DoD Program Support Reviews Findings: Perspectives on Technical Planning and Execution

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DEFENSE SYSTEMS
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Top Five Systems Engineering Issues*

- Lack of awareness of the importance, value, timing, accountability, and organizational structure of SE on programs
- Adequate, qualified resources are generally not available within government and industry for allocation on major programs
- Insufficient SE tools and environments to effectively execute SE on programs
- Requirements definition, development, and management is not applied consistently and effectively
- Poor initial program formulation

*** Based on an NDIA Study in January 2003**

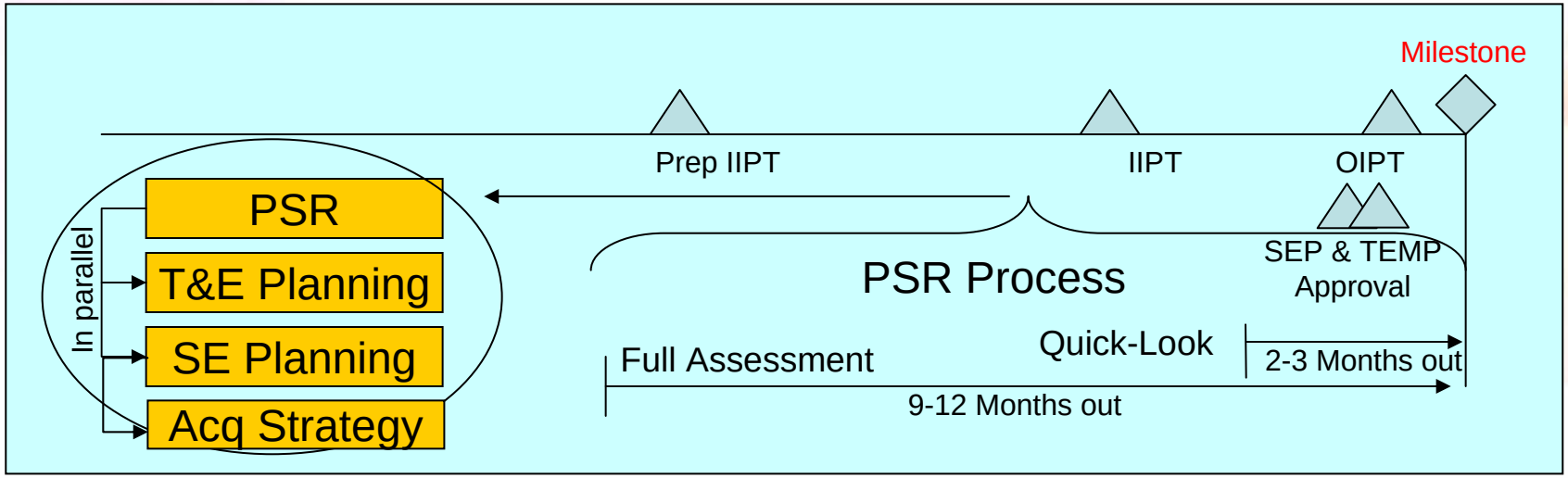
Recap: What We Have Done To Revitalize Systems Engineering

- Issued Systems Engineering (SE) policy
- Issued guidance on SE and Test & Evaluation (T&E)
- Integrating Developmental T&E with SE policy and assessment functions – focused on effective, early engagement of both
- Instituted system-level assessments in support of OSD major acquisition program oversight role
- Established SE Forum – senior-level focus within DoD
- Working with Defense Acquisition University to revise SE, T&E, and enabling career fields curricula
- Leveraging close working relationships with industry and academia

Necessary but not sufficient!

General Approach: Program Outreach Review Products

- Full reviews conducted 9-12 months before Milestone
  - Detailed findings, risks & actionable recommendations
  - Conducted in "PM support" vice "OSD oversight" mode
- "Quick-Look" reviews conducted 2-3 months before Milestone
  - Same form and formats as full assessment; conducted "for record" review
- Quarterly Defense Acquisition Executive Summary (DAES) assessments inputs
- Test & Evaluation Master Plan (TEMP) and Systems Engineering Plan (SEP) development and approval

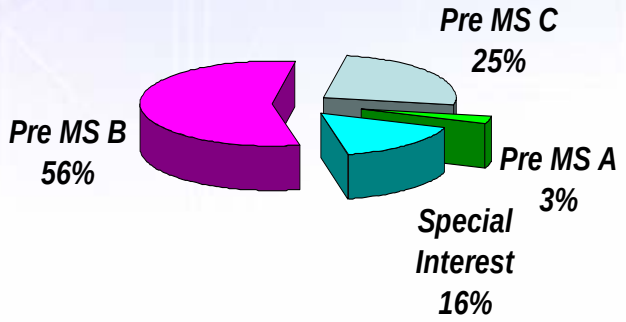


Systems Engineering Plans

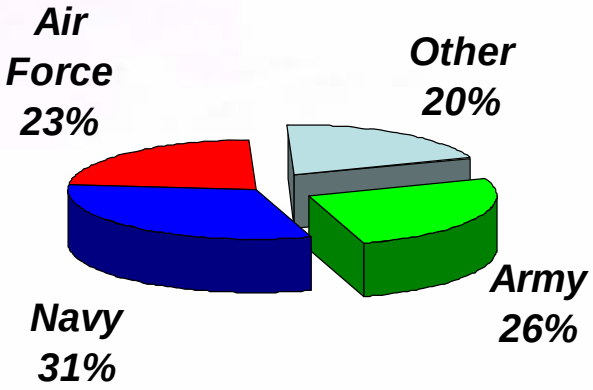
Systems Engineering Plan Activity
(since November 2004)

- Programs submitting SEPs: 36
- Number of SEPs reviewed: 61
  - Approved: 9
  - Pending final approval: 2
  - Pending draft review: 10
- Reviews planned for rest of FY06: >100

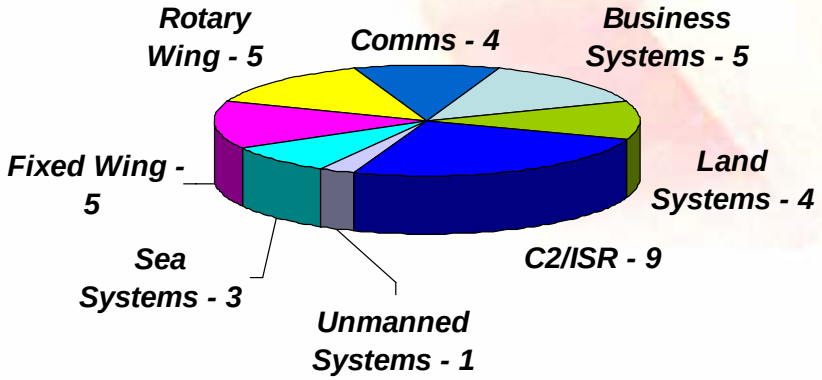
SEP Program Milestones



Component-Managed Acquisitions



Programs by Product Line



Samples of Systems Engineering Plan "Strengths"

- Programs establishing systems engineering working groups for the purpose of developing their systems engineering approach
- Increased Program Executive Office (PEO) involvement in SEP development (+/-)
- Increased organization role evidenced by assignment of Lead/Chief Systems Engineers in SEP organizational charts and descriptions of their roles and responsibilities
- Better understanding of what an event-driven versus a schedule-driven program, evidenced by better defined entry and exit criteria for technical reviews and milestones

