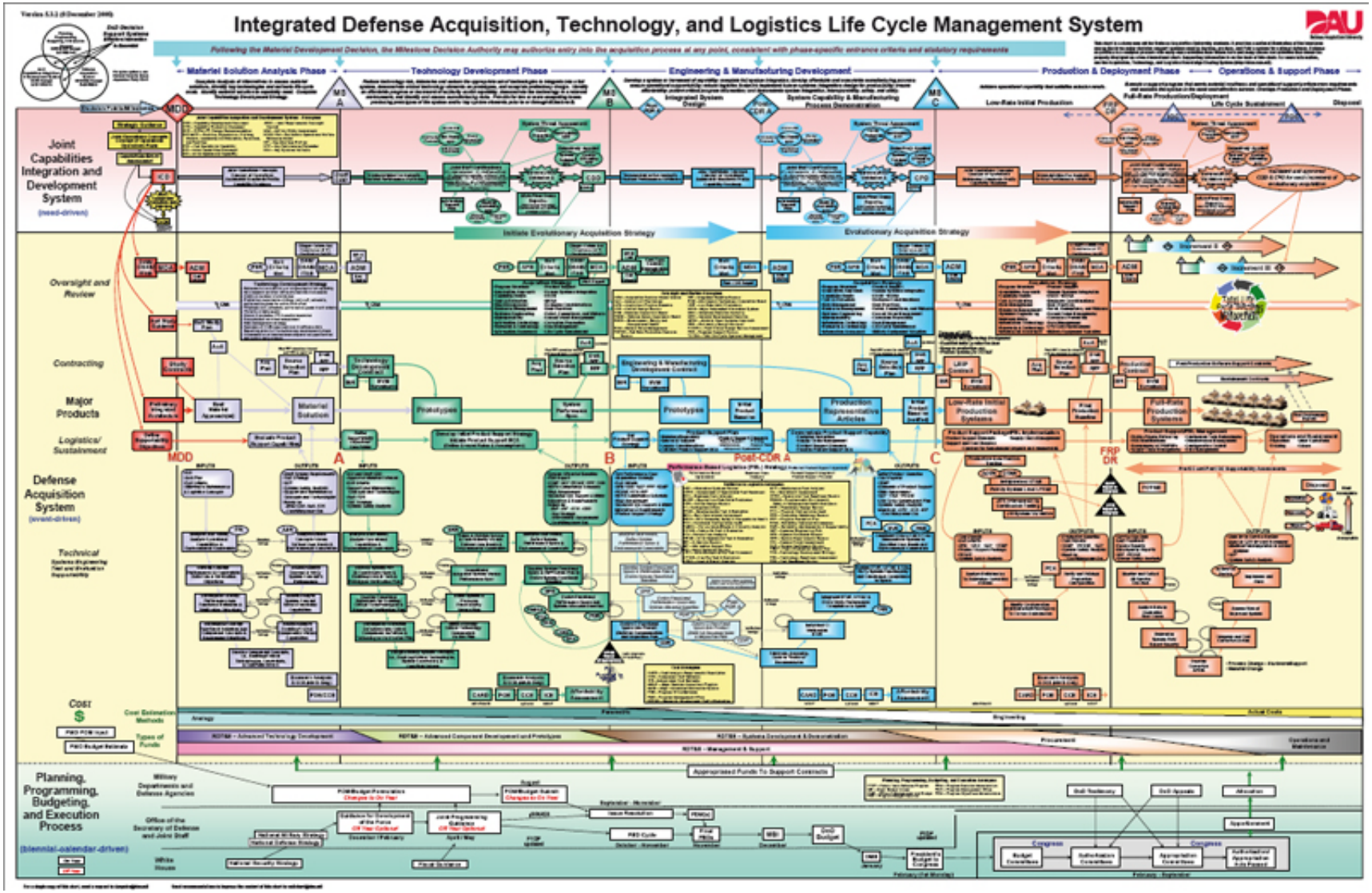
An Effective Process for Major Defense Systems – but not very agile



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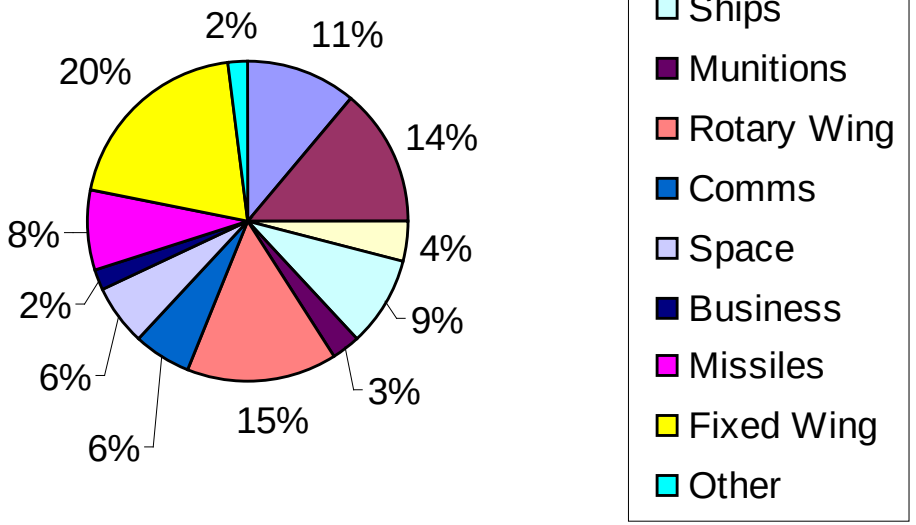
Scope of DDR&E Acquisition Program Oversight Efforts*

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
Total		274

% 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

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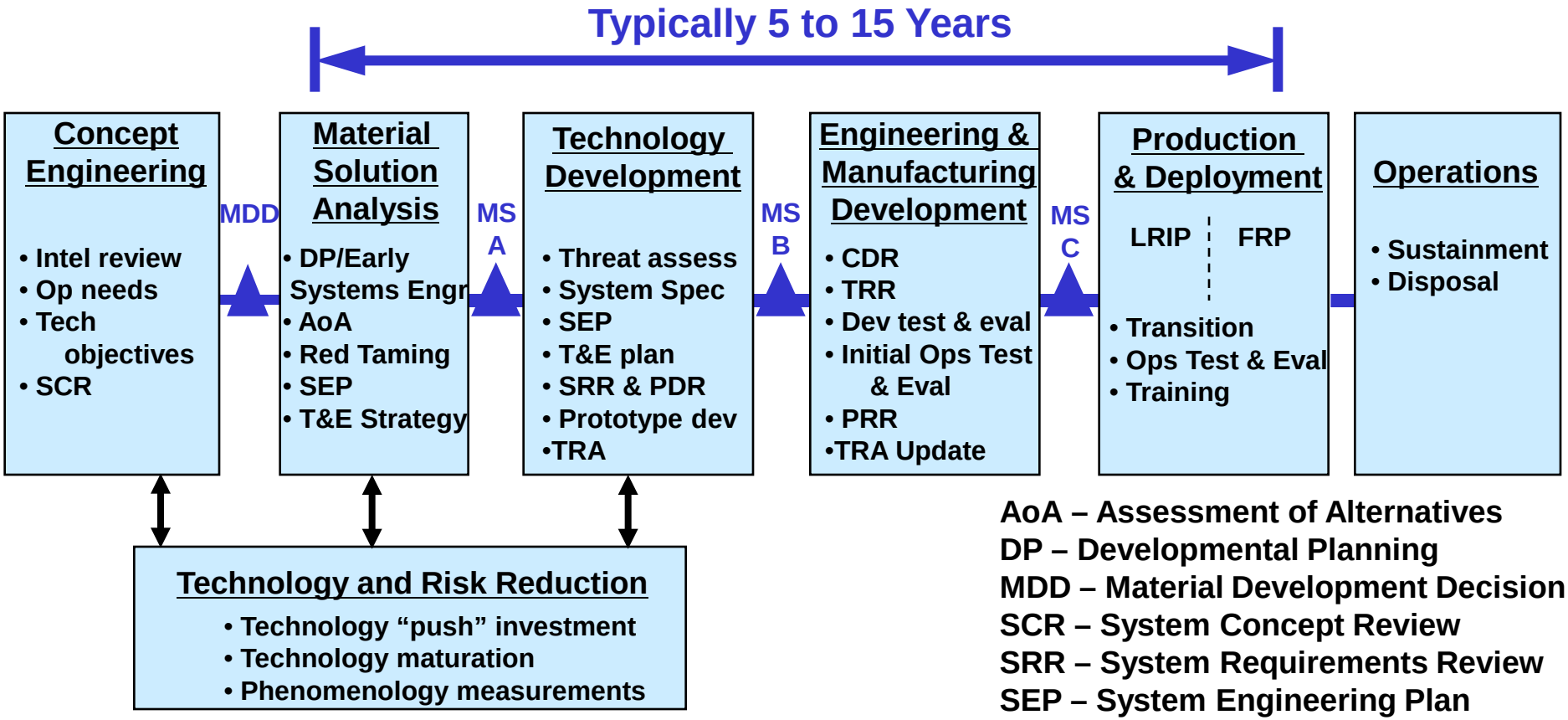
Defense Acquisition Approach
Systems Engineering is a key discipline



70-75% of Cost Decisions Made Prior to Milestone A
Impact 72% of Total Life Cycle Costs

AoA – Assessment of Alternatives
DP – Developmental Planning
MDD – Material Development Decision
SCR – System Concept Review
SRR – System Requirements Review
SEP – System Engineering Plan
PDR – Preliminary Design Review
CDR – Critical Design Review
TRR – Test Readiness Review
PRR – Production Readiness Review
LRIP – Low-Rate Initial Production
FRP – Full Rate Production

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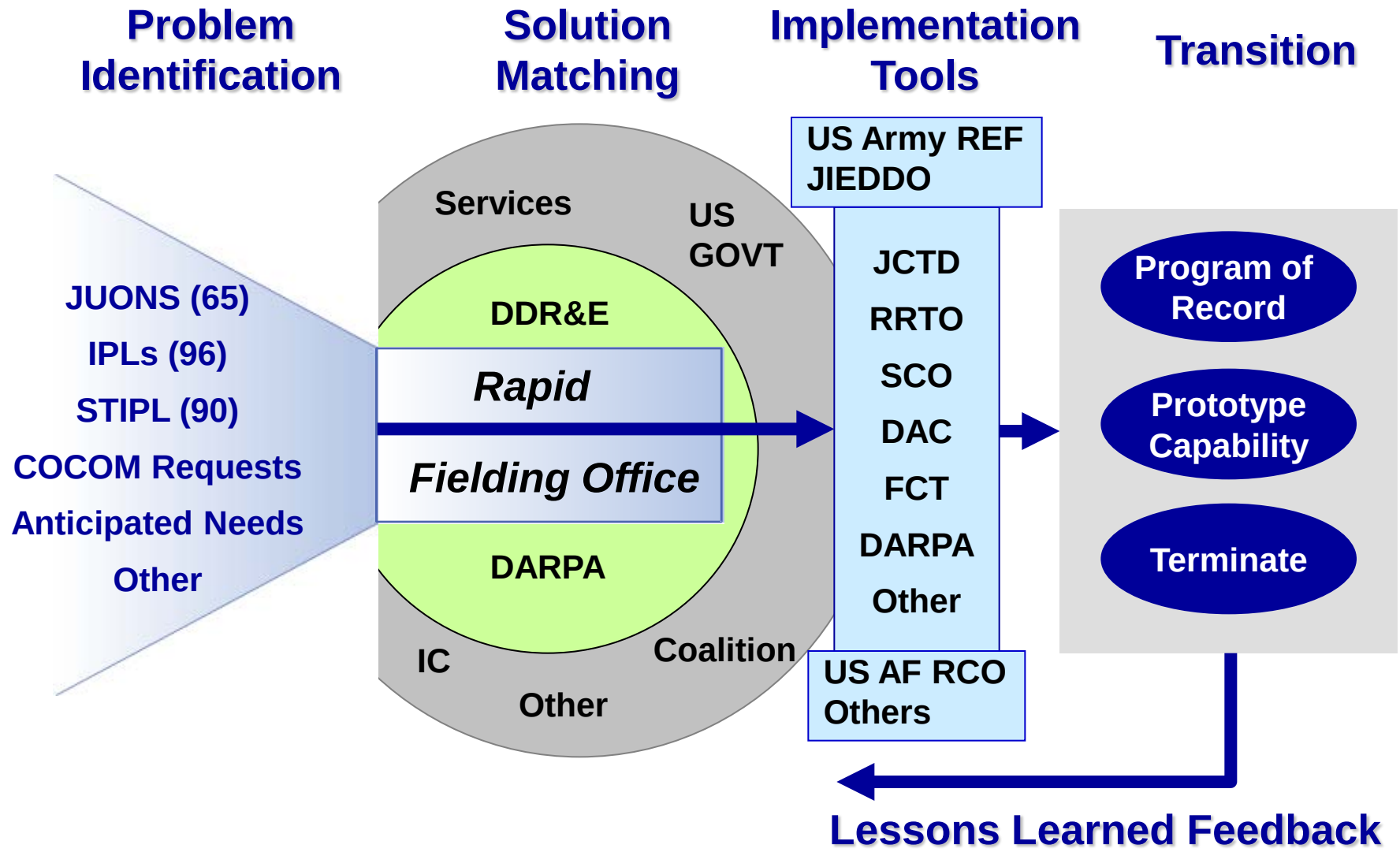
DDR&E Rapid Fielding Office: Accelerating Delivery of Capabilities



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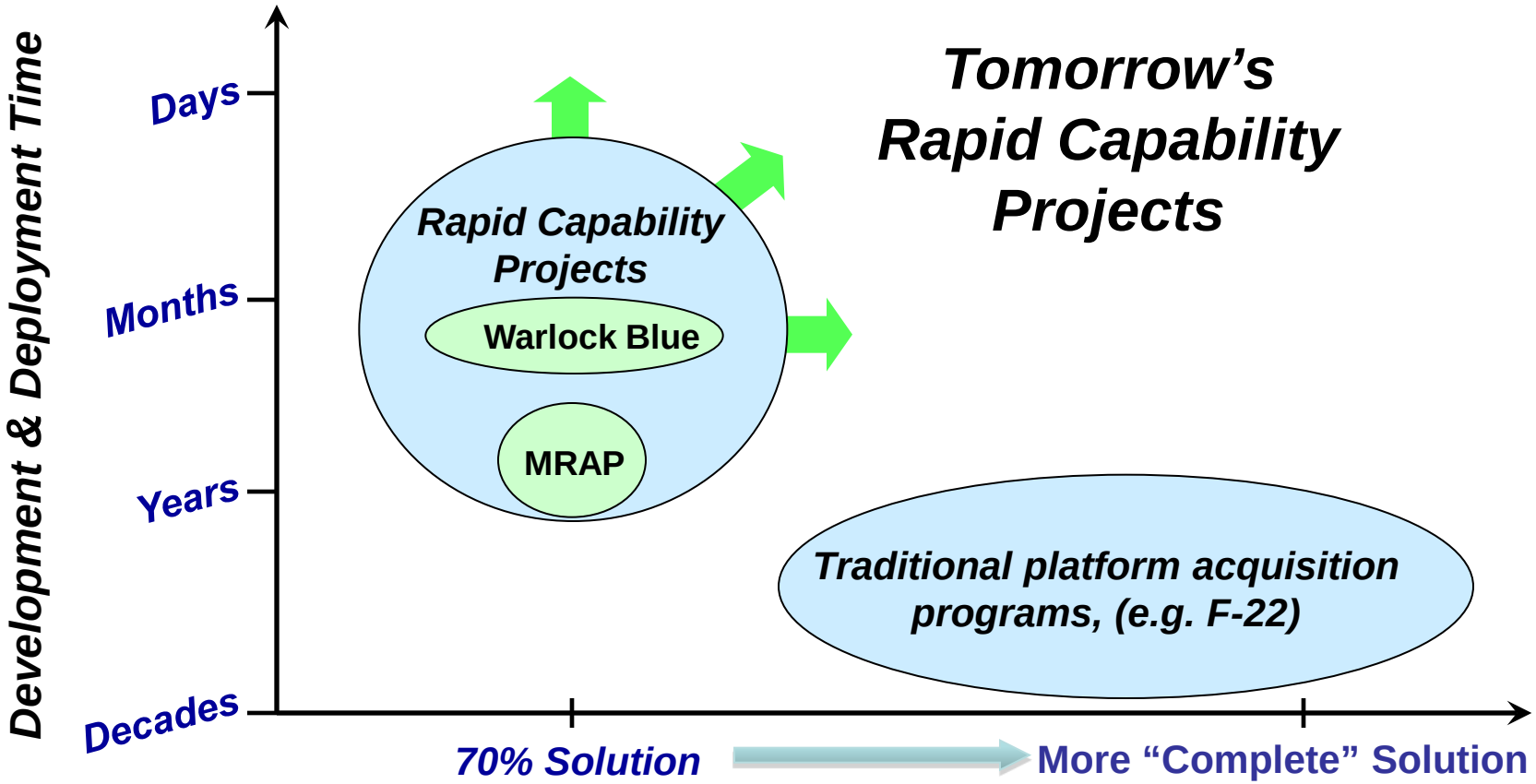
Pushing the Bounds of Innovation and Development



Performance – Sustainability – Adaptability - Robustness of Solution

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A New Generation of Concept Engineering Tools

Warfighter Needs

Anticipatory Opportunities

Accelerated Concept Engineering Environment

Iterative Virtual and Real Prototyping

- Conceptual Designs
- CONOPs
- TTPs
- Detailed Design Models

- **Immersive Virtual Environments**
- **Rapid Virtual Environment generation**
- **Virtual Environment to CAD tool translation**
- **Rapid Prototyping fabrication tools**
- **“Human-Centered Design” principles and tools**
- **Integrated engineering and virtual M&S**

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Summary: Challenges Ahead

- Develop tools to shorten the Acquisition cycle without diminishing the quality of solutions
- Evolve Systems Engineering to design systems for adaptability and to embrace complexity
- Expand the aperture of Defense Engineering to address 21st century technical challenges
- Expand the Defense Engineering human capital resource base

Program Executive Office
Command, Control, Communications,
Computers and Intelligence (PEO C4I)

Systems Engineering Rigor within the Acquisition Process

27 October 2009
Chris Miller
PEO C4I
858 537-8779
chris.miller@navy.mil

Statement A: Approved for public release; distribution is unlimited (26 OCT 2009)

About PEO C4I

Workforce

- Civilian: 204
- Military: 68

FY09 Total Obligation Authority ***(based on PB10)***

- Research & Development: $542M
- Procurement, Navy: $1,004M
- Operations & Maintenance, Navy: $437M
- Ship Conversion, Navy: $1351M

Programs - Total: 132

- ACAT I: 8* ACAT II: 4 ACAT III & Below: 119
- Rapid Deployment Capabilities (RDCs): 1

Platforms Supported – FY09

- Afloat: 260 Shore: 220 Expeditionary: 34

Includes: IAC – 3 IAM – 2 (1-DISA/1-PEO C4I)
IC – 2 PreMAIS/MDAP - 1

Navy C4I Key Facts

More than 170,000 C4I users

More than 5,200 radios fielded

More than 2,700 annual installations

More than 700 applications supported

Average/fielded bandwidth capability
- Carrier: 4 mbps - 24mbps
- Destroyer: 512 kbps - 8mbps
- Submarine: 128 kbps

Average technology refresh
- 18 months

Average time to market
- Initial fielding: 36 months
- Full Fielding: 8-10 years

updated 22 October 2009

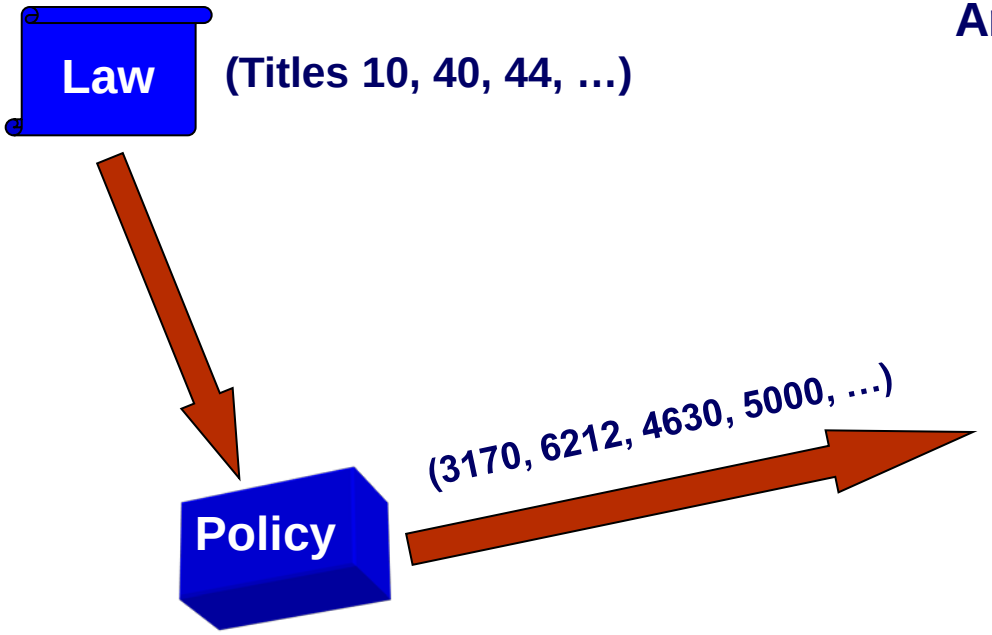
Unique Maritime Challenges Require New Focus on Systems Engineering

- Expansive Physical Environment
  - From the ocean floor to outer space and everything in between
- High Volume of Data
  - Linking Vessel, People, Cargo, Infrastructure data from multiple and disparate sources,
  - Then getting it to the tactical edge in a relevant format
- New Partners
  - Traditional: Coalition Partners and Interagency organizations drive Cross Domain and Releasable Solutions
  - Non-Traditional: new International and Interagency partners drive Non-classified solutions

Information Technology is a Game-changing Element of Warfare

Challenge:
Realistic Policy Implementation

Law begets Policy, Directives, and Guidance

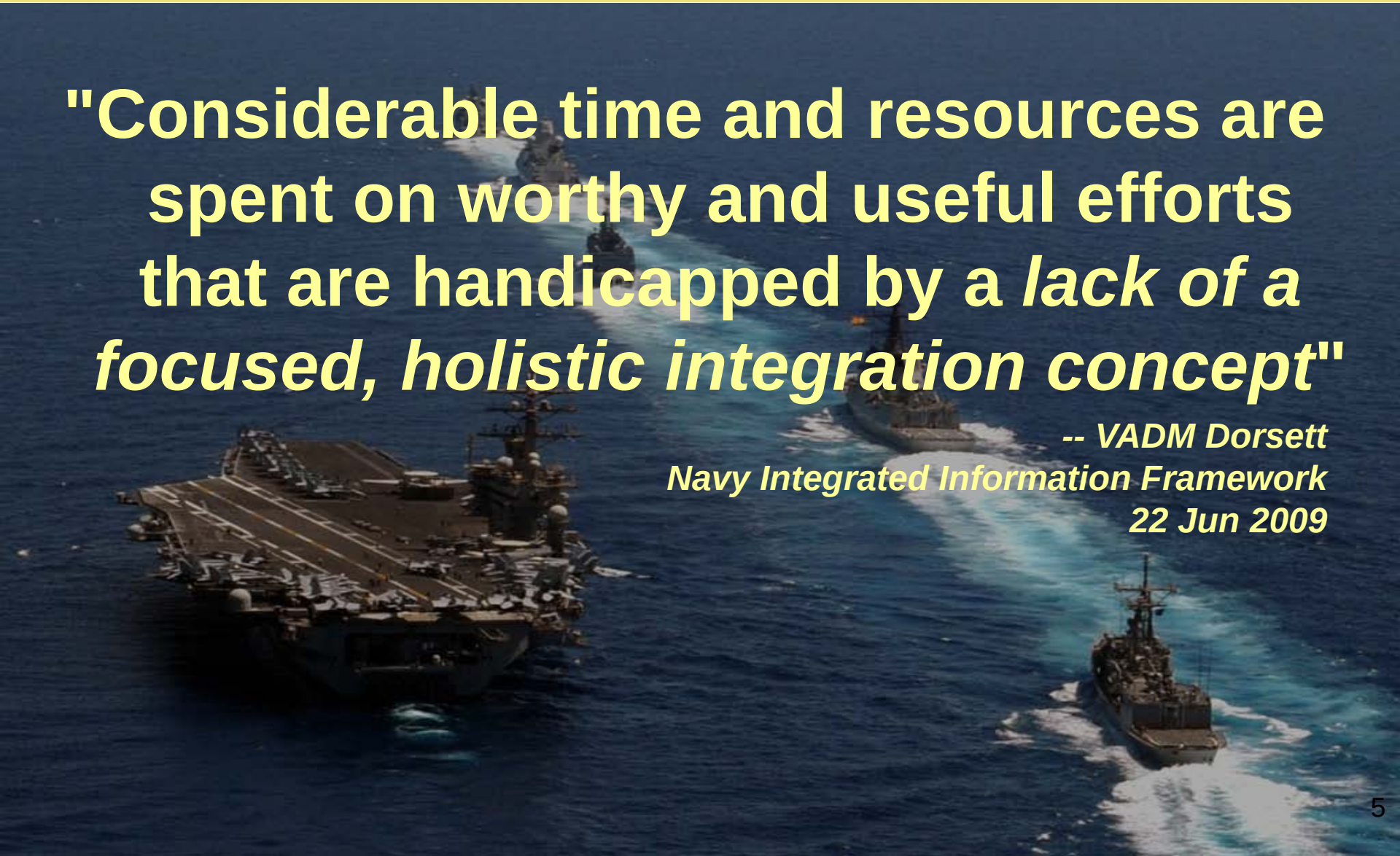


Development, complexity, and interpretation of Policy is overwhelming

Are we providing too much "help"?

Is he managing the Program, or the paperwork?

Need for Governance



"Considerable time and resources are spent on worthy and useful efforts that are handicapped by a *lack of a focused, holistic integration concept*"

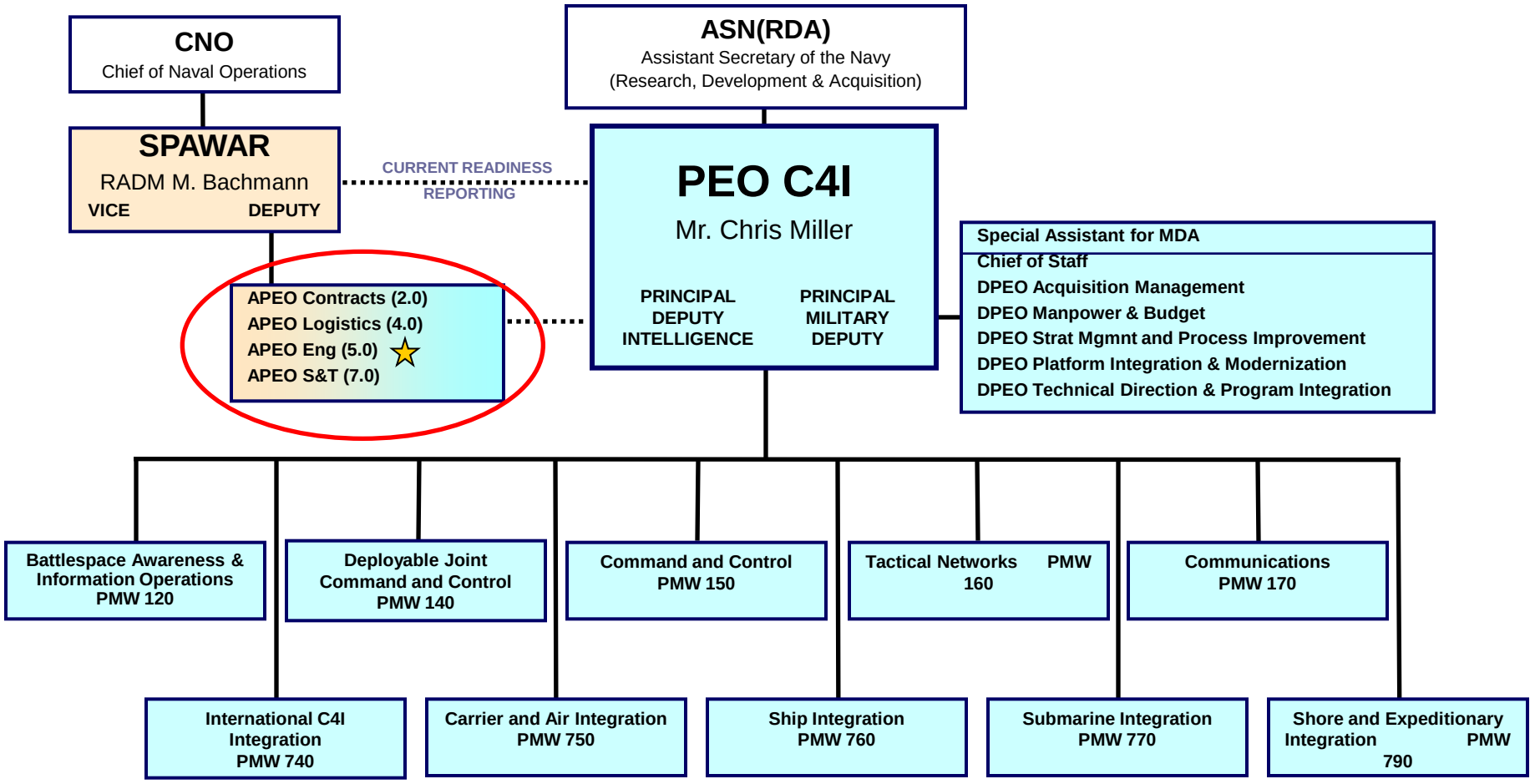
-- VADM Dorsett
Navy Integrated Information Framework
22 Jun 2009

Systems Engineering Governance

- Drivers
  - Paradigm shift in corporate culture
  - Increased focus on fielding integrated and interoperable systems
  - Need for up front and early adoption of systems engineering practices
- Systems Engineering Governance
  - Technical Authority and Standards
  - Enterprise Engineering and Certification

Enabled Through a Competency Aligned Organization (CAO)

Competency Aligned Organization (CAO)



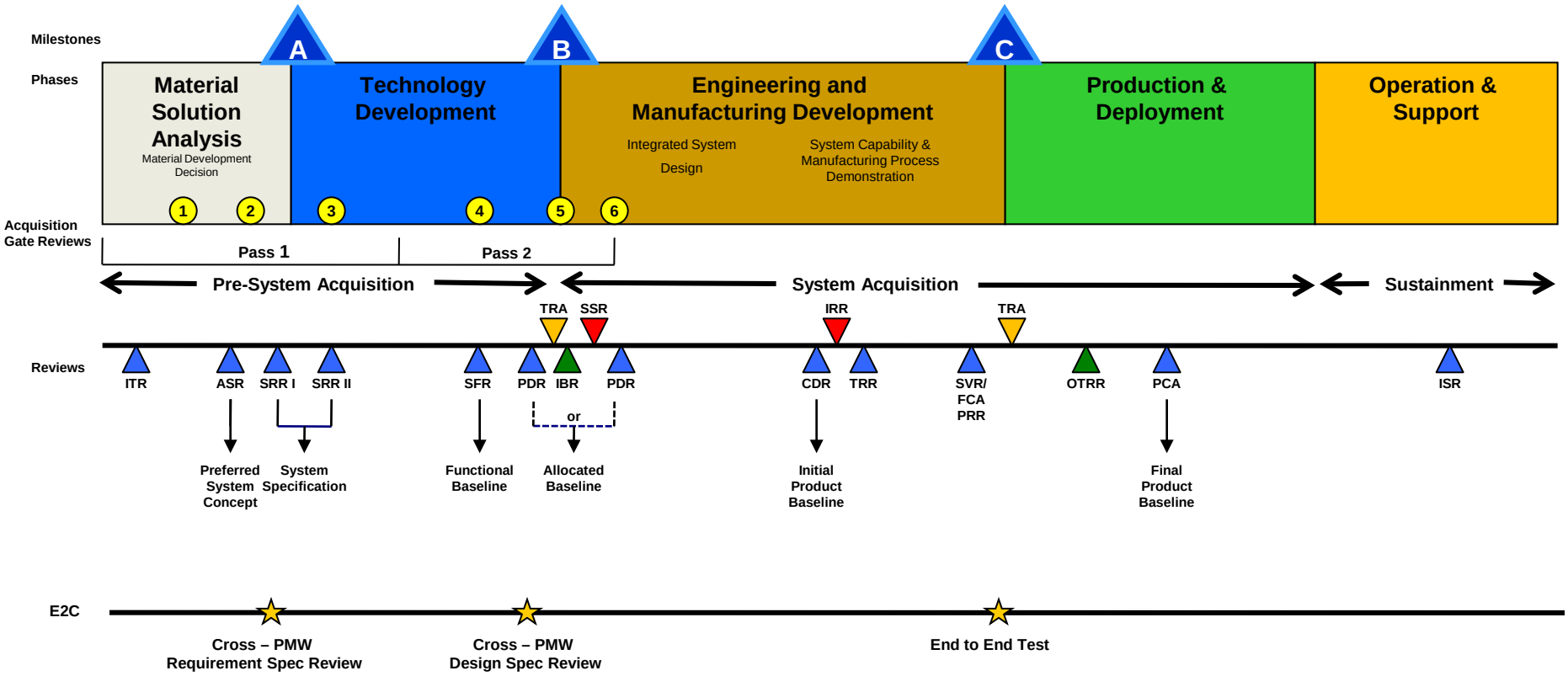
CAO implementation increases consistency and collaboration within engineering and acquisition

Updated 27 May 09

Systems Engineering
Rigor Applied to Acquisition

- Technical Authority provides:
  - Engineering expertise during system development and deployment
  - MDA with an independent assessment of program technical health
  - Consistent enterprise standards and processes to ensure interoperability with traditional and non-traditional partners within the GIG
- Enterprise Engineering and Certification (E2C):
  - Design system interoperability early in the systems engineering lifecycle
  - Test end-to-end capability packages for interoperability
  - Enforce acquisition programs to collaborate on engineering design, development and interoperability challenges prior to fleet installation

System Engineering Technical Reviews (SETR) & the Acquisition Lifecycle

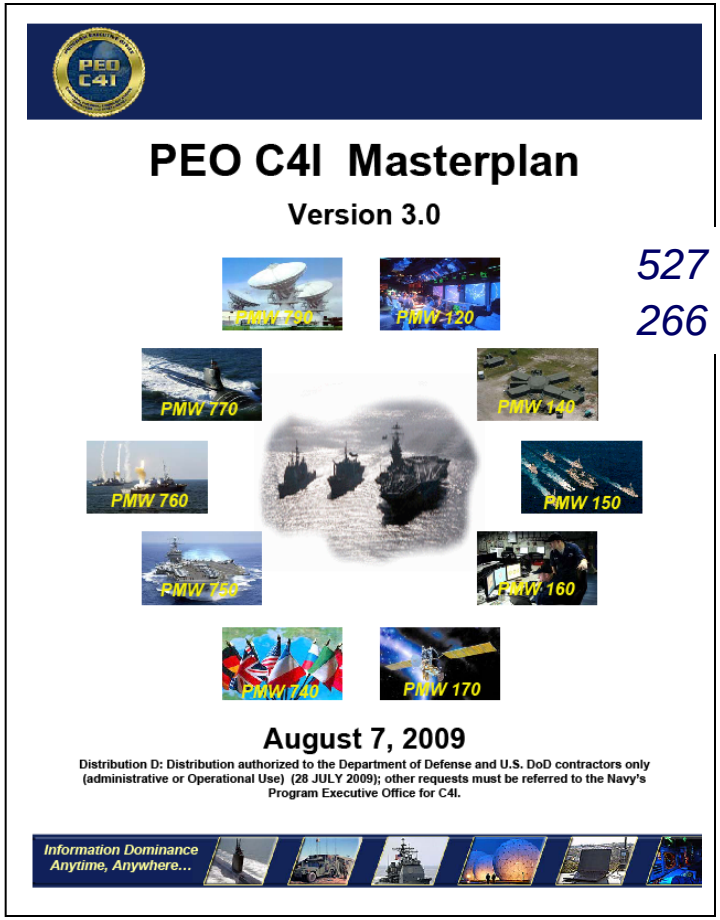


Technical reviews and E2C activities occur as the system matures throughout the program life cycle

NOTE: Gate Reviews are NOT SETR Events

PEO C4I Masterplan

Documents Portfolio Implementation across FYDP and beyond



527 Pages
266 Figures

Purpose- Provides an understanding of what transition is required across the PEO C4I portfolio in order to meet modern network-centric warfare needs

- what is planned and budgeted
- baseline architectures
- future architectures
- portfolio roadmaps
- future technical vision
- recommendations for modernization initiatives

Intended Audience- Intended to be used as a ready reference for all PEO C4I portfolio stakeholders, including program managers, resource sponsors and warfighters.

