



# **DoD Systems and Software Engineering**

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# Systems and Software Engineering Mission Statement

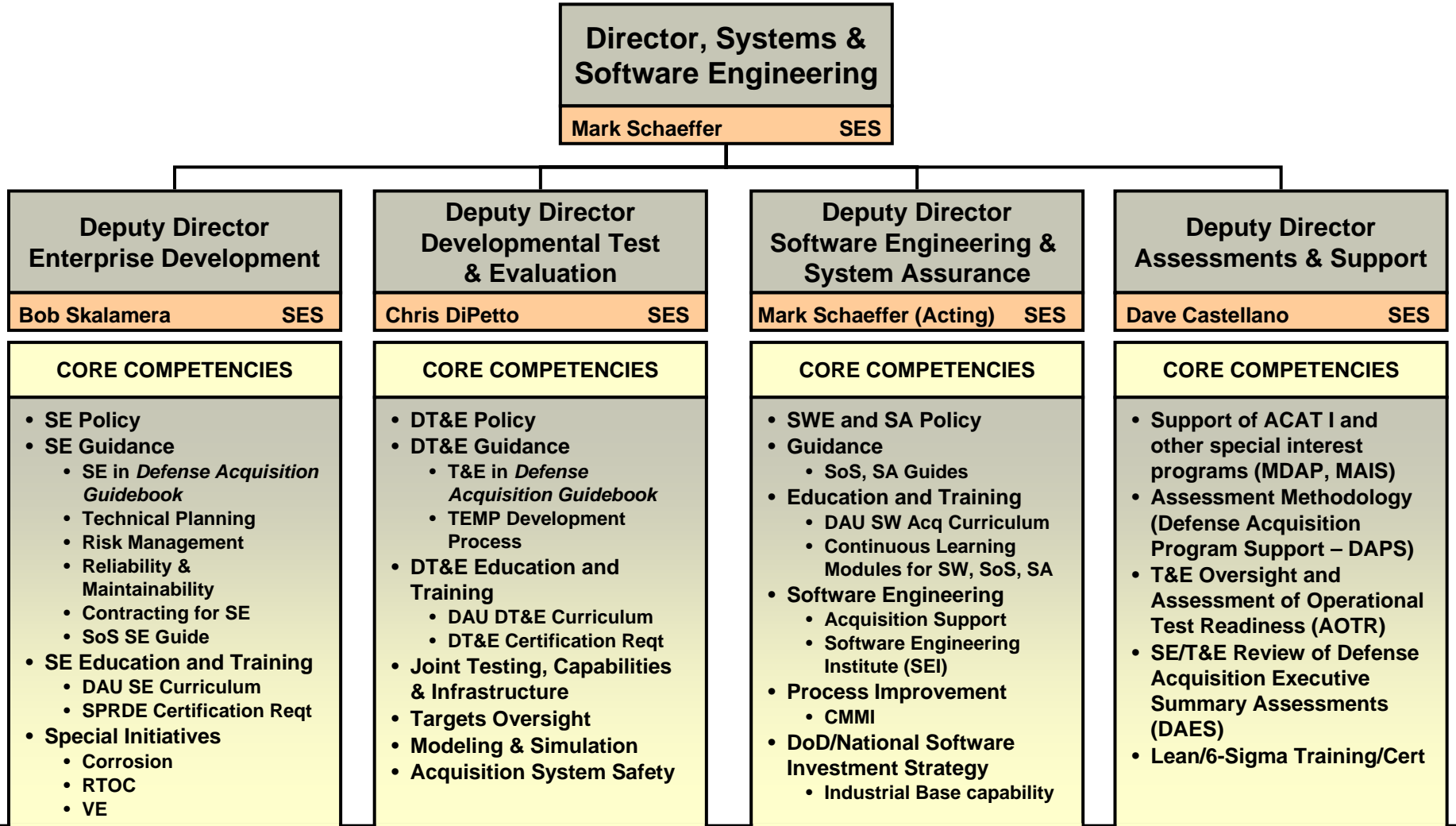
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- Shape acquisition solutions and promote early technical planning
- Promote the application of sound systems and software engineering, developmental test and evaluation, and related technical disciplines across the Department's acquisition community and programs
- Raise awareness of the importance of effective systems engineering and drive the state-of-the-practice into program planning and execution
- Establish policy, guidance, best practices, education, and training in collaboration with academia, industry, and government communities
- Provide technical insight to program managers and leadership to support decision making