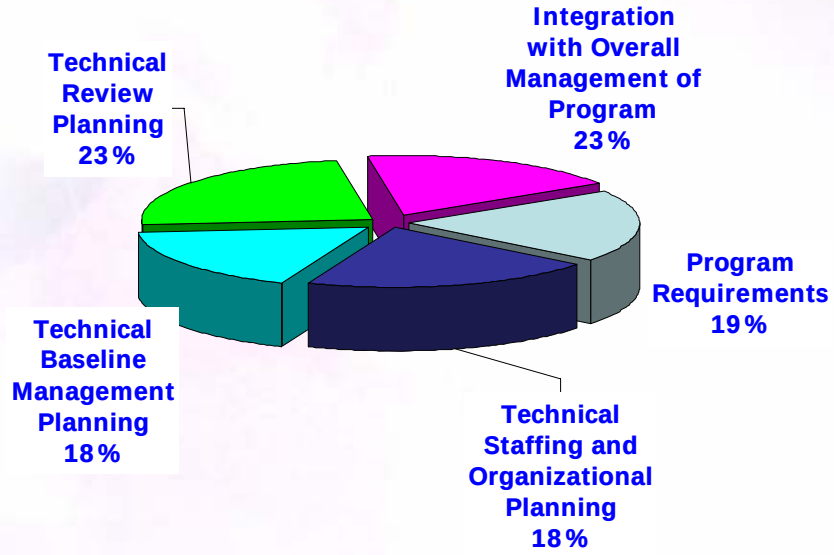
But not on all Programs…

Systems Engineering Focus Areas

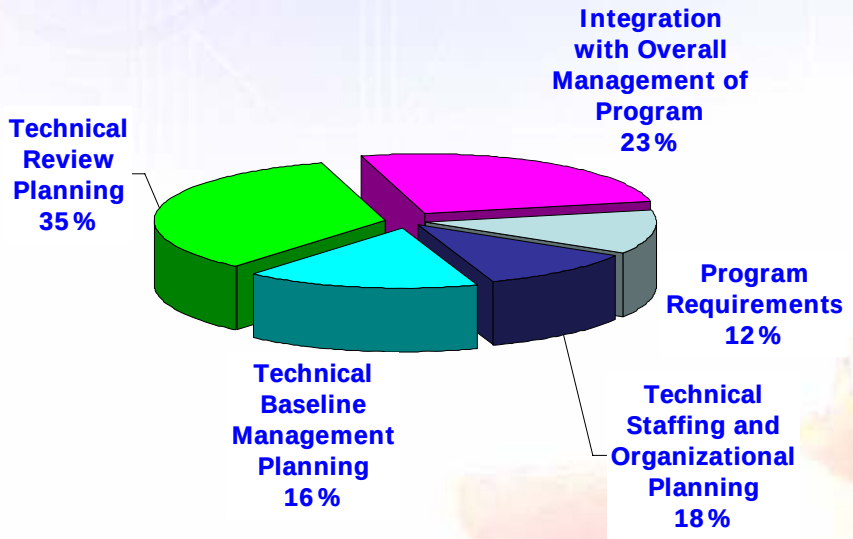
- Program Requirements
  - Capabilities, CONOPS, KPPs
  - Statutory/regulatory
  - Specified/derived performance
  - Certifications
  - Design considerations
- Technical Staffing/Organization
  - Technical authority
  - Lead Systems Engineer
  - IPT coordination
  - IPT organization
  - Organizational depth
- Technical Baseline Management
  - Who is responsible
  - Definition of baselines
  - Requirements traceability
  - Specification tree and WBS link
  - Technical maturity
- Technical Review Planning
  - Event-driven reviews
  - Management of reviews
  - Technical authority chair
  - Key stakeholder participation
  - Peer participation
- Integration with Overall Management of the Program
  - Linkage with other program plans
  - Program manager's role in technical reviews
  - Risk management integration
  - Test and logistics integration
  - Contracting considerations

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

Emerging SEP Issues – versus 5x5**
(not systemic across all programs)



1st Draft SEPs – Critical and Substantive

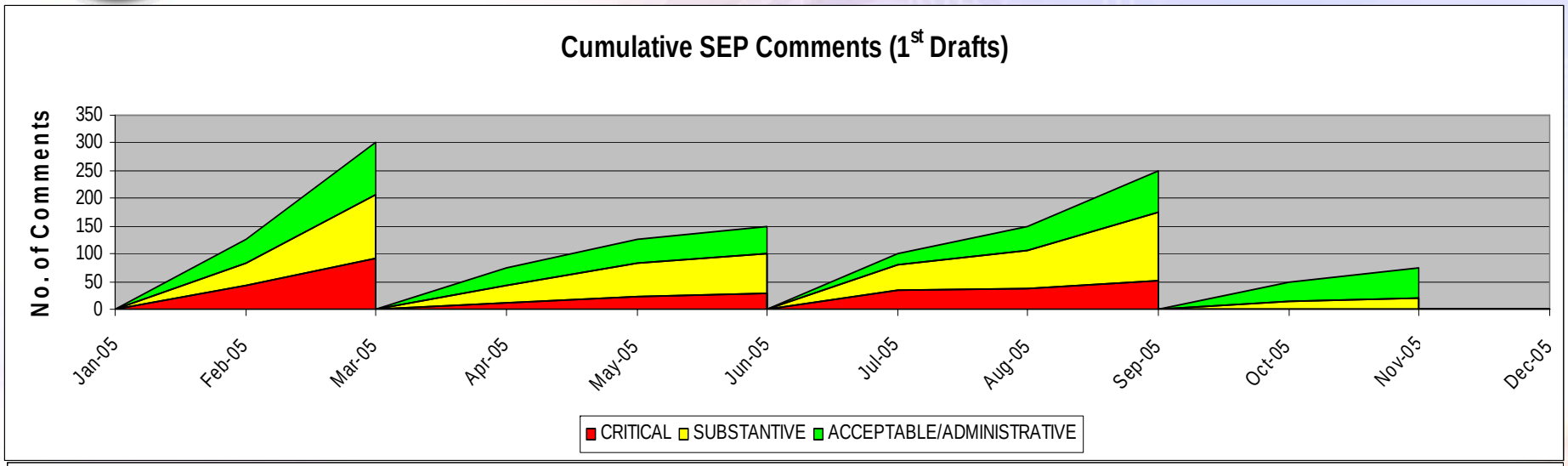


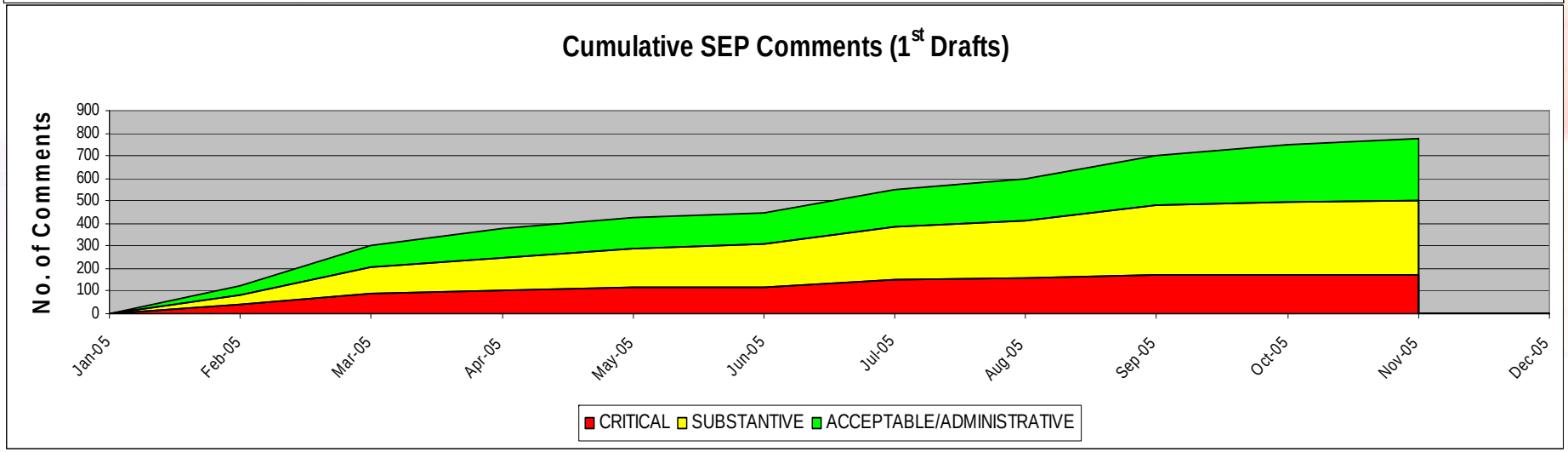
1st Draft SEPs – Critical

**BASED ON ANALYSIS OF 31 OUT OF 36 PROGRAMS

Emerging SEP Issues - Cumulative**
(not systemic across all programs)

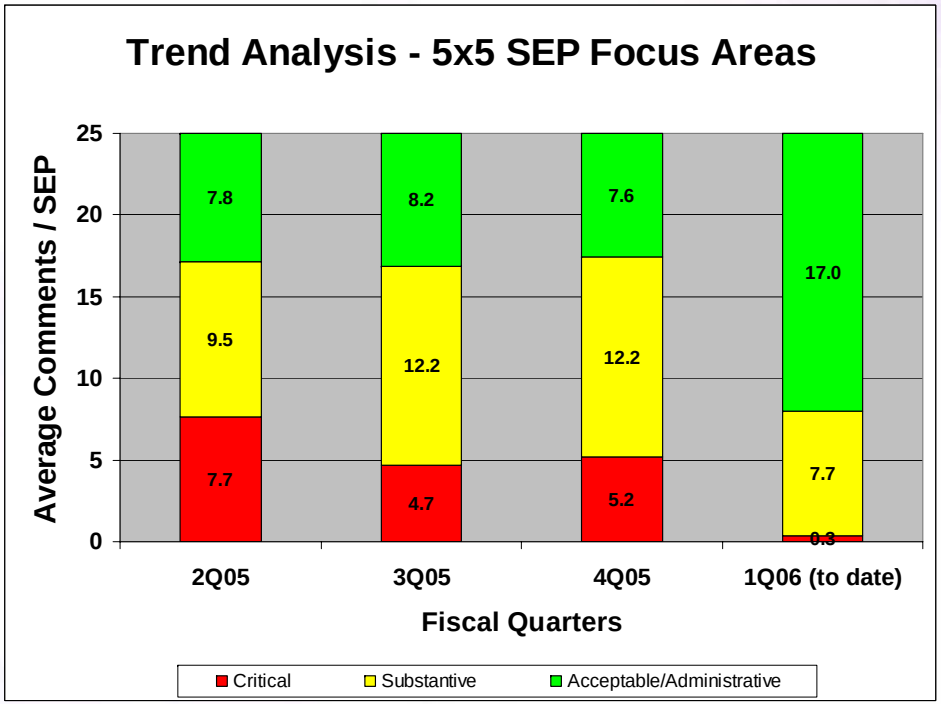
****BASED ON ANALYSIS OF 31 OUT OF 36 PROGRAMS**