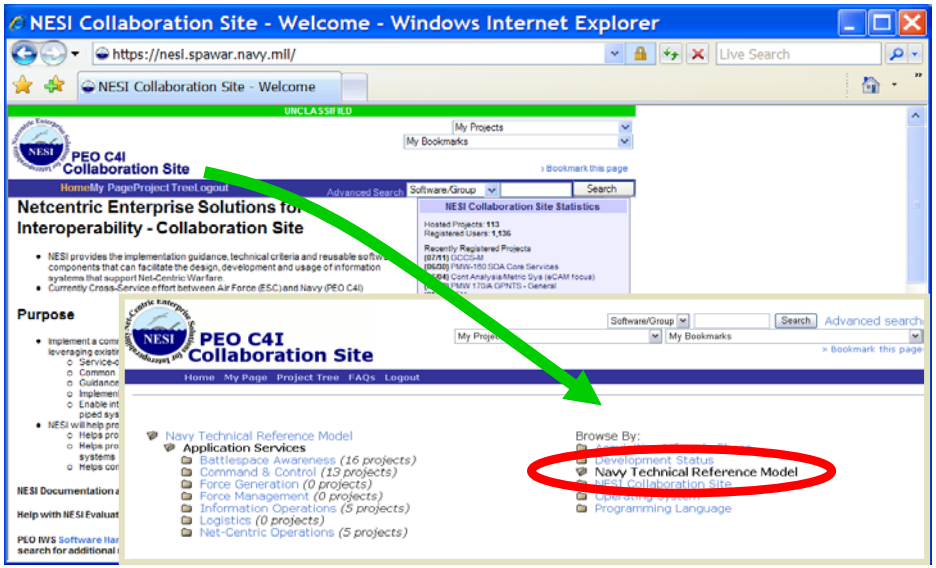
Updates- Living document updated annually.

Available at:

https://nserc.navy.mil/peo_c4i/se2/dpeo/dpeotechdir/PEO%20C4I%20Masterplan%20Version%2030/Forms/AllItems.aspx

Net-centric Enterprise Solutions for Interoperability (NESI)

- "A distillation of several higher level strategies into a manageable set of guidance"
- Framework of actionable engineering guidance
- Content evolves to support growing experience with net-centricity, interoperability and program needs



- Publicly available content
  - http://nesipublic.spawar.navy.mil

Master Plan utilizes the Navy Technical Reference Model to bin programs by functional area

Moving Forward

- Increase focus on enterprise standard development and implementation
- Standardize processes, best practices and lessons learned
- Work with stakeholders to develop enterprise level requirements to support the future warfighter

We get it.

We also integrate it, install it and support it. For today and tomorrow.

Welcome

to the

12th Annual

Systems Engineering Conference

Sponsored by

NDIA Systems Engineering Division

In Conjunction With

Director, Systems Engineering, Office of the Deputy Under Secretary of Defense (AT&L), Defense Research & Engineering

With Technical CoSponsorship By

Institute of Electrical & Electronics Engineers (IEEE)
Aerospace & Electronic Systems Society and
Systems Council

Systems Engineering

Why do we need systems engineering?

- **SE is the all-important facilitative umbrella engineering and “glue” that enables and fosters successful programs**
- **As the US military moves from a threat-based weapons procurement environment to a capability-based procurement environment, Systems Engineering becomes even more important.**

Capability-based Acquisition

- **The US was in a Threat-based mode for defense planning for 40 years, from the arrival of Robert McNamara as SecDef in 1961 until Donald Rumsfeld took over in 2001**
- **Analysts believe this led to two weaknesses:**
  - **Near impossible to do flexible and adaptive planning**
  - **Military planners became so narrowly focused that they missed potential dangers**

Gulf War was a surprise
Kosovo was a surprise
Sept 11, 2001 was a surprise
Iraqi insurgency was a surprise
Taliban revival was a surprise

Capability-based Acquisition

- In a recent RAND report, analyst Paul Davis observed that whatever its faults, capability based planning has the virtue of encouraging prudent worrying about potential needs that go well beyond currently obvious threats
- Capability-based Planning, and Acquisition, needs **competent systems engineering**---and this is what this Conference and the NDIA Systems Engineering Division – is all about.
- ---And unfortunately, our DoD Systems Engineering Capability has atrophied to a large degree

Dual-track Acquisition System

- To further exacerbate the problem, the recent (summer 2009) DSB Report on “Fulfillment of Operational Needs”, chaired by former AT&L Jacques Gansler, has recommended a dual-track acquisition system: the traditional force structure path and a quick-response path to rapidly answer demands for new kinds of equipment.
- According to the cover letter, the Pentagon “lacks the ability to rapidly field new capabilities for the warfighter in a systematic and effective way.”
- ***Such a rapid-response system will have need for competent systems engineering***

A few thoughts---

- **Do we need a 6th-generation fighter?**
  - **Gen 1: Jets – F-80, ME-262**
  - **Gen 2: Swept-wings, range-only radar – F-86, MiG-15**
  - **Gen 3: Supersonic speed, pulse radar, target acquisition beyond visual range – F-105, F-4, MiG-17, MiG-21**
  - **Gen 4: Pulse-doppler radar, high maneuverability, look-down, shoot-down missiles – F-15, F-16, Mirage 2000, MiG-29**
  - **Gen 4+: High agility, sensor fusion, reduced signatures - Su-30, F-16+, F/A-18, Typhoon, Rafale**
  - **Gen 4++: Electronically active scanned array radar, "active" waveform-canceling stealth, some supercruise – Su-35, F-15SE**
  - **Gen 5: All-aspect stealth, internal weapons, extreme agility, full-sensor fusion, integrated avionics – F-22, F-35**
  - **Potential Gen 6: Extreme stealth, efficient in all flight regimes (subsonic to multi-Mach), smart skins, highly networked, extremely sensitive sensors, optional manning, directed energy**

A few statistics---

- **Some USAF analyses claim that the USAF could be as many as 971 aircraft short of its minimum required inventory of 2,250 fighters by 2030.**
- **Who built our military airplanes? By WWII:**
  - **7,890 by Chance-Vought**
  - **8,810 by Martin**
  - **13,575 by Bell**
  - **15,603 by Republic**
  - **17,428 by Grumman**
  - **18,381 by Boeing**
  - **26,154 by Curtiss**
  - **30,696 by Douglas**
  - **30,903 by Consolidated Vultee**
  - **41,188 by North American**

A few more statistics---

- **Ops Tempo is high!**
  - **USAF flew 18,422 sorties in Iraq in 2008**
  - **Approximately 9,000 projected for 2009**
  - **USAF flew about 19,000 close-air-support sorties in Afghanistan in 2008**
  - **Number will double in 2009**
  - ***Sustained high Ops Tempo wears out aircraft!***
- **Despite recent program cuts, we will be designing and fielding new equipment, and competent systems engineering will be needed for this.**

And a few historical items---

- **October 2009 is the 50th anniversary of the first US InterContinental Ballistic Missiles**
  - **3 long-range, liquid-fueled ATLAS D missiles, armed with nuclear warheads, went on full combat alert at Vandenberg AFB, California, on October 31, 1959**
  - **Development took 14 years**
- **The first Combat Drones – Unmanned Air Vehicles – were deployed over North Vietnam in August 1964**
  - **Drones were manufactured by Ryan Aircraft in San Diego**
  - **They were dropped from C-130 aircraft**
  - **Performed surface-to-air missile recon over N. Vietnam**
  - **Drones recovered near Da Nang Air base**
    - **Engines commanded to shut down**
    - **Parachute deployed**
    - **Helicopter snagged the chutes and drones mid-air**

Program - Tuesday Oct 27

0815 - 1200 PLENARY SESSION **Bayview Ballroom**

0840 – 0930: Keynote Address

Hon Zachary J. Lemnios, Director, Defense Research & Engineering

0930 - 1000 COFFEE BREAK **Regatta Pavilion ("Tent")**

1000 - 1200: Acquisition Executives Panel:

Mr Terry Jaggers, OUSD(AT&L)DDR&E/SE, Principal Deputy

Moderator

Mr David Ahern, Director, Portfolio Systems Acquisition, OUSD(AT&L)

Mr. Thomas E. Mullins, Deputy Asst Secretary for Plans, Programs & Resources, OUSD(AT&L)

Mr. Christopher A. Miller, PEO for Command, Control, Communications, Computers & Intelligence, US Navy

Mr. Randall G.Walden, Director, Information Dominance Programs, SAF-AQ

Program - Tuesday Oct 27

1330-1515 PLENARY SESSION **Bayview Ballroom**

Test & Evaluation Executives Panel: View From The Top: How Can Systems Engineering Support Test & Evaluation

1515 - 1530 COFFEE BREAK **Regatta Pavilion("Tent")**

1530-1715 PLENARY SESSION **Bayview Ballroom**

SE and Acquisition Reform: The Way Ahead

1730-1900 Reception in Displays Area **Regatta Pavillion**

Luncheon Activities

Lunches in Regatta Pavilion

Tuesday

Mr. Stephen Welby, Director, Systems Engineering,
OUSD(AT&L)DDR&E

Wednesday

- Presentation of NDIA Lt Gen Thomas Ferguson Awards for Excellence in Systems Engineering

Individual (Leadership & Practitioner) & Group

- Presentation of DoD Top 5 Programs Awards

Thursday

Networking Lunch

Program - Wednesday Oct 28

0800-0945

1 Systems Engineering Effectiveness	Bayview III
2 Early Systems Engineering	Bayview II
3 Technology Maturity	Bayview I
4 Test & Evaluation	Mission I
5 Human Systems Integration	Mission II
6 System of Systems	Mission III
7 Program Management	Palm I
8 Net-Centric Operations/Interoperability	Palm II
0945 - 1015 COFFEE BREAK	**Regatta Pav.**

1015- 1200

All above continue, except Track 5 is System Safety - ESOH

1200 - 1330

Awards Luncheon in Displays Area **Regatta Pav**

See Program Brochure for Wednesday PM and Thursday sessions

Some Logistics Info---

Displays & Coffee Breaks are in Displays area in Regatta Pavilion. 17 Exhibitors are there to discuss their capability in Systems Engineering

Lunches are in Regatta Pavilion

And Special Thanks To---

Technical Program Chairs:

Steve Henry, Northrop Grumman
Dr. Tom Christian, USAF AFMC/ASC

DoD Partners:

Stephen Welby, Terry Jaggers, Jim Thompson, Kristen Baldwin, Nic Torelli, Chris DiPetto, and Dona Lee

Session & Track Chairs:

WAY too many to list, visit with them in the sessions-

NDIA Meeting Executive:

Suzanne Havelis

NDIA Director

Sam Campagna

Promotional Partners

Parametric Technologies Corp (PTC)
University of Phoenix
Lean Solutions Institute

13th Annual Systems Engineering Conference

October 25-28, 2010

Hyatt Regency Mission Bay

San Diego California

Call for Papers & Call for Displays is in your registration information

Papers Due Date: May 30, 2010

Headquarters U.S. Air Force

Integrity - Service - Excellence

How Can Systems Engineering Support Program Execution?

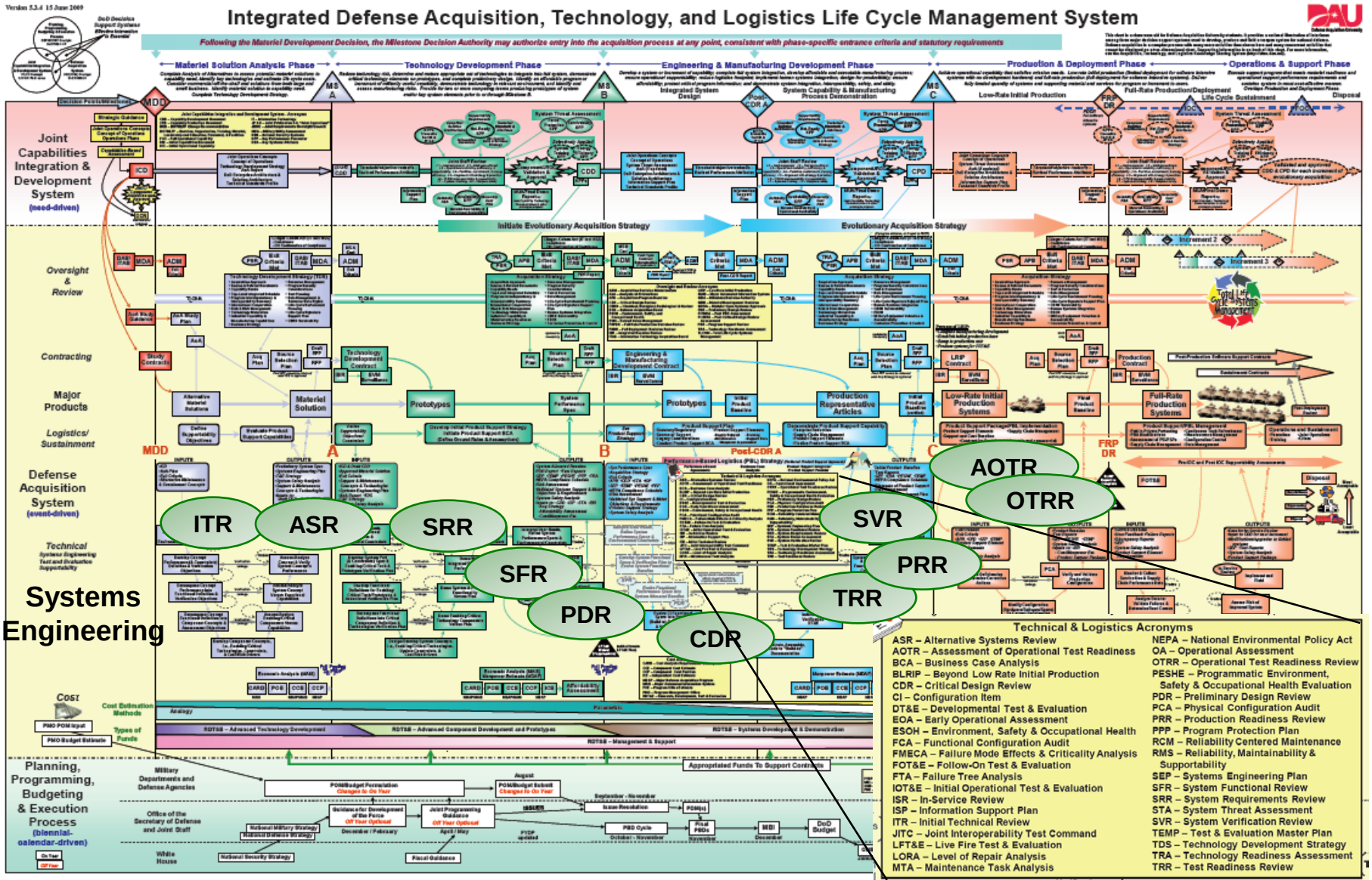
Mr. Randall Walden
Director, Information Dominance
Assistant Secretary (Acquisition)

12th Annual NDIA
Systems Engineering Conference
26-29 Oct 2009

U.S. AIR FORCE

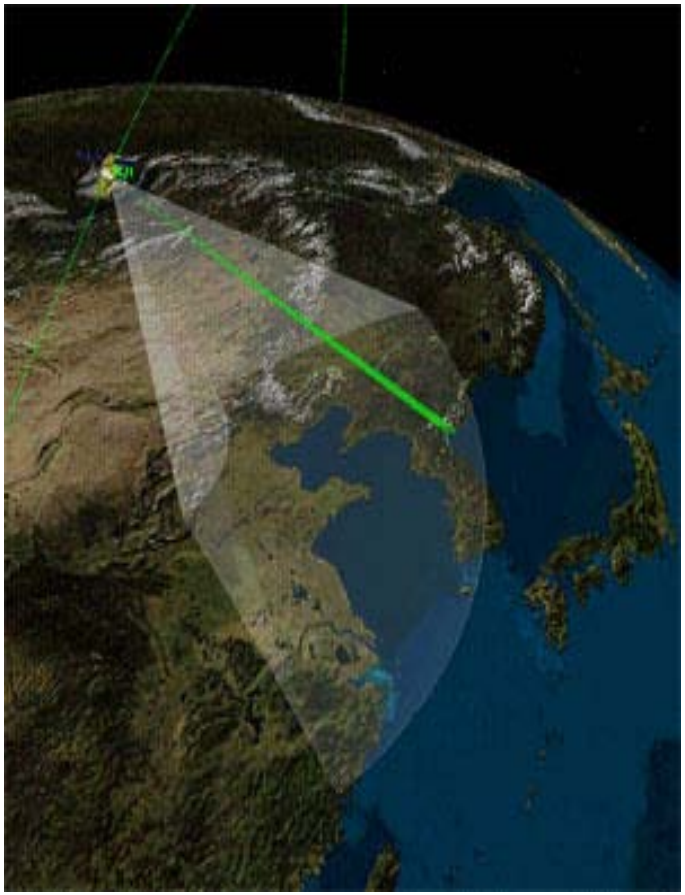
U.S. AIR FORCE

Defense Acquisition System
Sys Eng Throughout Life Cycle



U.S. AIR FORCE

DoD Acquisition Challenges



- Requirements Instability
- Technology Maturity
- Systems Engineering

U.S. AIR FORCE

Ample Direction for Early SE

Weapon Systems Acquisition Reform Act (WSARA) 2009

"Support each MDAP prior to Milestone A approval through a rigorous systems analysis and systems engineering process"

NRC Report "Pre-Milestone A and Early-Phase SE" (Jan 08)

"Attention to a few critical SE processes particularly during preparation for MS A and B is essential to ensuring programs deliver on time and on budget."

GAO Report – 09-326SP "Defense Acquisitions"

"ensure new programs follow a knowledge-based approach and must begin with strong systems engineering analysis"

Air Force Acquisition Improvement Plan

"There will be acquisition involvement earlier in requirements development process and SE techniques will be applied"

U.S. AIR FORCE

Air Force Acquisition Improvement Plan

SECAF & CSAF approved plan to recapture acquisition excellence

Five Major Goals

1. **Revitalize the Air Force Acquisition Workforce**
2. **Improve Requirements Generation Process**
3. **Instill Budget and Financial Discipline**
4. **Improve Air Force Major Systems Source Selections**
5. **Establish Clear Lines of Authority and Accountability**

Acquisition Improvements Heavily Dependent Upon SE

U.S. AIR FORCE

Focus on Air Force SE Processes

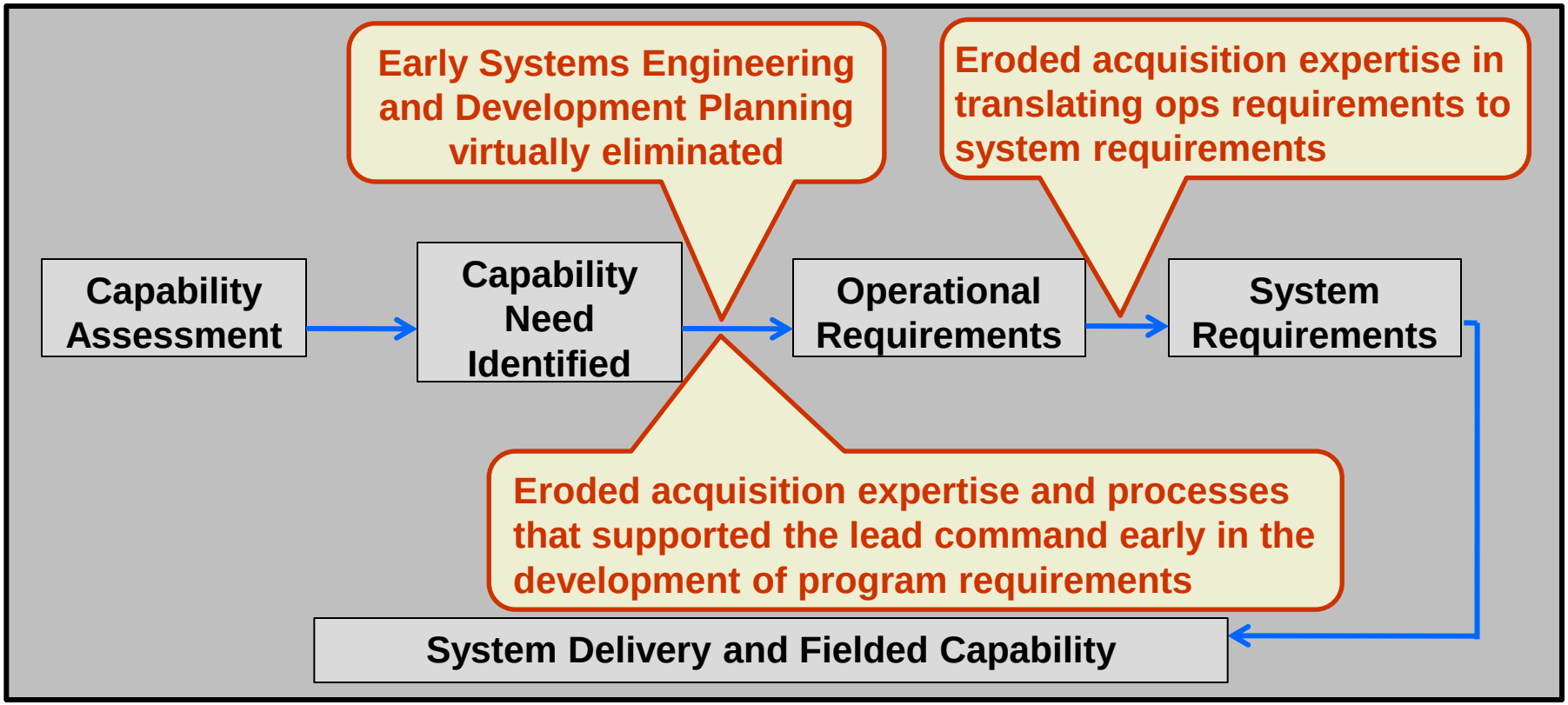
- Streamline Acquisition Processes
  - Move Faster, Smartly
- Instill Systems Engineering Discipline
  - Technical reviews and processes
- Active SE Early in Program Life Cycle
  - Shape scope, requirements definition, identify viable concepts
  - Extensive user/provider collaboration

U.S. AIR FORCE

Early Systems Engineering Was Lost

Problem Statement

"Overstated, unstable requirements that are difficult to evaluate during source selections"



Solution

"Ensure acquisition involvement and leadership in support of the lead command early in the development of program requirements"

U.S. AIR FORCE

Disciplined SE Reduces Risk

- Up to 75% of life cycle cost is determined during concept refinement and requirements generation
- Identify the key decision points
  - What are the significant cost drivers – budgetary risk
  - New technologies – engineering risk
  - What does the 80% solution look like
  - What is commercially available
  - What do we prototype
- Identify risk
  - Cost, technical, integration, manufacturing, and sustainment

Upfront Effort And Resources Will Pay Significant Life-Cycle Benefits

U.S. AIR FORCE

Air Force Vision

- **Attack problem early with Disciplined, Repeatable Processes from JCIDS CBA (pre-ICD) to AoA, Pre-MDD**
  - **Inform decision makers on technical feasibility of prospective concepts for materiel solutions**
  - **Initial integrated risk assessment addressing both operational and programmatic issues**
- **Support realistic program formulation through application of early Systems Engineering**
  - **Robust and disciplined up-front technical planning**
  - **Solid technical foundation for the future program**
  - **Reduce the chances of poorly planned concepts emerging from AoA with relatively high rankings**
  - **Use Concept Characterization & Technical Description approach**

Clear and Actionable Policy and Process

U.S. AIR FORCE

Improving Program Execution

- Development Planning
  - Early and often discussions with users to debate what is feasible
  - Ensure ICD/CDD are comprehensive, complete, and unambiguous
- Analysis of Alternatives
  - Examine new applications of existing technologies
  - Analyze technical feasibility and risk of alternatives
- Cost and Schedule Estimates/Execution
  - SE is responsible for WBS development – Basis for sound estimates
  - Independent assessment of contractor schedule & technical progress
- Contracting
  - Translating JROC validated requirements into technical basis of RFP
  - SE analysis key to negotiations with contractors on their proposals

Early Sys Engineering Is Critical To Long-Term Program Success

U.S. AIR FORCE

SE/STEM Workforce Initiatives

- AF is establishing a Science, Technology, Engineering and Mathematics (STEM) Emerging Issues Panel to address tech workforce requirements—to include SE
- STEM resources will be affordable, scalable, agile, and seamlessly aligned with the AF mission and strategies
  - Growing acquisition workforce – SE in high demand
  - Additional hires for Product Centers, ALCs, labs and other facilities
  - Recruiting additional Systems Engineers using expedited hiring
- Building on and establishing aggressive outreach efforts Air Force-wide with our high schools, colleges, universities, sister services and others existing efforts
- Aggressively using the education and training capabilities to keep AF STEM professionals current in their fields and on the cutting edge of technology – we must grow our technical expertise in-house
- 'Bright Horizons' strategic plan in development to properly size, train, and equip our SEs/STEM community with the technical depth and breadth needed for acquisition excellence

U.S. AIR FORCE

How Can Systems Engineering Support Program Execution?

- Disciplined Engineering is critical to program execution
- Early SE and Development Planning are up-front investments to reduce risk in later phases of the acquisition life cycle
- Systems Thinking & Tech Planning MUST start in the early stages of concept development, BEFORE formal program initiation
- SE Experience is critical – Invest and grow workforce

U.S. AIR FORCE

Air Force Acquisitions

PLENARY SESSION 2
Acquisition Executives Panel
View from the Top:
How Can SE Support Program Execution?

- **Moderator:** Mr. Terry Jaggers
  Principal Deputy, Systems Engineering, Office of the Director, Defense Research and Engineering
- Mr. David G. Ahern
  Director, Portfolio Systems Acquisition, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics)
- Mr. Thomas E. Mullins
  Deputy Assistant Secretary for Plans, Programs, and Resources (SAAL-ZR), Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology)
- Mr. Christopher A. Miller
  PEO for Command, Control, Communications, Computers and Intelligence (C4I), U.S. Navy
- Mr. Randall G. Walden
  Director, Information Dominance Programs, Office of the Assistant Secretary of the Air Force (Acquisition)

PLENARY SESSION 4
Systems Engineering Executive Panel:
SE and Acquisition Reform: The Way Ahead

- Moderator: Mrs. Kristen Baldwin
  Systems Engineering Directorate, Office of the Director, Defense Research and Engineering
- **Mr. Nicholas Torelli**
  Systems Engineering Directorate, Office of the Director, Defense Research and Engineering
- **Mr. Carl Siel**
  Office of the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN(RDA)CHSENG)
- **Mr. Ross Guckert**
  Office of the Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT))
- **Colonel Shawn Shanley, USAF**
  Chief Systems Engineer, Office of the Assistant Secretary of the Air Force for Acquisition, Science, Technology & Engineering (SAF/AQR)

12th Annual NDIA Systems Engineering Conference KEYNOTE

Honorable Zachary J. Lemnios
Director, Defense Research and Engineering, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics)

Systems Engineering in Army Acquisition

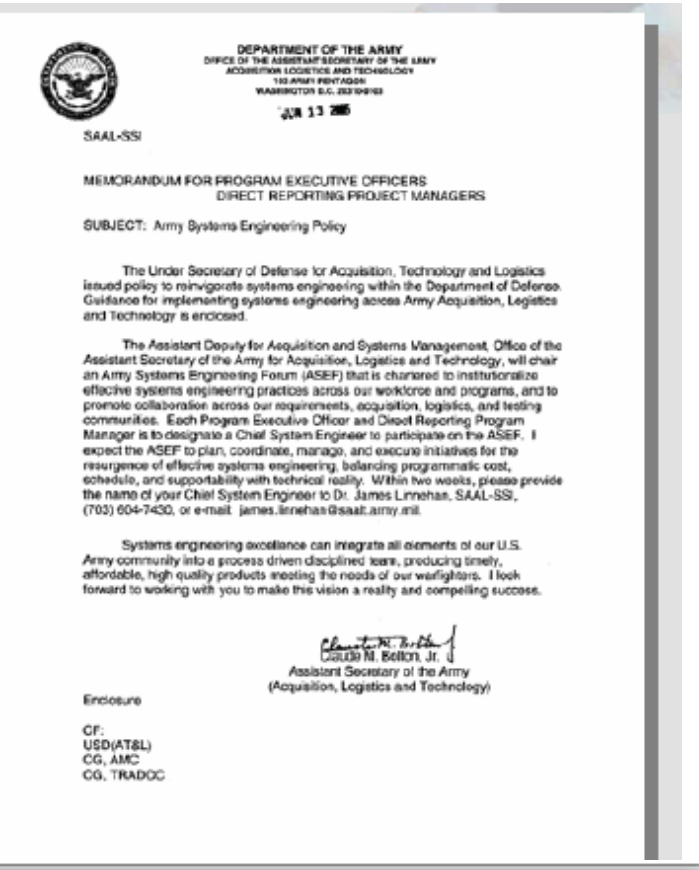
Mr. Thomas E. Mullins
Deputy Assistant Secretary of the Army
(Plans, Programs and Resources)
Office of the Assistant Secretary of the Army
(Acquisition, Logistics and Technology)

Army Systems Engineering Policy

The effective performance of systems engineering best practices on a development program yields quantifiable improvements in program execution (e.g., improved cost performance, schedule performance, technical performance).

The **Army System Engineering** program and policy approved (13 June 2005)

- Requires a SEP for each program
- Establishes a System Engineer within each program and PEO
- Establishes Army System Engineering Forum (ASEF)
- Establishes peer review at all major technical reviews
- Establishes the PEO as the SEP approval authority



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
ACQUISITION LOGISTICS AND TECHNOLOGY
103 ARMY PENTAGON
WASHINGTON D.C. 20310-0103

JUN 13 2005

SAAL-SSI

MEMORANDUM FOR PROGRAM EXECUTIVE OFFICERS
DIRECT REPORTING PROJECT MANAGERS

SUBJECT: Army Systems Engineering Policy

The Under Secretary of Defense for Acquisition, Technology and Logistics issued policy to reinvigorate systems engineering within the Department of Defense. Guidance for implementing systems engineering across Army Acquisition, Logistics and Technology is enclosed.

The Assistant Deputy for Acquisition and Systems Management, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology, will chair an Army Systems Engineering Forum (ASEF) that is chartered to institutionalize effective systems engineering practices across our workforce and programs, and to promote collaboration across our requirements, acquisition, logistics, and testing communities. Each Program Executive Officer and Direct Reporting Program Manager is to designate a Chief System Engineer to participate on the ASEF. I expect the ASEF to plan, coordinate, manage, and execute initiatives for the resurgence of effective systems engineering, balancing programmatic cost, schedule, and supportability with technical reality. Within two weeks, please provide the name of your Chief System Engineer to Dr. James Linnehan, SAAL-SSI, (703) 604-7430, or e-mail: james.linnehan@saalt.army.mil.

Systems engineering excellence can integrate all elements of our U.S. Army community into a process driven disciplined team, producing timely, affordable, high quality products meeting the needs of our warfighters. I look forward to working with you to make this vision a reality and compelling success.

Claude M. Bolton, Jr.
Assistant Secretary of the Army
(Acquisition, Logistics and Technology)

Enclosure

CF:
USD(AT&L)
CG, AMC
CG, TRADOC

System Challenge for the Army

Army systems are becoming more interdependent, and required operational capability is not provided by a single system but rather by a combination of systems

System of Systems (SoS) Systems Engineering (SE) capability at the Enterprise level is necessary to address:

- Stove-pipe product development
- Many interdependencies
- Path from Current to Future Systems
- LandWarNet and Battle Command operations…

  Requirements are done outside of the systems engineering process; we are engaging the Training and Doctrine Command (TRADOC) on Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) and battle command migration, and identifying new processes for system of systems development.