***Driving Technical Excellence into Programs!***



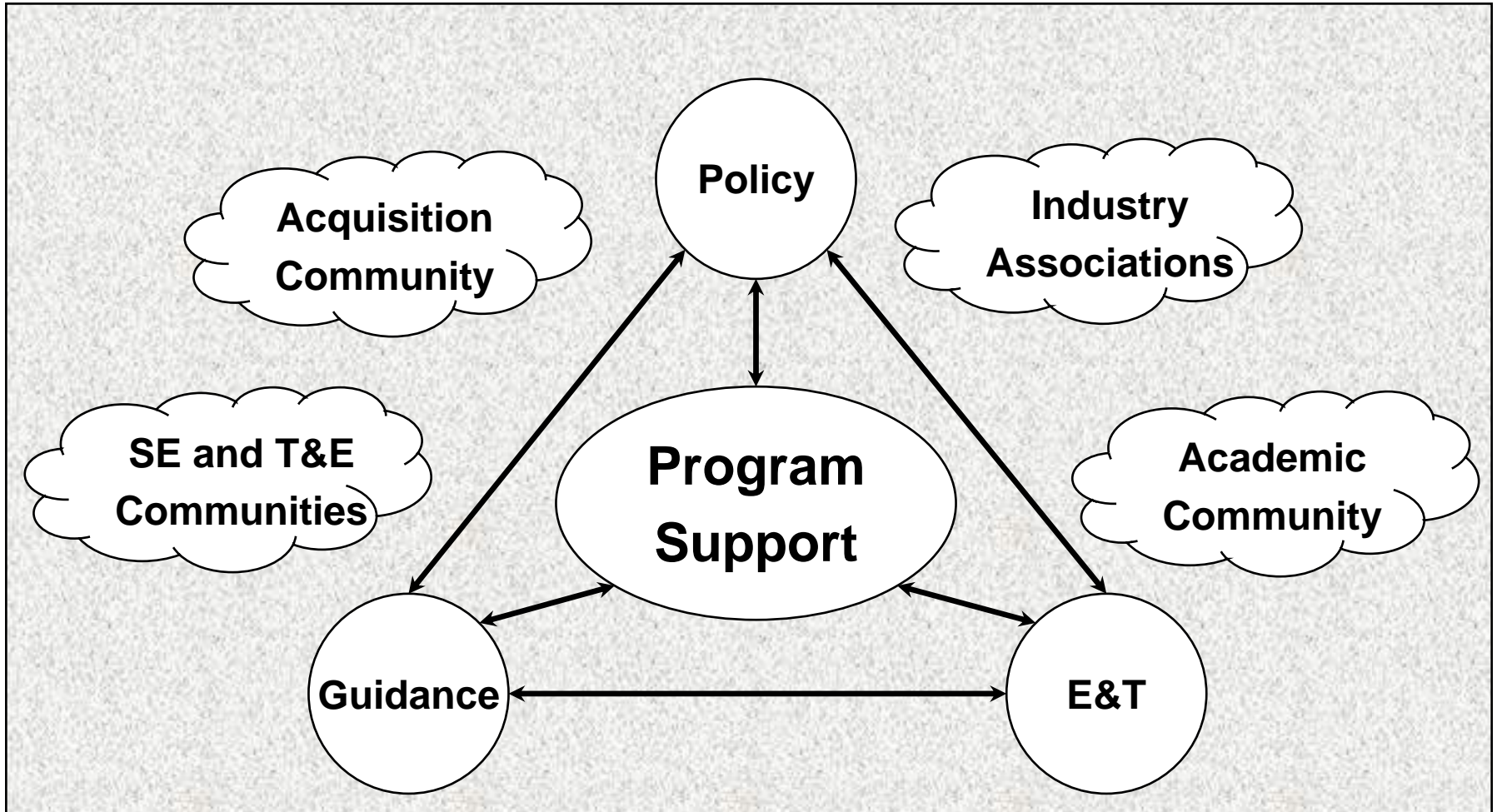
# Systems and Software Engineering Organizational Core Competencies



*Acquisition program excellence through sound systems and software engineering*



# Systems Engineering Revitalization Framework



***Driving Technical Excellence into Programs!***



# Systems Engineering Policy

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- Policy Memorandum (February 2004) and Policy Addendum (October 2004)
  - Programs shall apply robust SE approach and develop a SE plan
  - Each PEO shall have a lead or chief systems engineer
  - Event-driven technical reviews with entry criteria and independent SMEs unless waived by MDA
  - OSD shall review program SEPs for ACAT ID and IAM programs
  - Defense Systems shall establish a SE Forum
- DoDD 5000.2 Update
  - Reflect the policy changes of the two memos