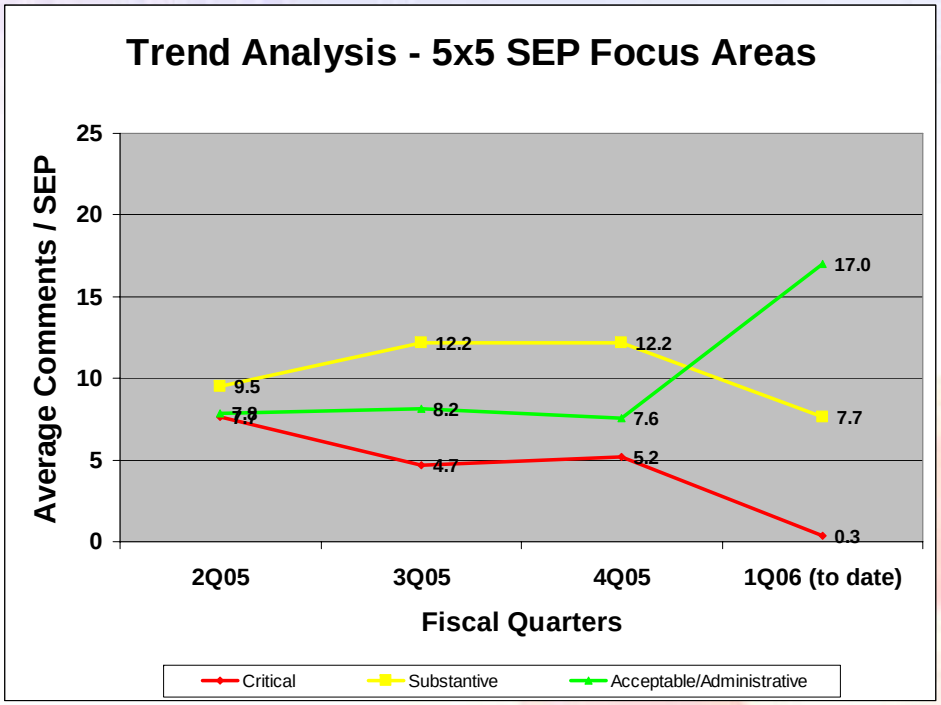




Emerging SEP Issues - Trends**
(not systemic across all programs)

****BASED ON ANALYSIS OF 31 OUT OF 36 PROGRAMS**





DoD Systems Engineering Shortfalls*

- Common failures on acquisition programs include:
  - Inadequate understanding of requirements
  - Lack of systems engineering discipline, authority, and resources
  - Lack of technical planning and oversight
  - Stovepipe developments with late integration
  - Lack of subject matter expertise at the integration level
  - Availability of systems integration facilities
  - Incomplete, obsolete, or inflexible architectures
  - Low visibility of software risk
  - Technology maturity overestimated

Major contributors to poor program performance

*** Findings from PSRs and DoD-directed Studies/Reviews**

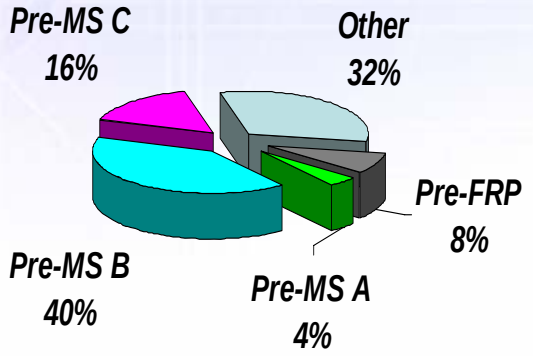
Program Support

Program Support Review Activity
(since March 2004)

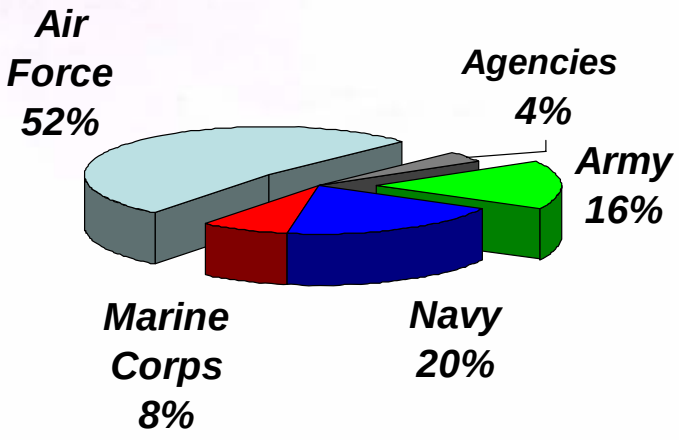
- Number of PSRs completed: 25
- Number of AOTRs completed: 4

- Reviews planned for rest of FY06
  - PSRs: at least 24
  - AOTRs: 2

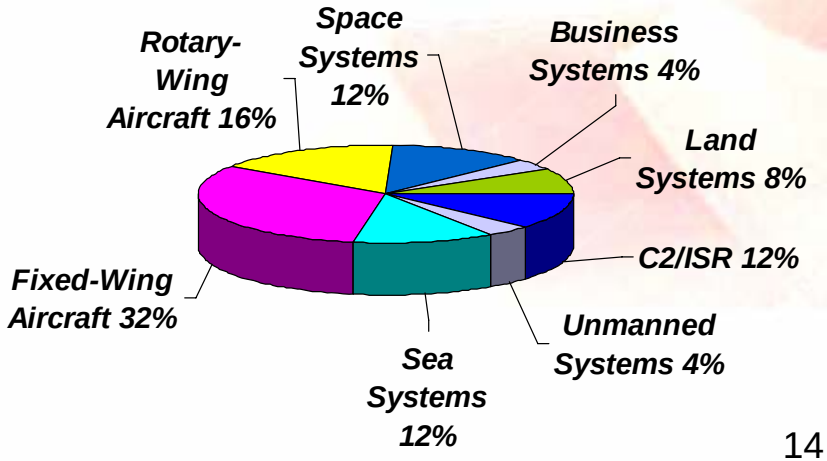
Reviews Conducted Prior to Each Milestone



Service-Managed Acquisitions



Programs by Product Line



Samples of Program Support Review "Strengths"

- Experienced and dedicated program office teams
- Strong teaming between prime contractors, sub-contractors, program offices and engineering support
- Use of well defined and disciplined SE processes
- Proactive use of independent review teams
- Successful management of external interfaces
- Corporate commitment to process improvement
- Appropriate focus on performance-based logistics
- Notable manufacturing processes
- Focus on DoD initiatives
- Excellent risk management practices

But not on all Programs…

General Review Areas

ASSESSMENT METHODOLOGY FOR PRE-MILESTONE C

1.0	Mission Capabilities/Requirements Assessment Area	4
	Sub-Area 1.1 – Operational Requirements	4
2.0	Resources Assessment Area	9
	Sub-Area 2.1 – Program Planning and Allocation	9
	Sub-Area 2.2 – Personnel	10
3.0	Management Assessment Area	16
	Sub-Area 3.1 – Acquisition Strategy/Process	16
	Sub-Area 3.2 – Project Planning	19
	Sub-Area 3.3 – Program and Project Management	21
	Sub-Area 3.4 – Contracting and Subcontracting	26
	Sub-Area 3.5 – Communication	28
4.0	Technical Process Assessment Area	30
	Sub-Area 4.1 – Technology Assessment and Transition	30
	Sub-Area 4.2 – Requirements Development	31
	Sub-Area 4.3 – Functional Analysis & Allocation	32
	Sub-Area 4.4 – Design Synthesis	33
	Sub-Area 4.5 – System Integration, Test and Verification	35
	Sub-Area 4.6 – Transition to Deployment	37
	Sub-Area 4.7 – Process Improvement	38
5.0	Technical Product Assessment Area	38
	Sub-Area 5.1 – System Description	38
	Sub-Area 5.2 – System Performance	42
	Sub-Area 5.3 – System Attributes	43
6.0	Environment Assessment Area	44
	Sub-Area 6.1 – Statutory and Regulatory Environment	45

ASSESSMENT METHODOLOGY FOR PRE-MILESTONE B

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	Sub-Area 2.2 – Personnel	10
	Sub-Area 2.3 – Facilities	12
	Sub-Area 2.4 – Engineering Tools	13
3.0	Management Assessment Area	16
	Sub-Area 3.1 – Acquisition Strategy/Process	16
	Sub-Area 3.2 – Project Planning	19
	Sub-Area 3.3 – Program and Project Management	21
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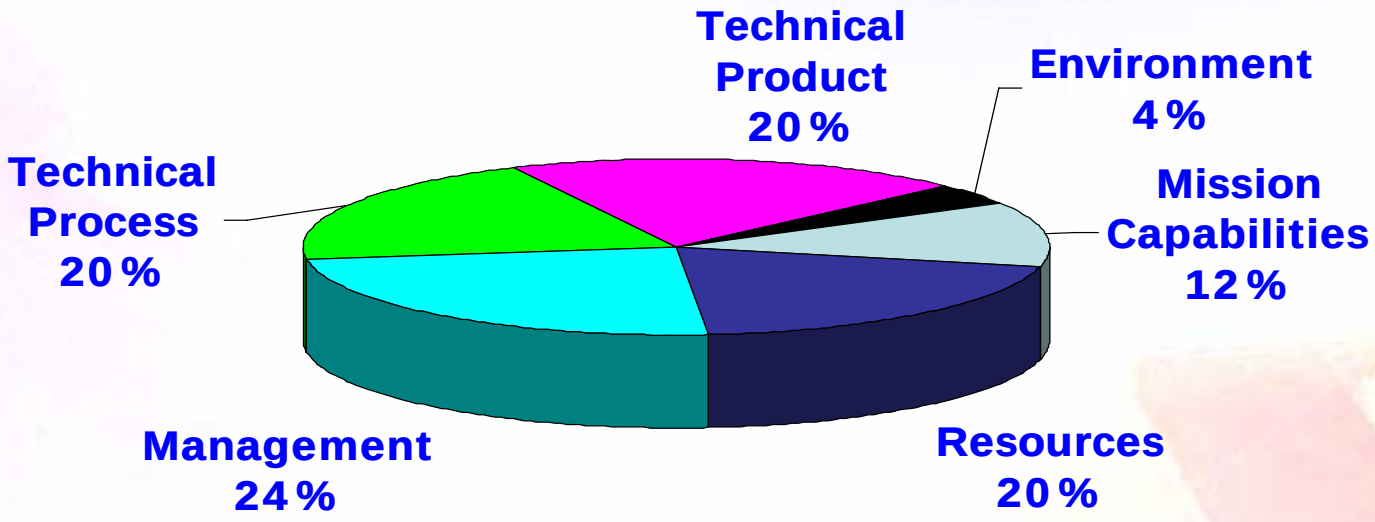
http://www.acq.osd.mil/sse

