



# **DoD Systems Engineering**

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# Briefing Topics

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## **Update:** *DoD SE Revitalization*

- Policy, Guidance, Education and Training

## **State of SE:** *What we are seeing in programs*

- Findings from our program support reviews

## **Join Us:** *Important SE Initiatives*

- CMMI
- System Assurance

## **What's Next:** *Where we are going with SE*

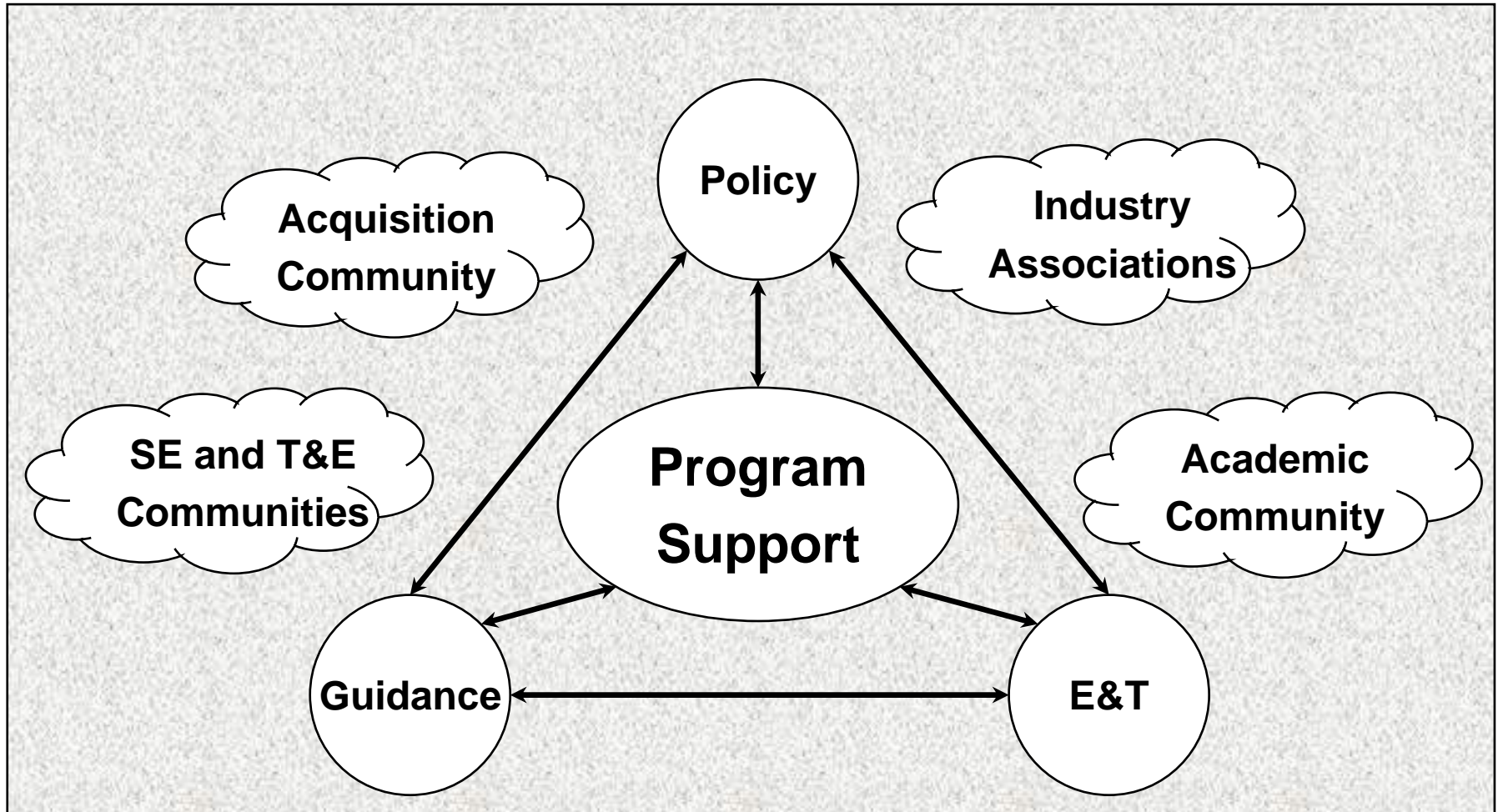
- Systems of Systems Engineering
- Institutionalize SE as a tool for program success