# Systems Engineering Guidance

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- Published Defense Acquisition Guidebook
- Published DoD Guide for Achieving Reliability, Availability, and Maintainability
- Published Integrated Master Plan and Integrated Master Schedule Preparation and Use Guide
- Published Systems Engineering Plan Preparation Guide
- Upcoming:
  - Update Defense Acquisition Guidebook
  - Update Risk Management Guide
  - Develop Contracting for SE Guide



# Systems Engineering Education, Training, & Outreach

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- Updating formal training across key career fields:  
SE, Acquisition Program Management, Contract Management, Finance, Logistics
- Developing continuous learning, on-line courses:  
Reliability and Maintainability, Technical Reviews, System Safety, Modeling and Simulation, Technical Planning, Corrosion Prevention and Control, Modular Open Systems Approach
- Engaging universities:  
Stevens Institute of Technology, University of Southern California, Stanford, Southern Methodist, George Mason, Service Academies and Naval Postgraduate School, AFIT/CSE



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## ***Hot Topics***

- Systems of Systems Engineering
- Software Engineering & System Assurance (SSA)
- Program Support Reviews





# SoS Engineering Guidebook

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## ➤ Purpose:

- Shape DoD and Industry experience
- Address lessons learned, current/future challenges

## ➤ Scope:

- SoS definition and implications
- Use Cases covering broad spectrum of SoS (Weapons/Services)
- SE and Software process considerations for SoS

## ➤ Major Milestones:

- 7 August: Chapter Outlines
- 15 September: Draft Guide

***Soliciting input, feedback across industry,  
academia and government***



# Software Engineering and System Assurance (SSA) Goals

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- Support Acquisition Success
  - Ensure effective and efficient software solutions across the acquisition spectrum of systems, SoS and capability portfolios
- Improve the State-of-the-Practice of Software Engineering
  - Advocate and lead software initiatives to improve the state-of-the-practices through transition of tools, techniques, etc.
- Lead the DoD and National Software Investment Strategy
  - Implement at Department and National levels, a strategic plan for meeting Defense software requirements
- Implement Global Outreach and Leadership
  - Enable the US and global industrial base capability to meet Department software needs, in an assured and

***Be a World-Class Leader in Software Engineering***



# Current SSA Software Engineering Efforts

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- Policy
- Defense Acquisition Guidebook
- DAU courseware
- CMMI DoD Sponsor
- SEI Joint Advisory Council member
- Software Assurance
- Program specific support to AT&L and NII programs
- Software Industrial Base Study (PDM-1)
- Implemented Section 804, FY03 National Defense Authorization Act - Components engaged but not focused

***Efforts Resource/Focus Limited***



# CMMI: Issues

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- Programs execute at lower maturity levels than their organizations have achieved and advertised
- High-maturity practices are not consistently applied at the project level after contract award
- How to ensure new projects will incorporate CMMI processes
- Appraisal sampling procedures – how to ensure adequate coverage of the organizational unit
- Appraiser quality – training, consistency
- Lack of agreement on what constitutes Levels 4 and 5
- Need to converge to a single representation
- Content of appraisal disclosure statements is lacking
- Inadequate training and education for acquirers
- Should CMMI be used for source selection

***What is the resolution of these issues?***



# CMMI: Next Steps

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- Implementing changes to the CMMI v1.2 product suite to ensure:
  - Integrity of appraisals
  - Quality of the product suite
  - Education of acquirers
  - Opportunities for streamlining where appropriate
- Developing a CMMI model for Acquirer process improvement
  - Partnership with General Motors
  - Stakeholders cross DoD, Govt Agencies and Industry