Emerging Program Support Findings**
(not systemic across all programs)

- Findings across the 6 general review areas…
  (based on assessment methodology areas)



**BASED ON ANALYSIS OF 14 OUT OF 22 REVIEWS

Driving Technical Rigor Back Into Programs
"How PMs are reacting to PSR recommendations?"

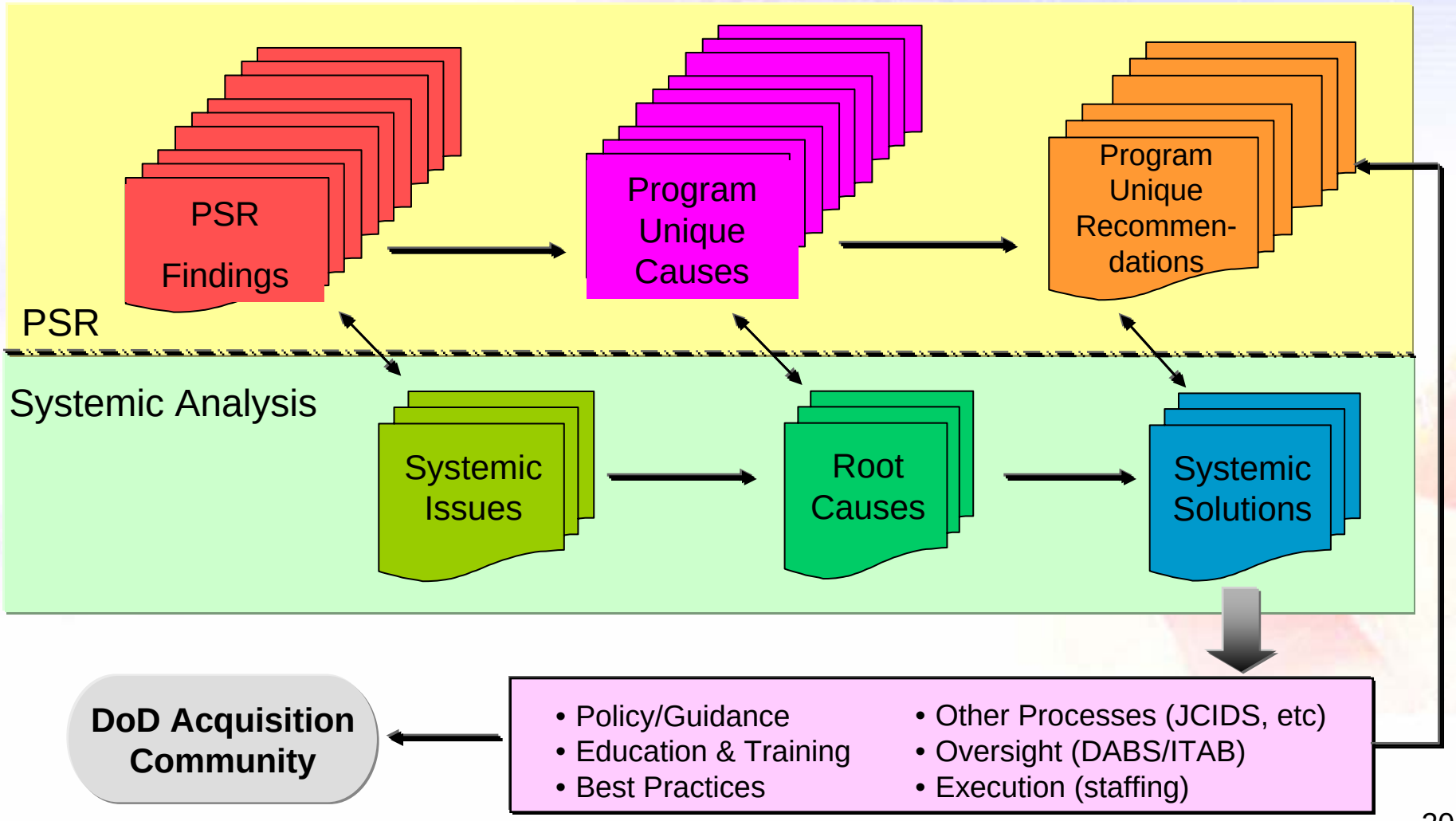
- Mission Capabilities - Requirements
  - – User requirements not fully defined and/or in flux
  - ☑ Established requirements management plan with all stake holders, including proactive plan for Net-Ready KPP
- Resources - Personnel
  - – Experienced, dedicated PM office staff, but stretched too thin
  - ☑ Expanded, empowered WIPT to bring in technical authority SMEs, users, and DCMA
- Management - Schedule Adequacy
  - – Technical review planning demonstrated schedule was high risk
  - ☑ Lengthen schedule to include full suite of SE technical reviews, supported by adjusted program funding
- Technical Process - Test & Evaluation
  - – Insufficient reliability growth program to meet user requirements by IOT&E
  - ☑ Increased the number of test articles and added sub-system level test events
- Technical Product - Supportability/Maintainability
  - – Logistics demonstration plan just prior to IOT&E
  - ☑ Demonstration re-scheduled prior to MS C

Better than 90% acceptance of recommendations

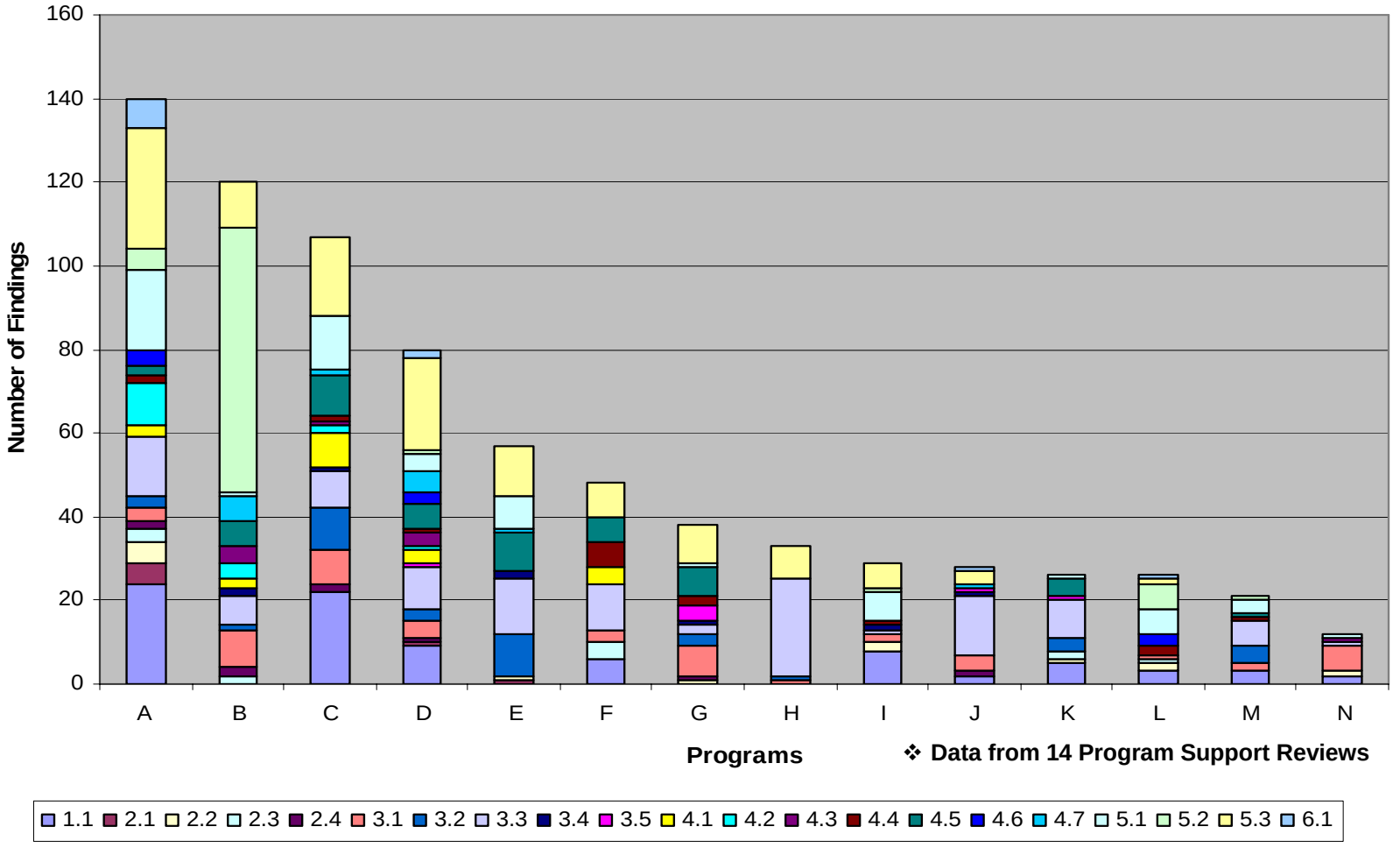
Systemic Analysis

Systemic Analysis Perspective

"How do we find solutions to the systemic problems?"

