

# Test and Evaluation of System-of-Systems



Dr. Catherine Warner  
Science Advisor  
Director, Operational Test & Evaluation



# Director, OT&E Initiatives

(DOT&E memo, November 24, 2009)

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1. Field new capability rapidly
  - Do not skip testing or reporting/Continue testing after fielding
2. Engage early to improve the requirements process
  - Unless programs start with clear, sensible, and rationalized requirements, the program and its testing suffer
3. Integrate testing (CT, DT, OT, LFT) using best practices of experimental design
  - Evaluators must plan to use all test data
  - Test early in the mission context and realistic operational environments
4. Significantly improve suitability (reliability) before IOT&E
  - Reliability is key contributor to life cycle costs
  - Reliability must be designed in, it cannot be tested in



# DOT&E Direction on the Reporting of OT&E Results



OPERATIONAL TEST  
AND EVALUATION

OFFICE OF THE SECRETARY OF DEFENSE  
1700 DEFENSE PENTAGON  
WASHINGTON, DC 20301-1700

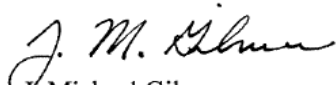
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MEMORANDUM FOR THE COMMANDER, U.S. ARMY TEST AND  
EVALUATION COMMAND  
COMMANDER, OPERATIONAL TEST AND  
EVALUATION FORCE  
COMMANDER, AIR FORCE OPERATIONAL TEST  
AND EVALUATION CENTER  
DIRECTOR, MARINE CORPS TEST AND  
EVALUATION ACTIVITY  
COMMANDER, JOINT INTEROPERABILITY TEST  
COMMAND



SUBJECT: Reporting of Operational Test and Evaluation (OT&E) Results

The statutory responsibilities of the Director, Operational Test and Evaluation, include prescribing policies and procedures for the conduct of operational test and evaluation in the Department of Defense. Currently, *DoD! 5000.02* (December 8, 2008) specifies the following:

  
J. Michael Gilmore  
Director

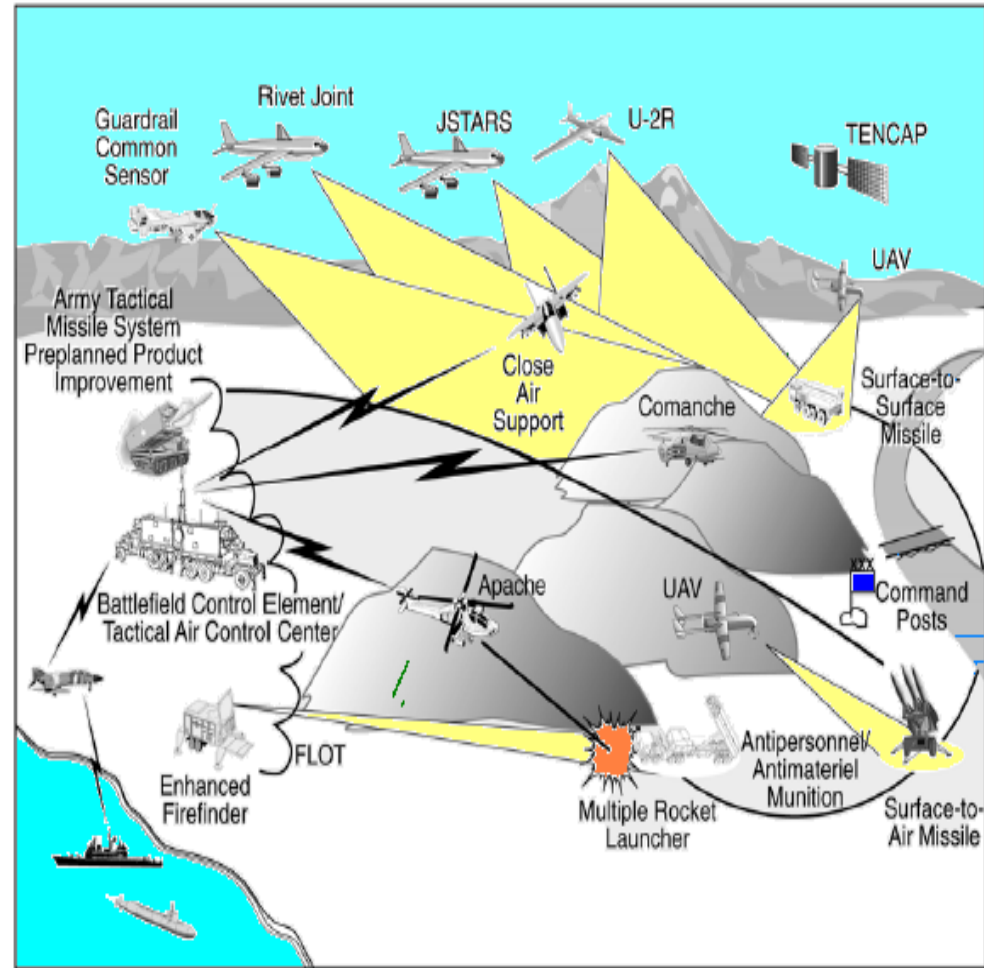
- Emphasis on system's use to accomplish combat missions
  - "performance attributes" are not the military effect or measure of operational effectiveness required for achieving the primary purpose of a T&E"
- Appropriate environment includes all interrelated systems needed to accomplish an end-to-end mission in combat.
- This statement of policy precludes measuring operational effectiveness and suitability solely on the basis of system-particular performance parameters.