System of Systems (SoS) - A set or arrangement of systems that results when independent and useful systems are integrated into a larger system that delivers unique capabilities

System of Systems Systems Engineering (SoS SE) - Planning, analyzing, organizing, and integrating the capabilities of a mix of existing and new systems into a SoS capability greater than the sum of the capabilities of the constituent parts

SoS SE Management Structure

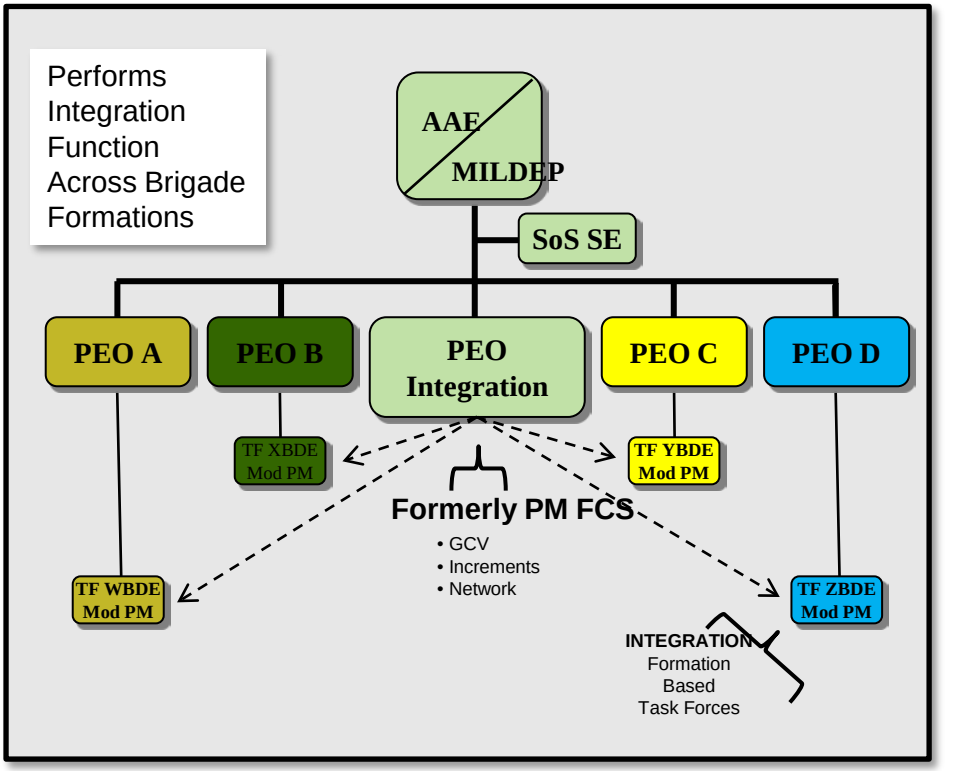
TODAY

- AAE
- MILDEP
- PM FCS
  - GCV
  - Spin Outs
  - Network
- PEO A
- PEO B
- PEO C
- PEO D
- REF
- Non-PORs

Solutions Fielded But Not Integrated Across Brigade Formations

FUTURE

Performs Integration Function Across Brigade Formations

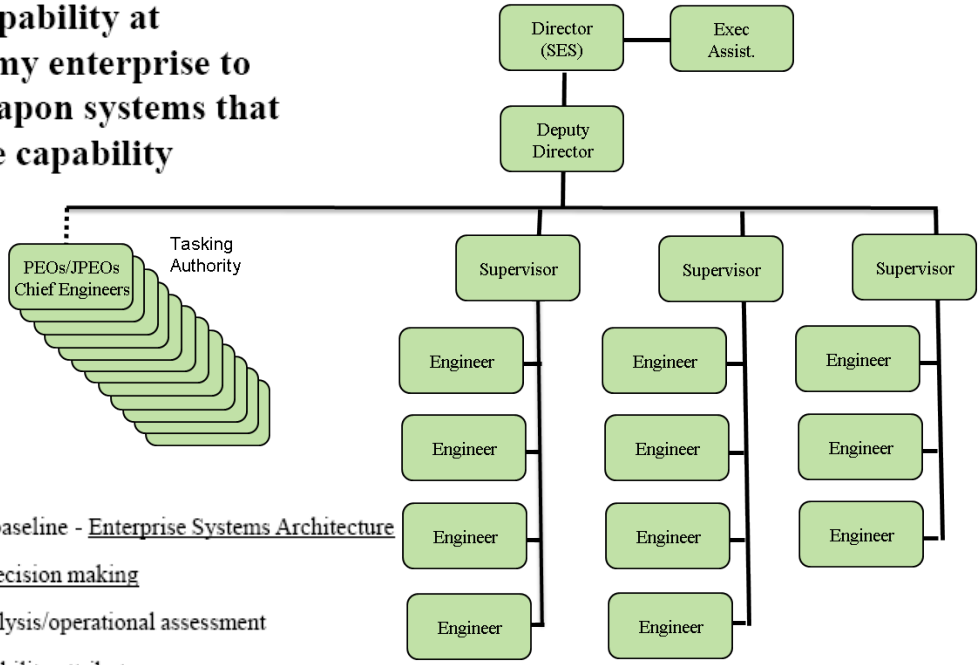


- Leverages Investment in BCT Modernization
- Organized to Integrate and Incrementally Deliver Materiel Solutions Across Brigade Formations

SoS SE Organization

MISSION

Provide Systems Engineering capability at System of Systems level across the Army enterprise to deliver integrated and interoperable weapon systems that provide optimized and affordable capability

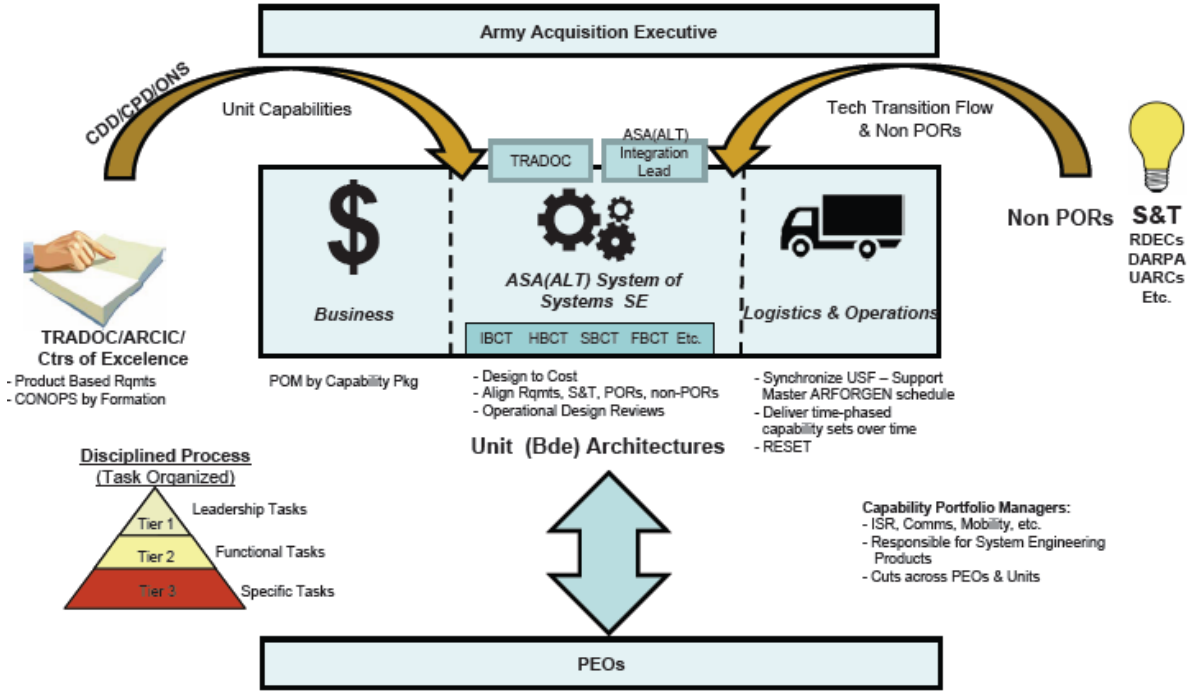


FUNCTIONS

- Develop, evolve, and maintain a detailed, interoperable SoS design baseline - Enterprise Systems Architecture
- Address technical, operational and cost aspects to frame issues for decision making
- Leverage experimentation and M&S tools as part of engineering analysis/operational assessment
- Establish and evolve an SoS vision over time, and translate into capability attributes
- Translate emerging requirements into implied system attributes for technology insertion solutions
- Lead targeted technical assessments to enable cost/capability trades within and across system boundaries
- Maintain visibility into individual system architectures, specifications & performance
- Coordinate technically with SEs in related programs (Army, Joint)

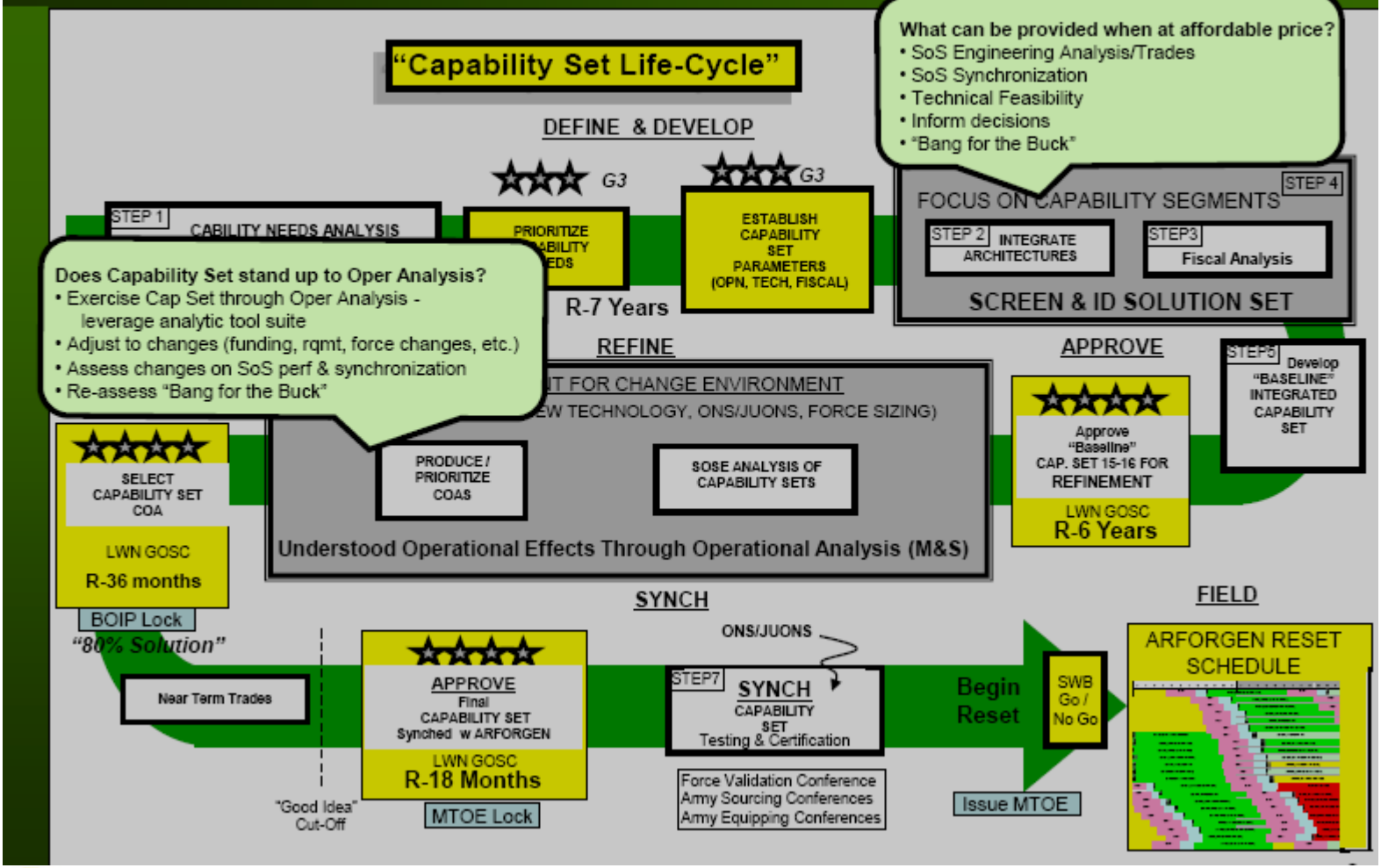
SoS SE Interface

Design, develop and facilitate the delivery of relevant, integrated and affordable capability sets by type of formation over time in support of the Army's modernization strategy, LANDWARNET and Army Force Generation (ARFORGEN) fielding cycles.



Build Combat Power by Type Formation Over Time to Cost

LWN/BC Capability Set Management Process



Summary

System of Systems systems engineering is an enabler in the new Army BCT Modernization strategy.

Systems Engineering is being done in Army programs; we need to ensure that it is consistent, and consistently followed across the PEOs.

Implement efforts to support requirements generation at the System of Systems or Enterprise Level, and help define the trade space.

The Role of Systems Engineering In Program Management

12th Annual NDIA SE Conference

Mr David Ahern
Director, Portfolio Systems Acquisition &
Functional Lead for Program Management
OUSD(AT&L)/A&T(PSA)

Unclassified

Agenda

- Major Policy Changes—
  - 5000.02
  - Weapons Systems Acquisition Reform Act (WSARA) of 2009
- Systems Engineering Role in EVM
- Systems Engineering In Reliability

Excerpts from Secretary Gates Congressional Testimony – January 27, 2009

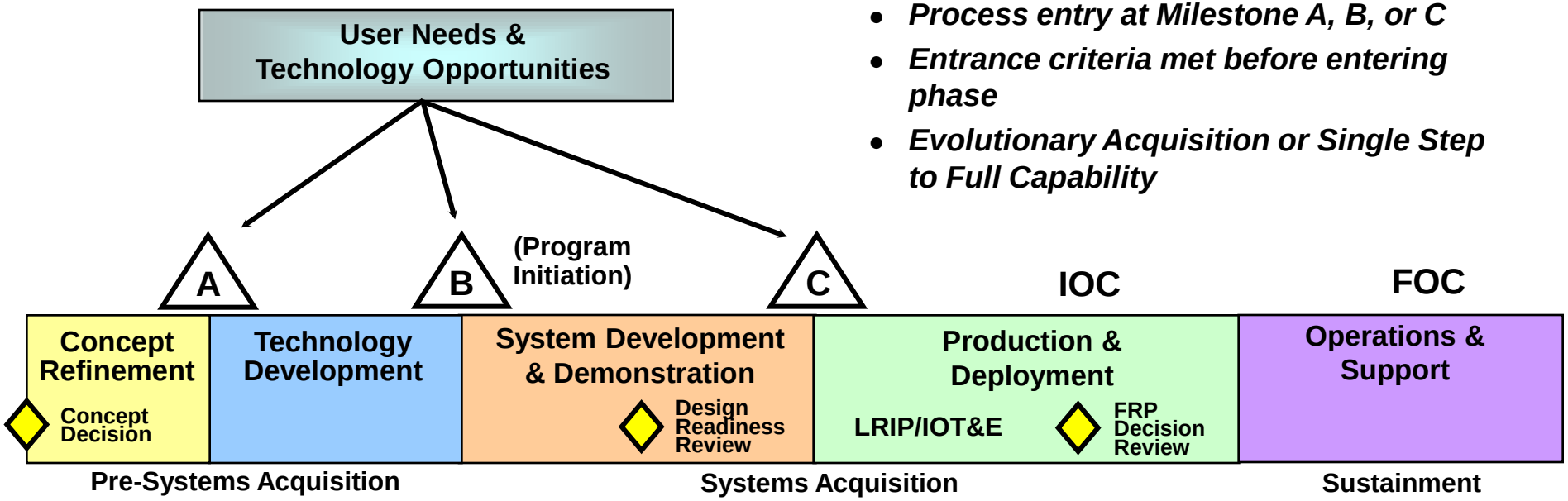
- The situation we face today: A small set of expensive weapons programs has had repeated – and unacceptable – problems with requirements, schedule, cost, and performance
- I do not believe there is a silver bullet, and I do not think the system can be reformed in a short period of time…
- That said, I do believe we can make headway, and I have already begun addressing these issues
  - We must freeze requirements on programs at contract award and write contracts that incentivize proper behavior
  - Programs that cost more than anticipated are built on an inadequate initial foundation. I believe the Department should seek increased competition, use of prototypes, and ensure technology maturity so that our programs are ready for the next phases of development

Systems Engineering plays a critical role in changing the future

DoD Instruction 5000.02 Summary

- While we have much to do, the Department has taken action to address many of the issues related to program execution
  - Ensuring a proper foundation before initiating programs
  - Limiting requirements changes
  - Requiring mature technologies and system engineering discipline
  - Competitive prototypes to reduce risk, improve competition, inform decisions
  - Better integration between development and operational test and evaluation
  - Improvements in how we incentivize contract performance
- It will take time to realize the results of these changes …but we are already seeing improvements

Previous Acquisition Process



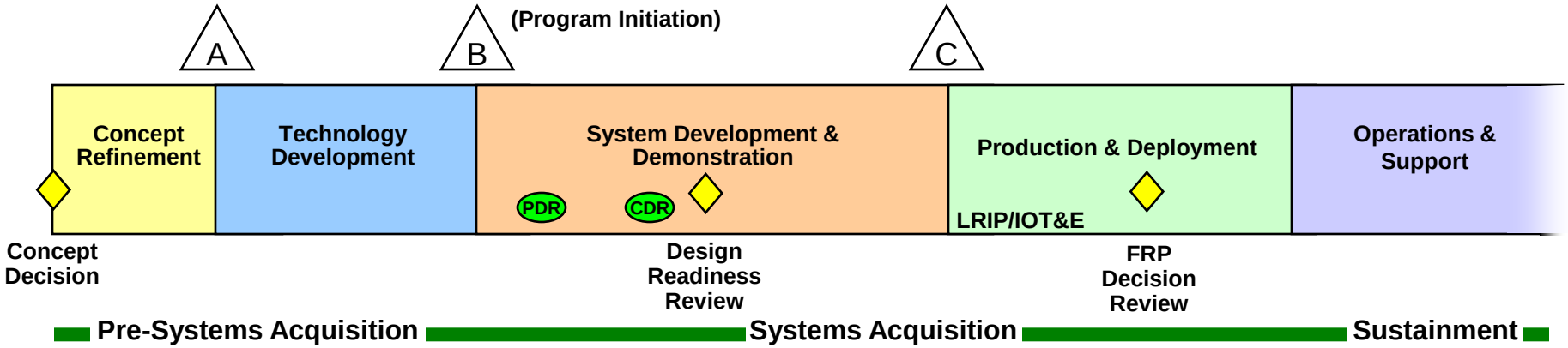
- *Process entry at Milestone A, B, or C*
- *Entrance criteria met before entering phase*
- *Evolutionary Acquisition or Single Step to Full Capability*

Problems Identified

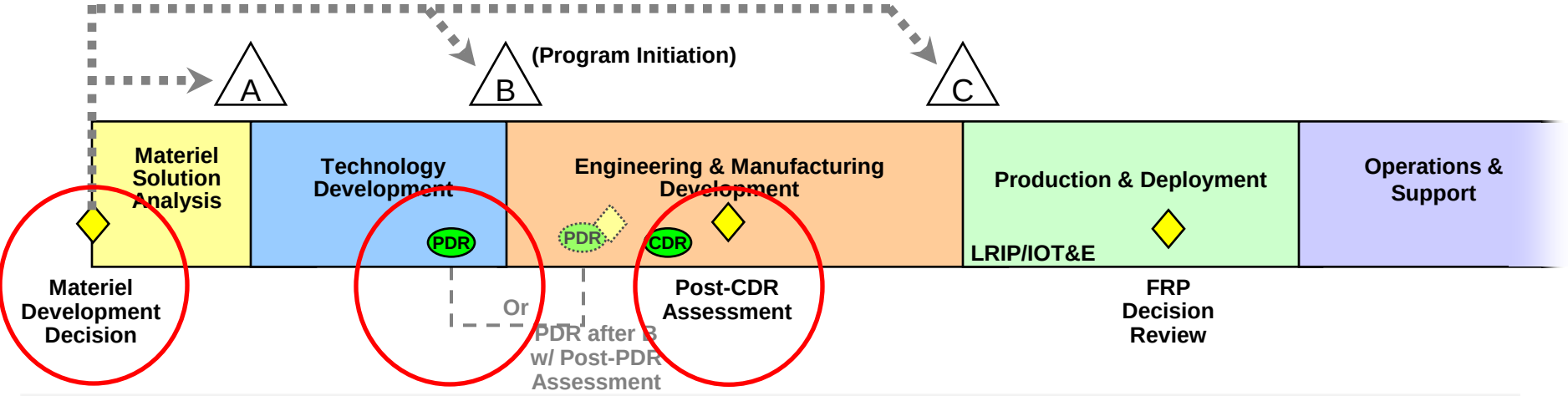
- ***Most potential programs proceed to Milestone B without a predecessor review to assess the capability need and direct analysis of alternatives***
- ***Technical maturity is not adequately demonstrated prior to program initiation***
- ***Program cost, schedule, and performance inadequately informed by design considerations***
- ***Requirements "creep" continues to de-stabilize programs***
- ***With the exception of Configuration Steering Boards at the CAE level, there is no formal and effective opportunity between Milestone B and Milestone C for MDA to assess progress, adjust / defer requirements, or, consistent with statute, re-structure the program***

Comparison to DoDI 5000.2, May 12, 2003

Defense Acquisition Management System, May 2003 – December 2008



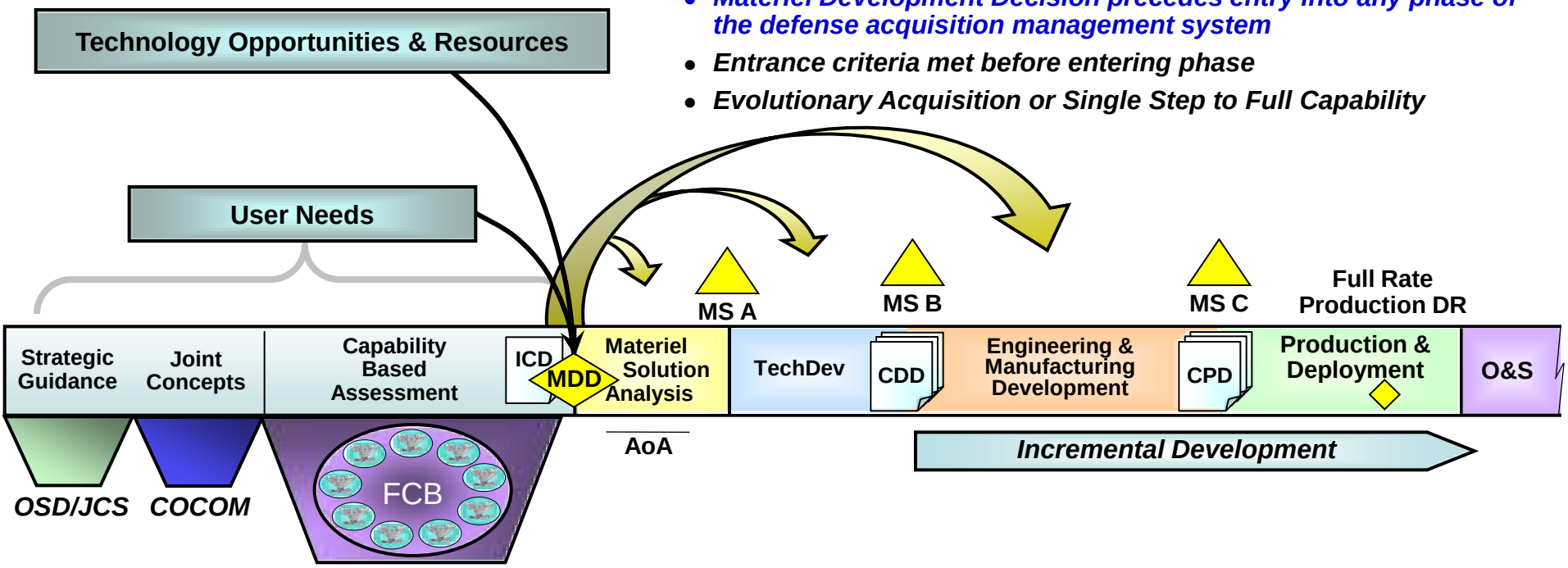
Defense Acquisition Management System, Revised December 8, 2008



Greater emphasis upfront—where systems engineering is most critical

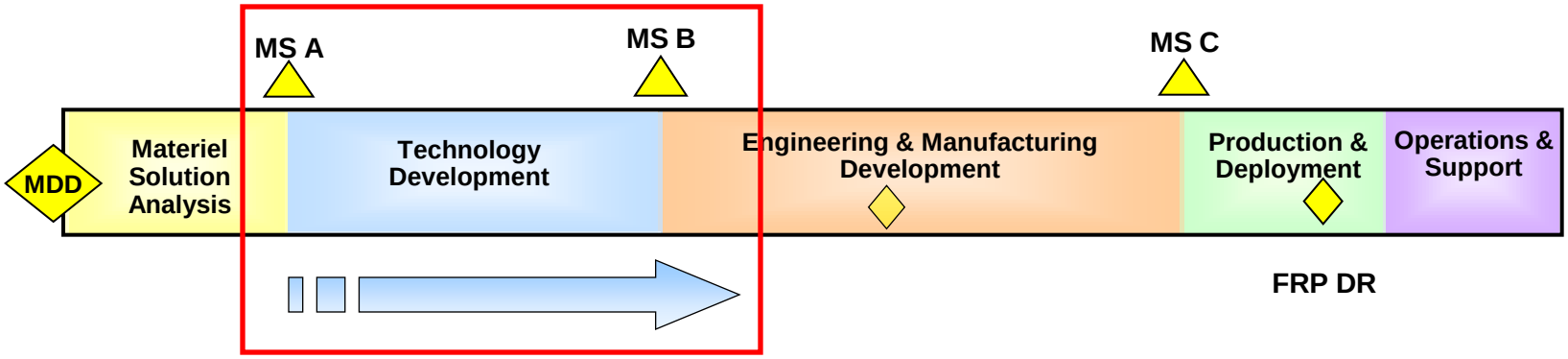
Opportunities for SE to have Impact
—MDD and Material Solution Analysis

- *Materiel Development Decision precedes entry into any phase of the defense acquisition management system*
- *Entrance criteria met before entering phase*
- *Evolutionary Acquisition or Single Step to Full Capability*



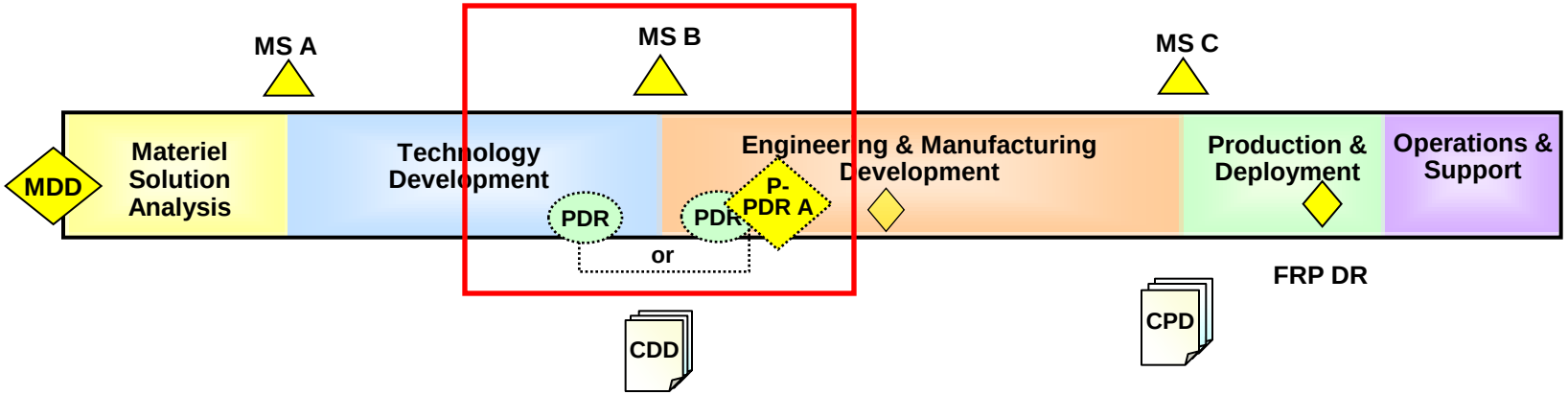
- **JROC recommends that the Milestone Decision Authority (MDA) consider potential materiel solutions**
- **MDA ensures necessary information is available to support the decision**
- **Materiel Solution Analysis Phase begins with the MDD—the formal entry point into the acquisition process, mandatory for all programs**
- **At the MDD, the Joint Staff presents the JROC recommendations; the DoD Component presents the ICD and a preliminary concept of operations, a description of the needed capability and operational risk, and the basis for determining that non-materiel approaches will not sufficiently mitigate the capability gap**
- **D,PA&E (or DoD Component equivalent) proposes Assessment of Alternatives (AoA) study guidance**
- **MDA approves the AoA study guidance; determines the acquisition phase of entry; identifies the initial review milestone; and designates the lead DoD Component(s)**
- **Decisions documented in an Acquisition Decision Memorandum (ADM)**

Opportunities for SE to have Impact —Prototyping and Competition



- **The Technology Development Strategy and associated funding shall provide for two or more competing teams producing prototypes of the system and/or key system elements prior to, or through, Milestone B. Prototype systems or appropriate component-level prototyping shall be employed to reduce technical risk, validate designs and cost estimates, evaluate manufacturing processes, and refine requirements. . . .**

Opportunities for SE to have Impact
—Preliminary Design Review

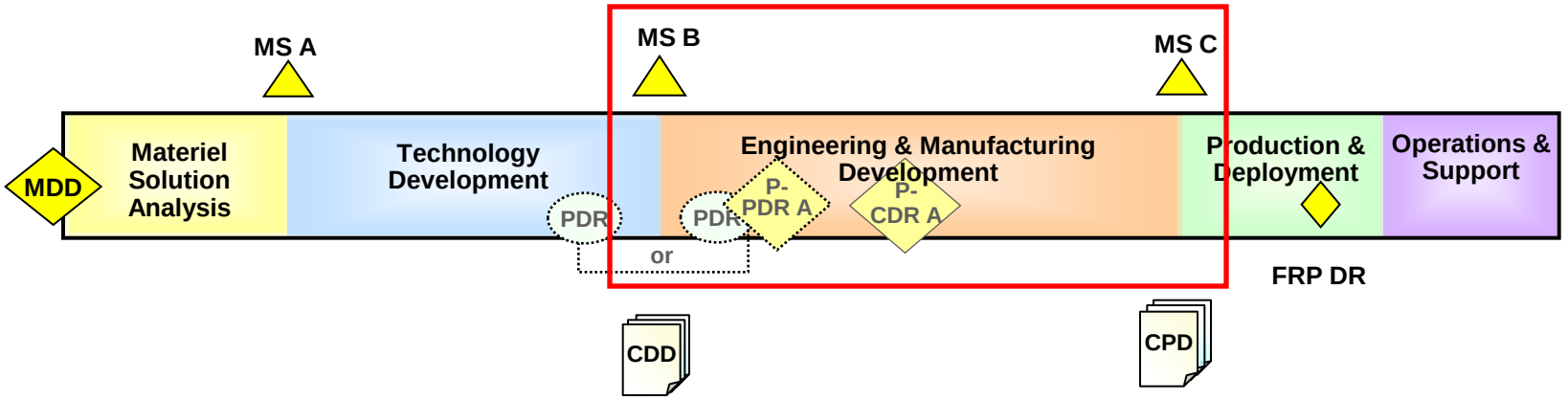


PDR Before Milestone B	or	PDR after B and Post-PDR Assessment

• Consistent with:
  • Technology Development Phase objectives
  • Associated prototyping activity, and
  • The MDA approved TDS
• Planning reflected in the TDS
  • Establishes the allocated baseline and underlying architectures
  • Defines a high-confidence design
• Conducted at the system level
• Informs requirements trades; improves cost estimation; and identifies remaining design, integration, and manufacturing risks.
		If a PDR has not been conducted prior to Milestone B:
		• Plan for a PDR as soon as feasible after program initiation
		• PDR report to the MDA prior to the Post-PDR Assessment
		  • Report reflects requirements trades based upon the PM's assessment of cost, schedule, and performance risk
		• Formal assessment; results documented in an ADM

2009 WSARA requires before Milestone B

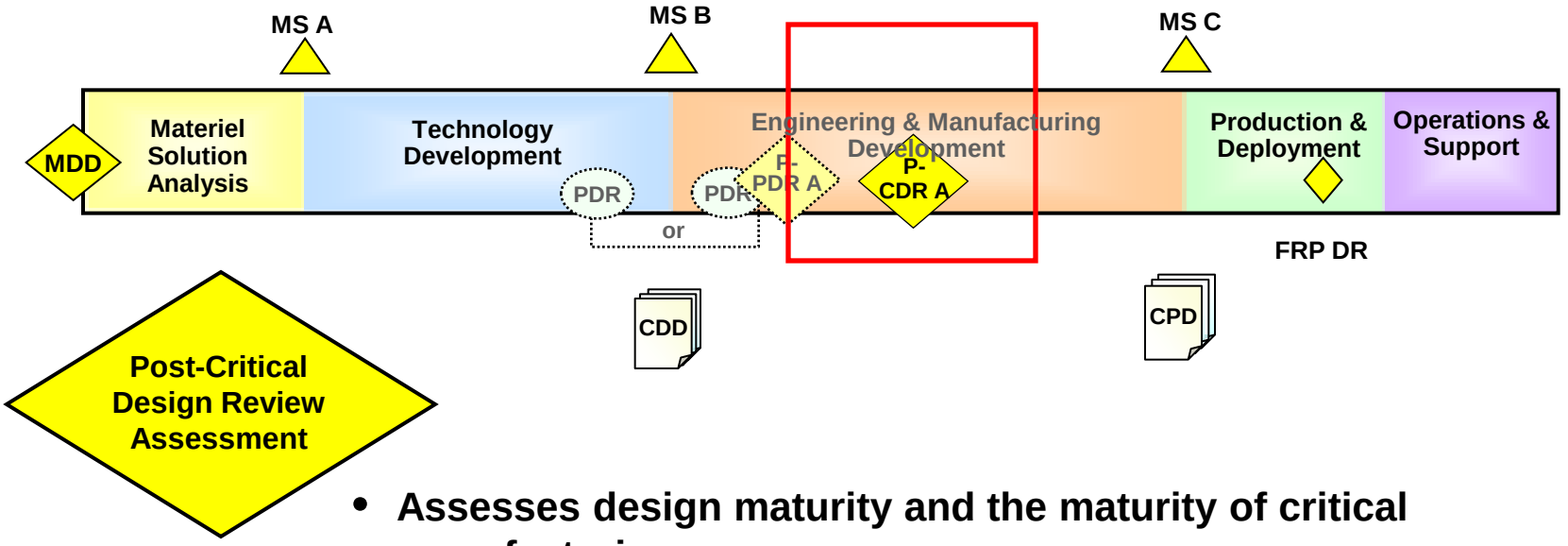
Opportunities for SE to have Impact
—Engineering and Manufacturing Development Phase



. . . develop a system or an increment of capability; complete full system integration; develop an affordable and executable manufacturing process; ensure operational supportability; implement human systems integration; design for producibility; ensure affordability; protect Critical Program Information; and demonstrate system integration, interoperability, safety, and utility.

Integrated System Design	System Capability and Manufacturing Process Demonstration
• Define system and system-of-systems functionality and interfaces • Complete hardware and software detailed design and reduce system-level risk • Establish product baseline for all configuration items	Demonstrate the ability to operate in a useful way consistent with the approved key performance parameters and that system production can be supported by demonstrated manufacturing processes

Opportunities for SE to have Impact
—Post CDR Assessment



- Assesses design maturity and the maturity of critical manufacturing processes
- Considers whether the program provides capability consistent with the Acquisition Program Baseline (APB) approved at Milestone B
- MDA determines whether
  (1) an adjustment should be made, or
  (2) the program should be permitted to proceed without change
- Results documented in an ADM

2009 Weapon Systems Acquisition Reform Act

Greater Emphasis placed on Systems Engineering

- **Establishes Directors of Developmental Test and Evaluation and Systems Engineering**
  - Newly created roles reporting directly to USD AT&L, through DDR&E
  - Responsible for issuing joint guidance relating to the integration of developmental test and systems engineering, and managing the associated workforces
  - Components required to develop and implement plans to ensure they have the appropriate resources for developmental testing and systems engineering, and the two Directors are required to assess these plans.
- **A Joint Annual Report to Congress (first one due March 31, 2010) shall:**
  - Report on the activities undertaken during the preceding year establishing Directors and accomplishing policy and guidance, review and oversight
  - Highlight activities relating to the MDAPs for the preceding year including:
    - ✓ A discussion of the extent to which the MDAPs are fulfilling the objectives of their SEPs and TEMPs
    - ✓ A discussion of the waivers of and deviations from requirements in TEMPs, SEPs, and other testing requirements that occurred for the MDAPs, any concerns raised by such waivers or deviations, and the actions taken/planned to address such concerns.
    - ✓ An assessment of the organization and capabilities of the DoD for SE, development planning, and DT&E with respect to MDAPs

WSARA SE Implications for Programs

- *Systems engineering and developmental test and evaluation now recognized in law as inherently necessary in requirements definition, development planning, and early acquisition*
- *Need for Program Office formation and PM skill-sets after Materiel Development Decision (MDD) and prior to Milestone (MS) A*
- *Increased importance of the Technology Development Strategy (TDS) (as a surrogate Acquisition Strategy) at MS A*
- *Earlier engagement with industry and different contracting strategies for technology maturation, competitive prototyping, data rights, Preliminary Design Review (PDR) before MS B, etc.*
- *Explicit need for earlier, formal SE process application (e.g., data, configuration, and risk management)*

Systems Engineering in Earned Value Management

- Earned Value is a management technique that relates resource planning to schedules and to technical, cost and schedule requirements
  - During the planning phase, an integrated baseline is developed by time phasing budget resources for defined work.
  - These time-phased "planned value" increments constitute a cost and schedule measurement baseline
- There are two major objectives of an earned value system
  - to encourage contractors to use effective internal cost and schedule management control systems; and to
  - Permit the customer to be able to rely on timely data produced by those systems for determining product-oriented contract status
- Success of EVM is dependant on good technical performance baseline measures and can be more effective as a program management tool if augmented with rigorous systems engineering processes

Systems Engineering in Reliability

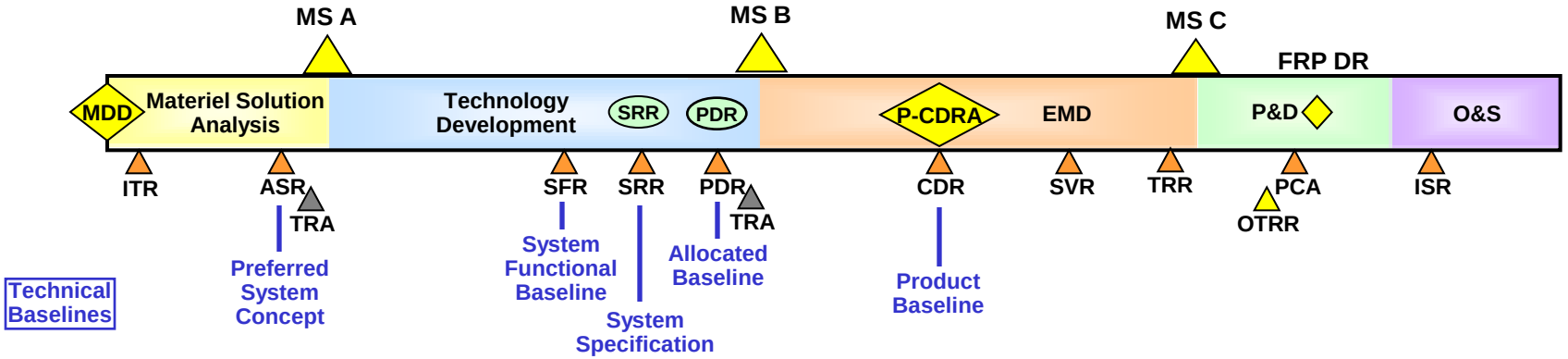
- ***DODI 5000.02 <u>Additional Technology Development Phase Requirements:</u> PMs for all programs shall formulate a viable Reliability, Availability, and Maintainability (RAM) strategy that includes a reliability growth program as an integral part of design and development. RAM shall be integrated within the Systems Engineering processes, documented in the program's Systems Engineering Plan (SEP) and Life-Cycle Sustainment Plan (LCSP), and assessed during technical reviews, test and evaluation (T&E), and Program Support Reviews (PSRs).***

How Systems Engineering Can Support Developmental Test & Evaluation

Mr. Chris DiPetto
Acting Director
Developmental Test & Evaluation

NDIA 12th Annual Systems Engineering Conference
Test & Evaluation Executives Panel

T&E Value Proposition

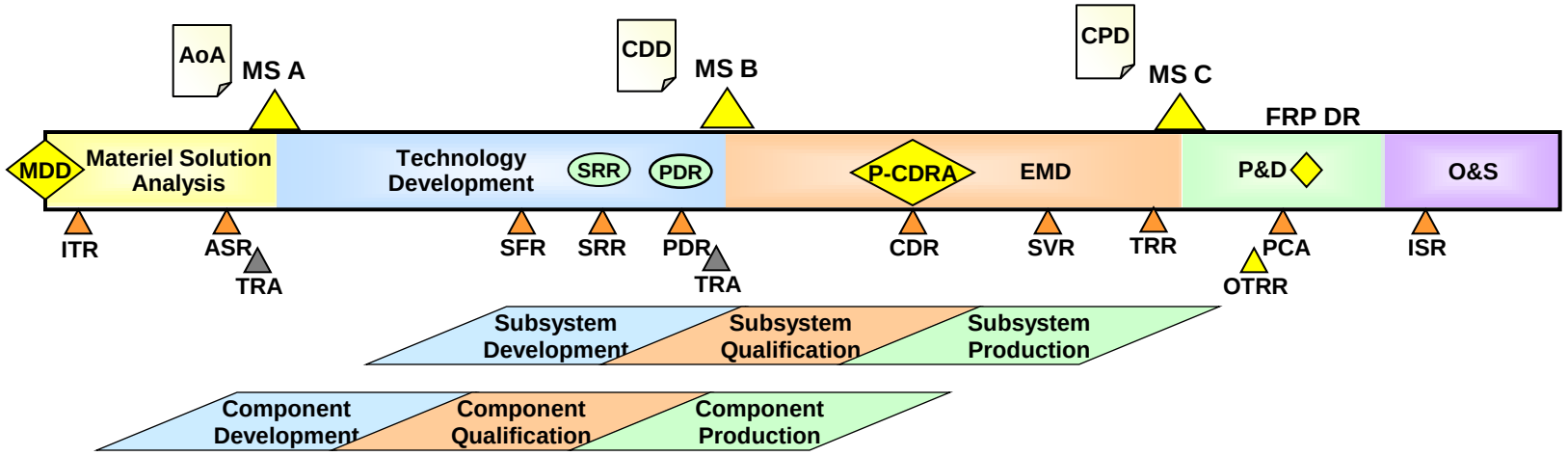


T&E Artifacts	T&E Strategy	T&E Plans			
		- TEMP - T&E plans - T&E reports	- TEMP - T&E plans - T&E reports	- TEMP - Updated T&E plans - T&E reports	

Reality meets Design

"Ground truth" for better decisions

T&E / SE Collaboration



- **Defining better requirements – evaluatable, meaningful**
- **Acquiring knowledge of system / subsystem / component capabilities / limitations**
- **Risk management – identification, mitigation**

DT&E Bottom Line

- T&E value is delivering credible knowledge for better decisions
- DT&E must lead with evaluation – testing supports
- DT&E must be timely, efficient, & effective
- T&E developed knowledge of capabilities / limitations should be used at the component, subsystem, and system level

**The right information,
to the right decision maker,
at the right time,
for better decisions.**

How Systems Engineering (SE) can support Developmental Test & Evaluation (DT&E)?