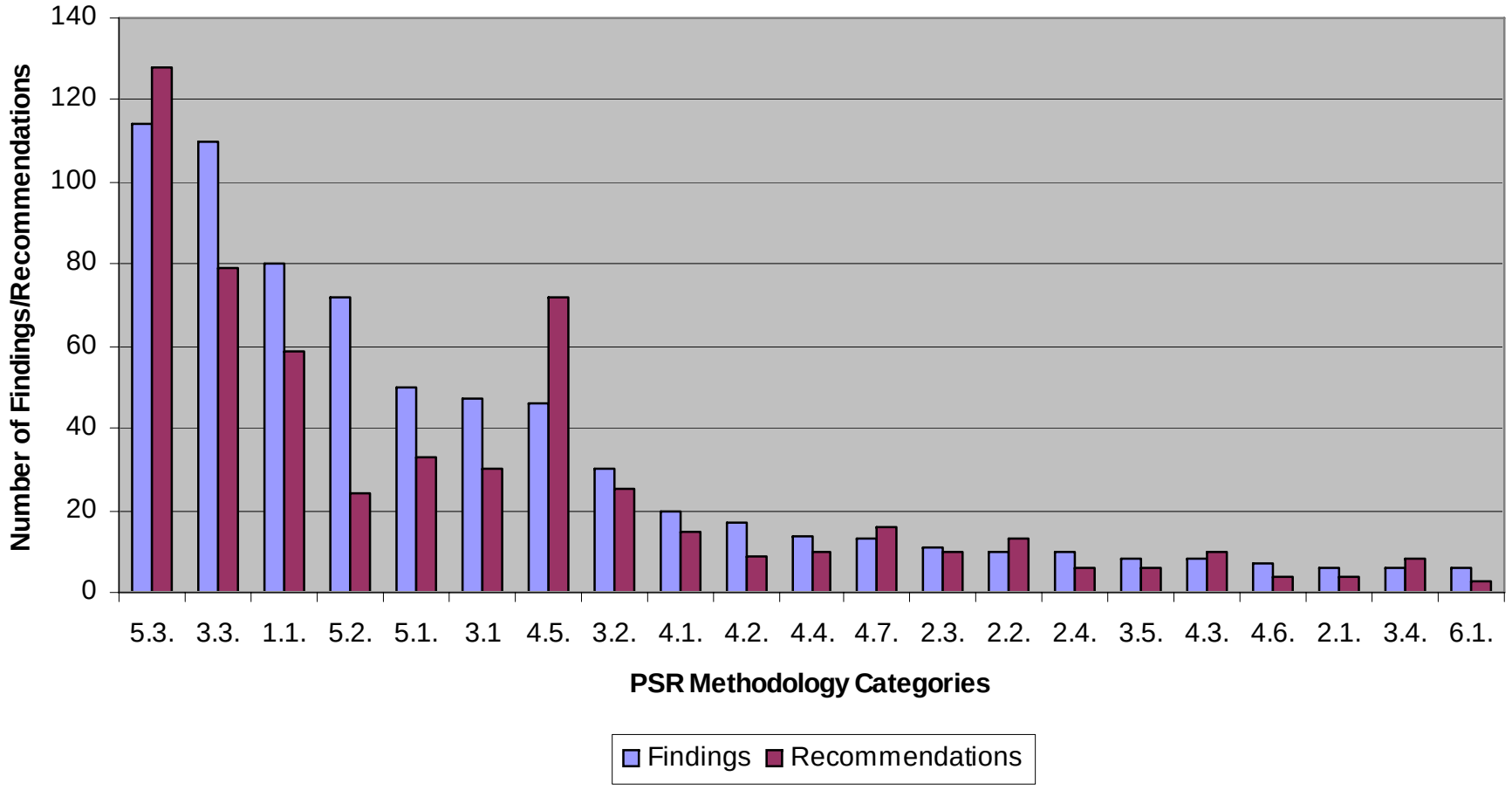


Number and Type of Findings by Program



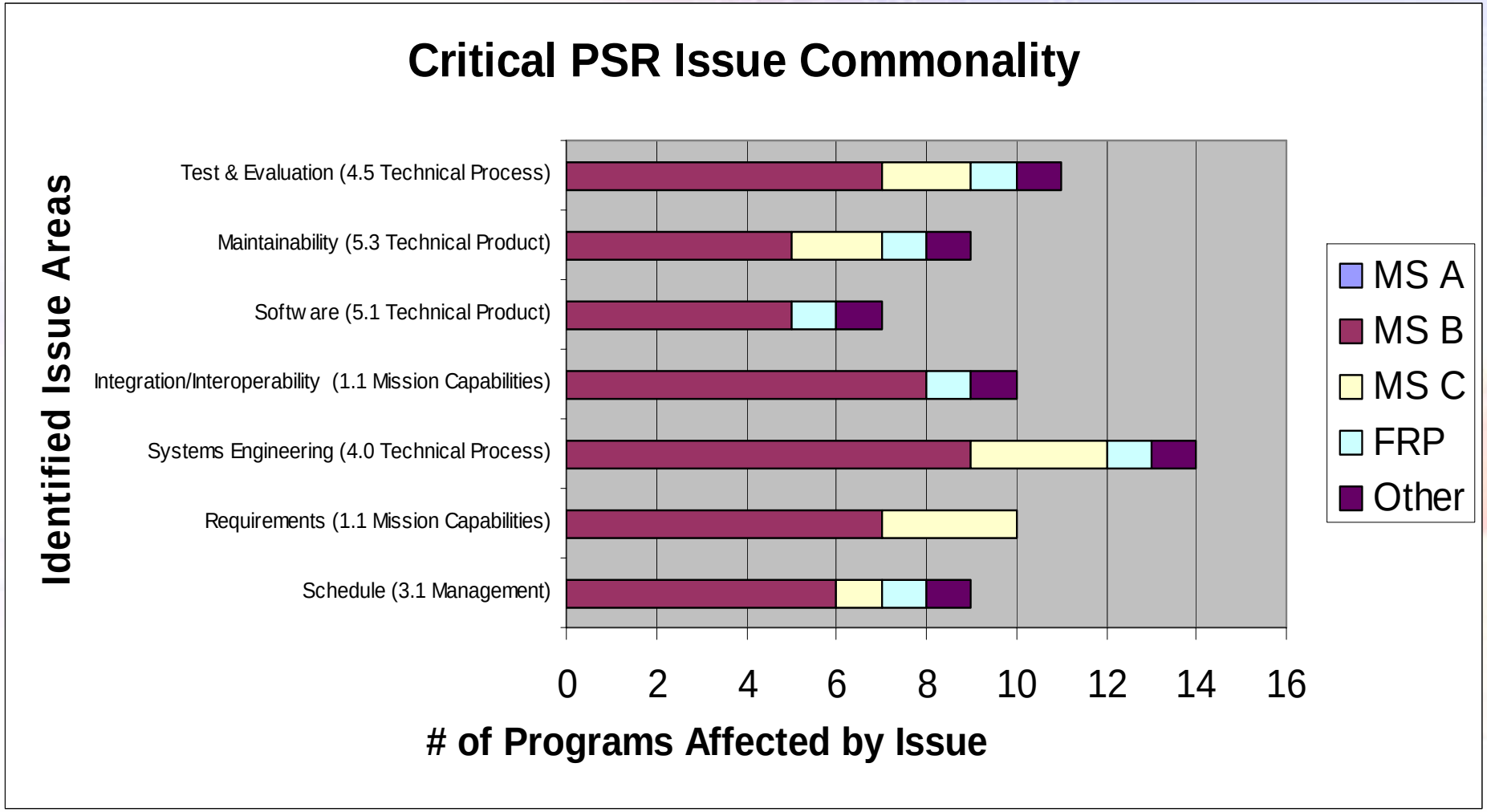
Numbers represent sections of the PSR Methodology

Level 2 Findings and Recommendations



❖ **Data from 14 Program Support Reviews**

Initial Thoughts on Systemic Issues



Representative Issues
(1 of 3)

- **Representative Issues for *Schedule***
  - Schedules too aggressive
  - Detailed schedules missing key components
  - Schedule concurrency (e.g. T&E activities)

- **Representative Issues for *Requirements***
  - Requirements don't support planned modifications, increasing capacity
  - Requirements changed without consideration or coordination with PM/PO and dependent programs
  - "Shortsighted" requirements, i.e. safety critical, bandwidth to support future capabilities

- **Representative Issues for *Integration/Interoperability***
  - Integration plans lacking key components
  - Multi-platform, scalable design benefits not realized due to low hw/sw commonality
  - Interoperability with Joint Forces not adequately addressed

Representative Issues
(2 of 3)

