How Can Systems Engineering Support Program Execution?

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DoD Acquisition Challenges

- Requirements Instability
- Technology Maturity
- Systems Engineering
Ample Direction for Early SE

U.S. AIR FORCE

Weapon Systems Acquisition Reform Act (WSARA) 2009

“Support each MDAP prior to Milestone A approval through a rigorous systems analysis and systems engineering process”

NRC Report “Pre-Milestone A and Early-Phase SE” (Jan 08)

“Attention to a few critical SE processes particularly during preparation for MS A and B is essential to ensuring programs deliver on time and on budget.”

GAO Report – 09-326SP

“Defense Acquisitions”

“ensure new programs follow a knowledge-based approach and must begin with strong systems engineering analysis”

Air Force Acquisition Improvement Plan

“There will be acquisition involvement earlier in requirements development process and SE techniques will be applied”
Air Force Acquisition Improvement Plan

SECAF & CSAF approved plan to recapture acquisition excellence

Five Major Goals

1. Revitalize the Air Force Acquisition Workforce
2. Improve Requirements Generation Process
3. Instill Budget and Financial Discipline
4. Improve Air Force Major Systems Source Selections
5. Establish Clear Lines of Authority and Accountability

Acquisition Improvements Heavily Dependent Upon SE

Integrity - Service - Excellence
Focus on Air Force SE Processes

- Streamline Acquisition Processes
  - Move Faster, Smartly

- Instill Systems Engineering Discipline
  - Technical reviews and processes

- Active SE Early in Program Life Cycle
  - Shape scope, requirements definition, identify viable concepts
  - Extensive user/provider collaboration
Early Systems Engineering Was Lost

Problem Statement
“Overstated, unstable requirements that are difficult to evaluate during source selections”

Solution
“Ensure acquisition involvement and leadership in support of the lead command early in the development of program requirements”

System Delivery and Fielded Capability

Eroded acquisition expertise and processes that supported the lead command early in the development of program requirements

Eroded acquisition expertise in translating ops requirements to system requirements

Early Systems Engineering and Development Planning virtually eliminated

System Requirements

Operational Requirements

Capability Need Identified

Capability Assessment
Disciplined SE Reduces Risk

- Up to 75% of life cycle cost is determined during concept refinement and requirements generation

- Identify the key decision points
  - What are the significant cost drivers – budgetary risk
  - New technologies – engineering risk
  - What does the 80% solution look like
  - What is commercially available
  - What do we prototype

- Identify risk
  - Cost, technical, integration, manufacturing, and sustainment

Upfront Effort And Resources Will Pay Significant Life-Cycle Benefits
Air Force Vision

- Attack problem early with Disciplined, Repeatable Processes from JCIDS CBA (pre-ICD) to AoA, Pre-MDD
  - Inform decision makers on technical feasibility of prospective concepts for materiel solutions
  - Initial integrated risk assessment addressing both operational and programmatic issues
- Support realistic program formulation through application of early Systems Engineering
  - Robust and disciplined up-front technical planning
  - Solid technical foundation for the future program
  - Reduce the chances of poorly planned concepts emerging from AoA with relatively high rankings
  - Use Concept Characterization & Technical Description approach

Clear and Actionable Policy and Process
Improving Program Execution

- Development Planning
  - Early and often discussions with users to debate what is feasible
  - Ensure ICD/CDD are comprehensive, complete, and unambiguous

- Analysis of Alternatives
  - Examine new applications of existing technologies
  - Analyze technical feasibility and risk of alternatives

- Cost and Schedule Estimates/Execution
  - SE is responsible for WBS development – Basis for sound estimates
  - Independent assessment of contractor schedule & technical progress

- Contracting
  - Translating JROC validated requirements into technical basis of RFP
  - SE analysis key to negotiations with contractors on their proposals

Early Sys Engineering Is Critical To Long-Term Program Success
AF is establishing a Science, Technology, Engineering and Mathematics (STEM) Emerging Issues Panel to address tech workforce requirements—to include SE

- STEM resources will be affordable, scalable, agile, and seamlessly aligned with the AF mission and strategies
  - Growing acquisition workforce – SE in high demand
  - Additional hires for Product Centers, ALCs, labs and other facilities
  - Recruiting additional Systems Engineers using expedited hiring

- Building on and establishing aggressive outreach efforts Air Force-wide with our high schools, colleges, universities, sister services and others existing efforts

- Aggressively using the education and training capabilities to keep AF STEM professionals current in their fields and on the cutting edge of technology – we must grow our technical expertise in-house

- ‘Bright Horizons’ strategic plan in development to properly size, train, and equip our SEs/STEM community with the technical depth and breadth needed for acquisition excellence
How Can Systems Engineering Support Program Execution?

- Disciplined Engineering is critical to program execution

- **Early** SE and Development Planning are up-front investments to reduce risk in later phases of the acquisition life cycle

- Systems Thinking & Tech Planning MUST start in the early stages of concept development, BEFORE formal program initiation

- SE Experience is critical – Invest and grow workforce