The Role of T&E in the Systems Engineering Process

Keynote Address

August 17, 2004

Glenn F. Lamartin
Director, Defense Systems
Top Priorities

1. Successfully Pursue the Global War on Terrorism
2. Strengthen Combined/Joint Warfighting Capabilities
3. Transform the Joint Force
4. Optimize Intelligence Capabilities
5. Counter Proliferation of WMD
6. Improve Force Manning
7. New Concepts of Global Engagement
8. Homeland Security
9. Streamline DoD Processes
10. Reorganize DoD and USG to deal with Pre-War Opportunities and Post War Responsibilities

Excerpt from SecDef Memo, 9/24/03
Current Situation
What We Need to Do Better

Requirements
- Adapting to changing conditions
- **Matching operational needs with systems solutions**
- Overcoming biases of Services and others
- PPBES
- Laying analytical foundation for budget military
- Moving to transform
- Aligning budgets with acquisition decisions

Acquisition
- Acquiring systems-of-systems
- Making system decisions in a joint, mission context
- Transitioning technology
- Assessing complexity of new work and ability to perform it

Sustainment
- Controlling schedule and cost
- Controlling O&S costs
- Passing operational
- Treating people as a
USD(AT&L) Imperatives

• “Provide a context within which I can make decisions about individual programs.”

• “Achieve credibility and effectiveness in the acquisition and logistics support processes.”

• “Help drive good systems engineering practice back into the way we do business.”
How Defense Systems is Responding

- Instituted a new Systems and Mission Integration organization
  - Engaging OSD, Joint Staff, Services, and COCOM staffs to define joint integrated architectures
  - Synchronizing the requirements, acquisition, and budget processes
- Warfare offices tailoring the application of DoD 5000
  - Leading IPT process for program oversight and review
  - Role is to help programs succeed
- Formed a new Systems Engineering organization
  - Institutionalizing Systems Engineering across DoD
  - Setting policy for implementation, capturing best practices, setting standards for training and education
  - Enhancing emphasis on system assessment and support
Systems Engineering

- Defines “good systems engineering” for the Department
- Finds, captures, and shares best practices
- Establishes systems engineering policy and procedures
- Implements education of government and industry workforce
- Conducts outreach with industry, academia, associations, individual programs, and others
- Directs and manages SE and SW studies and reviews
- Focal point for developmental test and evaluation
- Confirms designs meet specifications
Systems Engineering
Developmental Test & Evaluation

- A critical part of good systems engineering
- Ensures thorough test planning and assignment of resources
- Provides indication of technical maturity
- Verifies system performance
- Confirms the design meets specifications
- Stressing expanded use of models and simulation, especially for systems of systems
- Recommends changes to Department DT&E policies and procedures
- Key determinant of successful OT&E

T&E is integral to successfully fielding our weapon systems
What We Have Done To Revitalize Systems Engineering

- Issued Department-wide SE policy and provided implementation guidance
- Established SE Forum to ensure senior-level focus
- Instituted “context” briefings as part of Milestone Reviews
- Instituted system-level assessments to aid PMs
- Working with Defense Acquisition University to revise curricula
- Re-focused Warfare offices to help guide programs through the Milestone Review process
- Leveraged close working relationships with industry and academia
- Integrating DT&E with SE policy and assessment functions - focused on effective, early engagement of both
Opportunity for Greater SE Role in Acquisition

Increased use of disciplined Systems Engineering, including T&E and M&S, to effectively address technical issues.
Current Challenges

• Focus shifting from platforms to capabilities and system solutions
• System complexity is increasing – Family of Systems and/or System of Systems interdependencies
• Demand for network centric capability drives higher levels of integration
• Functional and physical interfaces expanding in number and complexity
• Evolutionary acquisition institutionalizing change
• New approaches to testing balanced with modeling and simulation must match new systems views
What You Can Do

- Remember the Under Secretary’s imperatives – our ultimate goal is to help our programs and ensure mission success
- Develop a strategy to better integrate T&E and M&S into program SE activities …
- Consider opportunities for expanded involvement in acquisition process — timing (early) and level (persistent and continuous)
- Think about SE, T&E, and M&S as they relate to Systems-of-Systems capabilities.
- Participate and engage … with an open mind
Backup Slides
The Acquisition Model
DoDD 5000

- Process entry at Milestones A, B, or C (or within phases)
- “Entrance criteria” met before entering phase
- Evolutionary Acquisition or Single Step to Full Capability

User Needs & Technology Opportunities

A: Concept Refinement
B: Technology Development
C: System Development & Demonstration

IOC: Production & Deployment

FOC: Operations & Support

Pre-Systems Acquisition
(Engineering and Manufacturing Development, Demonstration, LRIP & Production)

Systems Acquisition

Sustainment
Defense Systems Organization

DS
Defense Systems
Director: Dr. Glenn Lamartin
Principal Deputy: Mr. Mark Schaeffer