- **Representative Issues for *Software***
  - Software processes not institutionalized
  - Software development planning doesn't adequately capture lessons learned to incorporate into successive builds
  - Systems and spiral software requirements undefined
  - Software architecture immature
  - Software reuse strategies are inconsistent across programs
  - Software support plan missing

- **Representative Issues for *Maintainability***
  - Maintainability requirements incomplete or missing
  - Diagnostic effectiveness measures are either too ambiguous or missing
  - Tailoring out of criticality calculations translates to inability to monitor the maintainability status of reliability critical items

Representative Issues
(3 of 3)

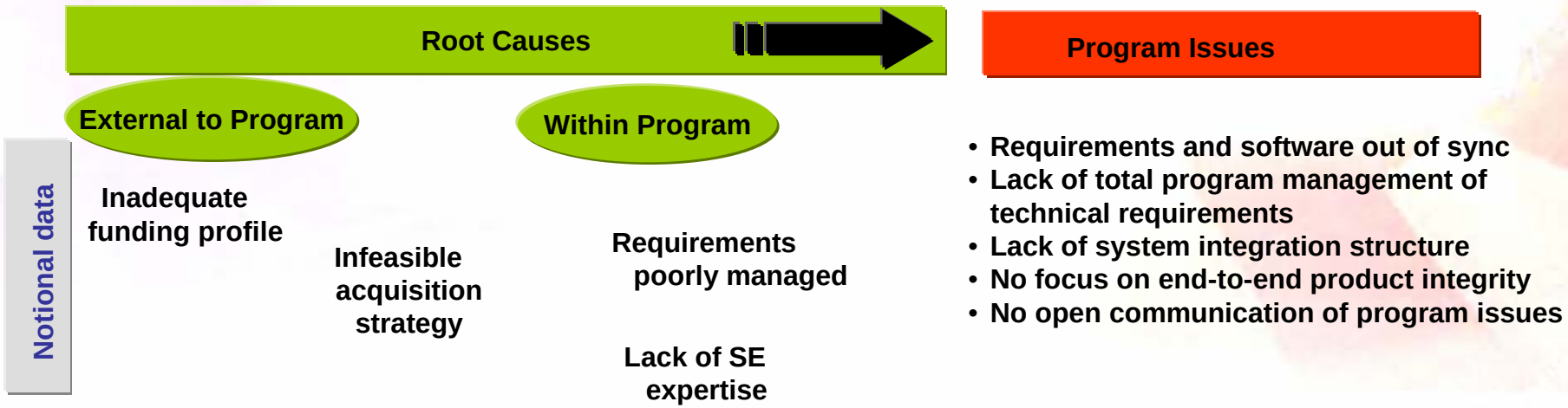
- **Representative Issues for *Test and Evaluation***
  - No reliability details (hours, profile, exit criteria, confidence level, OC curve)
  - Lack metrics
  - Basis for some threat-based requirements not fully explained or rationalized

- **Representative Issues for *Systems Engineering***
  - Lack of disciplined SE process, metrics, etc
  - PO not conducting PRR prior to LRIP
  - Missing Joint CONOPs
  - Missing System Functional Review (SFR) and PDR during SDD

Systemic Analysis Key Component - 1

Root Causes Analysis…

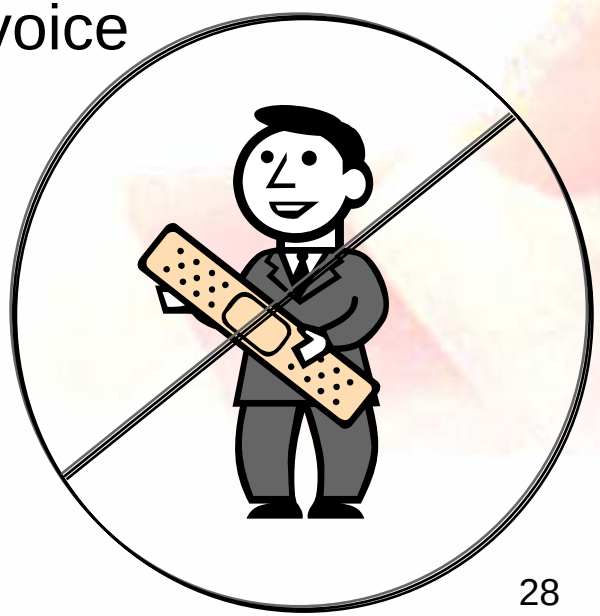
- Root cause issues drive one or more symptomatic program issue
- Root causes can be found within or external to program under review
- Understanding and addressing root cause issues can
  - Break the poor program performance cycle
  - Allow better understanding of barriers to program success



Systemic Analysis Key Component - 2

Systemic Recommendations…

- Address root cause issues
- Aimed at improving success across the greater community of acquisition programs versus single program focus
- Focus on policy, education, training, tools, techniques, methods
- Allows OSD to help programs by being voice to leadership
  - Data to validate gut-feel
  - Ability to raise “unpalatable truths”
  - Target specific recommendations to specific audiences (e.g. Service, program milestone, domain area)



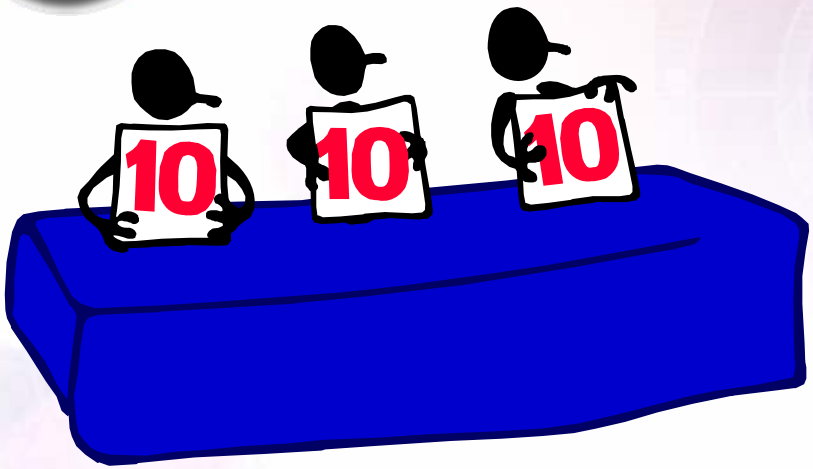
Systemic Analysis - Next Steps

- Form an internal IPT to develop a process for performing systemic analysis
  - Identify a data collection process -- beginning with data from the Program Support Reviews
  - Define desired systemic analysis outputs
  - Develop methods for root cause analysis and corrective action development
  - Incorporate quality assurance and peer reviews into the analysis
  - Determine near term and long term products
- Brief proposed process and products to SE Forum, 15 Dec 05
  - Goal is to share the process with SE Forum members to extend data collection and analysis across the community

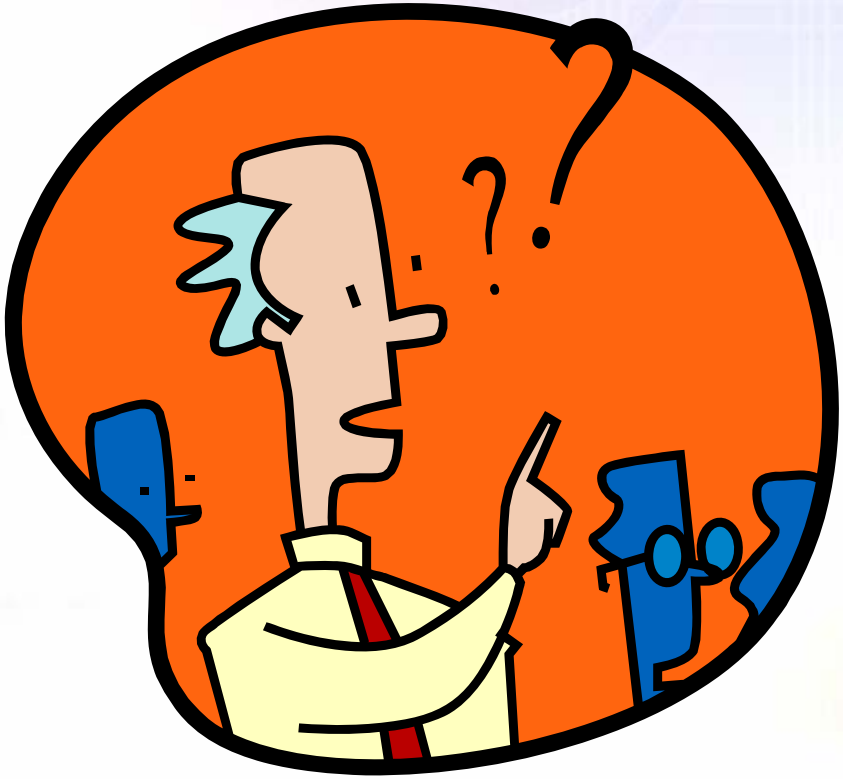
Summary

- We are working to meet the Under Secretary's imperatives in support of transformation by:
  - Providing a context for decisions
  - Putting credibility into the acquisition process
  - Driving systems engineering back into programs
- Our ultimate goal in conducting PSRs and SEP reviews is to help all programs achieve mission success through:
  - Early and persistent application of SE
  - Event-driven technical reviews and test programs