How Test & Evaluation can support Systems Engineering (SE)?

Navy Panelist Response

Ms. Amy Markowich, SES
Department of the Navy Deputy Test & Evaluation Executive
27 Oct 2009

Ways SE can support DT&E - # 1

- Include DT&E in SE team that manages requirements and translates them to technical specifications.
  - Disparate interpretations of performance measures for test indicate insufficient early coordination of program requirements.
  - T&E provides results of performance measures and does not participate in negotiation of trade space.
  - Written correctly, tech specs would ensure technical and operational T&E definitional needs are clearly set, reducing disputes on what constitutes requirements.

Ways SE can support DT&E - # 2

- Establish a lessons learned and best practice forum for Systems Engineering Plans (SEP) to generate an effective planning tool for DT&E (and SE).
  - Perception is the development process and structure of the SEP is not effectively implemented or enforced, resulting in inconsistent documentation.
  - T&E elements in OSD SEP Preparation Guide may not be as useful as they need to be.
    - Develop improved SEP guidelines for T&E aspects as needed.

Ways SE can support DT&E - # 3

- Require cross training and rotational assignments between SE and DT&E communities to improve integration, cooperation, and understanding.
  - Perception that SE and DT&E are separate communities who acknowledge each other's importance but lack effective collaborative processes and procedures.
  - Workforce limitations and culture of "doing more with less" generates smaller teams resulting in less collaboration between skill sets.
  - Cross training can help attack issue from two perspectives
    - Broader knowledge set within constrained workforce.
    - Recognition of what T&E expertise adds to team and when it is needed.

Ways SE can support DT&E - # 4

- Identify how DT&E and OT&E (i.e. Integrated T&E) can be better used to help SE community assess Interoperability.
  - Interoperability assessment, especially at the System of Systems level, presents a major challenge.
  - DoD is still working to understand and develop appropriate evaluation processes.
  - - Representative joint mission threads/environments and CONOPS are key to assessing performance.

How can DT&E support SE?

- Fulfill Verification in SE
  - Sync TEMP with SEP on CTP resolution for technical reviews.
  - Participate in RAM growth plan development.
  - Early in development stress components and systems to anticipated operational limits.
  - Track status of all deficiencies identified during test.
  - Formalize test result reporting within the program to quickly provide feedback across all working levels.
- Bridge Verification to Validation:
  - *DODI 5000.02, EMD Phase: "Developmental and operational test activities shall be integrated and seamless throughout the phase."*
  - Link Operational Test objectives with measures of technical performance early in requirements generation.
  - Relate DT results to impact on COI resolution.
    - *DODI 5000.02, "T&E ... should be reported in terms of operational significance to the user."*

Ways T&E can support SE

- DT tests spec compliance, OT test operational environment
- Use of Joint Mission Threads across life cycle provides realistic R&D and test scenarios.
- Getting OT involved early in SE process helps identify operational issues that can be corrected early in the system design. Full IT helps solve this.
  - Issues
    - Does the OTA really understand fleet need
    - Is OTA staffed to develop test requirements that early in program life
- Potential for sharing of models, simulators, labs, scenarios across SE and T&E
  - Cost savings and reduction of conflicting analysis environments

Questions?

“12th Annual Systems Engineering Conference

T&E Executives’ Panel on Developmental Test and Evaluation

NDIA
National Defense Industrial Association

PROMOTING NATIONAL SECURITY SINCE 1919

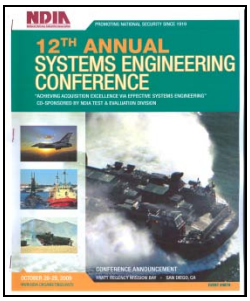
12TH ANNUAL SYSTEMS ENGINEERIN CONFERENCE

"ACHIEVING ACQUISITION EXCELLENCE VIA EFFECTIVE SYSTEMS ENGINEERING"

CO-SPONSORED BY NDIA TEST & EVALUATION DIVISION

CONFERENCE ANNOUNCEMENT

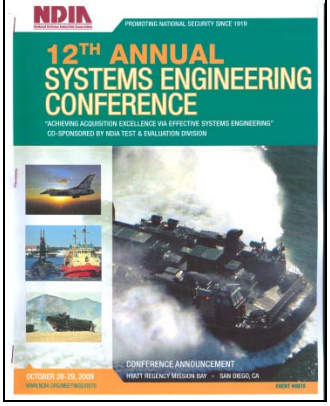
Thank You For Silencing Your Cellular Phones During the Conference Sessions



Achieving Acquisition Excellence via Effective Systems Engineering Building October 27, 2009

"One of the primary and critically important areas of program acquisition and execution lies in the umbrella discipline of Systems Engineering, which is the overall integrating function in defense programs, from proper requirements definition & flowdown, effective and affordable design that integrates reliability, availability and maintainability considerations into the overall balance of design that emphasizes supportability and usage aspects along with overall performance, cost and schedule.

Systems Engineering principles embody strong technical and risk management aspects, for both the acquiring program office as well as the executing defense prime and subcontractors. Strong emphasis on systems engineering throughout the life cycle of the program, from concept development through sustainment, is a key enabler of successful programs."

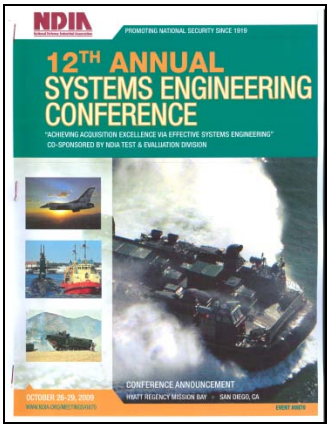


Achieving Acquisition Excellence vias Effective Systems Engineering October 27, 2009

"A major conference focusing on improving acquisition and performance of Defense programs and systems, including network centric operations and data/information interoperability, systems engineering and all aspects of system sustainment.

The DoD seeks to improve the acquisition process and overall program execution of military systems, to provide greater, more effective and reliable warfighting capability, at affordable cost and within reasonable schedules.

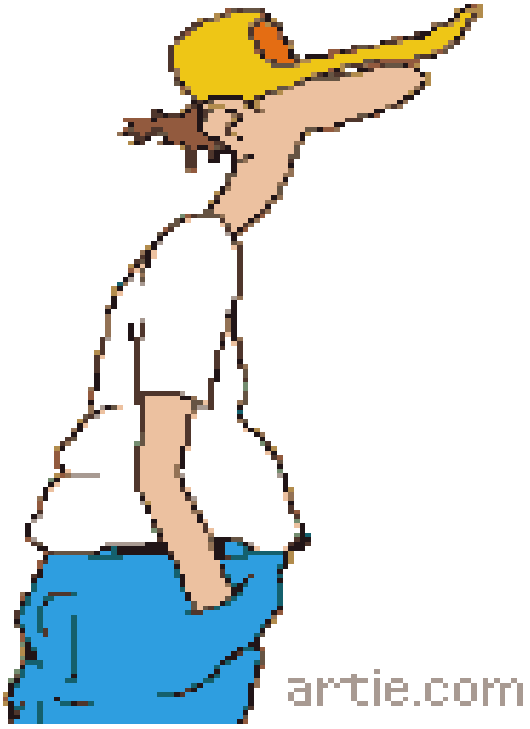
The annual Systems Engineering Conference explores the role of systems engineering in defense programs from all aspects and perspectives, including the pragmatic, practical and academic viewpoints, and brings key practitioners together to work on effective solutions to achieving a successful warfighting force."



OUR DISTINGUISHED PANELISTS:

- **Mr. Christopher DiPetto, Acting Director, Test and Evaluation, ODDRE, Pentagon**
- **Ms. Amy Markowich, Deputy, Department of Navy T&E Executive, Pentagon**
- **Col Dexter Sapinoso, Chief Air Force Test & Evaluation, Policy and Programs, Pentagon**
- **Dr. James Streilein, Technical Director, Deputy Commander, ATEC**

Awaiting Your Questions



“The DT&E function of OSD is broken and in serious need of strengthening. Current legislative proposals include establishing a Director, Developmental Test & Evaluation to address this shortfall.”

Defense Science Board Task Force on Developmental Test & Evaluation

Findings & Recommendations

•Lack of a disciplined engineering process during systems development.

•Numerous attempts at acquisition reform had reduced discipline in program formulation and execution.

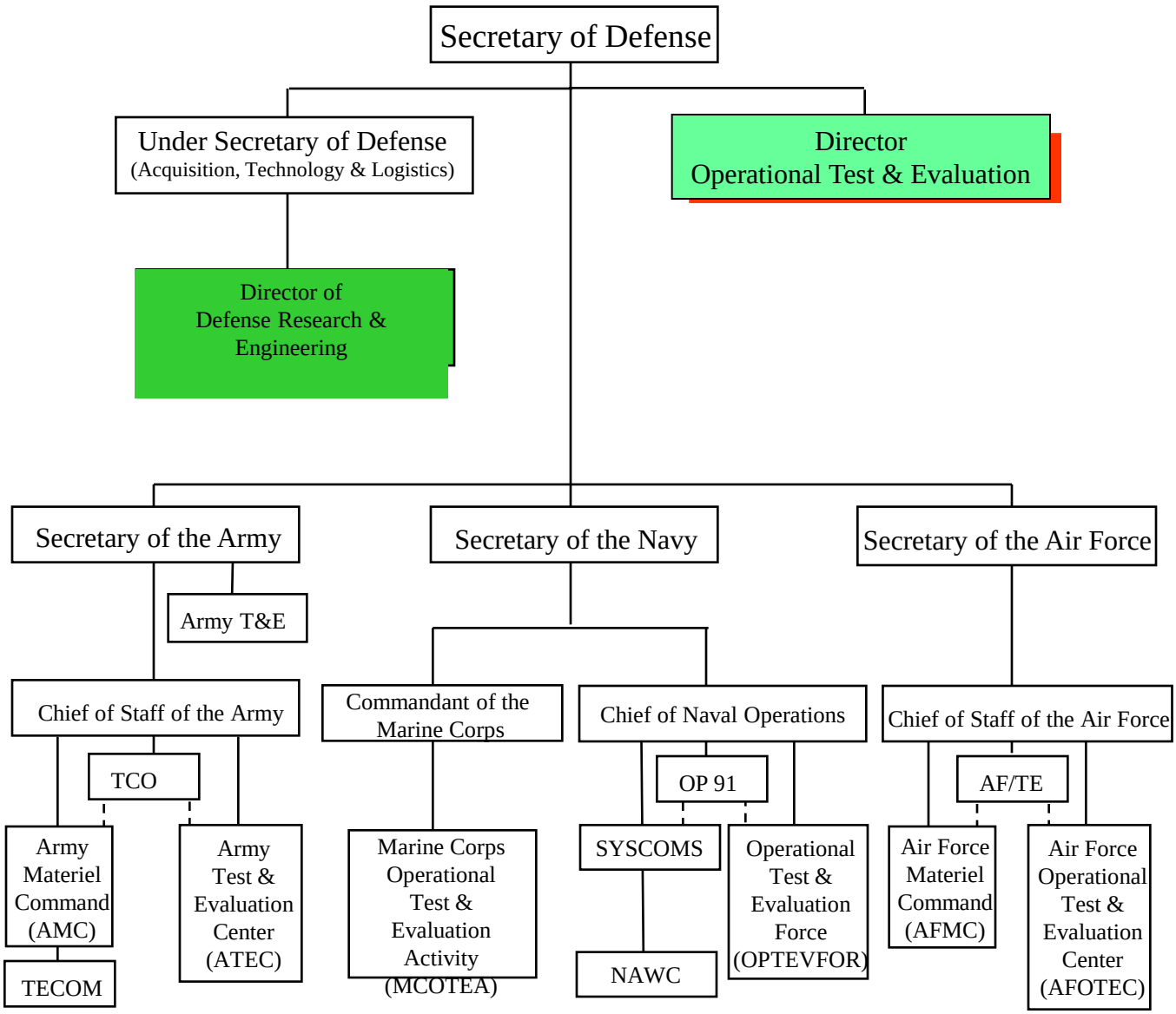
•Changing the test process will not remedy systemic deficiencies in program formulation and execution.

•Inadequate response to shortfalls identified during developmental test and evaluation (DT&E) in areas of reliability, availability and maintainability (RAM).

•Program constraints, such as schedule and funding, often preclude incorporating fixes into identified shortfalls.

•Defense Science Board Task Force on
•Developmental Test &Evaluation
•[chartered by the USD(AT&L],

Department of Defense T&E Community



Headquarters U. S. Air Force

Integrity - Service - Excellence

How Systems Engineering Can Support Developmental Test

NDIA Systems Engineering Conference

U.S. AIR FORCE

Colonel Dexter Sapinoso
Chief, Policy and Programs
Directorate of Test and Evaluation
Phone: 703 697-0190 or DSN 227-0190
E-mail: Dexter.Sapinoso@pentagon.af.mil

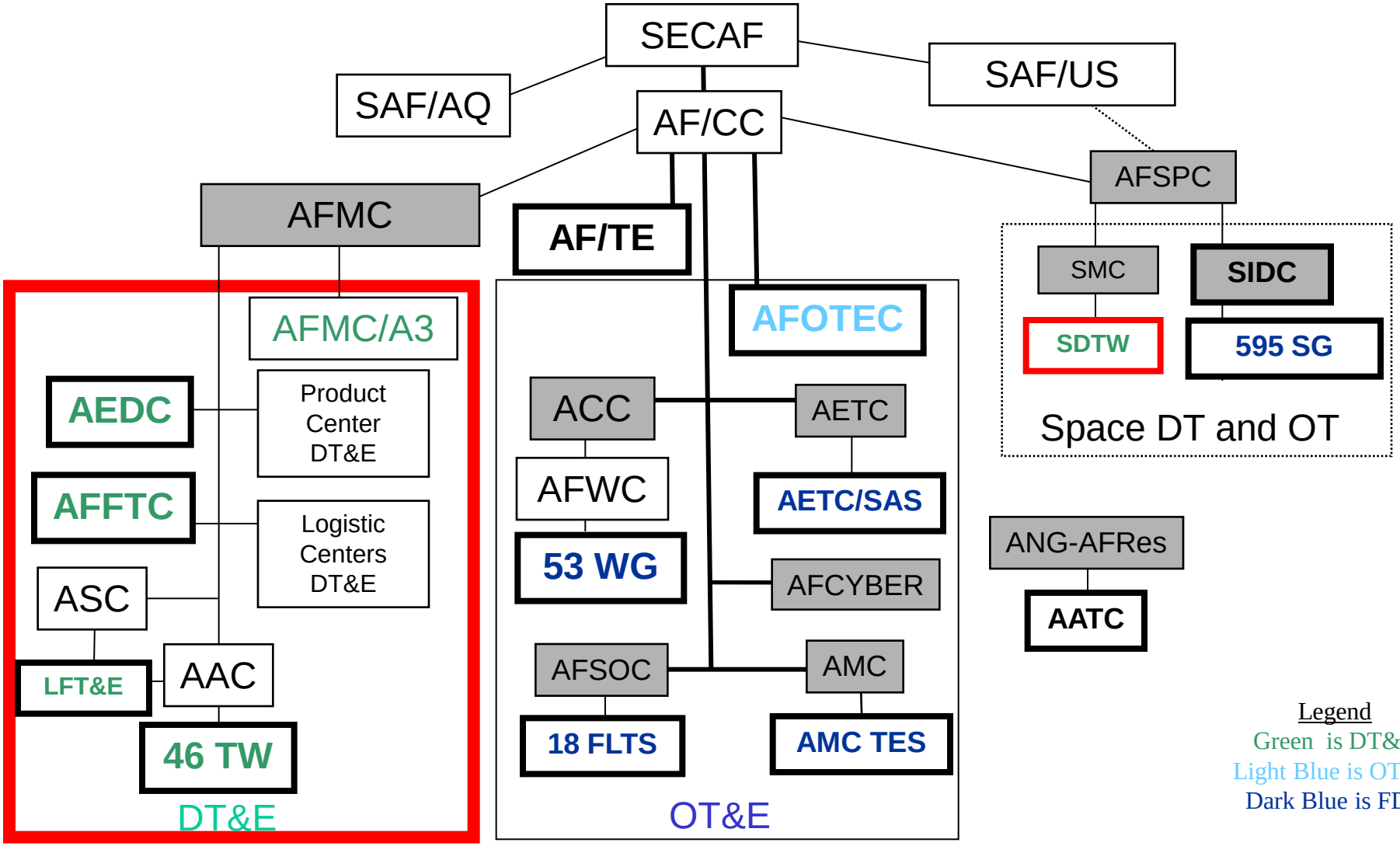
U.S. AIR FORCE

Five Things The T&E Process Must Do

- Support early development of requirements
- Reduce technical risk (CT and DT&E)
- Test efficiently - avoid redundant effort
- Collaboration between testers, developers & users
  - Periodic “vector checks” toward IOT&E
- Verify capabilities achieved (IOT&E)
  - Final test report briefings to Air Staff and OSD

U.S. AIR FORCE

AF T&E Structure



U.S. AIR FORCE

Systems Engineering at 4 levels

- Contractor (Prime & Sub) Level
  - Design Definition based on contract requirements
  - Attempts to tie design features to contract requirements
- DT Organization Level
  - Utilize Systems Engineering processes to improve testing
  - Testing to requirement correlation
  - Improved Systems-of-Systems understanding for testing
- Program Office Level
  - Operational Requirements to System Design Requirements
  - Provide framework for verification requirements of DT
  - Balance program schedule, risk, costs throughout lifecycle
- SAF/AQ and OSD Levels
  - Evaluate program schedule, risk, costs throughout lifecycle at SAF/AQ and DOD Levels

Systems Engineering

U.S. AIR FORCE

SE Process

Enabling Concepts

JCIDS
MAC/CL &
RFP

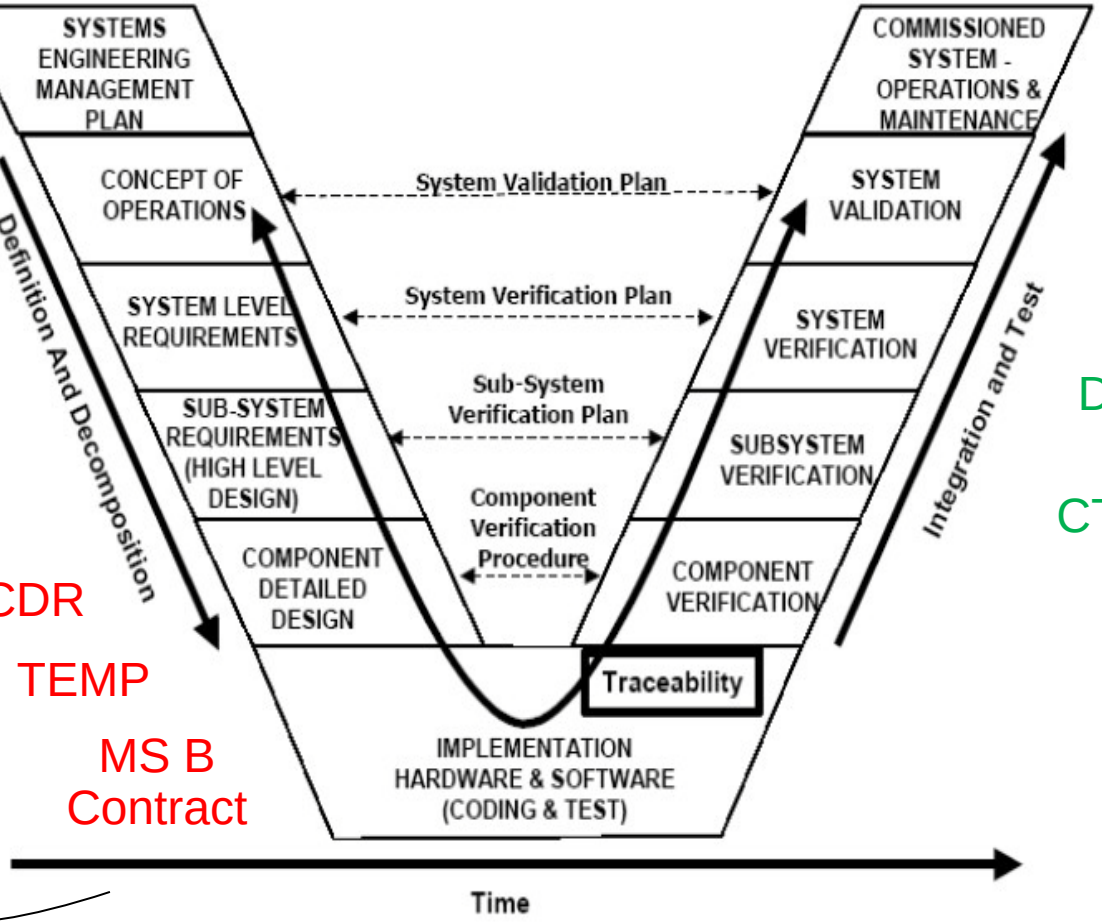
PDR

More T&E Involvement Needed Here

CDR

TEMP

MS B Contract



Sustainment

FDE

FOT&E

OT&E

LFT&E

DT&E

CT

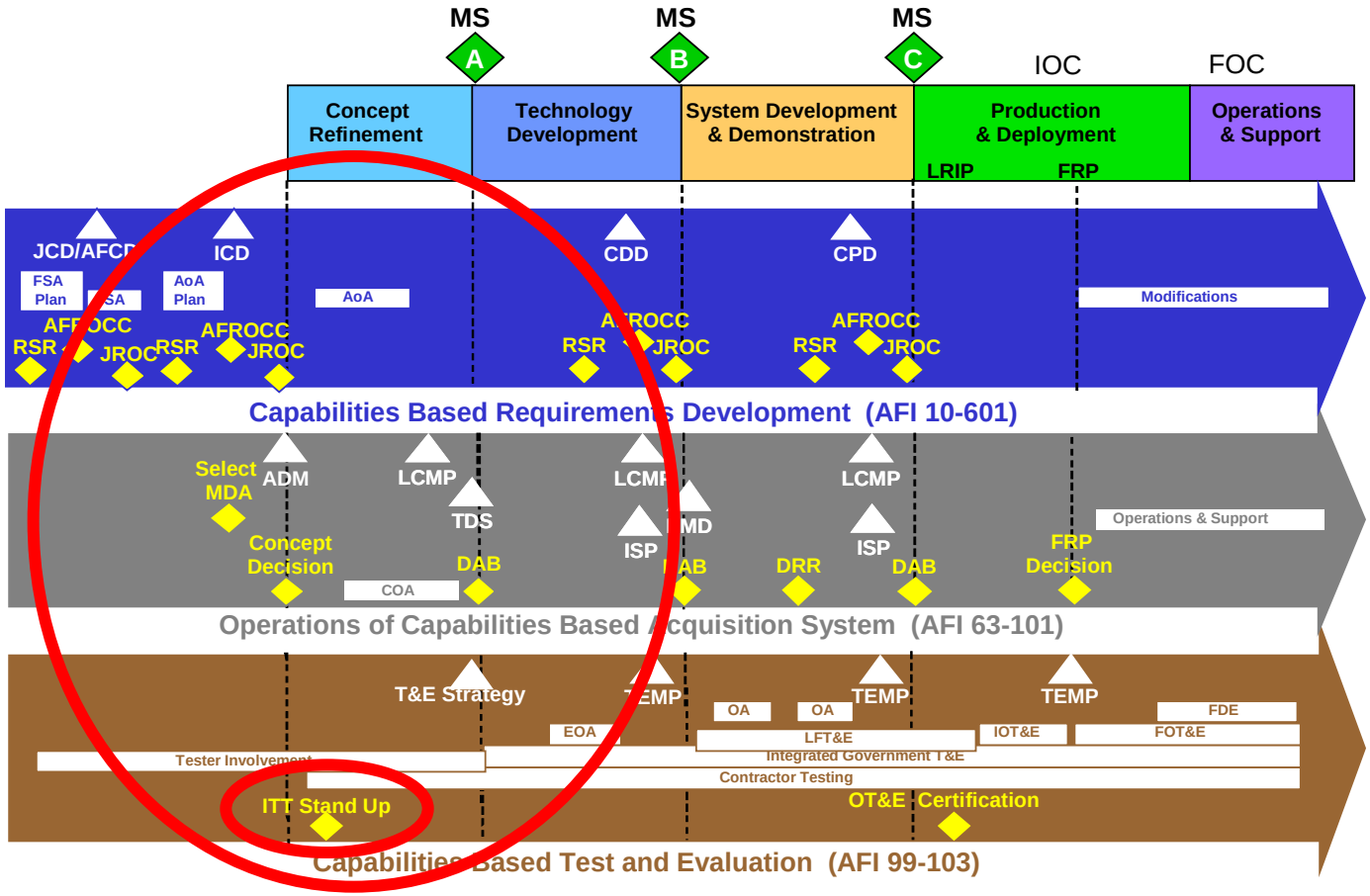
3 Major Processes Aligned -- Requirements, Acquisition & T&E

All 3 AFIs have same outline, use same terminology, and show this figure:

AFI 10-601
(Requirements)

AFI 63-101
(Acquisition)

AFI 99-103
(Test & Evaluation)



More T&E Involvement needed prior to MS B

U.S. AIR FORCE

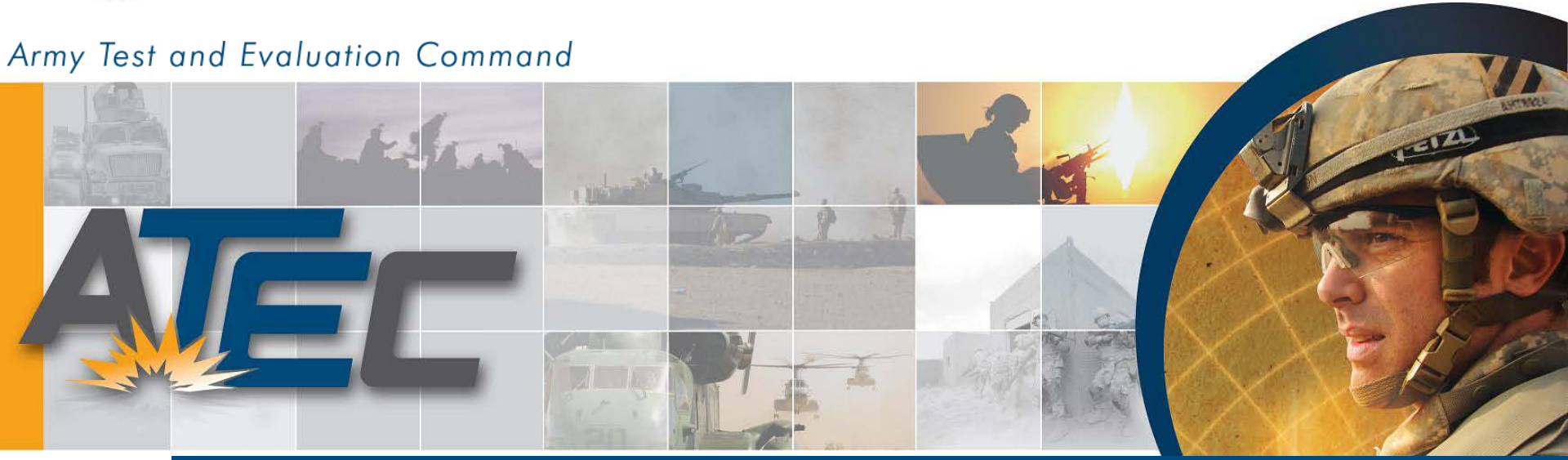
DT and SE Collaboration

- SE can aid DT by providing
  - Opportunities for early DT involvement beginning at MS-A
  - Assistance to AF/A3/5 in requirements definition
  - Early insight into schedule and risk assessments
  - Early insight into technical and test resource risks
- DT can aid SE by providing
  - Early input on definition and testability of requirements
  - Insight into test capabilities and limitations
  - Early detection of system Deficiencies and risks
  - Unique Lessons Learned from other programs earlier in development cycle
- Collaboration will improve early DT planning and increase understanding of system capabilities and risks

Challenges

- Requirements Definition
  - Ensure operational requirements are clear, testable, and verifiable
  - Ensure realistic and achievable technological goals (and avoidance of unobtainable conditions)
  - Achieve buy in from development/acquisition community
- Future Systems Integration and the NR-KPP
  - Requires significantly more systems engineering
  - DT knowledge of systems integration
  - Systems-of-Systems integration and testing
- Balance of DT and OT, and how to integrate them
- Development of SE knowledge base in DT

Army Test and Evaluation Command



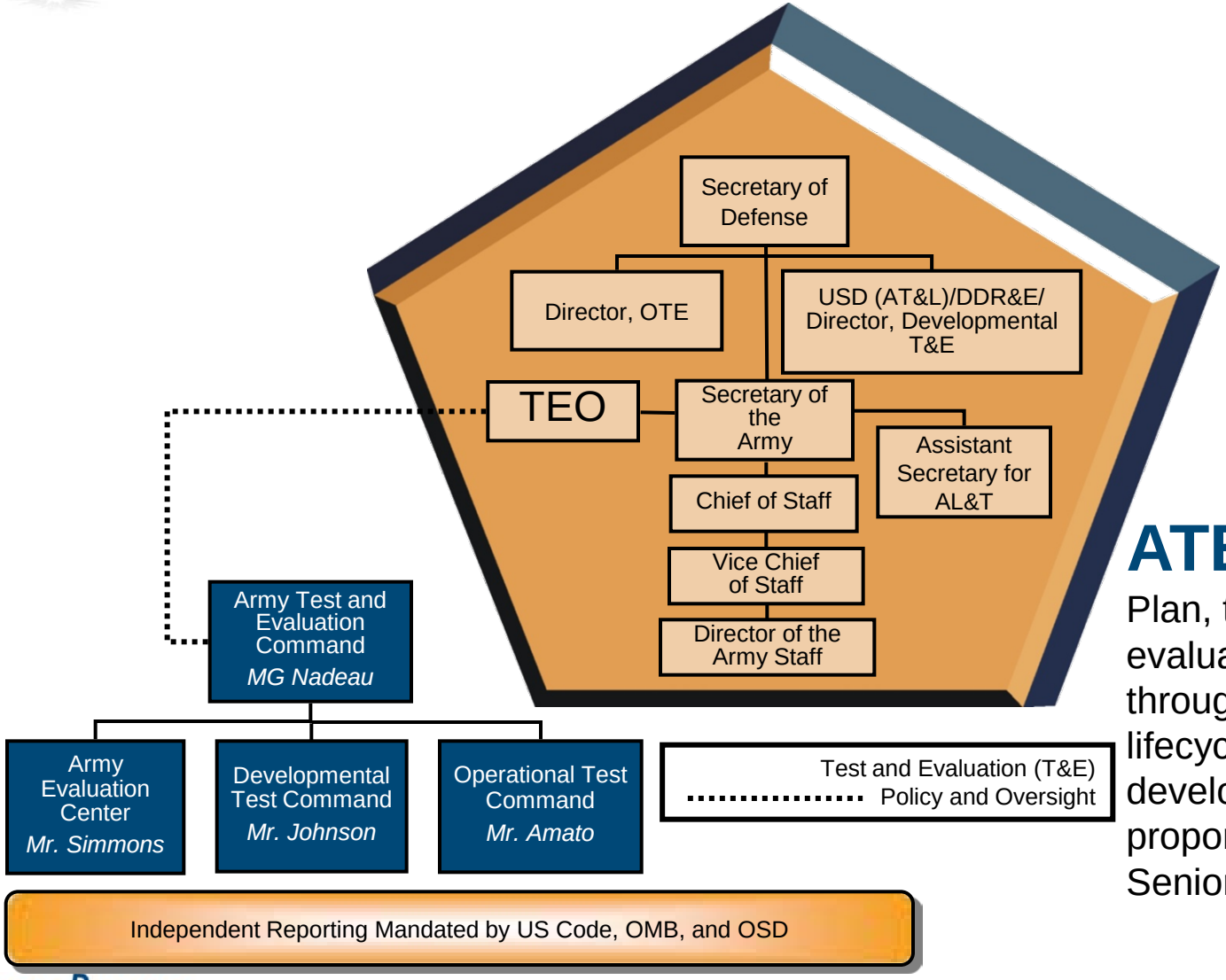
How Systems Engineering Supports Developmental Test and Evaluation