SE
Systems Engineering
Director: Mr. Schaeffer
- Enterprise Development: Mr. Skalamera
- Developmental Test & Evaluation: Mr. Lockhart
- Assessments & Support: Mr. Castellano

SA
Systems Acquisition
Director: Dr. Lamartin
- Joint Force Application: Mr. Durham
- Joint Force Integration: Ms. Quinlan
- Joint Force Operation: Mr. Kistler

SMI
Systems and Mission Integration
Director: Dr. Garber
- Missle Warfare: Dr. Stansberry
- Treaty Compliance: Mr. Troyano
- Naval Warfare: Ms. Costello (Acting)
- Land Warfare & Munitions: Mr. Melita
- Air Warfare: Ms. Wright
- Joint Force Application: Mr. Durham
- Joint Force Integration: Ms. Quinlan
- Joint Force Operation: Mr. Kistler
- Missle Warfare: Dr. Stansberry
- Treaty Compliance: Mr. Troyano
- Naval Warfare: Ms. Costello (Acting)
- Land Warfare & Munitions: Mr. Melita
- Air Warfare: Ms. Wright
- Joint Force Application: Mr. Durham
- Joint Force Integration: Ms. Quinlan
- Joint Force Operation: Mr. Kistler
- Missle Warfare: Dr. Stansberry
- Treaty Compliance: Mr. Troyano
Systems and Mission Integration

- Leads the development of systems views of integrated architectures
- Leads the development of integrated plans and/or roadmaps
- Establishes a broader context for DAB reviews
- Leads DAB reviews for Capability Areas
- Fosters interoperability, jointness, and coalition capabilities
- Develops/refines systems engineering concepts and practices for application at the architecture level
- Conducts systems assessments to judge how well newly fielded systems meet capability needs
Systems Acquisition

• Responsible for technical review and program oversight of assigned acquisition programs

• Leads overarching integrated product teams for strategic and tactical systems; develops recommendations on major weapon systems for the Defense Acquisition Board

• Provides technical support to arms negotiations, makes recommendations concerning treaty implications on the acquisition of new systems, and monitors compliance with treaties

• Tailoring the application of the revised DoD 5000 series
  – Emphasis now on helping programs succeed and transition to new Department processes
Development Growth Causes

(Stakeholder Analysis)

Principal Causal Factors:
- Requirements Immaturity 11%
- Requirements Creep 7%
- Programs Budgeted Too Early 7%
- Software and Integration Underestimated 5%
- Budget Instability 5%
- Competitive Process “Over-optimism” 5%
- Inadequate Pre-Acquisition Planning & Risk Reduction 5%
- Optimistic & Extrapolated Estimates 5%
- Lack of System Engineers 7%
- Program Director Turnover & Experience 5%
- All Other Causes 38%

Other:
- Acquisition Reform
- Program Length
- Too Many KPPs
- No Management Reserve
- Program Management Optimism

Lack of adherence to SE practices/principles accounts for >35% of growth

Source: 83 surveys, 67 Organizations, frequency of mention, Space Systems Development Cost Growth Analysis Booz-Allen-Hamilton
Next Two Days: Questions to Answer

- Are there any policy changes needed?
- How do we ensure that TE planning process is integrated into the SE processes?
- How do we integrate the SEP and TEMP?
- How do we ensure the tester is part of the SE process?
- How do we make T&E support verification of the SE process?
- Are there process changes needed by industry and government?
- Can we precisely define the role of T&E in the SE process?
- How do you determine when you have done enough T&E?
Opportunity? ...
SE As Integrating Enabler for TE

Acquisition Oversight

Systems Engineering Throughout Weapon System Life Cycle

Program Managers

Services, Congress Depts/Agencies Industry Academia

Other OSD
Summary

- T&E is an important part of the SE process and thus important to the success of programs
- Determine an overall optimum strategy for incorporating the appropriate Test & Evaluation activities in a program’s Systems Engineering activities
  - Service’s/MDA’s vision of appropriate/workable strategy
    - Include System of Systems (SoS) & Family of Systems (FoS)
Director, Defense Systems

• Principal advisor to the Under Secretary of Defense (Acquisition, Technology & Logistics)

  • Technical review, evaluation, and oversight of strategic and tactical programs

  • Chairs Overarching Integrated Product Teams in the Defense Acquisition Board process

  • Enables effective joint and combined operations through the development of system of systems capabilities

  • Implements policies regarding system integration and interoperability

  • Sees to the application of sound systems
Capability Area Reviews

- Focus on capabilities and Systems-of-Systems
- Provides mission area context for DAB principals
- Relates acquisition process to capability and programming processes
- Identifies joint solutions and additional work to be done
- Reveals need for management, engineering, and testing across a capability area
- Helps align individual program expectations for capability and schedule
- Provides basis to set metrics and gauge progress in developing capability