Panel Discussion…



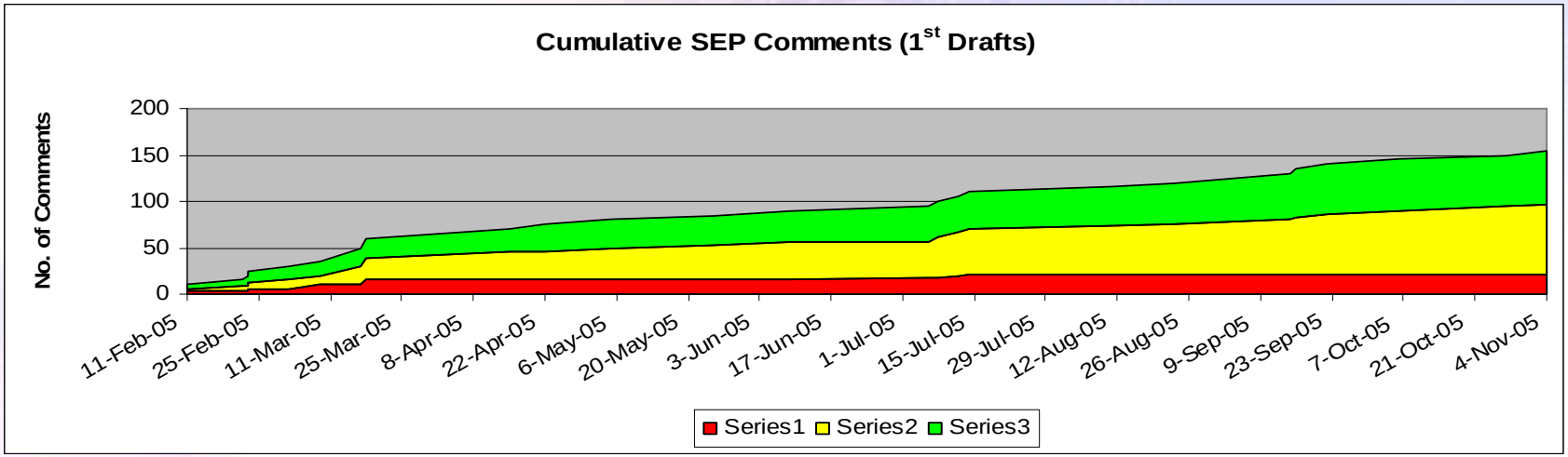
Questions…perhaps Answers

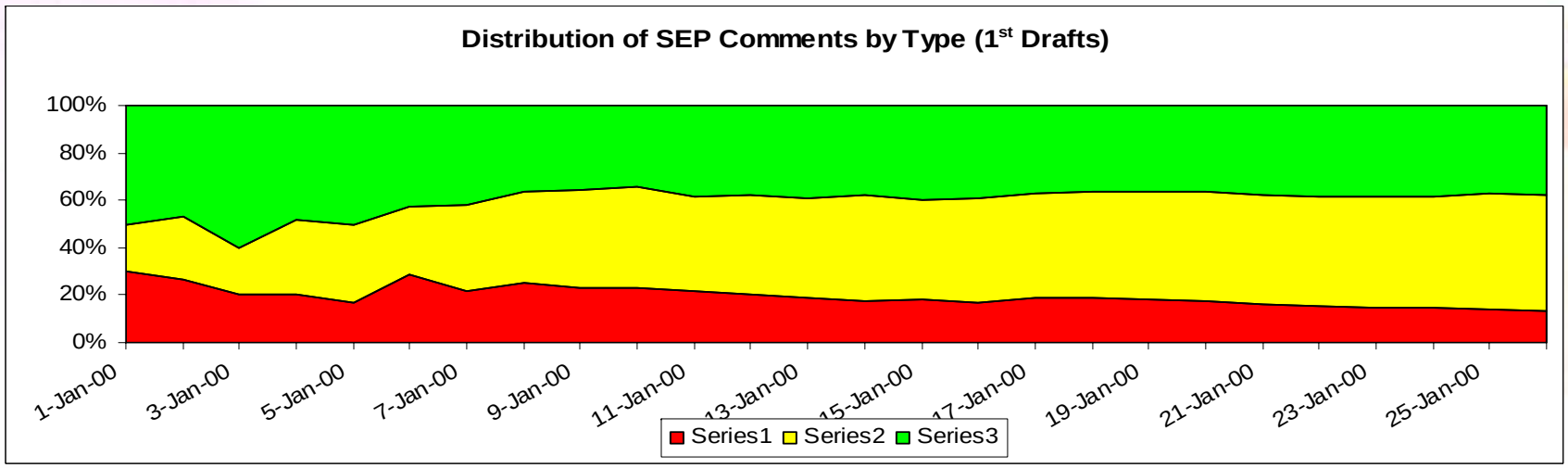


Backup Slides

Emerging SEP Comments**
(not systemic across all programs)

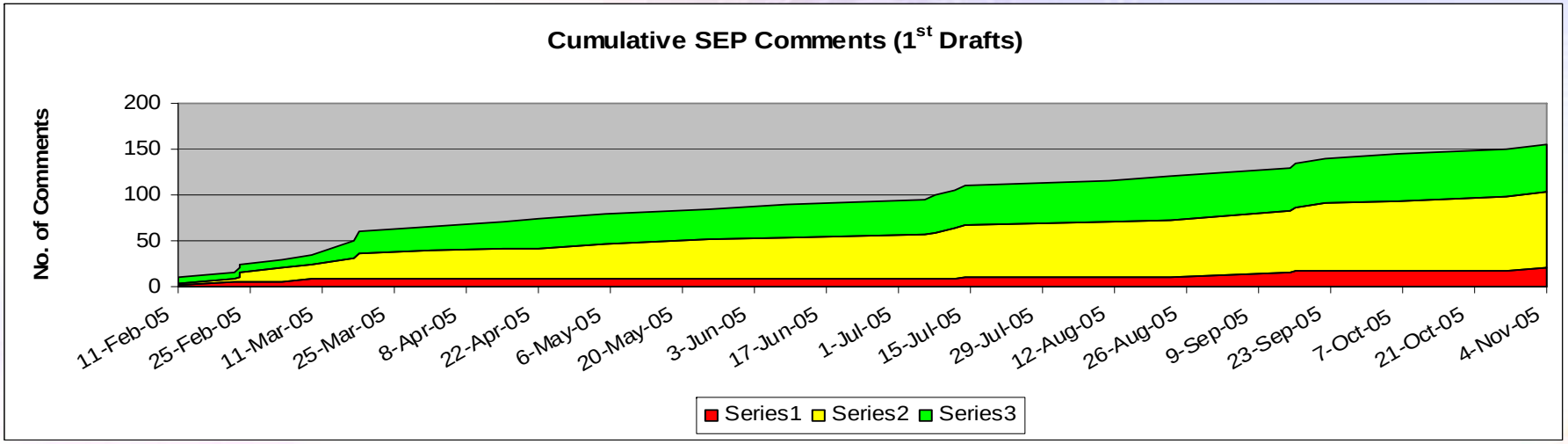
Trends for Category A: Program Requirements

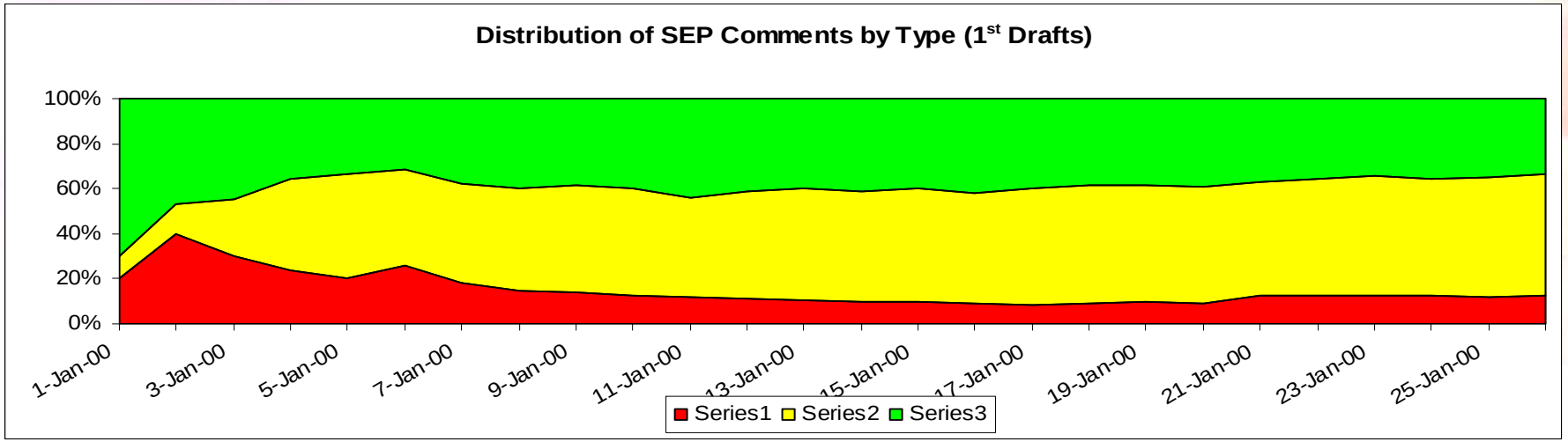




Emerging SEP Comments**
(not systemic across all programs)

