TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Systems Engineering for the Science & Technology Community

12th Annual NDIA Systems Engineering Conference
28 October 2009

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Introduction

This presentation provides insight into changes in the Tank Automotive Research Development and Engineering Center (TARDEC) Army Technology Objectives (ATO) culture and examines lessons learned from the application of formal Systems Engineering principles and practices.

Systems Engineering

- Department of Defense Instruction 5000.2 Requires Systems Engineering Be Performed On All Programs.
- RDECOM SE Policy, Dated 24 April 2007, Requires SE Be Performed On All New ATO-D Programs.
  - Must Have A Systems Engineering Plan (SEP) Formally Defining The SE Process
    - SE Group Developed SEP Instructions To Standardize SEPs. The Instructions Provide a Detailed Explanation, Examples For Each Paragraph
  - SE Group Then Works With ATOs To Implement The SEP Contents Within The Program

The SEP Process

- Conduct Initial Meetings With ATO Personnel and SE Subject Matter Experts (SME)
  - Begin SEP Process With Planning Before Writing
  - Discuss Objectives; Status Of Requirements; Schedules; Potential Risks; Partners; etc.
  - Include Additional (Non-ATO) Issues, Such As Disposability, Security, Manufacturing
- Using The SEP Instructions And Results Of Initial Meetings, SE and ATO Personnel Develop Draft SEP
- After Formal Approval, The SEP Is Published in an Army Database
  - Available For Reference By Other Interested Parties

Subject Matter Experts

- SE Has Specialists (SMEs) In Support Of the Enterprise Community
  - Risk Management, Requirements Management, SEP Generation, Etc.
  - The Use Of SE SMEs Reduces Risks, Costs & Schedule Impacts
- Central Pool of SMEs Eliminates Technology Teams' Need To Hire / Maintain SE Experts
  - Technology Teams Must Still Have A Fundamental Knowledge Of Systems Engineering

Requirements Management

- Right From The Start –
  - Define, Decompose, And Manage Project Requirements
  - Must Be Data-driven, Clear, And Unique
- Government Should Control Requirements, Not Contractors
  - Ensure Correct Work Is Performed
  - Impacts Required Validation & Verification
  - Reduces Risks, Cost, Schedule Impacts

Government Owns & Manages Requirements

Risk Management

- Identify Risks, From The Very Beginning
- Continuously Identify Additional Risks Throughout The Program
  - Designate A Risk Manager For The Project
  - Allow Anyone To Submit A Risk
- Track And Manage Risks In A Database
  - Identify Mitigation Techniques
  - Perform Frequent Reviews Of Risks
  - When No Longer Valid, Close Risks Out Of The Database.

Control Risks At The Project Level

Enhance Communications

- Participate in ATO Approval Process
  - Ensure Proposals Address Documented Warfighter / PEO Needs
  - Ensure Proposals Include Systems Engineering
- Technology Transfer Agreements
  - Ensure The Customer Knows Our Intent; We Know the Customer's Needs
- IPTs And SEITs
  - PM/TRADOC/Contractor/Industry Partners Involvement
  - Resolve Concerns Early
- Increased Levels Of Communications Reduces Risks, Costs, Schedule Delays And Replans

Technical Reviews

- Use A Rigorous Approach To Technical Reviews
  - Clearly Define Inputs, Artifacts, Exit Criteria, And Roles And Responsibilities
  - Designate The Technical Review Decision Authority
    - Approves Transition To Next Phase
      - Full Approval
      - Conditional Approval (Minor Issues To Close Out)
      - Disapproval (Major Issues To Resolve; Present At Another Review!)
  - Involve SMEs From Related Programs
- Have Customer/Contractor/Industry Partner Participation

PROGRAMS Go Through Design Reviews, Not CONTRACTS!

Key to Success!

- Most Unsung Hero: Communication / Interaction Between Projects, Their Program Managers, And The TRADOC User Community
  - No Surprises
  - Reduce Risks
  - Manage Requirements
  - Eliminate Confusion
- Strong Participation In Technical Reviews
- Involve Everyone In IPTs/SEITs

Consistent Systems Engineering Sets Expectations For The Customer, The Developer, & The Warfighter

Some Lessons Learned

ATO Managers Conducted A Review Several Months After The First Set Of SEPs Were Completed.

Comments Received Included:

- SEPs Improved Communications Between Stakeholders
  - PM, Contractors/Government Partners, And ATO Personnel
  - Ensured Consensus, Commitments
  - Use Of SEIT, IPT, Technical Reviews
- Helped Align Projects With Program Manager's Strategic Plans, Goals, And Priorities

Lessons Learned

- SE Practices Added Value
  - Risk Mgmt, Schedules, SEIT/IPT, Event-Driven Technical Reviews, Modeling & Simulation
- Increased Uses For WBS: Planning, Developing the Statement of Work and Integrated Master Schedule
- Aligned Technical Process with Communication and Management Processes

Systems Engineering Must Be Planned Before The Project Starts!

Lessons Learned

In General:

- Need To Tailor Efforts
- Research Projects Have Different Needs Than Production Programs
- Needs Vary One Research Project To Another
- Use CM From The Very Beginning
  - Documents Are Stored In A Common Facility; Enables Access By Contractors/Government Partners

Systems Engineering, Up Front and Early

Quotes

- "SEIT makes the tough decisions and is a good sounding board"
- "Identifying risks early aided in developing mitigation plans to manage the risks when manifested"
- "Development of the SEP for the ATO helped communicate the ATO execution strategy to TARDEC's PM partners, developing ties to their modernization plan and ensuring the program is aligned with PM goals."