**Update:**  
*DoD SE Revitalization*



# 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



# Driving Technical Rigor Back into Programs "Importance of TEMP"

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- TEMP provides insight into adequacy of T&E planning:
  - Are the scope and content of planned tests adequate?
  - Is the T&E program structured to support decisions at major milestones? Measure technical progress and maturity?
  - Are the schedule and resource requirements adequate?
  - Is DT&E program structured to achieve successful OT&E?
- Living document that must reflect all major changes to a program

***The TEMP is fundamental to validating  
program maturity***



# 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, and 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

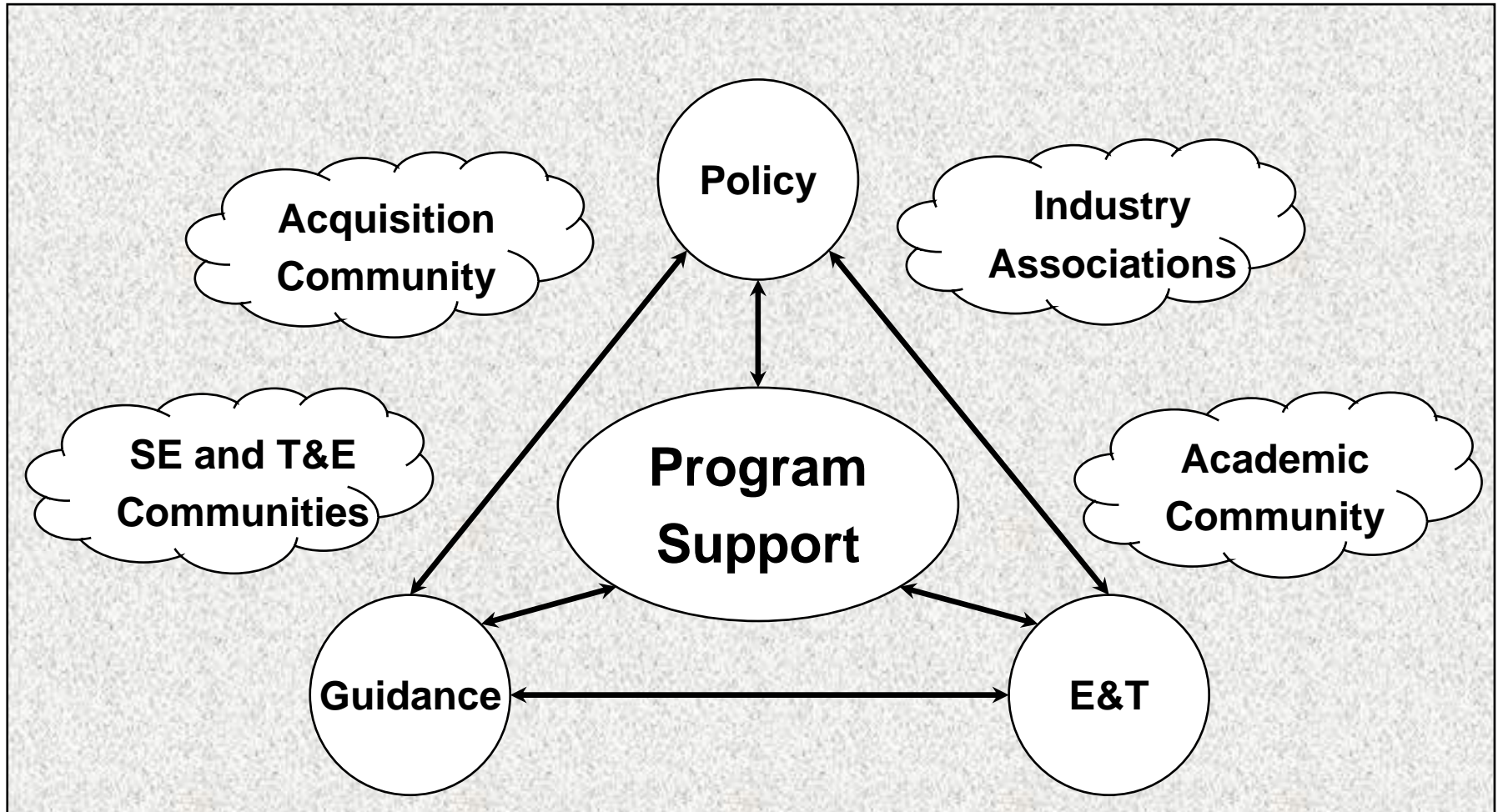