Dr. James Streilein

Technical Director/Deputy Commander ATEC

Army Proven
Battle Ready

How We Fit



ATEC Mission

Plan, test, independently evaluate, and report throughout program lifecycles to advise combat developers/functional proponents, PEOs, and Senior Leadership

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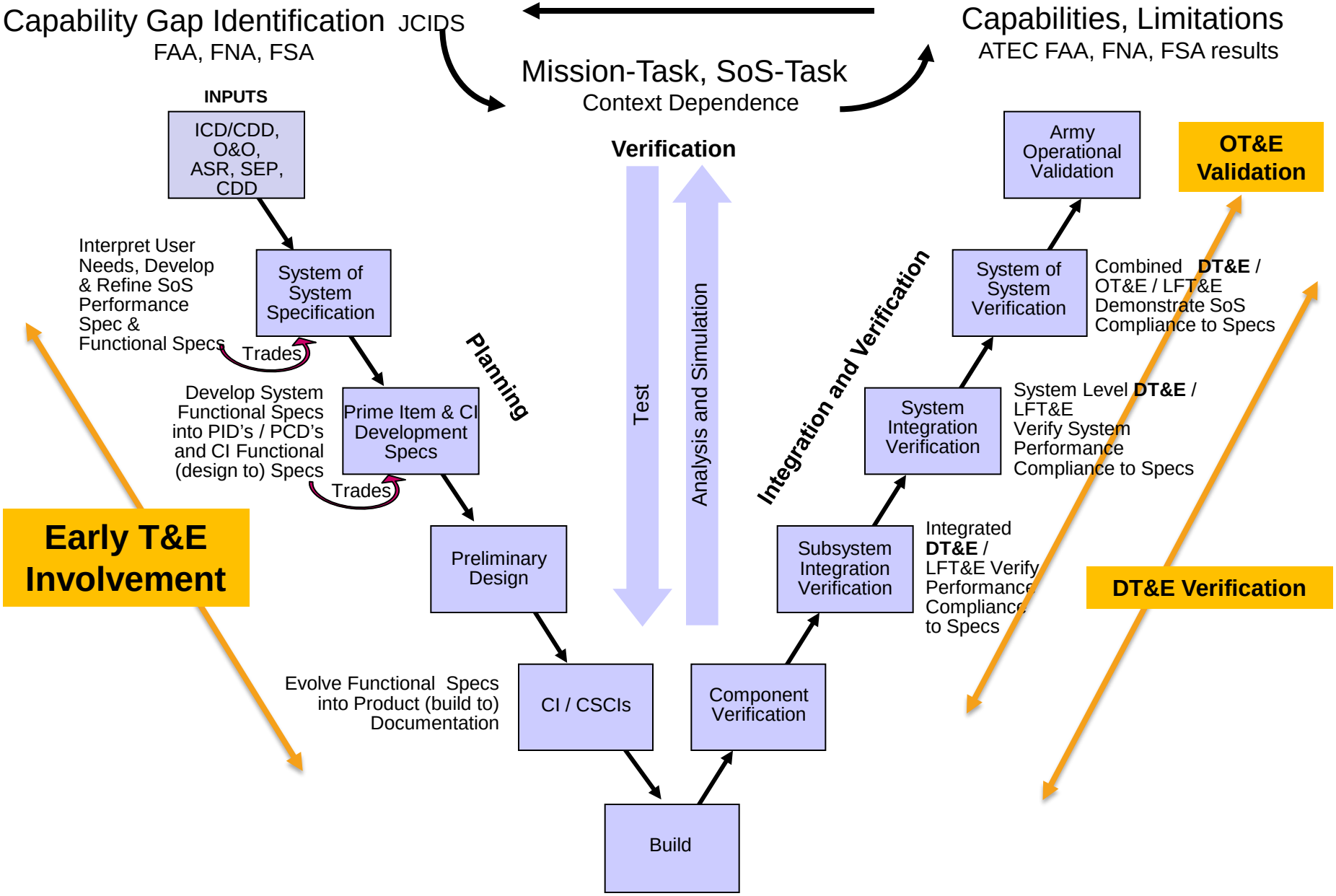
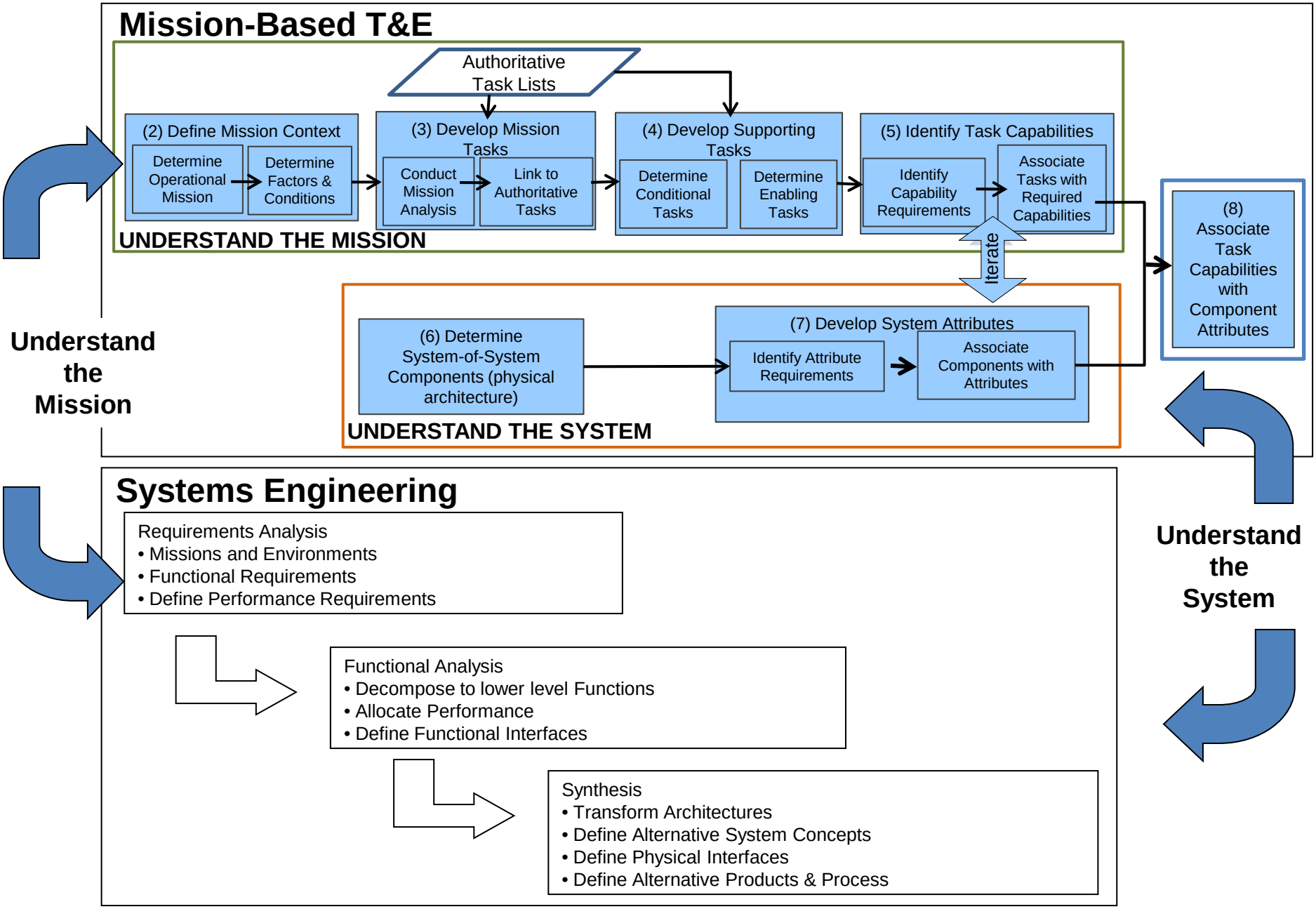
Systems Engineering



Mission-Based Systems Engineering

- Unlike the commercial arena, systems engineering for military applications must be more rigorous to ensure effectiveness, suitability, and personnel survivability in the harshest environments.
- As such, effective systems engineering must expand requirements analysis into the mission context.
- The expansion requires an understanding of the engineered attributes (function and performance) of the system. Part of that understanding is learned through DT.
- Mission-based approach can lead the way to research, develop, test and verify mission capabilities.
  - Goal is robust application for SoS, commercial-off-the-shelf intensive systems, and recapitalized systems.

MBT&E and SE


Mission-Based T&E
Authoritative Task Lists
(2) Define Mission Context
Determine Operational Mission
Determine Factors & Conditions
(3) Develop Mission Tasks
Conduct Mission Analysis
Link to Authoritative Tasks
(4) Develop Supporting Tasks
Determine Conditional Tasks
Determine Enabling Tasks
(5) Identify Task Capabilities
Identify Capability Requirements
Associate Tasks with Required Capabilities
UNDERSTAND THE MISSION
Iterate
(8) Associate Task Capabilities with Component Attributes
Understand the Mission
(6) Determine System-of-System Components (physical architecture)
(7) Develop System Attributes
Identify Attribute Requirements
Associate Components with Attributes
UNDERSTAND THE SYSTEM
Systems Engineering
Requirements Analysis
• Missions and Environments
• Functional Requirements
• Define Performance Requirements
Functional Analysis
• Decompose to lower level Functions
• Allocate Performance
• Define Functional Interfaces
Synthesis
• Transform Architectures
• Define Alternative System Concepts
• Define Physical Interfaces
• Define Alternative Products & Process
Understand the System

MBT&E & SE Aligned Goals*

- Execute SE and scope T&E efforts earlier in the acquisition cycle based on mission task capabilities.
  - Addresses:
    - "Insufficient systems engineering applied early in the program life cycle…"
    - "Requirements not always well-managed, including the effective translation from capabilities statements into executable requirements…"
  - By: Focusing on mission task capabilities as the starting point.

- Enable robust SE and T&E strategy development for Joint networked SoS and a common environment for collaborative effort between capabilities developer, materiel developer and T&E.
  - Addresses: "Collaborative environments, including SE tools, are inadequate to effectively execute SE at the joint capability, SoS and system levels."
  - By: Using a framework that links all components of the SoS to the mission capability and uses a common definition of terms.

* From NDIA SE Division Task Group Report July 2006

SE Connections to T&E

- T&E must be an integrated aspect of the SE process from virtually the beginning to the end.
  - Both DT and OT are integral to the SE process.
  - DT addressing the technical maturity and specification compliance.
  - OT addressing customer needs and satisfaction.
- Testers working together with requirements systems engineers assure requirements and specifications are unambiguous and verifiable.
- The role of SE is determining and translating operational needs to engineering specifications. MBT&E checks both.
- T&E supports the system engineering process by turning information into knowledge.
  - The cost associated with obtaining information is not trivial. However, the cost of ignorance is huge.
  - Some believe testing is expensive but fixing the problems found late in the program is far more expensive.
- Successful design reviews answer questions, assure risk is appropriate and convince decision makers to approve moving into the next phase.
  - T&E results provide the most compelling rationale.

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Challenges

- Integrating DT/OT
- Information Assurance/Network security
- Software
- System of Systems integrations
- Live, Virtual, Constructive considerations

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PLENARY SESSION 2
Acquisition Executives Panel
View from the Top:
How Can SE Support Program Execution?

- **Moderator:** Mr. Terry Jaggers
  Principal Deputy, Systems Engineering, Office of the Director, Defense Research and Engineering
- Mr. David G. Ahern
  Director, Portfolio Systems Acquisition, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics)
- Mr. Thomas E. Mullins
  Deputy Assistant Secretary for Plans, Programs, and Resources (SAAL-ZR), Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology)
- Mr. Christopher A. Miller
  PEO for Command, Control, Communications, Computers and Intelligence (C4I), U.S. Navy
- Mr. Randall G. Walden
  Director, Information Dominance Programs, Office of the Assistant Secretary of the Air Force (Acquisition)

PLENARY SESSION 4
Systems Engineering Executive Panel:
SE and Acquisition Reform: The Way Ahead

- Moderator: Mrs. Kristen Baldwin
  Systems Engineering Directorate, Office of the Director, Defense Research and Engineering
- **Mr. Nicholas Torelli**
  Systems Engineering Directorate, Office of the Director, Defense Research and Engineering
- **Mr. Carl Siel**
  Office of the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN(RDA)CHSENG)
- **Mr. Ross Guckert**
  Office of the Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT))
- **Colonel Shawn Shanley, USAF**
  Chief Systems Engineer, Office of the Assistant Secretary of the Air Force for Acquisition, Science, Technology & Engineering (SAF/AQR)

12th Annual NDIA Systems Engineering Conference KEYNOTE

Honorable Zachary J. Lemnios
Director, Defense Research and Engineering, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics)

NDIA 12th Annual Systems Engineering Conference

Organizing for the Future

Army SE Initiatives

ROSS R. GUCKERT
Assistant Deputy for Acquisition and Systems Integration
Assistant Secretary of the Army for Acquisition, Logistics and Technology
Ross.Guckert@us.army.mil
27 October 2009

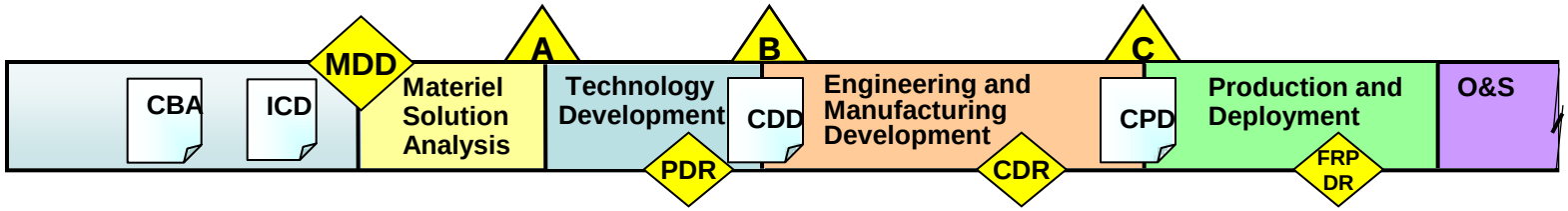
Agenda

- Developmental Planning in the Army
- Army's Capability Package Process
- System Engineering Enablers
  - System-of-Systems Systems Engineering (SoS SE)
  - PEO Integration
- Army Reliability Initiatives

Developmental Planning

in the Army

Army Developmental Planning



- Army Capstone Concept
- Army Expeditionary Warrior Experiment
- Army Evaluation Task Force
- C4ISR On-The-Move

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

Army's Capability Package Process

ASA (AL&T)

Army Capability Set Management Process

"Capability Set Life-Cycle"

What can be provided when at affordable price?
- SoS Engineering Analysis/Trades
- SoS Synchronization
- Technical Feasibility
- Inform decisions
- "Bang for the Buck"

Does Capability Set stand up to Oper Analysis?
- Exercise Cap Set through Oper Analysis - leverage analytic tool suite
- Adjust to changes (funding, rqmt, force changes, etc.)
- Assess changes on SoS perf & synchronization
- Re-assess "Bang for the Buck"

DEFINE & DEVELOP

G3 — STEP 1 CABILITY NEEDS ANALYSIS

PRIORITIZE ABILITY EDS

G3 — ESTABLISH CAPABILITY SET PARAMETERS (OPN, TECH, FISCAL)

R-7 Years

FOCUS ON CAPABILITY SEGMENTS

STEP 2 INTEGRATE ARCHITECTURES

STEP3 Fiscal Analysis

STEP 4 SCREEN & ID SOLUTION SET

REFINE

IT FOR CHANGE ENVIRONMENT

EW TECHNOLOGY, ONS/JUONS, FORCE SIZING)

PRODUCE / PRIORITIZE COAS

SOSE ANALYSIS OF CAPABILITY SETS

Understood Operational Effects Through Operational Analysis (M&S)

APPROVE

Approve "Baseline" CAP. SET 15-16 FOR REFINEMENT

LWN GOSC

R-6 Years

STEP5 Develop "BASELINE" INTEGRATED CAPABILITY SET

SELECT CAPABILITY SET COA

LWN GOSC

R-36 months

BOIP Lock

"80% Solution"

SYNCH

Near Term Trades

APPROVE Final CAPABILITY SET Synched w ARFORGEN

LWN GOSC

R-18 Months

MTOE Lock

"Good Idea" Cut-Off

ONS/JUONS

STEP7 SYNCH CAPABILITY SET Testing & Certification

Force Validation Conference
Army Sourcing Conferences
Army Equipping Conferences

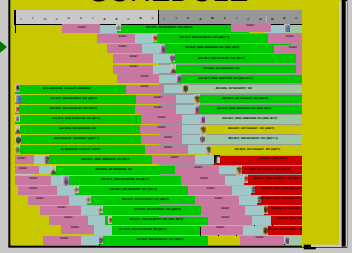
FIELD

Begin Reset

SWB Go / No Go

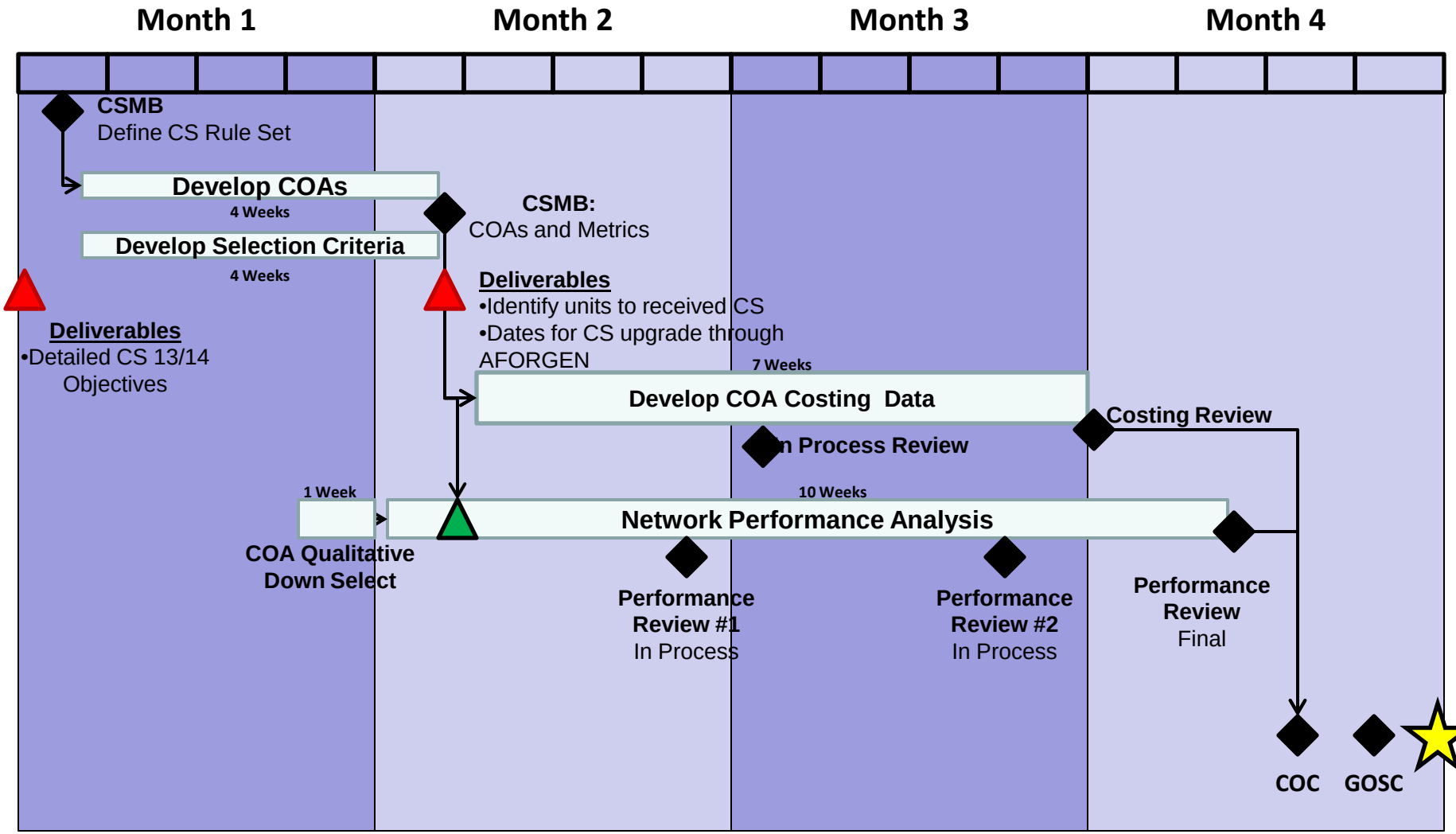
Issue MTOE

ARFORGEN RESET SCHEDULE



ASA (AL&T)

Notional Timeline for Capability Sets



Task Force 120 - Overview of COAs

FCS NIKs

JCR key leaders

Common to all COAs:

CO CP comms, WIN-T Incr 2, FCS SO sensors

Rifleman Radio

LW or GSE → COA 3 — EPLRS for FCS NIKs

MBITR → COA 2 — PRC-117G for FCS NIKs

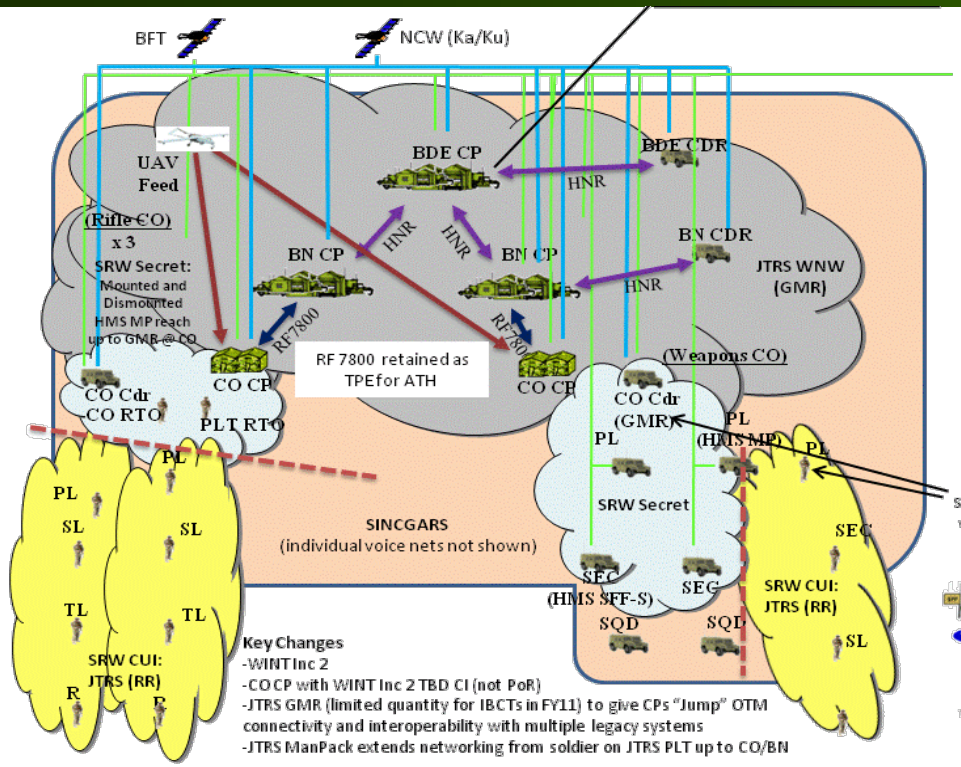
GMR → COA 1

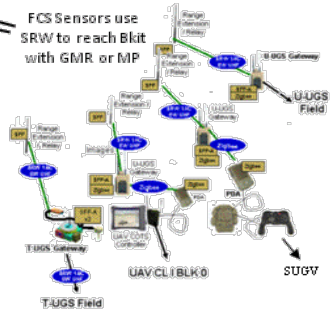
50% GMR / 50% MP → MP → COA 1b; SFF-S → COA 1c

SFF-V → COA 1d

PRC-117G → COA 1e

Task Force 120 – Recommended Course of Action





AN/PRC 119 (SINCGARS VHF)	190
AN/PRC 148 (VHF UHF)	242
AN/PRC 150 (HF)	8
AN/PSC 5	20
AN/VRC 104 V3 (HF)	63
SINCGARS VEH RTs(VHF)	1313
AN/PRC-154 (RR)	1658
COA 1b/1c/1d/1e	

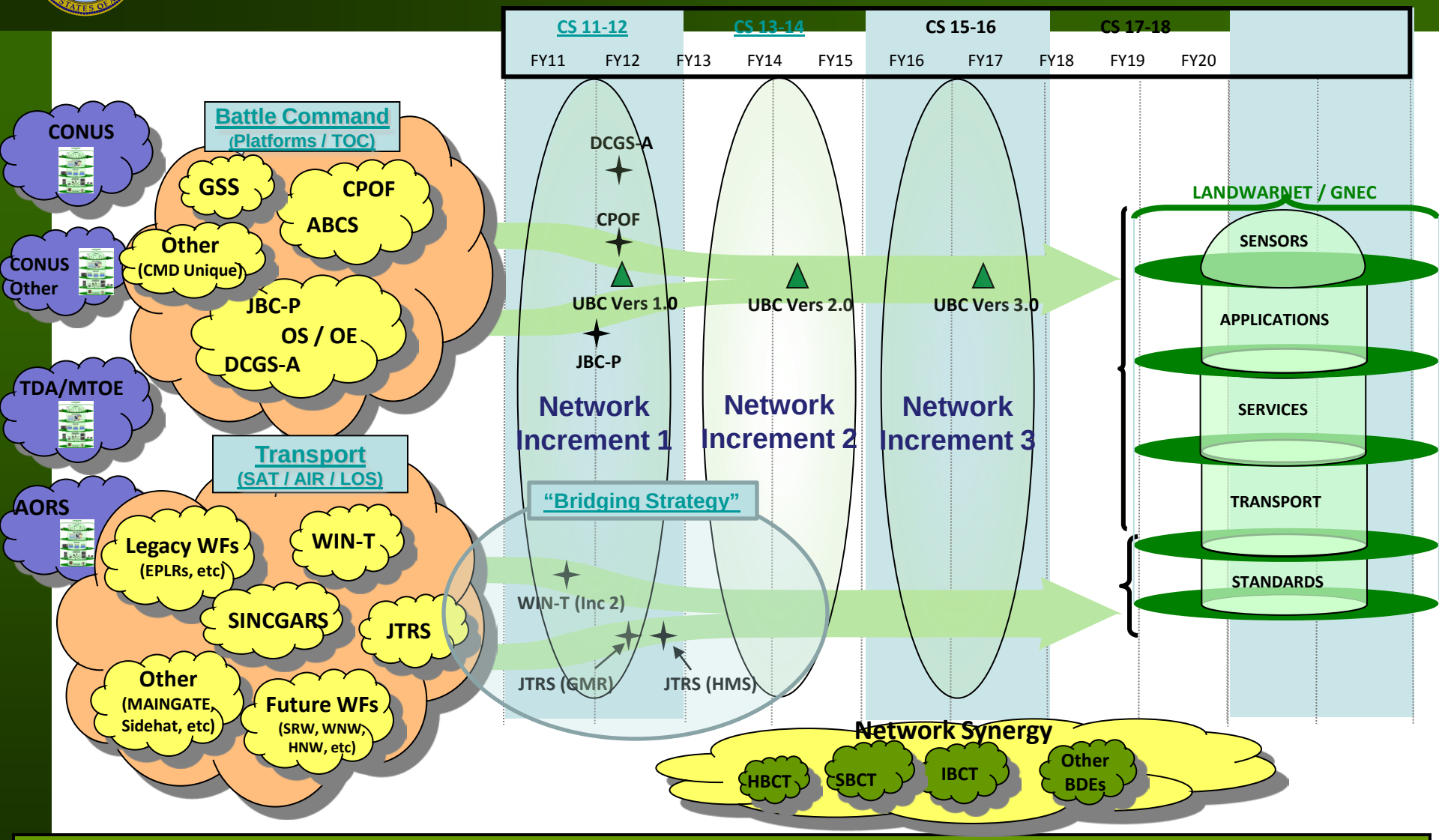
CSS VSAT	7
DVB-RCS (GBS)	5
GRRIP (HUMINT TMS)	3
HCLOS	2
RF 7800W	38
SMART-T	2
TROJAN SPIRIT V3	4
TSR-8 (GBS)	8
WIN-T Inc 2 TCN	8
WINT Inc 2 TBD ATH LOS and BLOS	13
WINT Inc 2 PoP	7
WINT Inc 2 SNE	34
WIN-T LAW (WIN-T INC 2 VWP)	10
JTRS GMR	40
JTRS HMS MP	116
BFT1 - Ground	282
JTRS SFF-S	60

SO B-Kit ICS	81
SO B-Kit Antenna	81
Urban - Unattended Ground Sensors (U-UGS)	29
Tactical - Unattended Ground Sensors (T-UGS)	12
Non-Line of Sight Launch System (NLOS-LS)	6
Small Unmanned Ground Vehicle (SUGV) Block 1	38
Class I Block 0	22
Other Hardware (Inmarsat BGAN, S-PoP)	1
SO A-Kit HMMWV	81

- Assumes availability of HMS Manpack (same as COA 1b)
  - Comms within CO uses SRW (instead of WNW)
  - FCS NIKs below CO use HMS MPs (~50%)
- Assumes availability of SFF-S
  - Single channel radio, shares SINCGARS vehicular adapter
  - Postulated as low cost/SWAP approach for vehicles that only require one SRW channel as an advanced waveform
  - For key leader JCR vehicles
    - As alternative to HMS manpack
    - SRW net for more robust comms (augments BFT)
  - SFF-S is not currently part of JTRS program of record
- For dismounts
  - Rifleman Radio up to Platoon Leader
  - Retain PRC-148 down to Squad Leader

ASA (AL&T)

Army Network Modernization Strategy



Capability Set and POR specific ARFORGEN focused fieldings that introduce new technologies reallocates assets, divest older technologies and incrementally modernizes the Army's network.

System Engineering Enablers

- System-of-Systems Systems Engineering (SoS SE)
- PEO Integration

ASA(ALT) Management Structure for Army Mod Plan

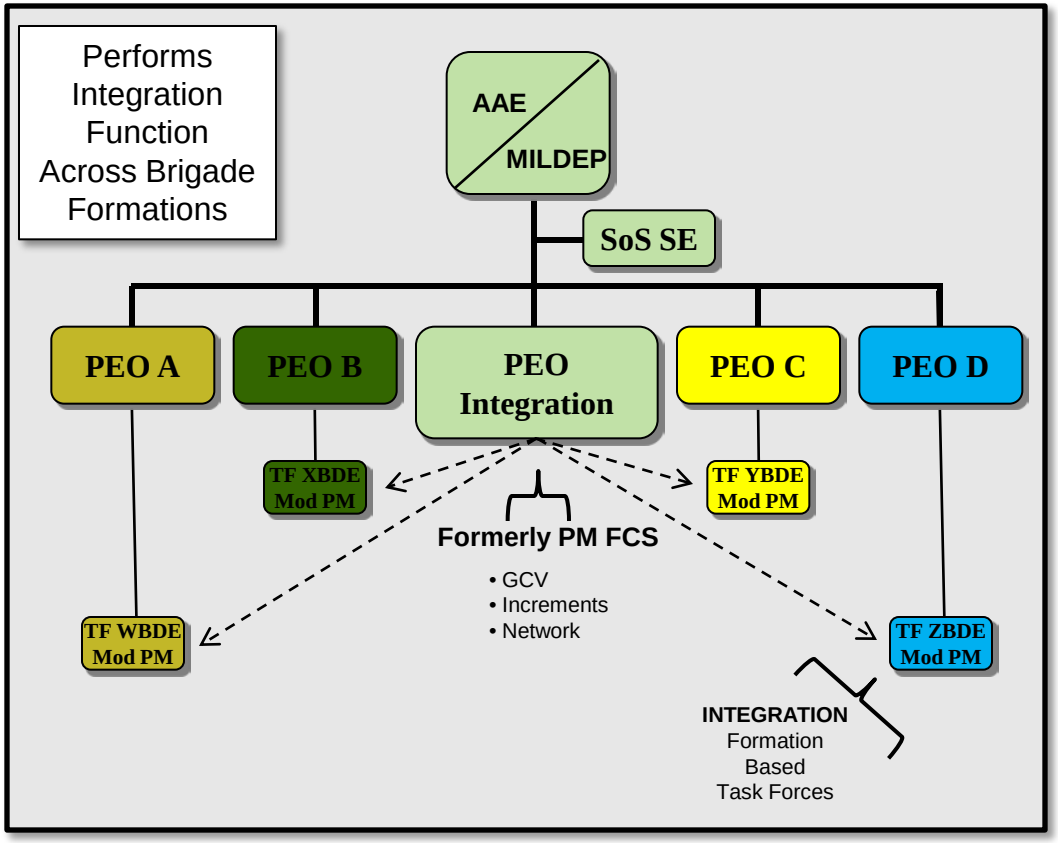
TODAY

- AAE
- MILDEP
- PM FCS
  - GCV
  - Spin Outs
  - Network
- PEO A
- PEO B
- PEO C
- PEO D
- REF
- Non-PORs

Solutions Fielded But Not Integrated Across BDE Formations

FUTURE

Performs Integration Function Across Brigade Formations



Leverages Investment in FCS and OIF/OEF Procurements –
Organized to Integrate and Incrementally
Deliver Materiel Solutions Across Brigade Formations

ASA (AL&T)

SoS Systems Engineering

Strategic Enterprise Transformation Results

SOS SE Strategic Goal - Warfighters have what they need, when they need it, and it works.

SOS SE Vision - The SOS SE organization leads the synchronization of Army technical efforts and enables delivery of world-class integrated materiel solutions to the Warfighter.

SOS SE Mission - Architect and enable the incremental delivery of relevant, integrated and affordable capabilities by formation type in support of the Army's guidance, modernization strategy, and Army Force Generation model.