Trends for Category B: Technical Staffing and Organizational Planning





Emerging SEP Comments**
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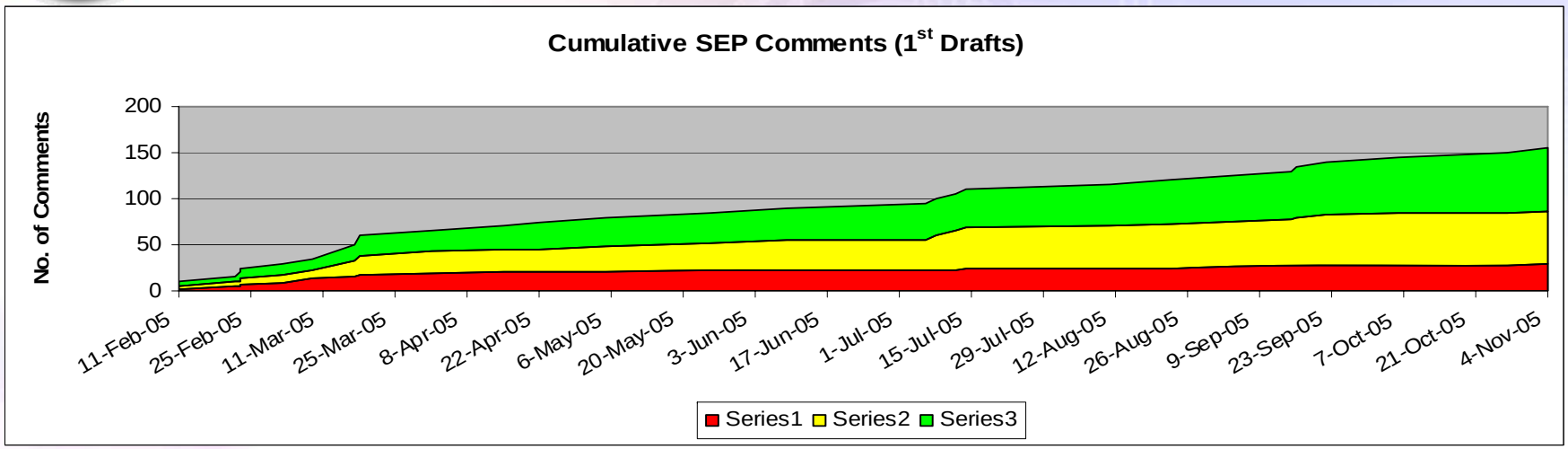
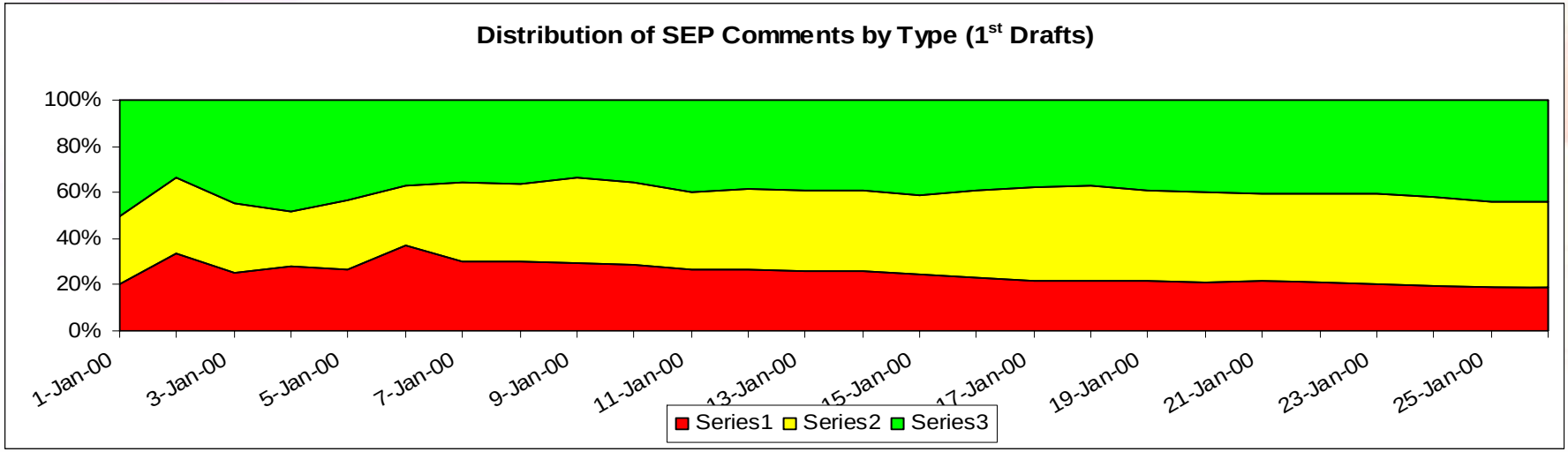
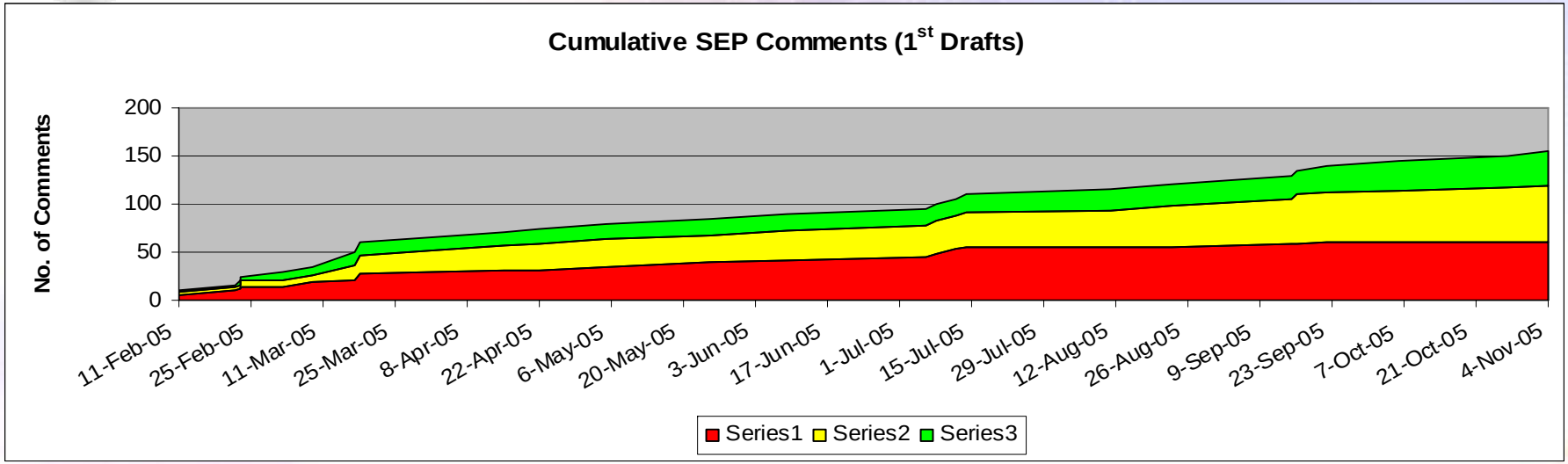
Trends for Category C: Technical Baseline Management Planning

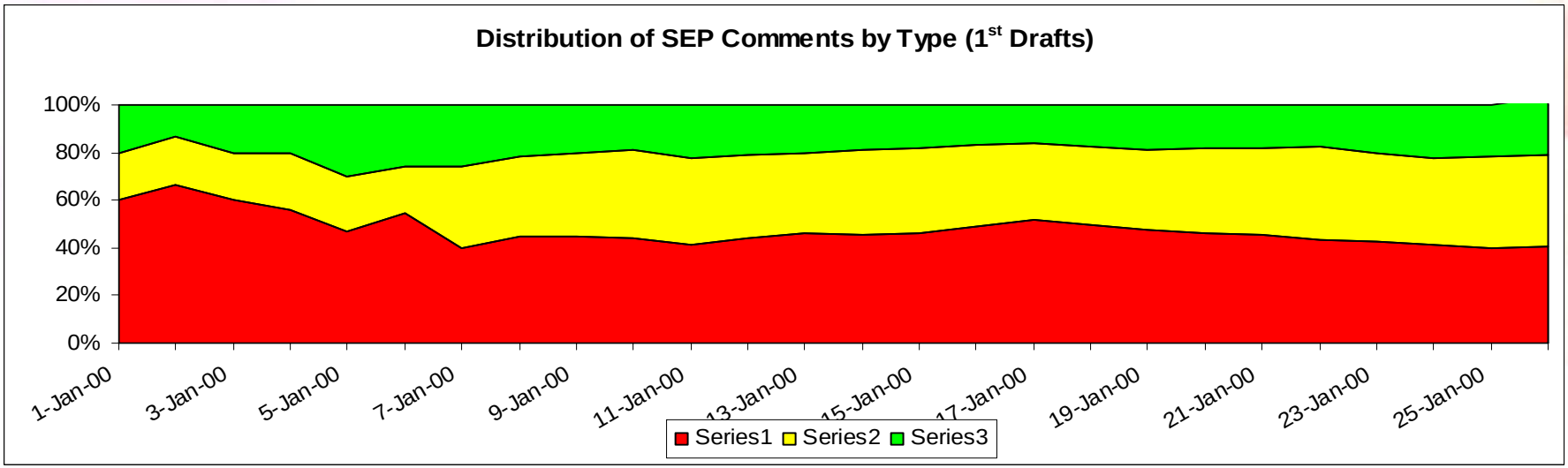




Emerging SEP Comments**
(not systemic across all programs)

Trends for Category D: Technical Review Planning





Emerging SEP Comments**
(not systemic across all programs)

Trends for Category E: Integration with Overall Management of the Program