# **State of Systems Engineering:** *What we are seeing in programs*



# Systems Engineering Revitalization Framework



***Necessary but not Sufficient***



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

- 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***



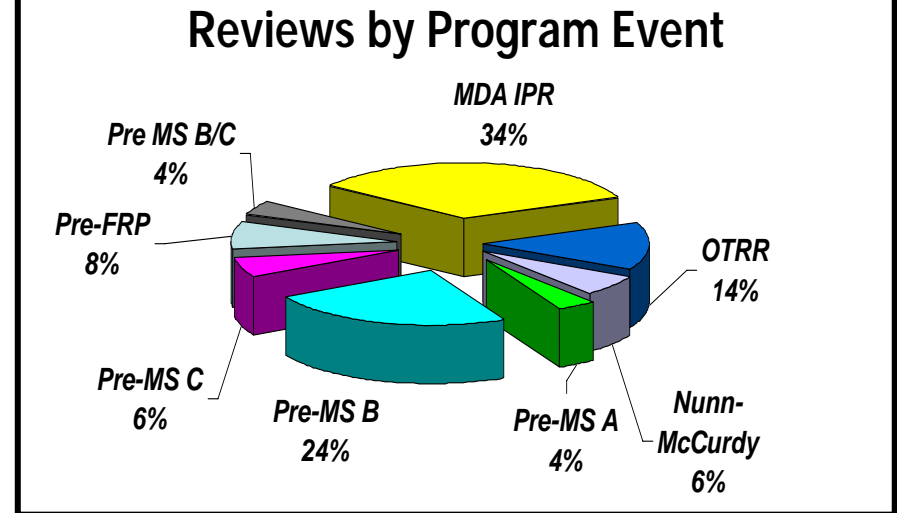
# Balancing Key Programmatic Elements

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

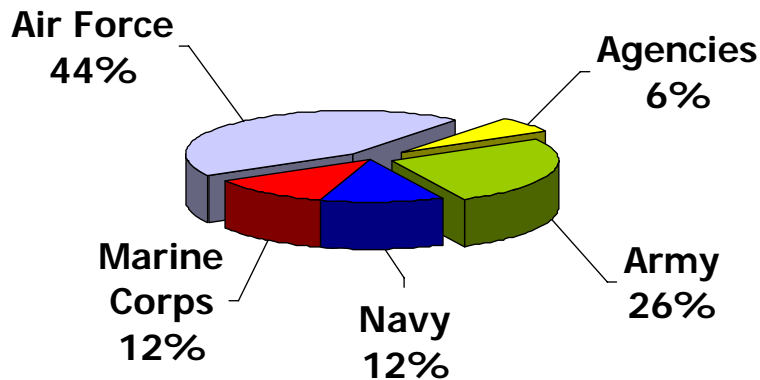


# Program Support Review Activity (since March 2004)

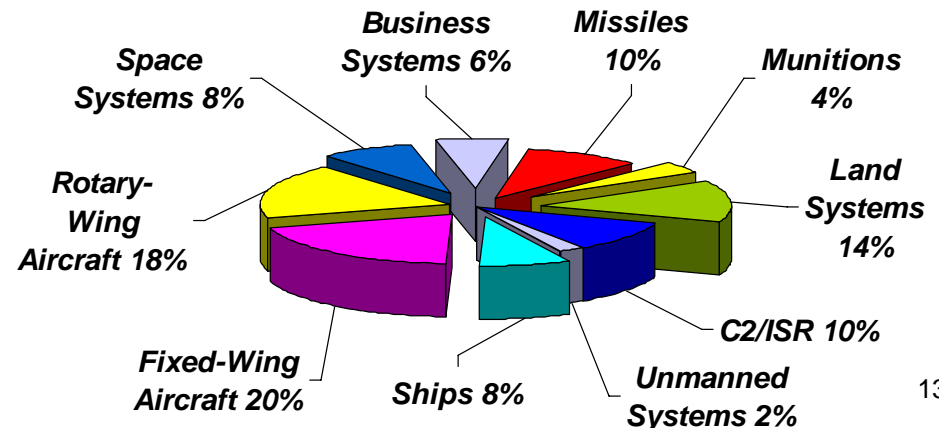
- PSRs/NARs completed: 33
- AOTRs completed: 7
- Nunn-McCurdy Certification: 3
- Participation on Service-led IRTs: 4
- Technical Reviews: 3
- Reviews planned for rest of FY06
  - PSRs/NARs: 12+
  - AOTRs: 2
  - Nunn-McCurdy: 2



### Service-Managed Acquisitions



### Programs by Domain Area





# Representative Issues\*

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- **Requirements**
  - Change without consideration, lack support for planned modifications, lack SoS definition
- **Management**
  - Overworked PM offices, poor SoS integration, lack measures driven approach to risk management, lack quantifiable exit criteria
- **Schedule**
  - Aggressive, concurrent, missing key components
- **Software**
  - Processes not institutionalized, lessons learned not incorporated into successive builds, immature architecture, support plans missing
- **Test and Evaluation**
  - Lack metrics, reliability details, poor planning to evaluate joint interoperability, inability to pass IOT&E
- **Systems Engineering**
  - Lack of disciplined SE process, metrics, missing technical reviews, technology risks not mitigated



**Join Us:**  
*Important SE Initiatives*



# System Assurance

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- Re-energizing DoD focus on Anti-Tamper
  - Draft DoD Instruction on Program Protection will address Anti-Tamper
- Developing a 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.***