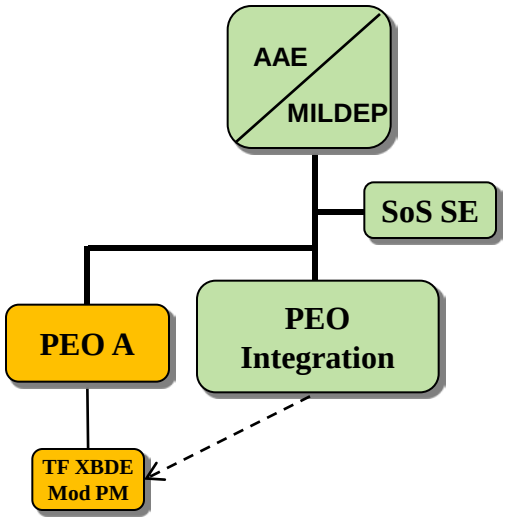
SOS SE Stakeholder Values

- Ensure materiel solutions (including systems, components, applications and networks) work properly together
- Provide authoritative, suitable, relevant, responsive, flexible, integrated, interoperable, synchronized, balanced SOS architectures
- Coordinate and synchronize efforts across PEOs and external entities (Materiel Enterprise (ME), ARSTAFF, ATEC, OSD)
- SoS SE policy, guidance, enterprise governance and terms of reference, define system interfaces and implementation of technical standards
- Agile, responsive, synchronized SoS SE in support of the acquisition process to deliver capability in accordance with ARFORGEN
- Establish a uniform set of Modeling & Simulation and analysis tools
- Synchronize decomposed requirements and adjudicate conflicts and duplications with requirements community
- Shape technology transition to ensure greatest enterprise value
- SoS-level Analysis/Trades to provide objective recommendations in operational terms (with TRADOC) to enable better Army and DOD level decisions
- Adjudication of cross PEO level SoS issues

SOS SE Strategic Objectives

- Synchronize acquisition program requirements and programmatics
- Use SOS SE efficiencies to improve capabilities delivered despite fiscal constraints
- Be a recognized source for authoritative SOS acquisition decision data
- Provide authoritative SOS architectures for all Army formations
- Shape tools needed to execute SOS SE mission
- Establish systems engineering enterprise standards
- Shape S&T investment strategy

Responsibilities – SoS SE, PEO I, Task Forces



SoS SE

- Representative, authoritative architectures for each Brigade type
  - COA development, analysis, costing and decision support
  - Establish operational value
- Establishing standards and policy (via MILDEP policy or AAE ADM)
- Alignment/reconciliation of resourcing and requirements with HQDA and TRADOC
- Direct and lead SoS trades
- Resolve conflict, provide governance
- Synchronize PEOs with Army Mod Strategy and delivery of Capability Packages - Maintain strategic IMS/IMP

PEO Integration

- Specific architectures for Brigades to be "touched" in ARFORGEN
  - COA "executability" determination
- Execute SoS Trades ICW ASA(ALT), provide recommendations to ASA(ALT)
- Recommend resource and requirement changes to align PORs/non-PORs to Capability Packages
- Maintain IMS/IMP for all Brigades in ARFORGEN cycle
- Development and management of vehicle-network architectures, as well as other critical interface/touch point architectures IAW established standards

Task Forces

- Manage IMS/IMP for specific Brigades to be "touched"
- Coordinate across PEOs to deliver IAW architectures and IMS/IMP
- Ensure policy/standard implementation
- Manage SoS testing/certification
- Synchronize Unit Set Fielding
- Recommend resourcing changes to accommodate Capability Package fielding

Army Reliability Initiatives

Army Reliability Policy

- Mandates development and demonstration of a mid-SDD reliability test threshold for all pre-Milestone B programs with a JPD of JROC Interest[1]:
  - Default value is 70% of CDD reliability requirement
  - Must be demonstrated with at least 50% statistical confidence by end of the first full-up, system-level developmental test event of SDD
  - Threshold value must be approved as a part of the TEMP, and recorded in the SDD contract and APB at Milestone B
  - Requires review of material developer's reliability case documentation
    - AMSAA and AEC to apply Reliability Scorecard

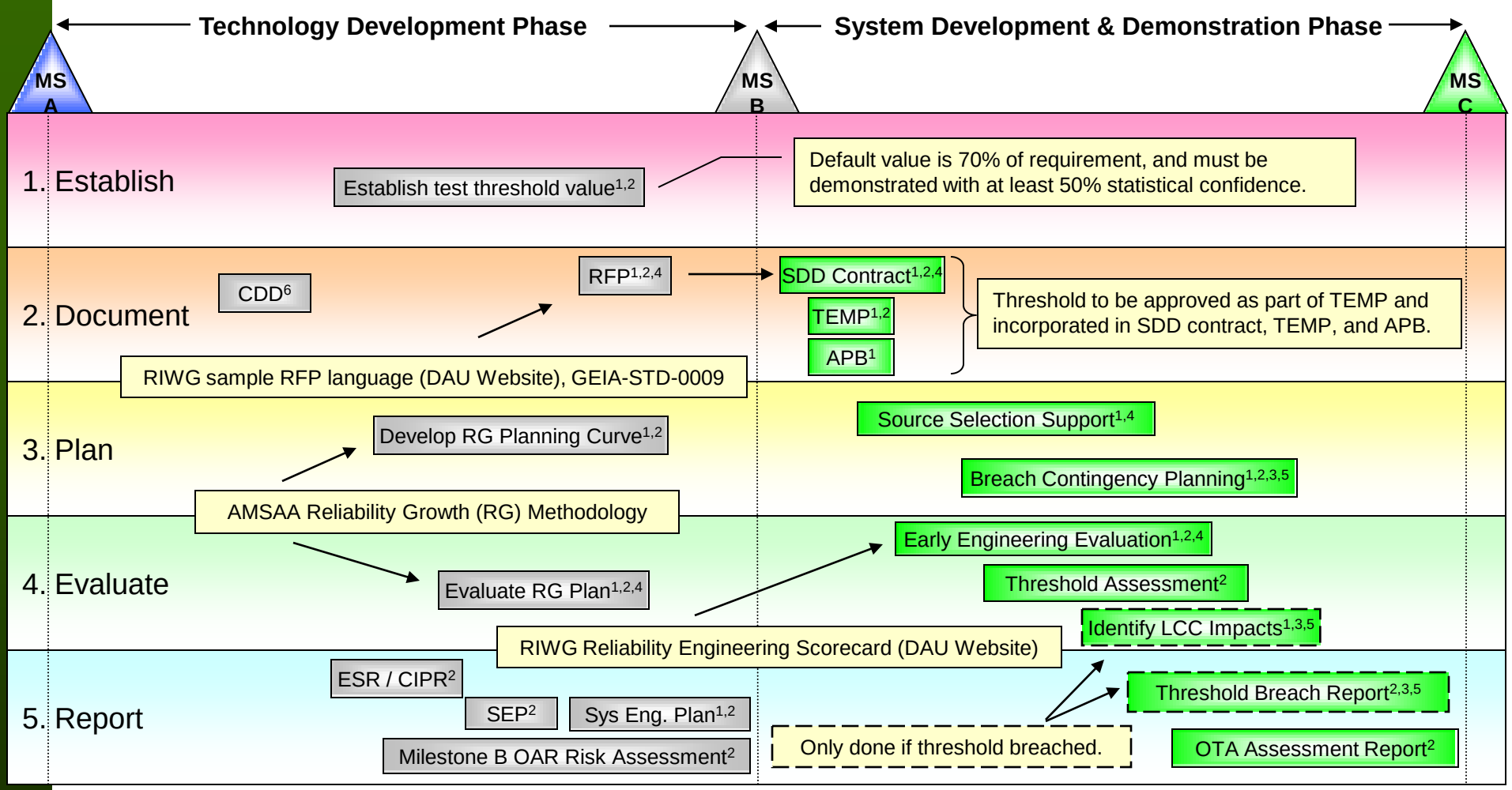
- ATEC to perform threshold assessment, and lead IPR in event of a breach:
  - PEO/PM develops corrective action plan
  - AEC performs assessment of PM's plan and projected reliability
  - AMSAA/AEC estimates ownership cost impacts
  - TRADOC assesses utility of system given current reliability maturity level
  - ATEC CG provides recommendation to ASA(ALT) thru Army T&E Executive, with PEO coordination in advance

ASA(ALT) policy expands the Army's current T&E mission

1. Per CJCSI 3170.01F, JROC "Interest" refers to programs that have a potentially significant impact on joint warfighting.

ASA (AL&T)

Enabling Early SE
5-Step Army Policy Implementation Plan



- **Key players**: 1 PEO/PM, 2 AEC-RAM, 3 AEC-ILS, 4 AMSAA - Reliability Branch, 5 AMSAA - Resource Studies Branch, and 6 TRADOC.
- **Documentation**: Currently developing an ATEC guide on this implementation plan and associated reliability growth planning processes.
- **Reference**: ASA(ALT) Memorandum, Dated 6 December 2007, Subject: Reliability of U.S. Army Materiel Systems.
- **GEIA**: Government Electronics and Information Technology Association.

Summary

- **Agility and Responsiveness are Critical Attributes for Army Acquisition**
- **The Army Must Organize for Success to Execute the Army's Modernization Strategy**
- **We Must Leverage Enablers to Deliver Warfighting Capability**

Air Force Activities in Support of WSARA

NDIA 12th Annual Systems Engineering Conference
27 Oct 2009

Colonel Shawn "Magnum" Shanley
Chief, Engineering & Technical Management Division
SAF/AQR
shawn.shanley@pentagon.af.mil

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Agenda

- **Background**
  - AF Acquisition Improvement Plan & WSARA
  - Problem Statement
  - Early SE & Earlier SE – Study Recommendations
- **Employing Early Systems Engineering**
  - Increased Focus on Systems Engineering
  - Addressing the Content Gap – Current State
  - Concept Characterization & Technical Description (CCTD) approach
- **Path Ahead**

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USAF Flight Path

Air Force 2008-2010 Strategic Plan

- *Reinvigorate AF Nuclear Enterprise*
- *Win Today's Fight*
- *Develop & Care for Airmen & Families*
- *Modernizing Aging Air & Space Inventories*
- ***Recapture Acquisition Excellence***

- **Acquisition Improvement Plan (AIP)**
  - **Revitalize the Air Force acquisition workforce**
  - **Improve requirements generation process**
  - **Instill budget and financial discipline**
  - **Improve Air Force major systems source selections**
  - **Establish clear lines of authority and accountability within acquisition organizations**

AF Acquisition Improvement Plan (AIP) & WSARA

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Acquisition Improvement Plan

- **Revitalize the Air Force acquisition workforce**
- **Improve requirements generation process**
- Establish clear lines of authority and accountability within acquisition organizations
- **Instill budget and financial discipline**
- **Improve Air Force major systems source selections**

Weapon System Acquisition Reform Act (PL 111-23)
Sec. 102 Directors of Developmental Test and Evaluation and Systems Engineering

(a) In General

§ 139d. (b) (5) Director of Systems Engineering shall

(D) provide advocacy, oversight, and guidance to elements of the acquisition workforce responsible for systems engineering, development planning, and lifecycle management and sustainability functions;

(E) provide input on the inclusion of systems engineering requirements in the process for consideration of joint military requirements by the Joint Requirements Oversight Council …

(b) Developmental Test and Evaluation and Systems Engineering in the Military Departments

(1) Plans. -- The(SAE) … shall develop and implement plans to ensure the military department … has provided appropriate resources for …

(B) Development planning and systems engineering organizations with adequate numbers of trained personnel in order to

(i) support key requirements, acquisition, and budget decisions made for each major defense acquisition program prior to Milestone A approval and Milestone B approval through a rigorous systems analysis and systems engineering process; …

(iii) identify systems engineering requirements, including reliability, availability, maintainability, and lifecycle management and sustainability requirements, during the Joint Capabilities Integration Development System process, and incorporate …into contract requirements …

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Background/Problem Statement

Problem Statement

- *"Overstated and unstable requirements that are difficult to evaluate during source selections"*
- *"Ensure acquisition involvement and leadership in support of the lead command early in the development of program requirements"*

Reference: Acquisition Improvement Plan, 4 May 09

Events – circa 1989-1993 – and their unintended consequences

- **Acquisition Workforce reduction**
  - Early Systems Engineering and Development Planning functions virtually eliminated
  - As a consequence, there was erosion of acquisition expertise and processes that supported the lead command early in the development of program requirements
- **Ownership of funding and program advocacy shifted from AFSC to MAJCOMs**
  - Further eroded acquisition early involvement
- **Congress "zeroed" Development Planning PE**
- **Significant reduction of specifications and standards – thru 1998**
  - Shifted burden to industry
  - Acquisition expertise in translating operational requirements into system requirements eroded

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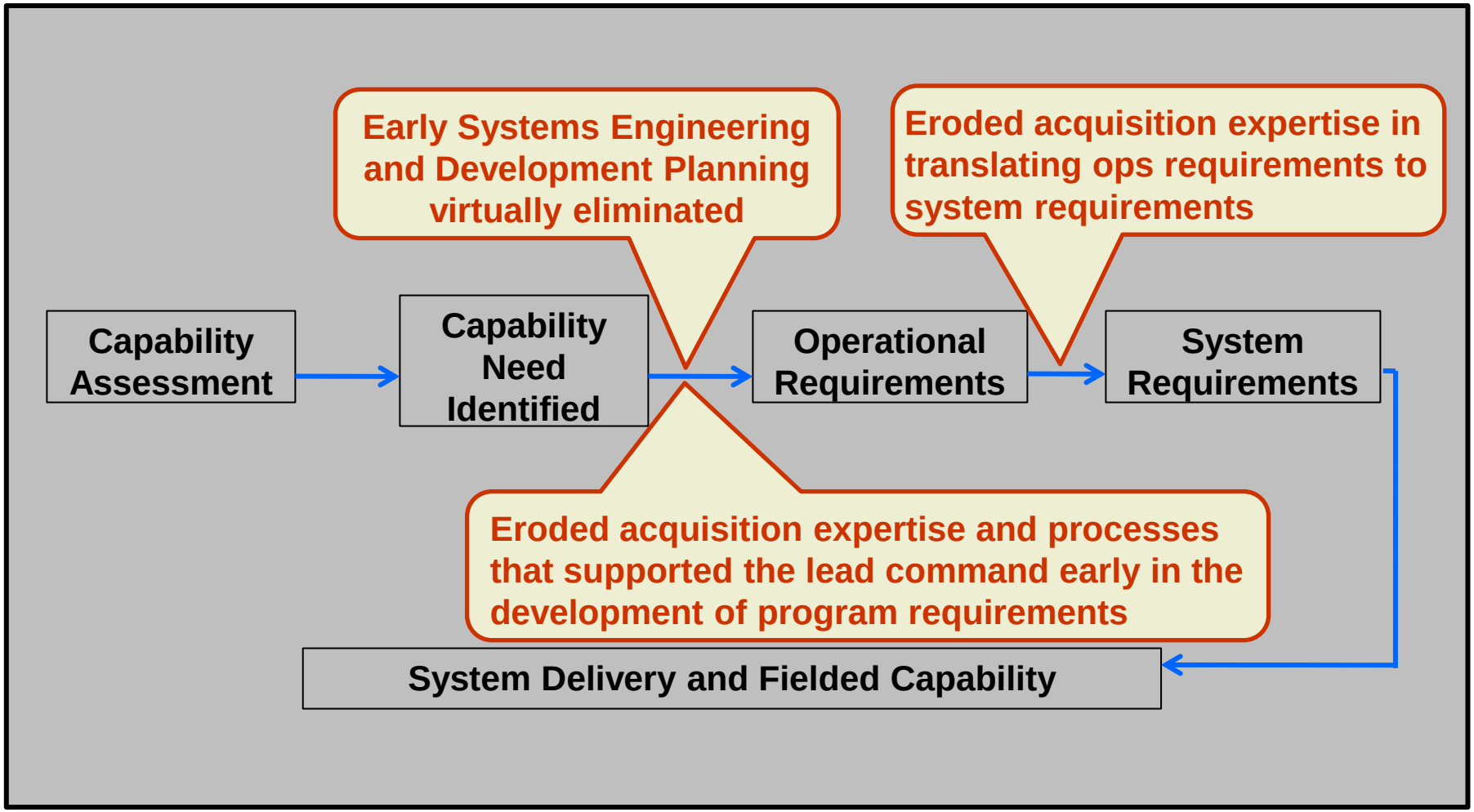
So What?



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Get Back to Early SE Roots?

- **Weapon Systems Acquisition Reform Act 2009**
  - **"Support…each MDAP prior to Milestone A approval…through a rigorous systems analysis and systems engineering process"**
- **Acquisition Improvement Plan**
  - **"There will be acquisition involvement earlier in the AF requirements development process and systems engineering techniques will be applied"**
- **NRC "Pre-Milestone A and Early-Phase Systems Engineering" study committee report (Jan 08) –**
  - **"Attention to a few critical SE processes … particularly during preparation for Milestones A and B is essential to ensuring … programs deliver … on time and on budget."**
- **GAO Report – 09-326SP "Defense Acquisitions"**
  - **"... ensure new programs … follow a knowledge-based approach … must begin with strong systems engineering analysis"**

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National Research Council Study Recommendations

1. **Air Force leadership should require that Milestones A and B be treated as critical milestones in every acquisition program and that … the "Pre-Milestone A/B Checklist" … be used to judge successful completion.**
2. **Assess career field needs and develop a program to address**
3. **Pre-A decisions should be supported by rigorous SE processes and analyses involving teams of acquirers, users, and industry**
4. **A development planning function should be established in the military departments to coordinate the concept development and refinement phase of all acquisition programs to ensure that the capabilities … as a whole are considered and that unifying strategies such as … interoperability are addressed.**

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Increased Focus on Systems Engineering

Major Policy and Law

- SECAF "Go Fix SE" direction – 2002
- DODI 5000.2 – Mar 03
- SE Plan Requirements Policy Memo – Mar 07
- **USD (AT&L) RAM Memo – Jul 08**
- USD (AT&L) Lifecycle Mgt Framework Memo – Jul 08
- **SAF/AQR CCTD Guidance Memo – Dec 08**
- DODI 5000.02 – Dec 08
- CJCSI 3170.01 – Mar 09
- Weapon Systems Acq Reform Act – May 09

Other Support Activities

- **Center for Systems Engineering Standup 2005**
- NRC Early SE Study – Jan 08
- AF SE Assessment Model (SEAM) – Aug 08
- **Early SE Guide – Mar 09**
- **DP Strategic Plan, Continuous Capability Planning Guide – Jul 09**
- **Concept Maturity/DP Workshop – Aug 09**

2002 2003 2004 2005 2006 2007 2008 2009

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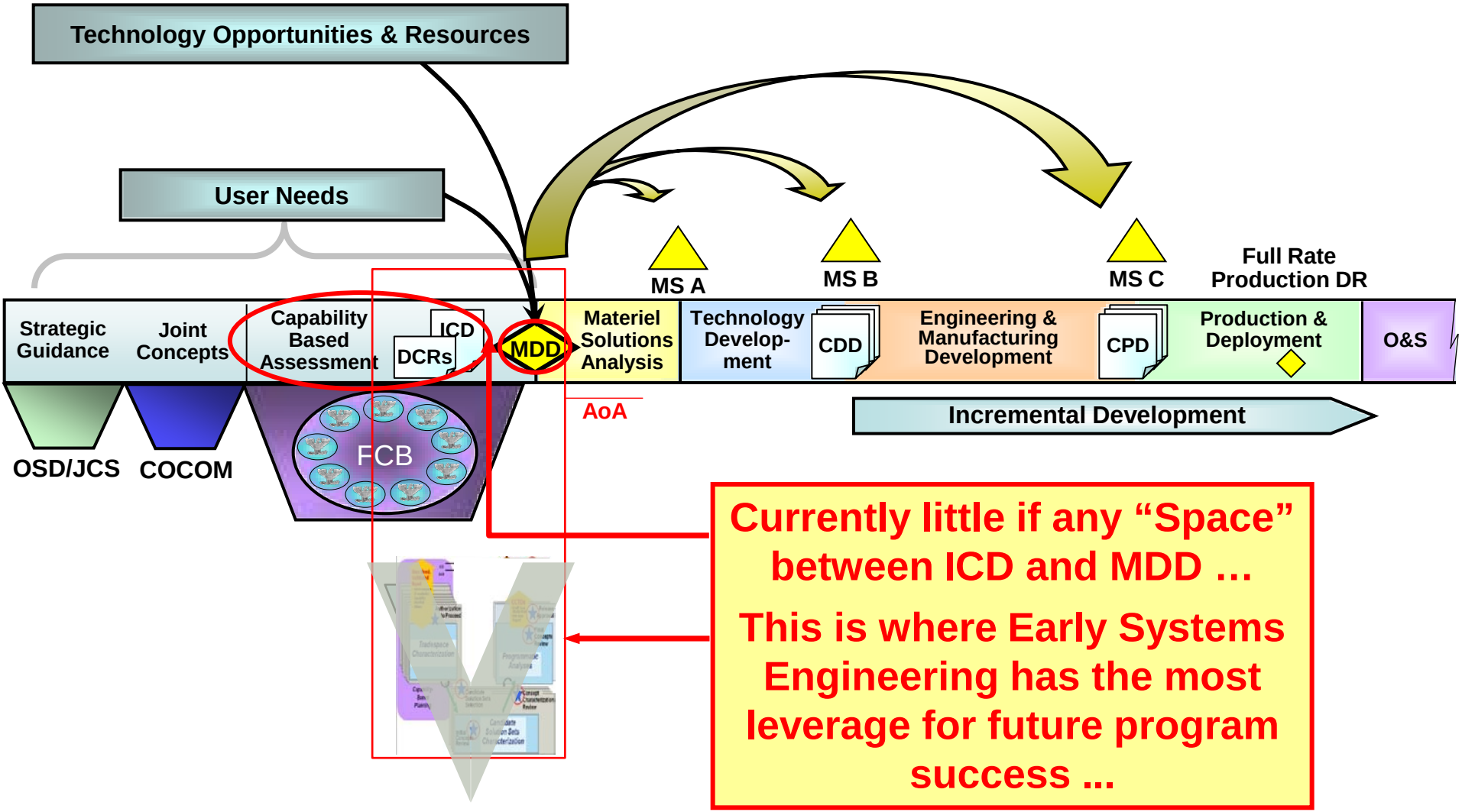
Current State

Filling the Gap Between CBA and MDD



Currently little if any "Space" between ICD and MDD …

This is where Early Systems Engineering has the most leverage for future program success ...

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Early Systems Engineering Vision

- ***Disciplined, repeatable processes*** **from JCIDS CBA (pre-ICD) to AoA; Pre-MDD Focus**
  - Inform decision makers on technical feasibility of prospective concepts for materiel solutions
  - Initial integrated risk assessment addressing both operational and programmatic issues
- **Support realistic program formulation through application of early Systems Engineering**
  - Robust and disciplined up-front technical planning
  - Solid technical foundation for the future program
  - Reduce the chances of poorly planned concepts emerging from AoA with relatively high rankings
  - Extensive user/developer collaboration early & throughout lifecycle

Clear, Actionable Policy & Process

Early Systems Engineering, Capability Planning, Development Planning, and 5000.02

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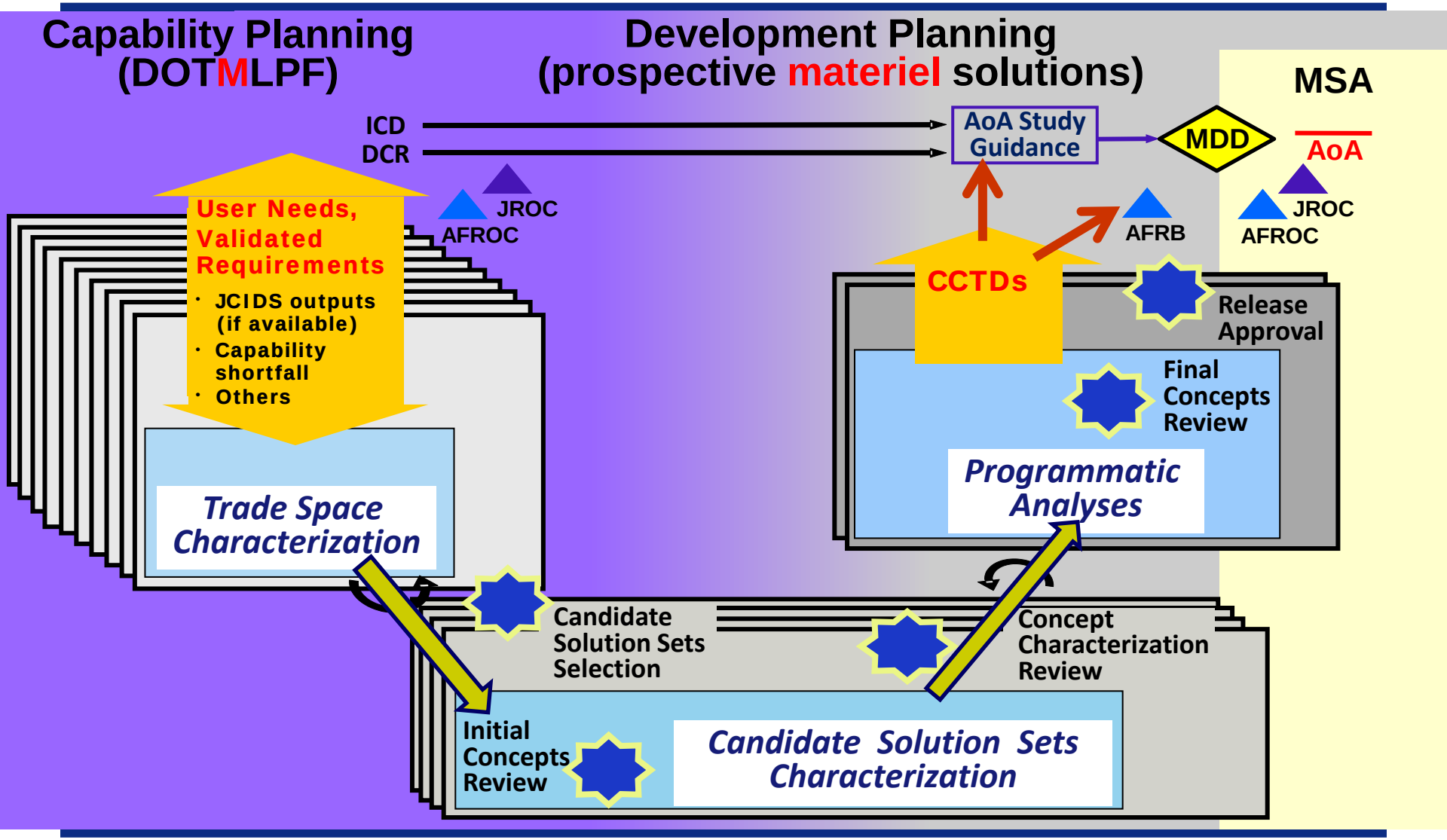

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Concept Characterization & Technical Description Elements

1. Mission / Capability Need Statement / CONOPS
2. Concept Overview
3. Trade Space Definition / Characterization
4. Studies, Analyses, Experiments
5. Concept Characterization / Design
6. Program Characterization
7. Risk Assessment
8. DOT_LPF Implications
9. Conclusions (Capability Description; Traceability to Need Statement)

Tailored to meet MDD needs
Tailored to timeline needed to support decision

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CCTD Summary

- **Supports AoA Study Guidance and MDD**
- **Documents application of disciplined early Systems Engineering processes**
  - Serves as “concept spec” or initial technical baseline
- **“Living document” that later supports development of**
  - Technical Requirements Document (TRD)
  - System Requirements Document (SRD)
- **Generally executed by Product Center Capability Development / Planning / Integration offices (XR)**
  - Assistance from decision makers, user, HAF/A5, AFMC/A5, AFMC/EN, Center/EN, AFRL, others

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Path Ahead

- **IN WORK**
  - **Institutionalize CCTD process across Product Centers**
  - **Clarify CCTD descriptions; develop Guidebook**
    - Simplify implementation
    - Provide template for authors to follow
  - **Update Early SE Guide – set and enforce policy**
  - **Address resource requirements**
- **FUTURE**
  - **Flesh out "Collaborative Development Centers" concept for use across all Product Centers**

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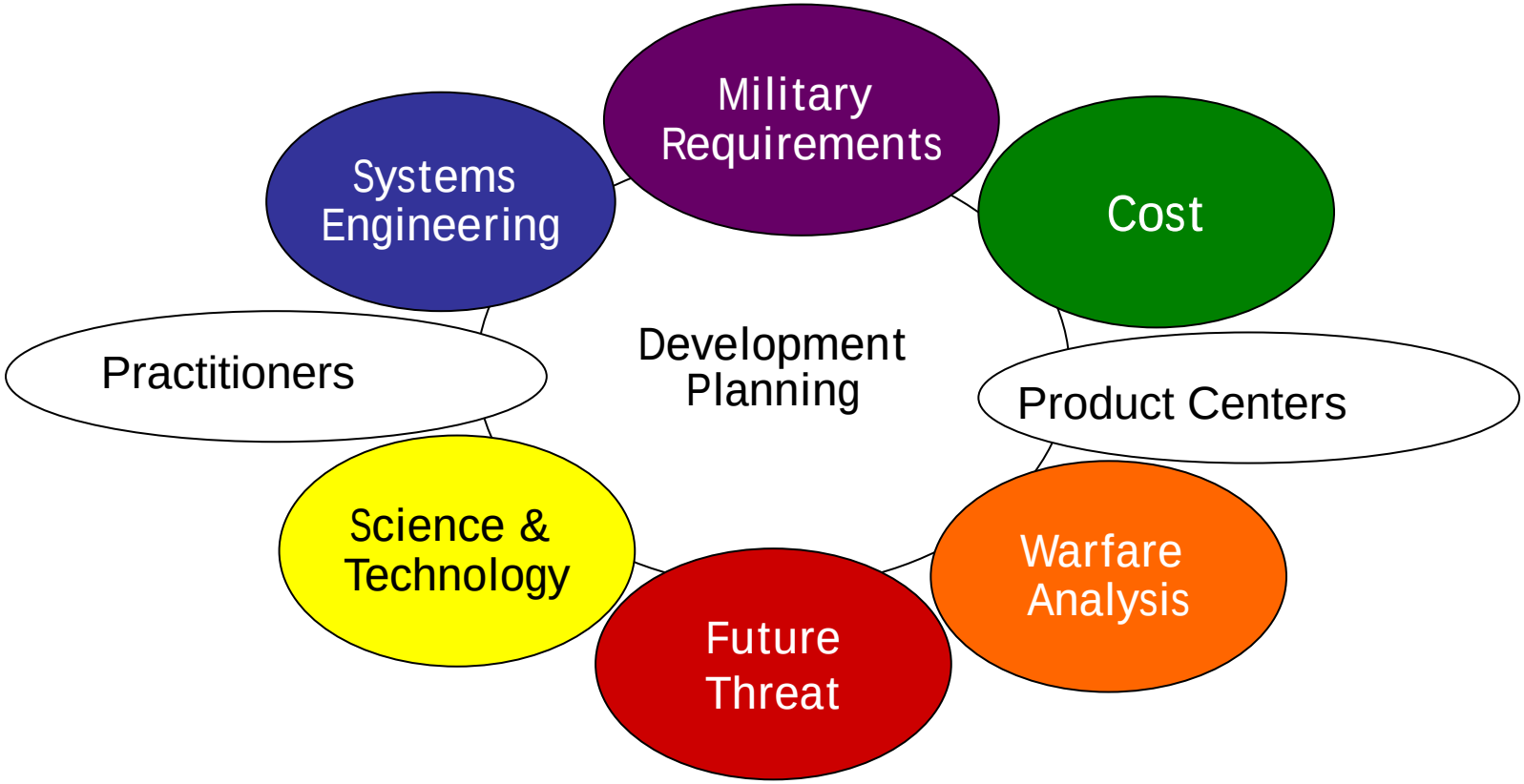
Conclusion: Development Planning Is A Team Sport!



- To be effective, development planning is a collaboration among communities
- Systems engineering provides a structured, disciplined approach as a basis for this collaboration

Prevent This!

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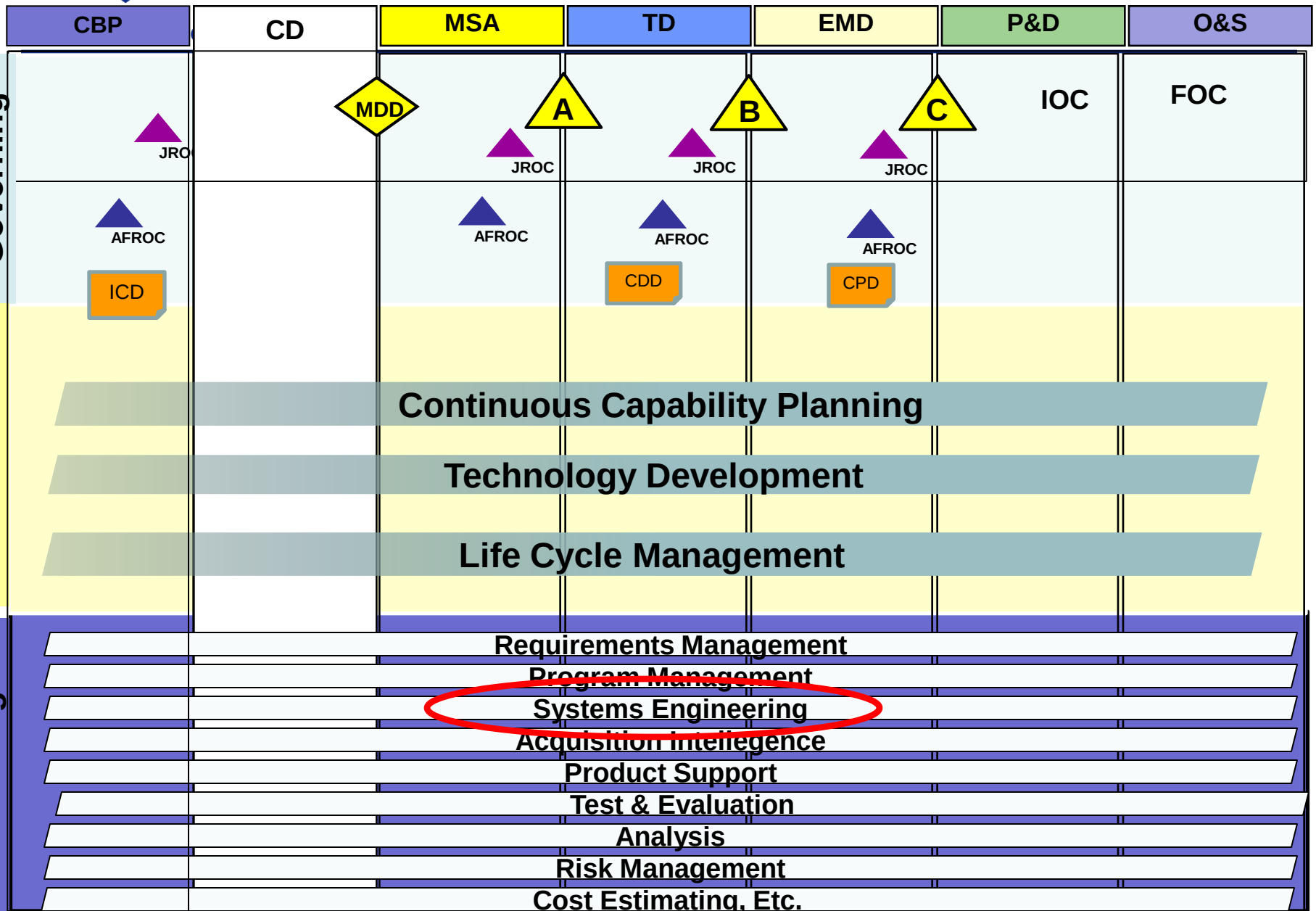
Backup

SE Is One of Many Enabling Processes



Development Planning

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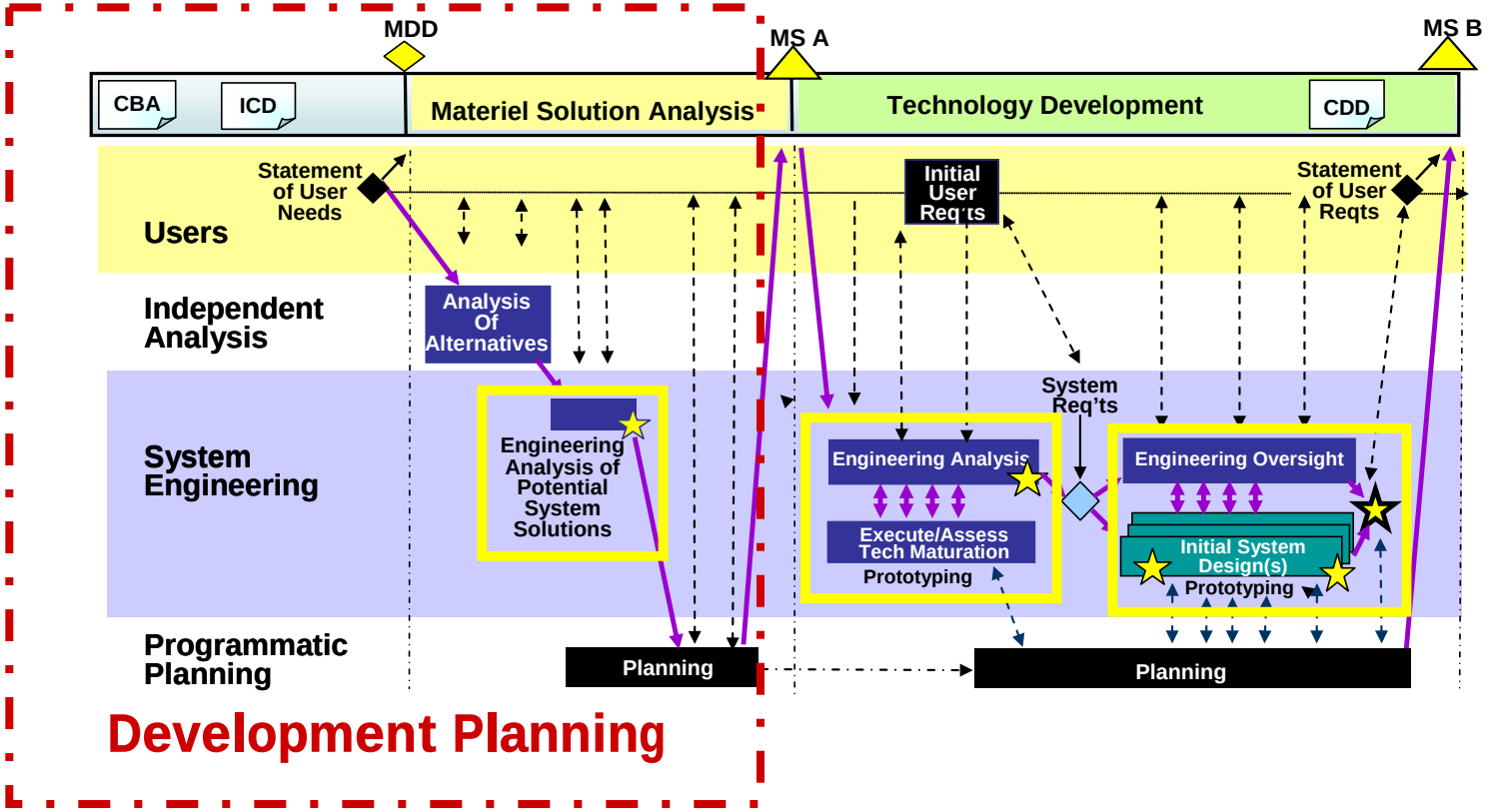

- Begins before acquisition
- Natural application of systems engineering process
- Ensures that alternative system approaches evaluated during MSA are validated

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Where Does Development Planning Fit?