***CMMI continues to evolve and improve***



# System Assurance

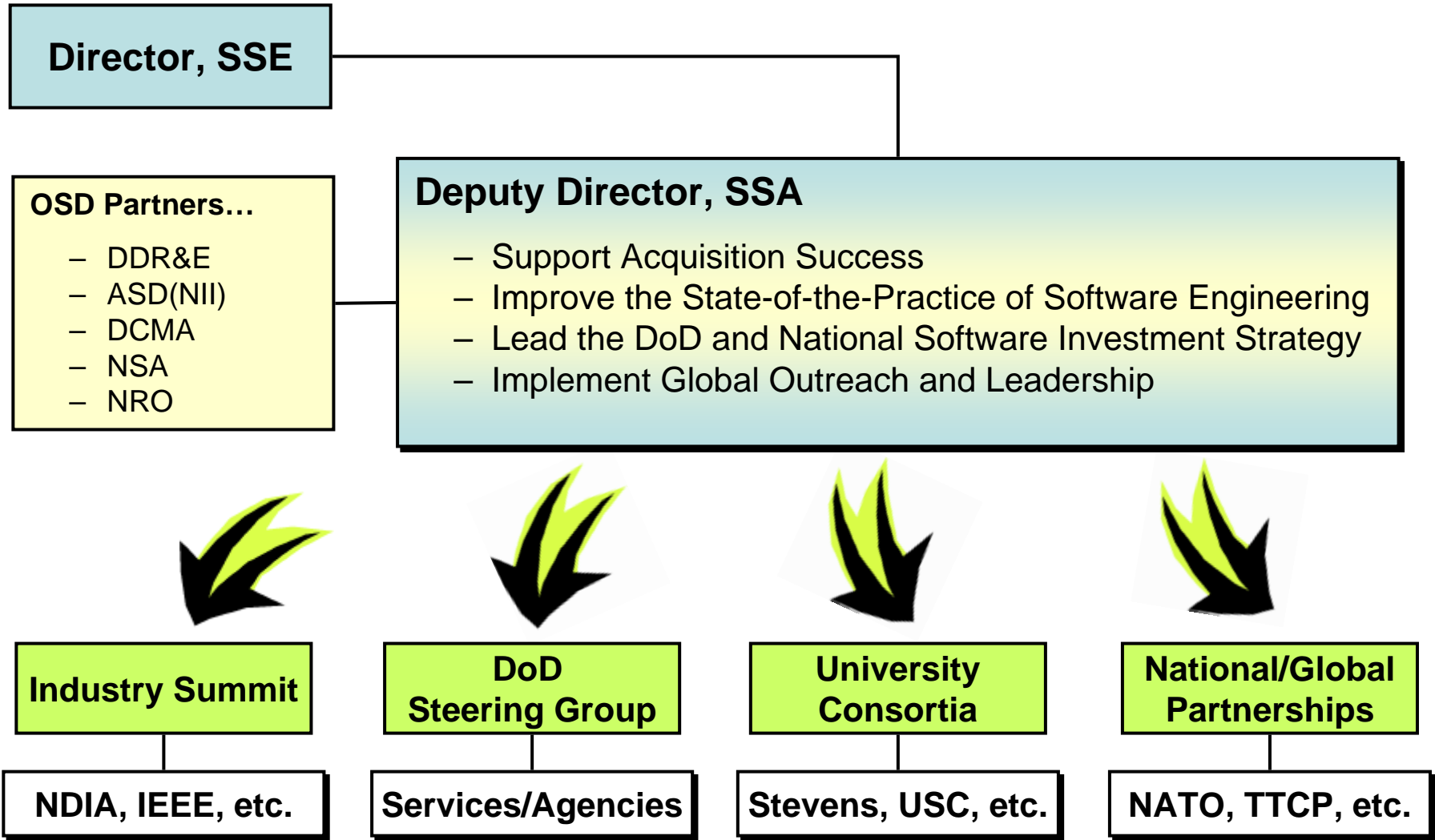
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- Re-energizing DoD focus on Anti-Tamper
  - Draft DoD Instruction on Program Protection will address Anti-Tamper
- Developing comprehensive Software Assurance strategy
- NDIA chartered a System Assurance committee to:
  - Enable nationwide collaboration across industry, government
  - Leverage standards activities to address system vulnerabilities
  - Develop a Handbook for Engineering System Assurance

***“Effective” system assurance in DoD acquisition must be holistic in its approach and consistently applied by industry and Government alike across the entire acquisition life cycle.***



# SSA Extended Outreach





# Driving Technical Rigor Back Into Programs “Program Support Reviews”

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- Program Support Reviews provide insight into a program’s technical execution focusing on:
  - SE as envisioned in program’s technical planning
  - T&E as captured in verification and validation strategy
  - Risk management—integrated, effective and resourced
  - Milestone exit criteria as captured in Acquisition Decision Memo
  - Acquisition strategy as captured in Acquisition Strategy Report
- Independent, cross-functional view aimed at providing risk-reduction recommendations