# CMMI: Issues

- 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

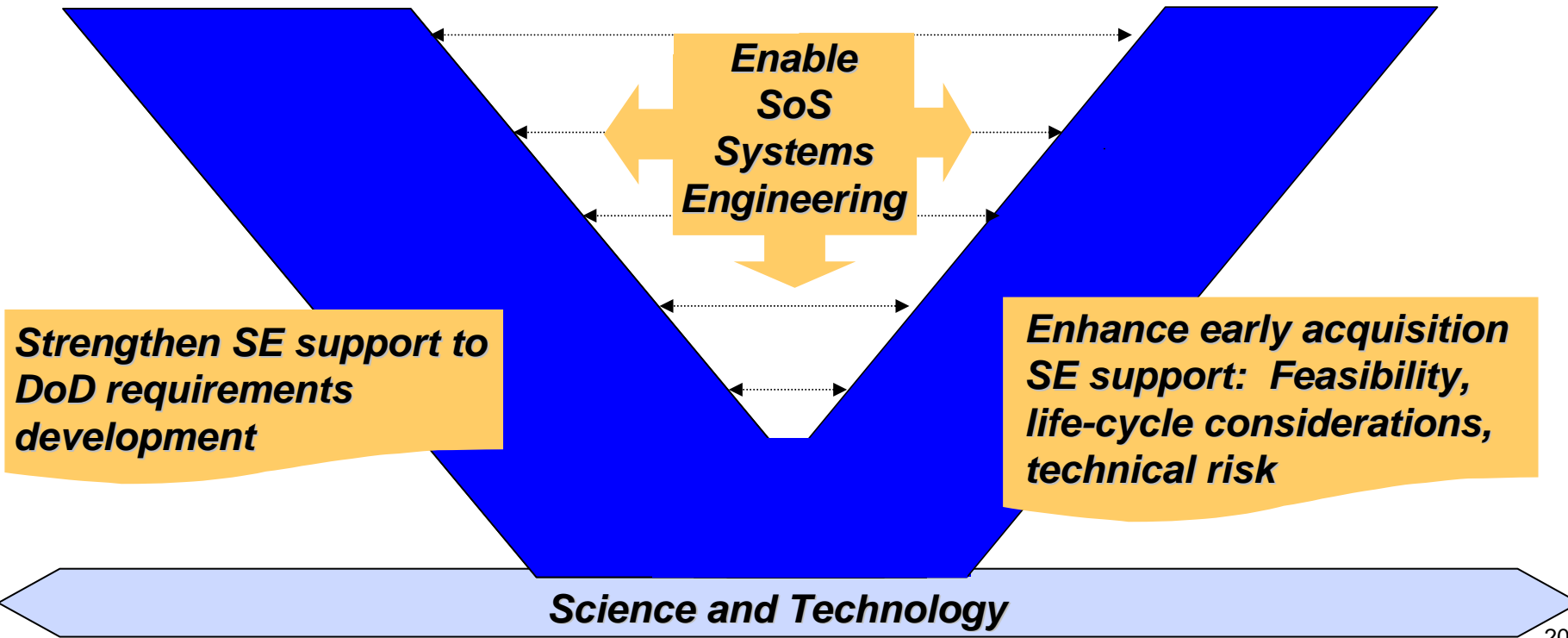
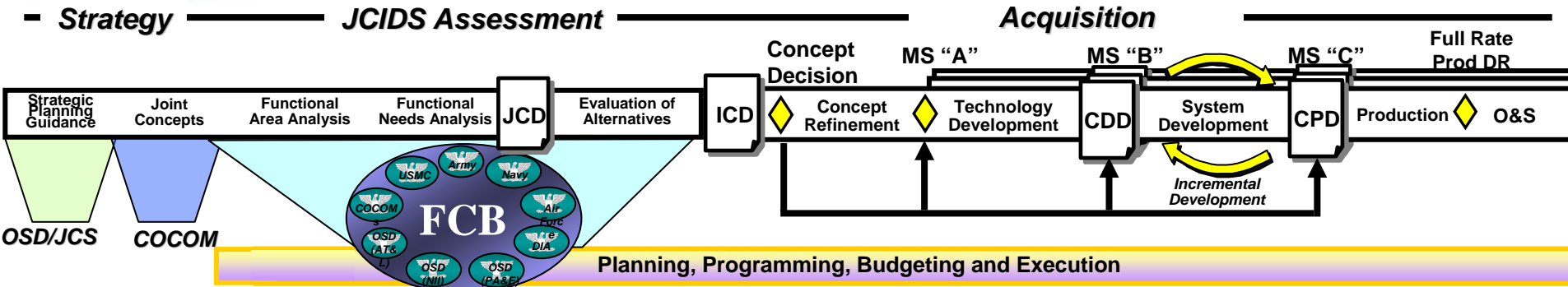
***CMMI continues to evolve and improve***



**What's Next:**  
*Where we are going with SE*



# Systems Engineering Support to Capabilities Acquisition





# Striving for Technical Excellence

- All programs shall develop a SE Plan (SEP)
  - Each PEO shall have a lead or chief systems engineer who monitors SE implementation within program portfolio
  - Event-driven technical reviews with entry criteria and independent subject matter expert participation
  - OSD shall review program's SEP for major acquisition programs (ACAT ID and IAM)
- Technical planning
  - Technical leadership
  - Technical execution
- Technical excellence

***Strong technical foundation is the value of Systems Engineering to the program manager***