Needs and Opportunities

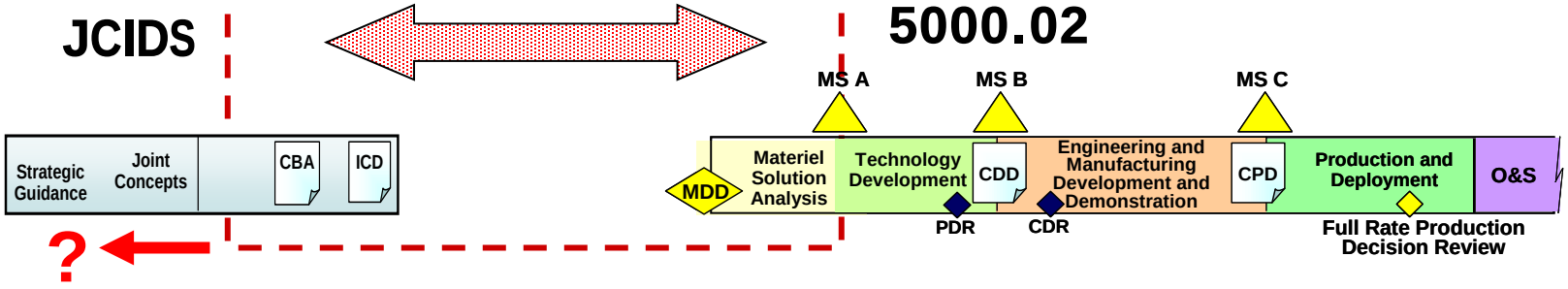
- IPL
- Urgent Need
- New Threat
- New Technology
- New Strategic Direction
- JCIDS

Viable Solutions

Translating User Needs and Opportunities Into Viable Solutions

Delivery Options

- Rapid Fielding
- Technology Refresh
- O&S Upgrade
- Experimentation
- JCTDs
- 5000.02



- Applies more broadly than JCIDS to 5000.02 acquisition

NDIA 12th Annual Systems Engineering Conference

Chief Engineer Panel

27 October 2009

Mr. Carl R. Siel, Jr.
ASN(RDA) Chief Systems Engineer
carl.siel@navy.mil

Topics

RDA CHIEF SYSTEMS ENGINEER

- DoD 5000 and Weapon System Acq Reform Act
- DoN Acquisition Governance
- Mission Level System Engineering
- System Engineering Workforce

Acquisition Areas of Emphasis

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- DODI 5000.02
  - Earlier definition of requirements KPP/KSA feasibility
  - Technology Development Strategy and System Engineering
  - Use of prototyping during TD phase
  - T&E Strategy
  - Total Ownership Cost
  - Cost Estimates to Budget
  - Sustainment / Logistic Planning and Execution
  - RMA considerations

- Weapon System Acquisition Reform Act
  - Development and tracking of measurable performance criteria
  - Competitive prototyping
  - Role of systems engineering in development planning, lifecycle management and sustainability
  - Completion and MDA assessment of system level Preliminary Design Review before MS B

DoN Acquisition Governance

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- The Secretary of the Navy
  - Comprehensive review of the Acquisition process
  - Challenges in Program Planning and Execution.
- Enhance the Acquisition Governance process
  - Inject Early Senior Leadership
  - Continuous Engagement and Transparency
- Increase discipline during each phase of Program Maturity
- Codified by SECNAVNOTE on 26 February 2008

“Two Pass / Six Gate”

DoN Acquisition Governance

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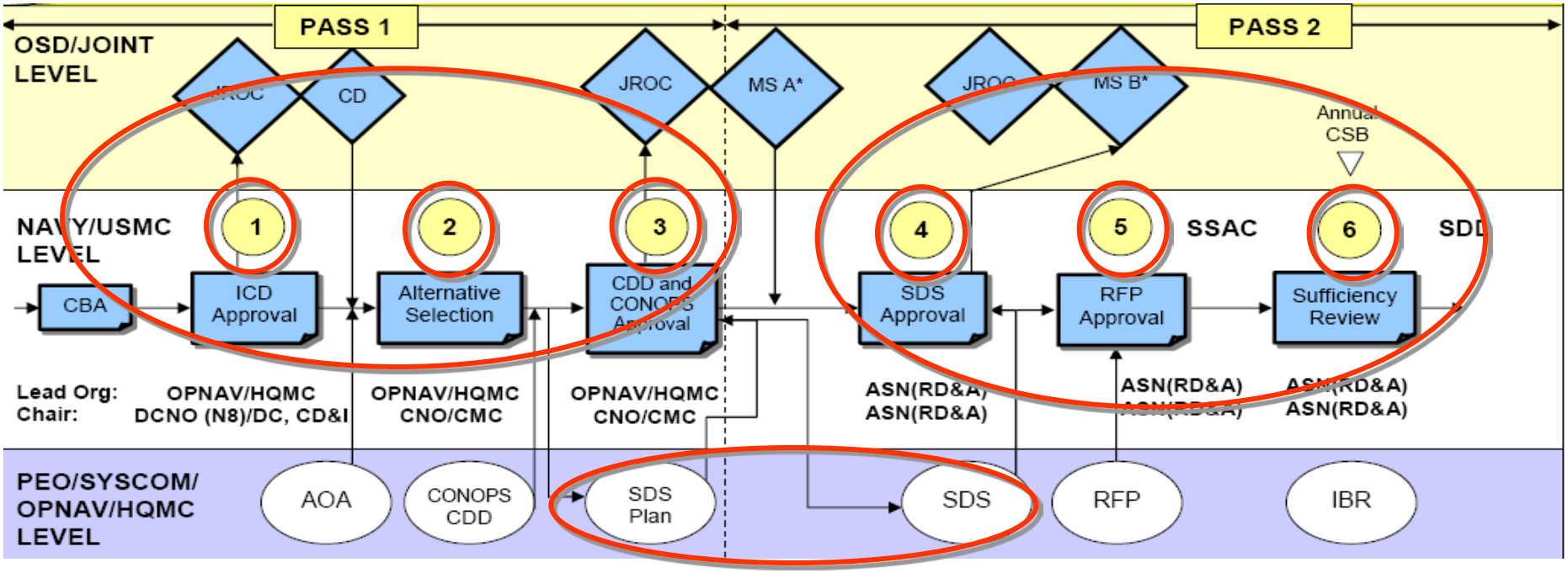

- First Pass - Requirements Establishment
- Second Pass - Acquisition Execution
- Gates - Reviews to Assess Readiness to Proceed
- System Design Specification - Capability and Performance Expectations

Gate Review Process Updates to Align with DoD 5000 and WSARA

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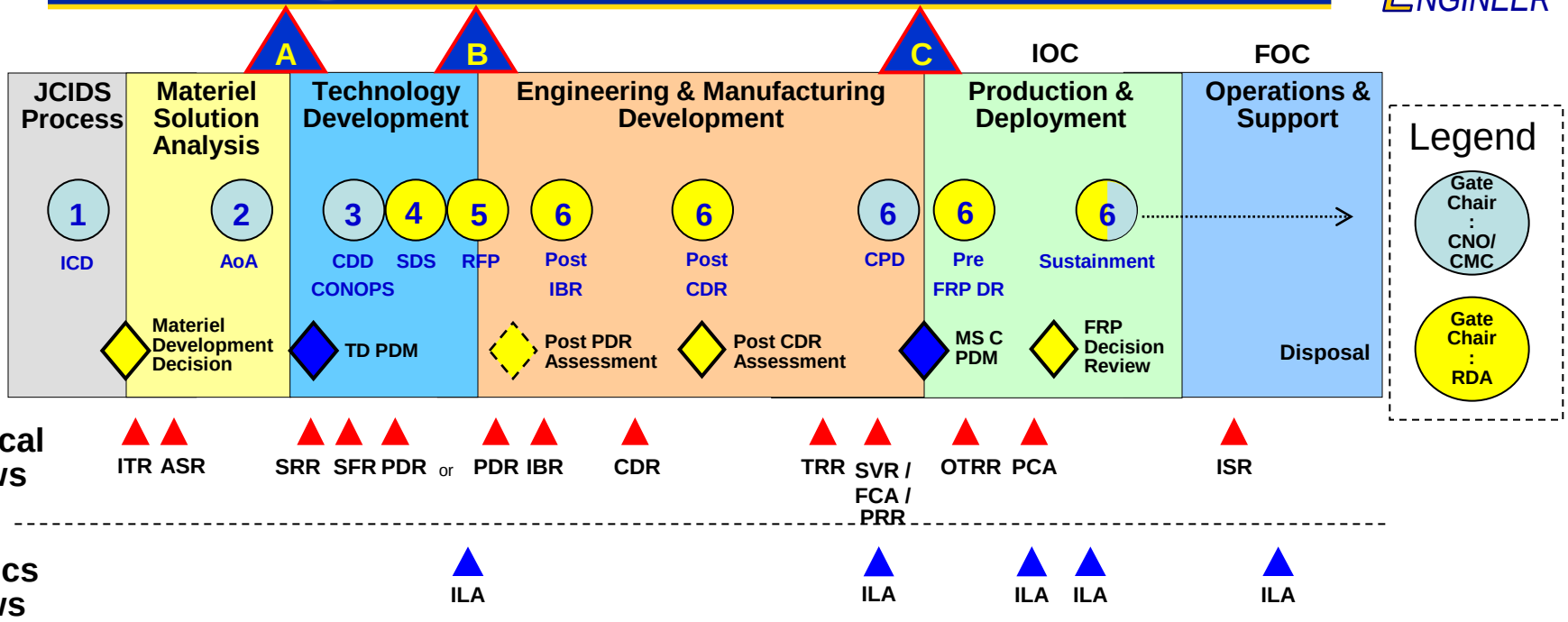

- Total Ownership Costs
  - Affordability assessments earlier
- Life Cycle Sustainment Planning and Execution including RMA
- Operational Manpower Estimates

- Program and Technical Baseline
  - Earlier look at KPP / KSA feasibility
  - Emphasis on Prototyping, Tech Development, and System Engineering
- Dev, Integrated, and Operational T&E Planning and Execution
  - T&E Deficiency resolution

Naval Probability of Program Success v2

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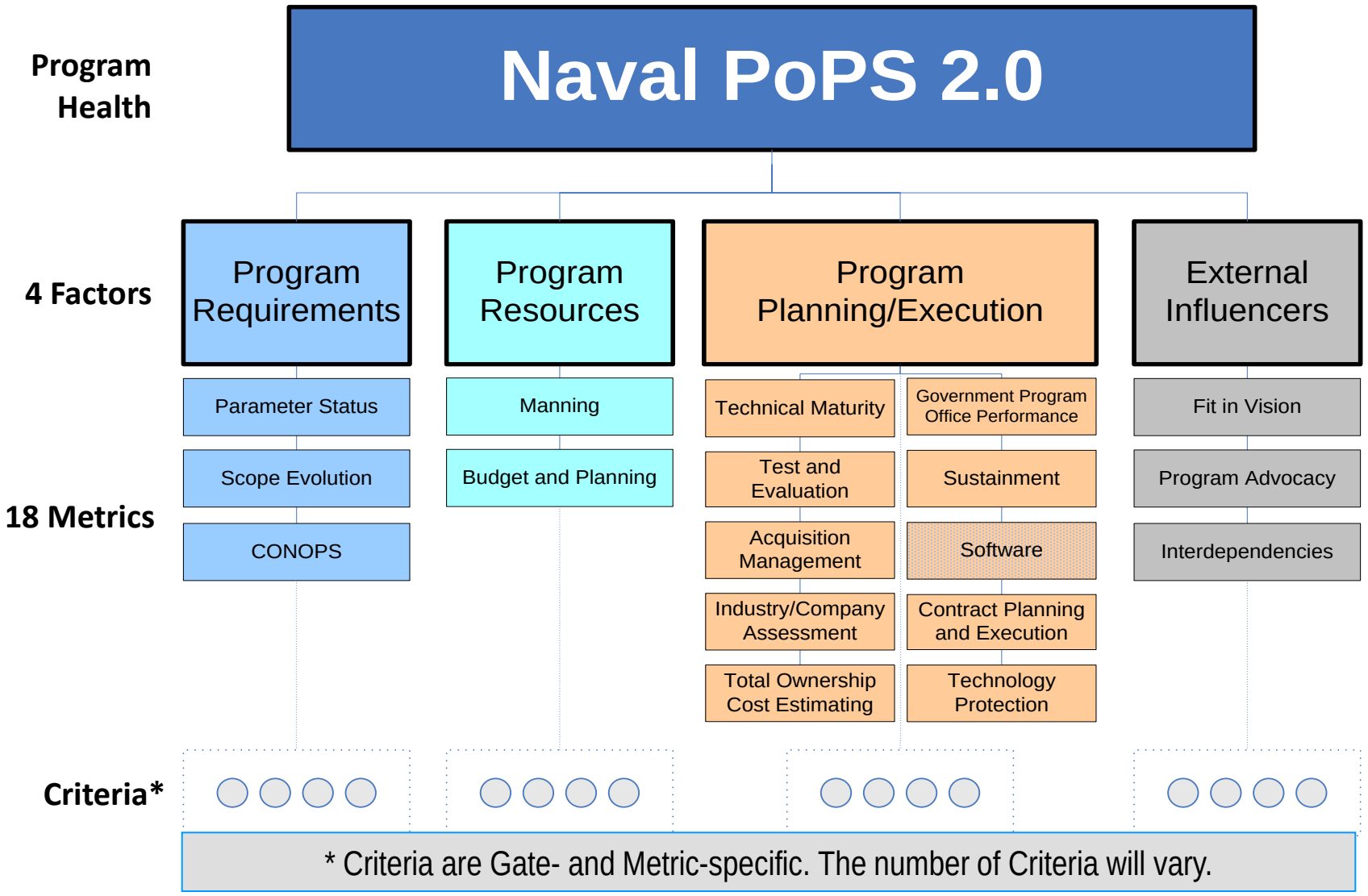

Net-Centric Integration and Interoperability

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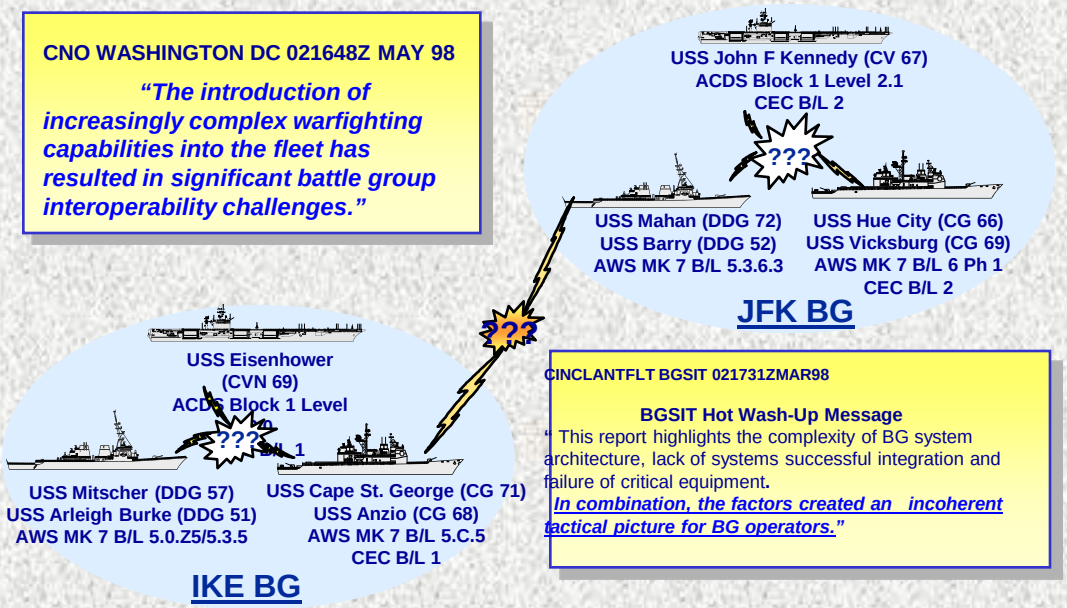
Navy Battle Group Operations: 1997 - 1998

CNO WASHINGTON DC 021648Z MAY 98

"The introduction of increasingly complex warfighting capabilities into the fleet has resulted in significant battle group interoperability challenges."



CINCLANTFLT BGSIT 021731ZMAR98

BGSIT Hot Wash-Up Message

"This report highlights the complexity of BG system architecture, lack of systems successful integration and failure of critical equipment. ***In combination, the factors created an incoherent tactical picture for BG operators."***

Impact of System Deficiencies:

- *Disrupted CINC Deployment Plans*
- *Perturbated Program Execution Budget and Timelines*
- *Caused Nearly 10% Program Growth*

What's Needed? . . . *Elevating Systems Engineering to a New Level ……..the Mission Level*

Engineering at the Mission Level

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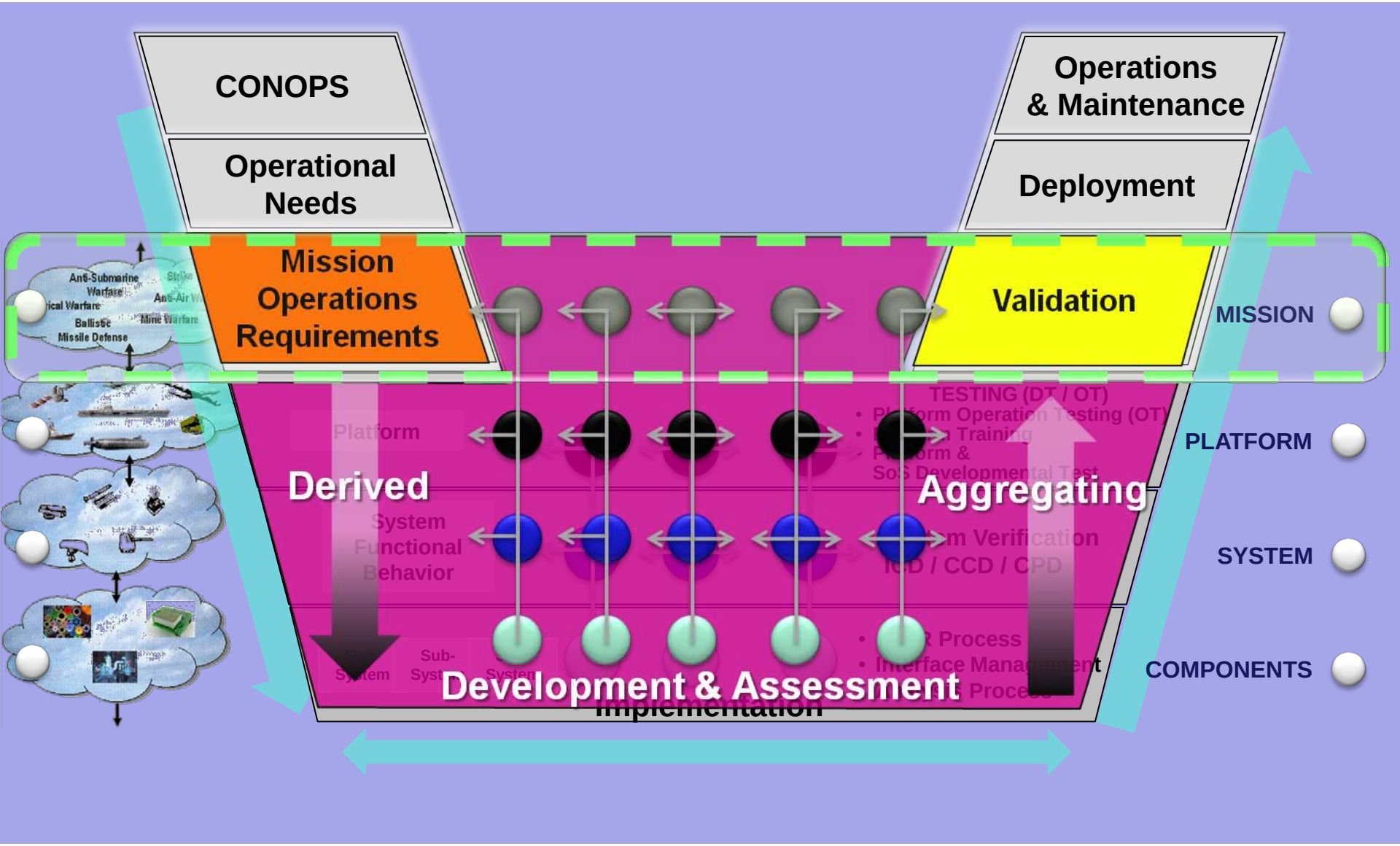

Engineering Practices at the Mission Level

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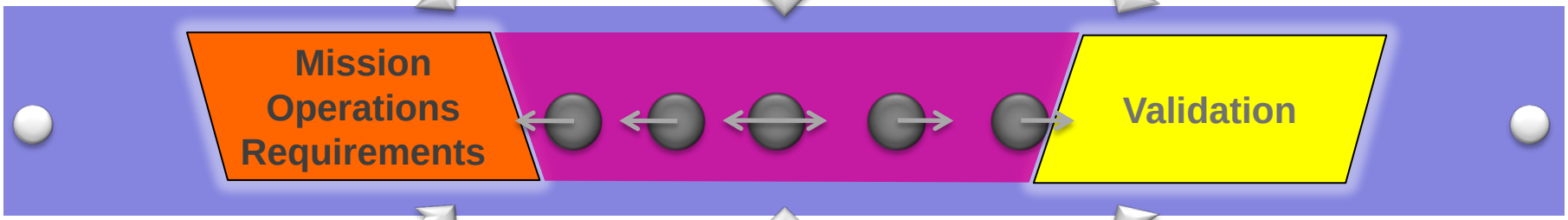
Net-Centric Integration & Interoperability

- ISP Review
- NR KPP Guidebook
- **DODAF Usability For Engineers**
  - -Architecture Data Elements
  - -Architecture Repository
  - -Architecture Hierarchy
- Mission/SoS Engineering Guidebook
- Mission Area CHENGs



Leveraging Modeling and Simulation

- Large Scale Capability Assessments
- COTF/MCOTEA – Test in the intended Environment

Meta Data Strategy
Analysis – Engineering – T&E Community

- Mission Threads
- Mission Based Test Scripts
- Use of Live Virtual Constructive Environment

The Engineering Workforce

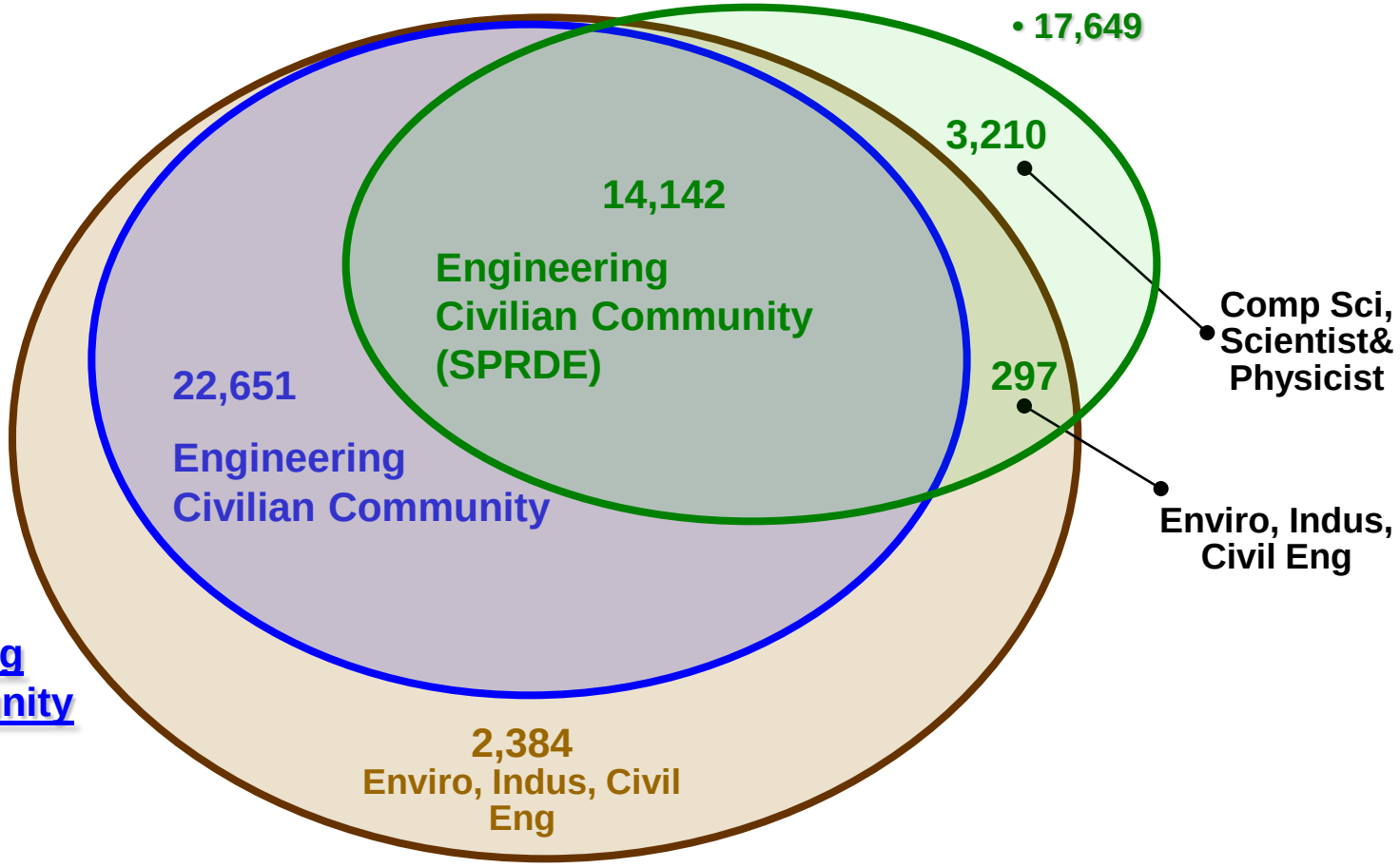
RDA CHIEF SYSTEMS ENGINEER

All Engineering Occupations (08xx)

- 39,474

Systems Planning, Research, Development & Engineering (SPRDE)

- 17,649



DoN Engineering Civilian Community

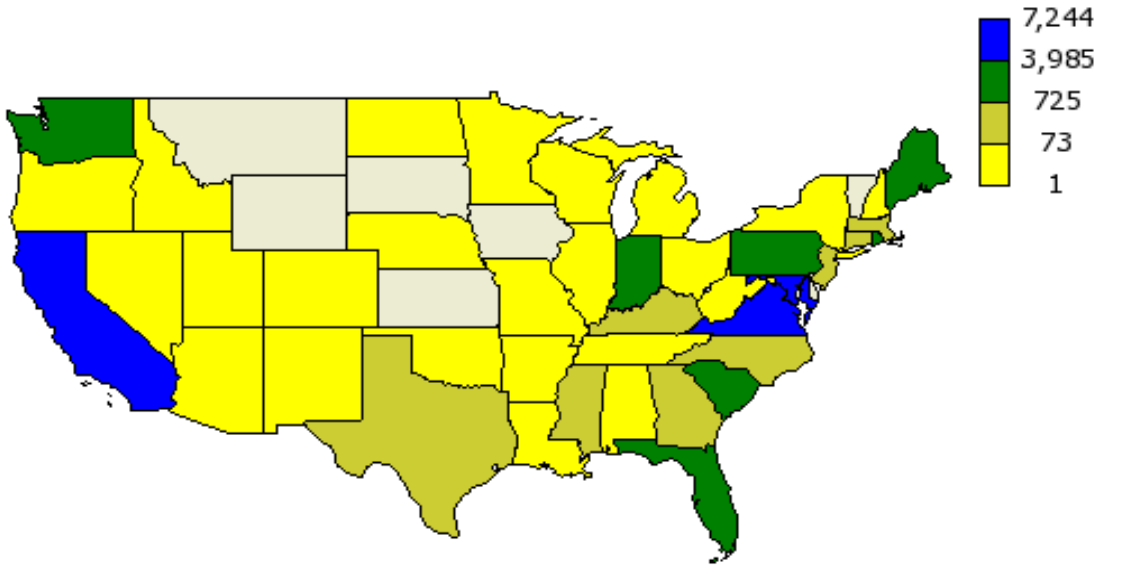
- 36,793

Figuring Out Who We Are Managing

OPM, DAWIA and Other Grouping Constructs

Engineering Community Workforce Geographic Location

RDA CHIEF SYSTEMS ENGINEER



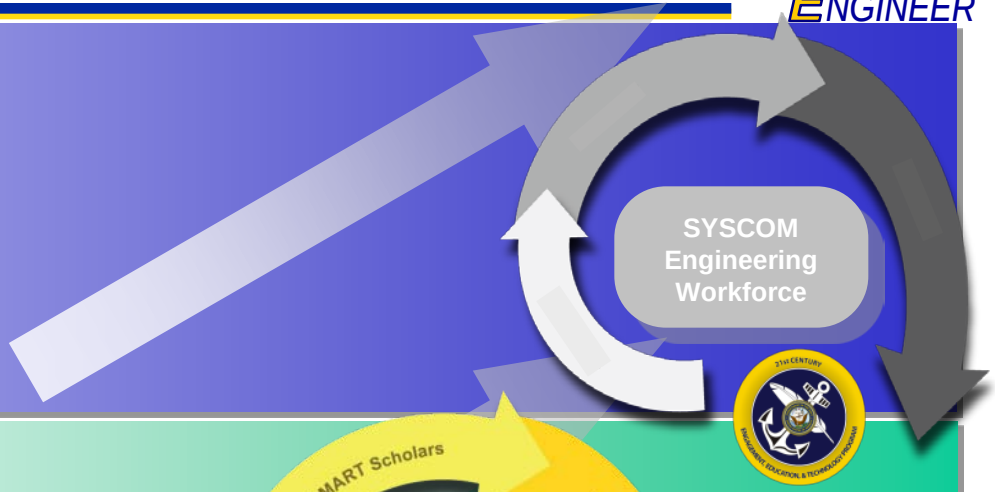
Alabama	17	Indiana	1627	Nebraska	2	Rhode Island	1613
Arizona	58	Iowa	0	Nevada	33	South Carolina	977
Arkansas	1	Kansas	0	New Hampshire	4	South Dakota	0
California	7243	Kentuckzy	0	New Jersey	669	Tennessee	28
Colorado	0	Louisiana	40	New Mexico	18	Texas	81
Connecticut	137	Maine	1309	New York	19	Utah	12
Delaware	0	Maryland	4630	North Carolina	621	Vermont	0
District of Columbia	2082	Massachusetts	85	North Dakota	1	Virginia	6001
Florida	1832	Michigan	1	Ohio	3	Washington	2755
Georgia	201	Minnesota	0	Oklahoma	11	West Virginia	9
Idaho	31	Mississippi	305	Oregon	2	Wisconsin	2
Illinois	55	Missouri	14	Pennsylvania	1228	Wyoming	0
Data Current as of March 2009						CONUS Total	33,757
						OCONUS Total	1,682
						Grand Total	35,439

Workforce Development Continuum

RDA CHIEF SYSTEMS ENGINEER

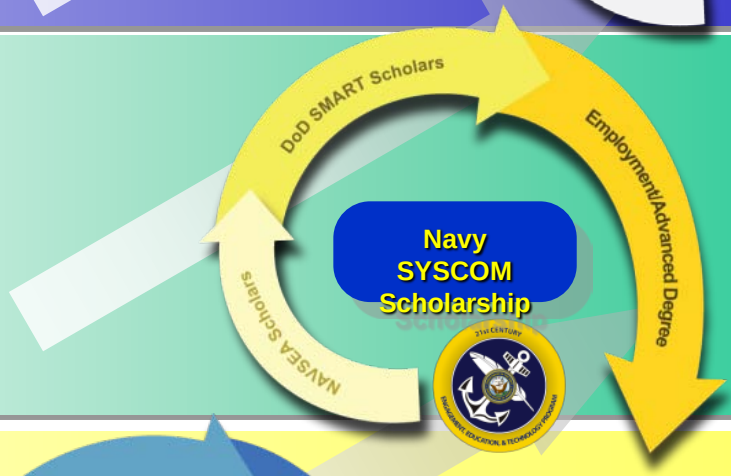
In-Service Workforce

- Job Assignments
- Work Experience
- DAWIA Certification
- Graduate Education
- Other Training



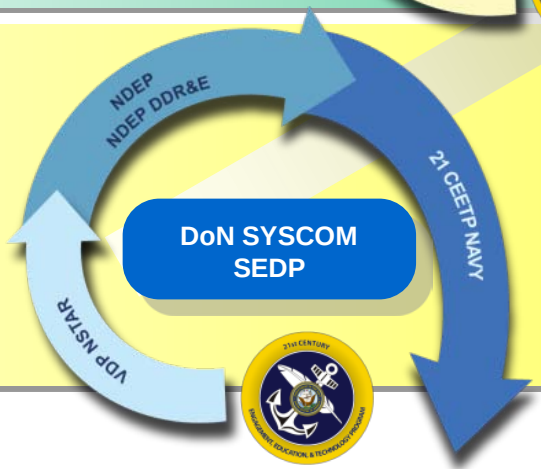
Undergraduate Workforce

- COOP/Summer Jobs
- Internships
- Scholarships
- Collaborative Research
- Recruiting



Future Workforce (K-12)

- Tutoring
- Competitions (Robotics, ROVs, etc)
- Science Fairs
- Influencing Educators / Curriculum



CHIEF / LEAD SYSTEMS ENGINEER
Training, Qualification & Certification Program

RDA CHIEF SYSTEMS ENGINEER

DOD TRAINING

SPRDE
SE/PSE
LEVEL I/II/III

DoN EDUCATION

GRADUATE
SE/ENG
COURSES

DoN SE TRAINING

- Naval SE Guide
- SEP Development
- Technical Authority
- ECPs for Engineers
- Leadership
- Communication
- SYSCOM Unique Courses

PERFORMANCE

DoN TWH CERTIFIES

SYSCOM
CHIEF /LEAD
SYSTEMS
ENGINEER

- DEMONSTRATED ABILITY TO PLAN and IMPLEMENT ENGINEERING PROCESSES
- BREADTH AND DEPTH OF TECHNICAL EXPERIENCE
- 8-10 YEARS OF EXPERIENCE

Naval Systems

RDA CHIEF SYSTEMS ENGINEER

SHIPS AND AIRCRAFTCARRIERS

SUBMARINES

AIRCRAFT

C4ISR SYSTEMS

WEAPON SYSTEMS

LAND COMBAT SYSTEMS

Questions?