***The PSR reduces risk in the technical and programmatic execution on a program***





# Balancing Key Programmatic Elements

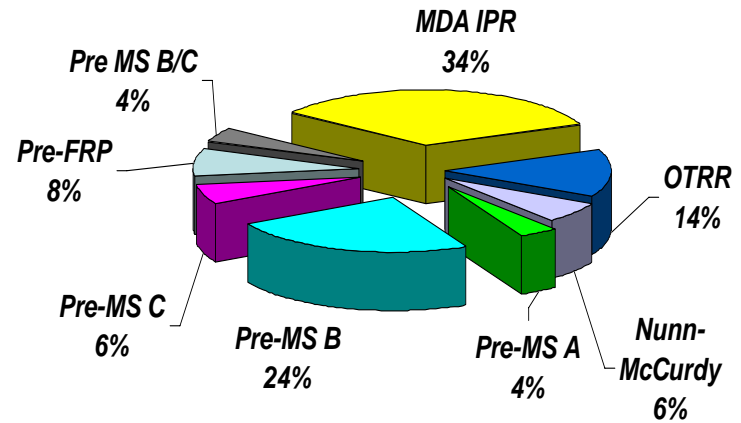
Element	Systems Engineering	Test & Evaluation	Risk Management	Exit Criteria	Acquisition Strategy
Focus Areas	Requirements	V&V Traceability	Risk ID	Mission Systems	Mission Capability
	Organization & Staffing	Test Resources	Risk Analysis	Support	Resources & Management
	Technical Reviews	Test Articles	Risk Mitigation Planning	Manufacturing	Technical Process
	Technical Baseline	Evaluation	Risk Tracking	R & M	Technical Product
	Linkage w/ Other Program Mgmt & Controls	Linkage w/ Other Program Mgmt & Controls	Evidence of Effectiveness	Net Centric	Enterprise Environment
Product	SEP	TEMP	RM Plan	Phase Exit Criteria	ASR/APB



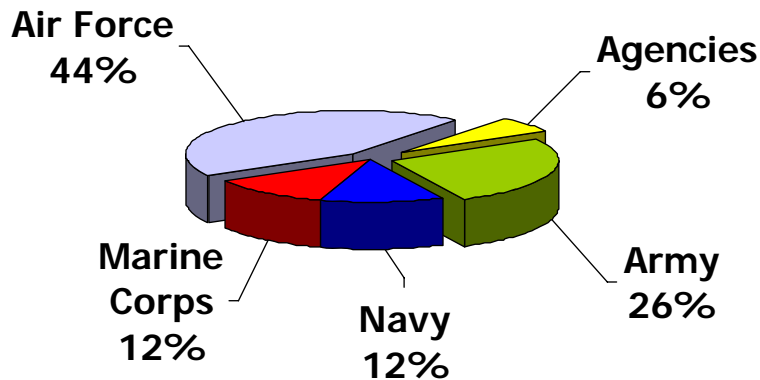
# Program Support Review Activity (since March 2004)

- PSRs/NARs completed: 33
- AOTRs completed: 7
- Nunn-McCurdy Certification: 3
- Participation on Service-led IRTs: 4
- Technical Reviews: 3
- Reviews planned for rest of FY06
  - PSRs/NARs: 12+
  - AOTRs: 2
  - Nunn-McCurdy: 2

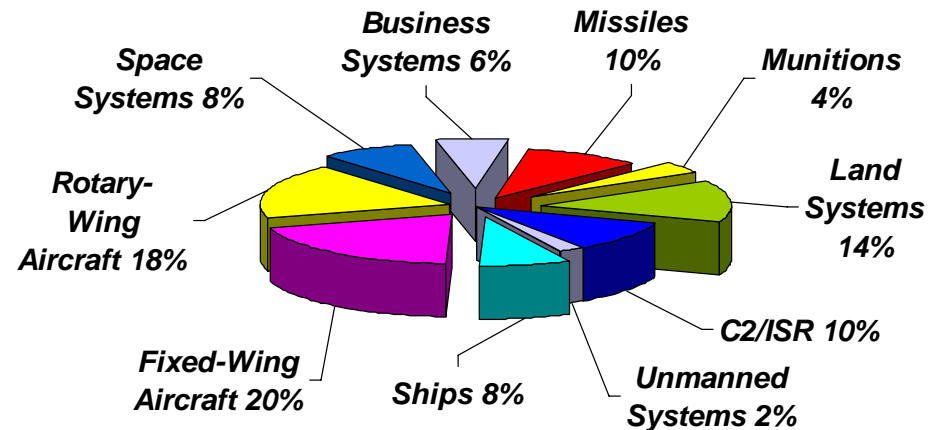
## Reviews by Program Event



## Service-Managed Acquisitions



## Programs by Domain Area





# Program Support Reviews

## Representative Issues

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### ➤ Mission Capabilities

- Requirements—reasonable, measurable, complete

### ➤ Resources/Management

- Schedule adequacy—success-oriented vice event-driven; schedule realism
- Risk management—inadequate or not linked to technical effort

### ➤ Technical Process

- Systems Engineering Planning—inadequate technical planning
- Test & Evaluation—insufficient tests or test articles

### ➤ Technical Product

- Reliability—insufficient reliability growth program
- Supportability/Maintainability—timing of validation