"Engineering": Overlapping Taxonomies

Each of the "Engineering" workforces is defined by a separate taxonomy:

"0800-Engineering & Architecture" is *1 of 23* white collar occupational groups

- Source: OPM's Handbook of Occupational Groups and Families
- Scope: Covers Federal civilian workforce

Occupational Group *- A major category of white collar occupations, embracing a group of associated or related occupations; e.g., the Engineering and Architecture Group, GS −0800....*

"Engineering Civilian Community" is *1 of 22* Navy Civilian Communities

- Source: Civilian Community Management's Community Definition (also adopted by CHR)
- Scope: Covers Navy civilian workforce

Community *- A subset of the organization's workforce, grouped from the highest organizational perspective by similarity of occupation, competencies, and career experience. The purpose of communities is to cultivate and manage a set of skills in the workforce, across the programs, lines of business, departments, or lower level organizational units.*

"Systems Planning, Research, Development, & Engineering" is 3 of 15 DoD/DoN AT&L Position Categories

- Source: DoD/DoN DAWIA Operating Guides
- Scope: Covers DoD/DoN active, reserve, and civilian acquisition workforce

Position Category *- subsets of AT&L positions that are characterized by a common set of core acquisition and functional competencies.*

Taxonomies: Authority/Policy

"0800-Engineering & Architecture" –
part of OPM's Occupational Definition

- US Code, Title 5

"Engineering Civilian Community" –
part of Navy Civilian Community Management (N111)'s Community Definition

- CEB Decision Memo (Jul 01)
- OPNAVNOTE 5430
- TFPM MOA, dated May 14, 2008

"Systems Planning, Research, Development, & Engineering" –
part of DoD/DoN's AT&L Position Categories

- DAWIA – Defense Acquisition Workforce Act (US Code, Title 10, Chapter 87)
- DOD DAWIA Operating Guide
- DoN DAWIA Operating Guide

***Related Efforts**:*

- *OSD/Component Functional Community Managers (CFCM)*
  - *DODI 1400.25*
- *SECNAVINST on Civilian Competencies and Community Management*
  - *Draft in routing*

Weapon Systems Acquisition Reform Act (WSARA) 2009

OSD Systems Engineering Perspective

Mr. Nicholas Torelli

October 27, 2009

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WSARA: Two Positions Established: Directors of DT&E and Systems Engineering

Adds new section to US Code Title 10, Chapter 4: Sec. 139d. Director of Developmental Test and Evaluation; Director of Systems Engineering: joint guidance

- **Director of Developmental Test and Evaluation (DT&E) AND Director of Systems Engineering appointed by the Secretary of Defense; report to USD(AT&L)**
- **Principal advisors to SecDef and USD(AT&L) on developmental test and evaluation AND on systems engineering and development planning, respectively in DoD**
- **Two Directors will closely coordinate to ensure that the developmental test and evaluation activities of DoD are fully integrated into and consistent with the systems engineering and development planning processes of the Department**

Systems Engineering Duties:
Establish Policy and Guidance

- Use of systems engineering principles and best practices, generally;
- Use of systems engineering approaches to enhance reliability, availability, and maintainability (RAM) on major defense acquisition programs (MDAPs);
- Development of SEPs for MDAPs including systems engineering considerations in support of lifecycle management and sustainability; and
- Inclusion of provisions relating to systems engineering and reliability growth in requests for proposals;

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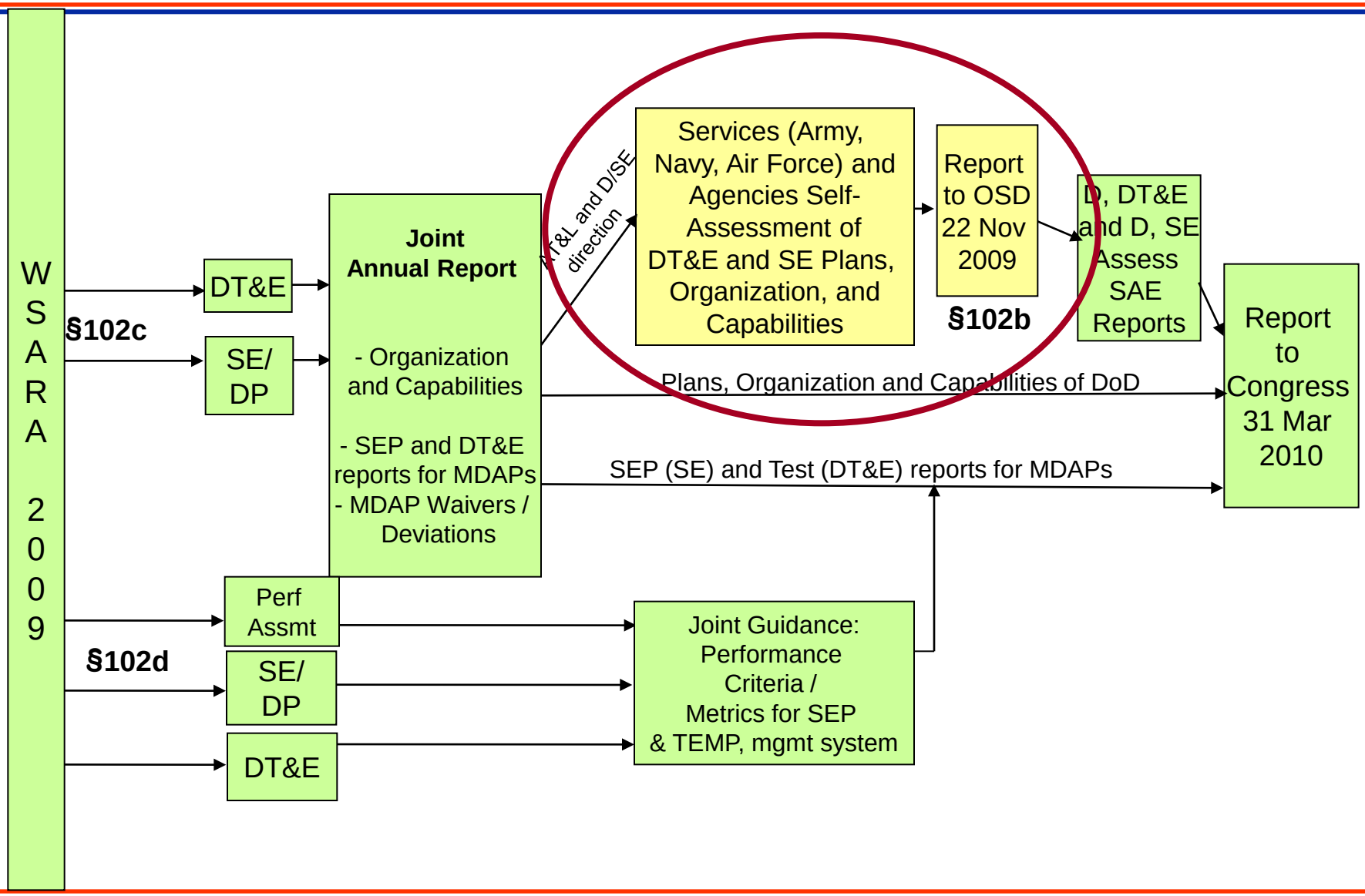
Systems Engineering Duties:
Review and Oversight

- Review and approve the SEP for each MDAP;
- Monitor and review the systems engineering and development planning activities of the MDAPs;
- Provide advocacy, oversight, and guidance to elements of the acquisition workforce responsible for systems engineering, development planning, and lifecycle management and sustainability functions;
- Provide input on the inclusion of systems engineering requirements in the process for consideration of joint military requirements by the Joint Requirements Oversight Council, including specific input relating to each capabilities development document;
- Periodically review the organizations and capabilities of the military departments with respect to systems engineering, development planning, and lifecycle management and sustainability, and identify needed changes or improvements to such organizations and capabilities

WSARA: Roadmap for 2010 Joint Report



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DoD Developmental Test and Evaluation and Systems Engineering Joint Annual Report Outline

1.0 Executive Summary

2.0 Introduction

3.0 Overview of Military Department Assessments

4.0 Assessments of Military Departments' Developmental Test & Evaluation

5.0 Assessments of Military Departments' Systems Engineering

6.0 OSD/DT&E Activities & Oversight Functions

7.0 OSD/SE Activities and Oversight Functions

8.0 Assessments of MDAPs

9.0 SECDEF Comments

10.0 Acronyms

Proposed MDAPs for Joint Report - SE

- **Air Force**
  - BCS-F Inc 3 (Battle Control System-Fixed Increment 3)
  - C-130 AMP (C-130 Aircraft Avionics Modernization Program)
  - CITS (Combat Information Transport System)
  - HC/MC-130 (HC/MC-130 Recapitalization Program)
  - ISPAN Bk 1 (Integrated Strategic Planning and Analysis Network-Block 1)
  - MPS I-III (Mission Planning Systems Increments I-III)
  - SDB II (Small Diameter Bomb Increment II)
- **Army**
  - ACS (Aerial Common Sensor)
  - FCS (Future Combat Systems)
  - IAMD (Army Integrated Air Missile Defense)
- **Navy**
  - CH-53K (Heavy Lift Replacement Program)
  - H-1 UPGRADES (4BW/4BN) (Unite States Marine Corps Mid-lifeUpgrade to AH-1W Attack Helicopter and UH-1N Utility Helicopter)
  - JHSV (Joint High Speed Vessel)
  - SM-6 (Standard Missile-6)
  - SSC (Ship-to-Shore Connector)
  - SSN 774 (VIRGINIA Class Submarine)
- **Joint**
  - JCA (Joint Cargo Aircraft)-Army Executive Agent
  - JTRS GMR (Joint Tactical Radio System Ground Mobile Radio)
  - MIDS (Multi-Functional Information Distribution System (Includes Low Volume Terminal and Joint Tactical Radio System))

DRAFT

WSARA Report
Near-Term Schedule

Near Term

- ✓**June 26 / June 30 / July 8 :** OSD SE/DT&E Planning Meetings
- ✓**July 15:** first Working Group meeting with Components
- ✓**July 21:** SE Forum – Briefed SE Component Leaders on plan
- ✓**Aug 10:** Memo staffed through DDR&E to USD (AT&L)
- ✓**Aug 13:** USD(AT&L) Memo to Components to support Joint Report Congressional timeline
- ✓**Aug 24**: D/SE Memo to Components to support SE portion of Congressional Report timeline
- ✓**Aug 26**: D,MA meeting to establish WSARA Policy and Guidance WG
- ✓**Sept 3:** D,SE update meeting
- ✓**Sept 15:** WSARA OSD Working Group (OWG) meeting
- ✓**Sept 18:** Kickoff with Components on actual SE reporting requirements
- ✓**Sept:** Initial DP/SE/DT&E meeting for Section 102d Reporting Requirements
- ✓**October 1**: OSD/SE work on OSD portion of report; working with DT&E
- ✓**October 6:** SE Forum - Status update to Component Leaders
- **November 17:** SE Forum - Status update to Component Leaders
- **November 22:** Components' Reports submitted to OSD/SE (and OSD/DT&E)

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WSARA Report
Longer-Term Schedule

- **November 22, 2009:** Services provide baseline organization assessments and plans to OSD / SE and DT&E
- **November 2009 – January 2010:** Development of Draft Joint Report
  - D/DT&E and D/SE review Service assessments for Congressional Report
  - Components provide 15 min briefs on the submitted reports (Target: **December 11, 2009**)
  - OSD Writers Draft Sections 2–8
  - WSARA DT&E/SE JAT Completes Initial Draft Report Review (Target: December 23, 2009)
- **January 2010:** Draft Congressional Report
  - **SE Forum updates on WSARA report status in January / February / March**
- **March 2010:** Submit Congressional Report
- **Post-March 2010:** Obtain Congressional feedback and initiate plans for 2011 report accordingly

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DoD Systems Engineering

Mr. Stephen Welby
Director, Systems Engineering
Office of the Director, Defense Research and Engineering

12th Annual NDIA Systems Engineering Conference
October 27, 2009

Support from the Top for Change

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 SECDEF and the USD(AT&L)
- 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

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)
MDA – Milestone Decision Authority

Director, Systems Engineering

Director, Systems Engineering
Steve Welby

Terry Jaggers, Principal Deputy

Systems Analysis
Kristen Baldwin

- System Complexity Analysis
- Red Teaming
- Modeling & Simulation Coordination Office
- Development Planning
- SE for Systems of Systems
- Program Protection/Acquisition Cyber Security
- SE Research Center

Major Program Support
James Thompson

- Program Support Reviews
- Systems Engineering Plans
- Program Technical Auditing
- OIPT/DAB/DSAB Support
- DAES Database Analysis and Support
- Performance Measurement
- Systemic Root Cause Analysis

Mission Assurance
Nicholas Torelli

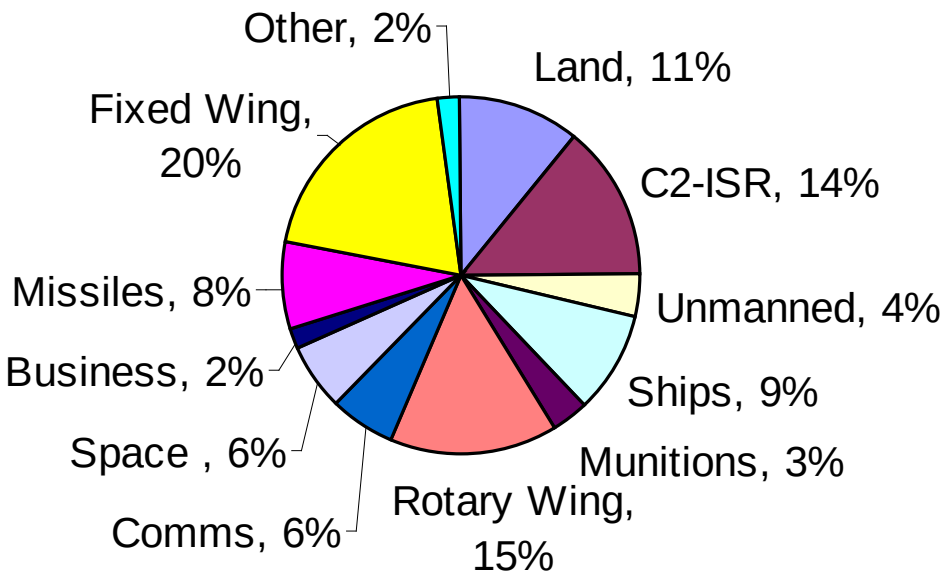
- Systems and Software Engineering Policy, Guidance, Standards
- System Safety
- Reliability, Availability, Maintainability
- Quality, Manufacturing, Producibility
- Human Systems Integration (HSI)
- Technical Workforce Development
- Organizational Capability Assessment (WSARA)

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

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
Total		274

% 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

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Systems Engineering Contributions to Acquisition

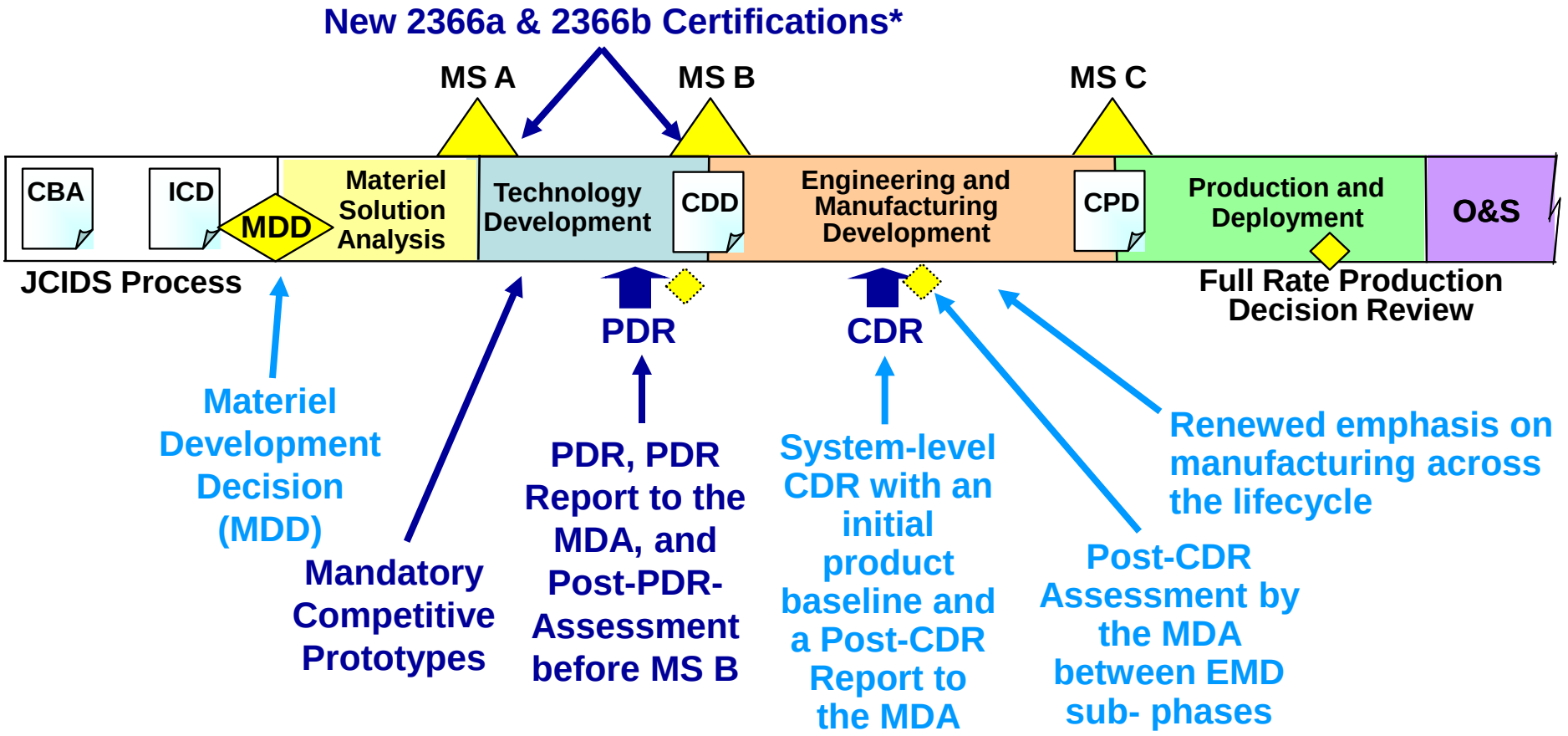
- Systems-level technical leadership
- Risk identification and management
- Interface management
- Life cycle focus
- Robust exploration of the need
- Achievable system design
- Integration of technical disciplines

Systems Engineering Mission

Execute substantive technical engagement throughout the acquisition life cycle with major and selected acquisition efforts across DoD to apply best Systems Engineering practices to:

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

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



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

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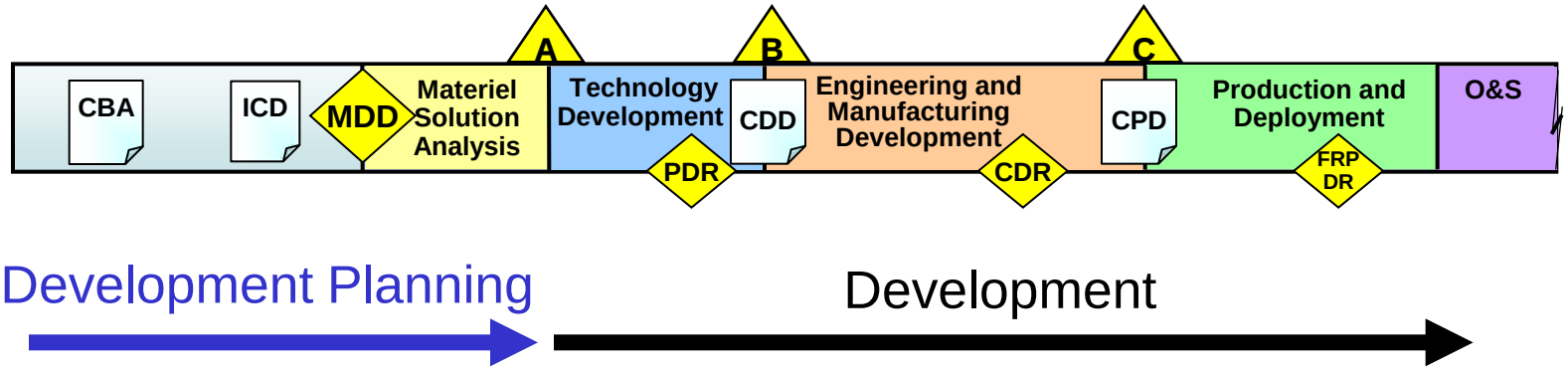
* Director, SE supports MDA certifications including PDR Report assessment at MS B

New Emphasis on Development Planning and Early Systems Engineering



CBA: Capabilities Based Assessment
CDD: Capability Development Document
CDR: Critical Design Review
CPD: Capability Production Document
DP: Development Planning
FRP DR: Full-Rate Production Decision Review
ICD: Initial Capabilities Document
MDD: Materiel Development Decision
O&S: Operations and Support
PDR: Preliminary Design Review

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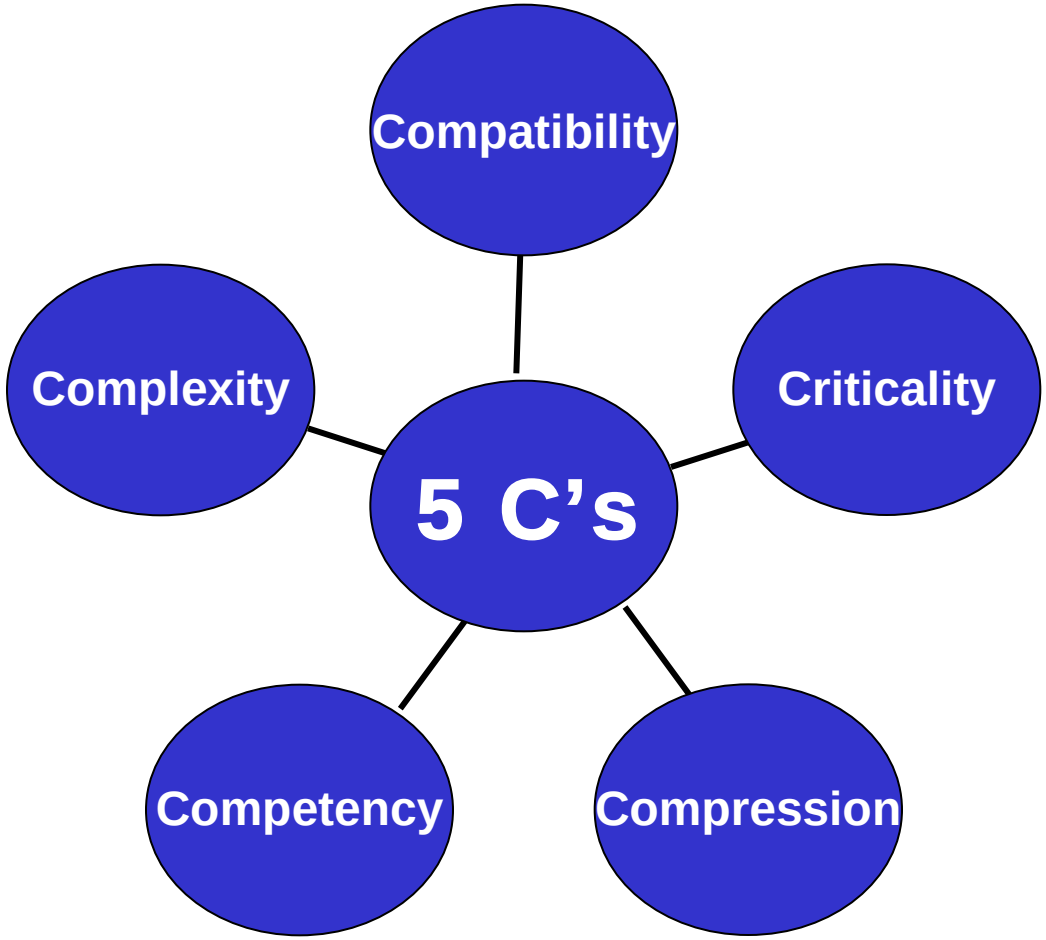
The Current Systems Engineering Environment



Systems Engineers confront a spectrum of issues that challenge "traditional" systems engineering

DDR&E Imperatives

1. Accelerate delivery of technical capabilities to win the current fight
2. Prepare for an uncertain future
3. Reduce the cost, acquisition time and risk of our major defense acquisition programs
4. Develop world class science, technology, engineering, and mathematics capabilities for the DoD and the Nation

(Draft) FY2010 Systems Engineering Initiatives

DDR&E 1 Accelerate delivery of technical capabilities to win the current fight

SE 1.1 Leverage "lighter-weight" tailored Systems Engineering process for urgent needs, rapid fielding and technology insertion

Director, Systems Engineering Focus:
Support the current fight, manage risk with discipline

DDR&E 2 Prepare for an uncertain future

SE 2.1 Develop Systems Engineering techniques to formally specify and measure adaptability/flexibility/adjustability of defense systems to operate in new and unknown environments/missions

SE 2.2 Develop new approaches to address emerging Systems Engineering competencies in complex systems, large scale software, and trusted and secured systems

SE 2.3 Conduct Systems of Systems analysis in support of system and architecture level assessment of emerging capabilities

Director, Systems Engineering Focus:
Grow engineering capabilities to address emerging challenges

(Draft) FY2010 Systems Engineering Initiatives

DDR&E 3 Reduce the cost, acquisition time and risk of our Major Defense Acquisition Programs

- **SE 3.1 Engage continuously with Service acquisition efforts – provide mentorship and support to program offices**
- **SE 3.2 Support early development planning for emerging acquisition efforts per WSARA**
- **SE 3.3 Review and approve Systems Engineering Plans for all MDAP and MAIS efforts and report to Congress**
- **SE 3.4 Eliminate serial oversight – Integrate Systems Engineering Program Support Reviews with specialty reviews across DDR&E and A&T**
- **SE 3.5 Leverage the Systems Engineering process for major systems acquisition to identify and mitigate technical and programmatic risks early**
- **SE 3.6 Manage risk escapes through the use of formal DDR&E red teams to provide comprehensive technical assessment of critical programs**
- **SE 3.7 Manage system vulnerability and mitigate security risk through program threat protection policy and assessment**

Director, Systems Engineering Focus:
Champion Systems Engineering as a tool to improve acquisition quality

(Draft) FY2010 Systems Engineering Initiatives

DDR&E 4 Develop World Class Science, Technology, Engineering and Mathematics capabilities for the DoD and the Nation

SE 4.1 Create opportunities to attract, foster and grow future DoD engineering leaders

SE 4.2 Engage with industry to develop and share Systems Engineering "Best Practices"

SE 4.3 Support workforce development, competency modeling and assessment and certification standards

SE 4.4 Assess Service Systems Engineering capabilities and report to Congress per WSARA

SE 4.5 Develop, support and coordinate next generation Modeling, Simulation and Analysis capabilities

SE 4.6 Provide consistent Systems Engineering guidance and policy to the Services, Agencies and industry

Director, Systems Engineering Focus:
Develop future technical leaders across the acquisition enterprise

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

STEVENS Institute of Technology

USC UNIVERSITY OF SOUTHERN CALIFORNIA

AUBURN UNIVERSITY

UMASS

UCSD

UNIVERSITY OF MARYLAND

AFIT The Air Force Institute of Technology

Fraunhofer

NPS PRAESTANTIA PER SCIENTIAM

PENN STATE Great Valley

SYSTEMS ENGINEERING Research Center

MISSOURI S&T

A&M

UAHuntsville THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

TEXAS TECH UNIVERSITY

Massachusetts Institute of Technology

Carnegie Mellon University

SMU

UNIVERSITY of VIRGINIA

Wayne State University

Multi-Level Engagement

SE

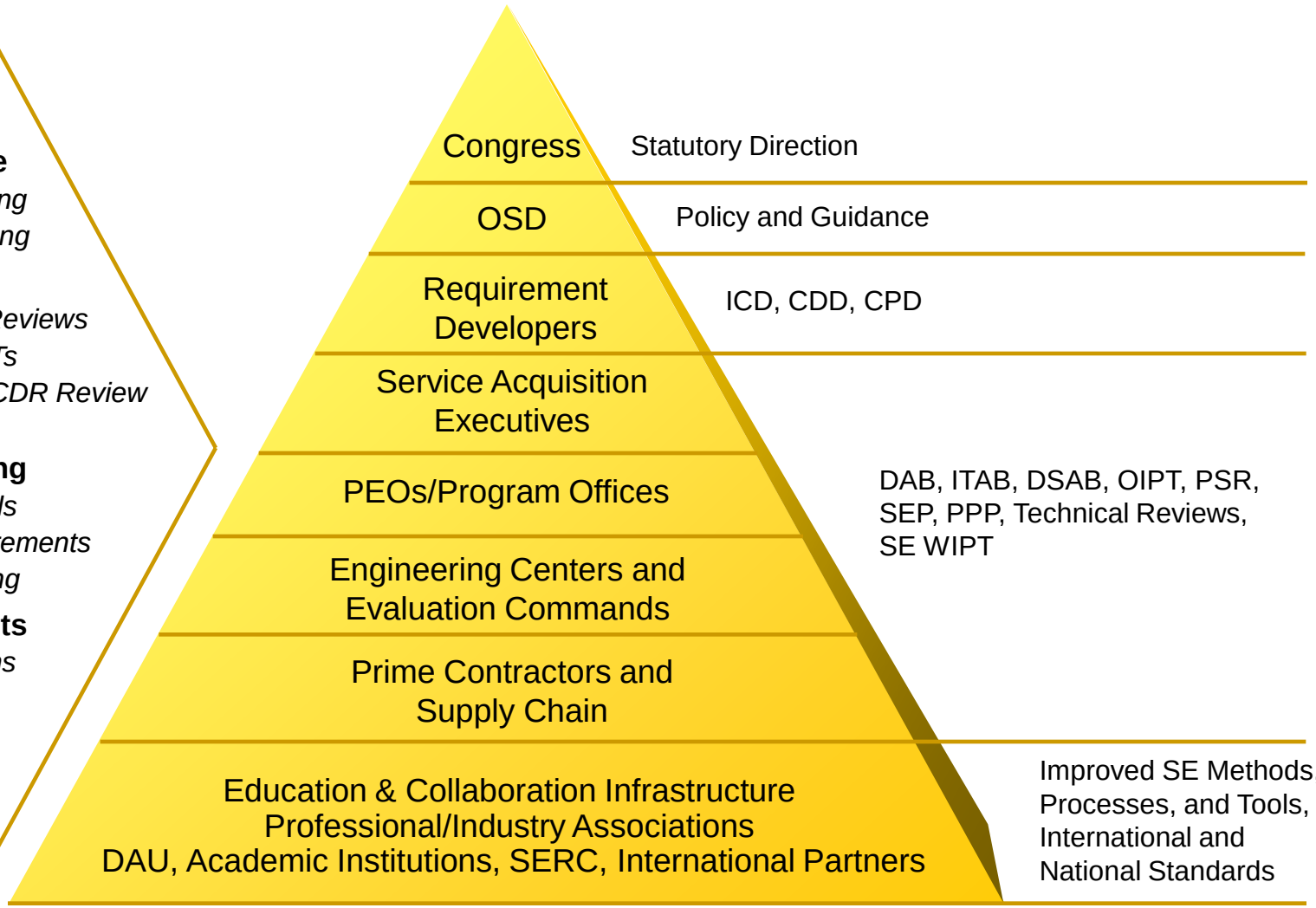
Policy & Guidance
- *Systems Engineering*
- *Software Engineering*

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

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

Emerging Concepts
- *Systems of Systems*
- *SE Research*

Outreach
- *SE Forum*
- *Engagement Strategy*



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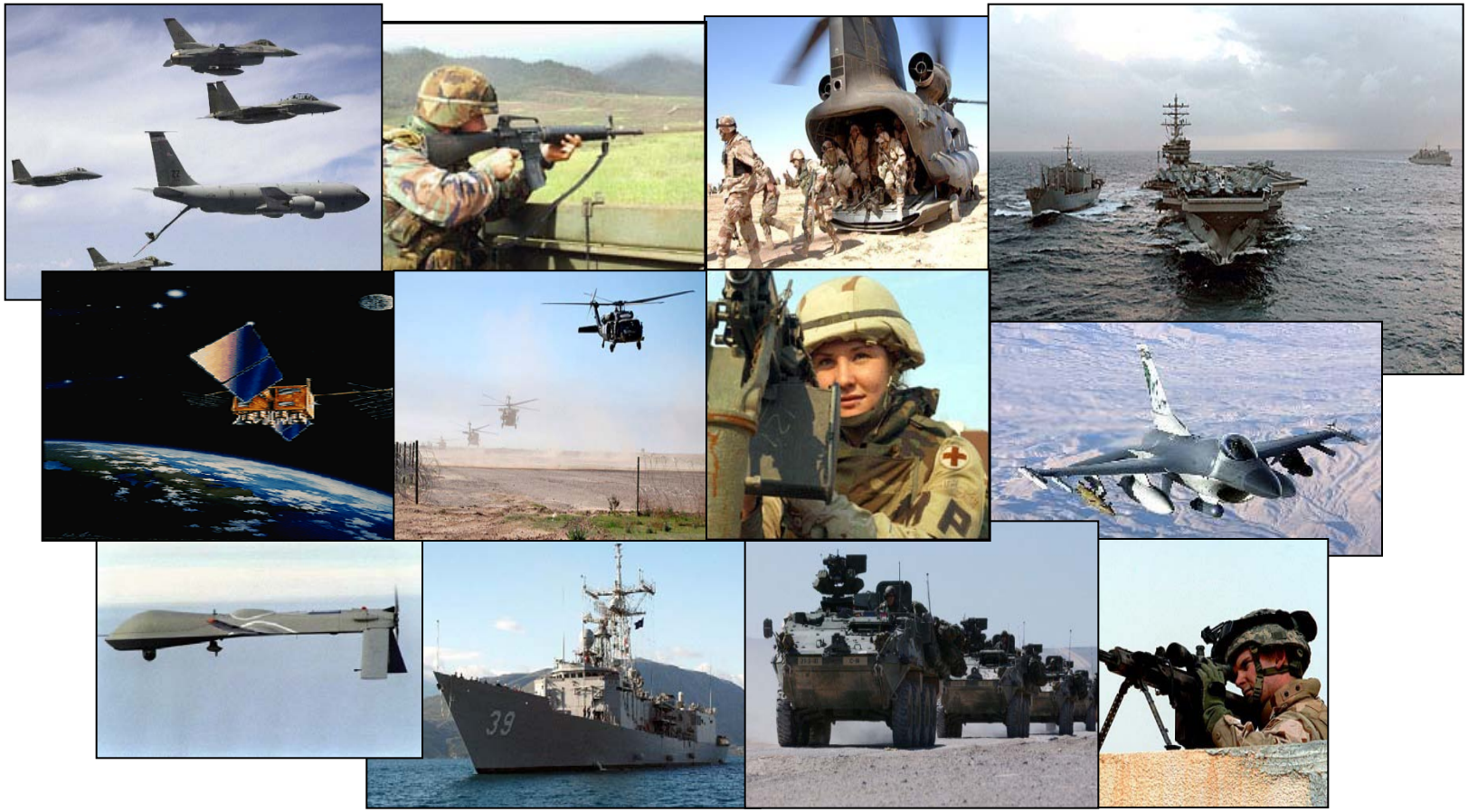
Systems Engineering's Partnership with Industry

- **Systems Engineering's industry stakeholders include:**
  - Prime and sub contractors
  - Supply chain vendors
  - Practicing systems engineers
  - Systems engineering tool vendors
- **Systems Engineering leverages industry and professional associations to:**
  - Disseminate policy and guidance
  - Obtain feedback from industry
  - Promote sound systems engineering best practices

Opportunities

- **Acquisition reform efforts have recognized criticality of strong Systems Engineering focus for program success**
  - ***Systems Engineering toolkit focused on identifying and managing risk – development risk, production risk and life-cycle***
- **Growing focus on addressing "early-acquisition" phases - requirements definition, development planning, and early acquisition**
  - ***Leading to more informed decisions at MS B***
- **Our development processes need to evolve to provide faster product cycles, more adaptable products and address emerging challenges**
- **Future US Defense capabilities depend on a capable US engineering workforce in and out of government**
  - ***Need to create opportunities to grow future Engineering Heroes***

Systems Engineering: Critical to Program Success



Innovation, Speed and Agility