# System of Systems (SOS) Environment

## Precision Strike End to End Mission Example

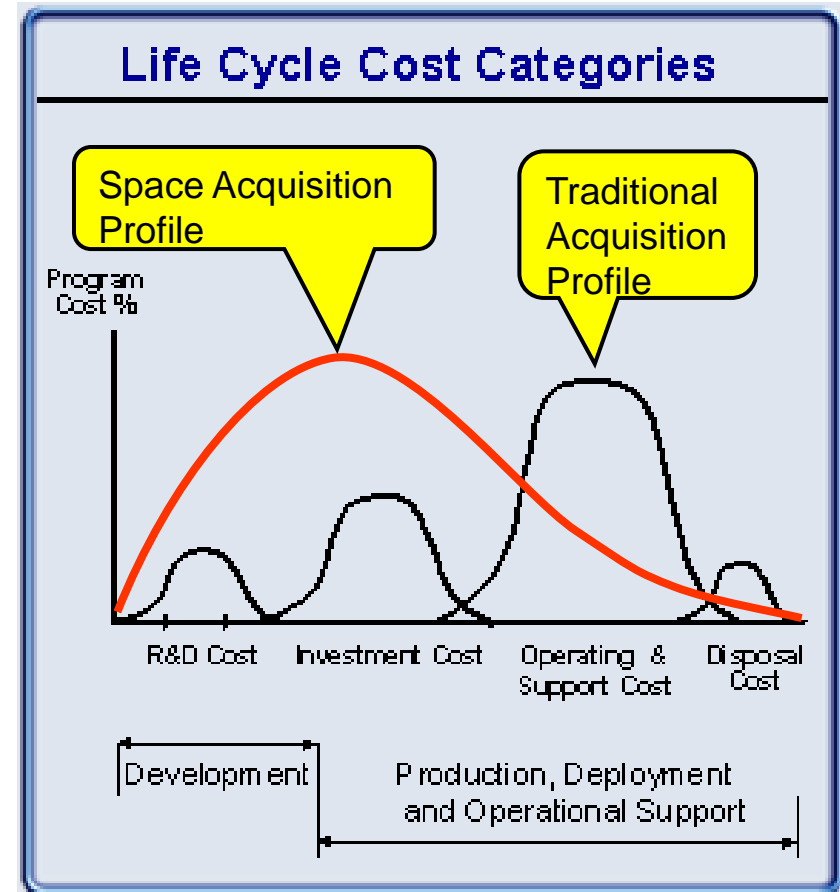
- Plan operational realism as EARLY as possible
- SoS testing is very complex and resource-intensive
  - Plan testing, including data collection, as early as possible
  - Use DOE to screen for critical system interactions
- Liaison work:
  - Making program manager aware of issues
  - Working with PM/T&E IPT to facilitate exposure to joint environments:
- Information Assurance – increasingly important for all systems
  - Policy: Procedures for OT&E of Information Assurance in Acquisition Programs (*update in progress*)
  - I/O range





# Space Operational Test and Evaluation Model

- Roadmap for early program influence, tailor-able as needed
  - Can be applied to other high-tech/ small-quantity programs
- Three key tenets are:
  - Early and continuous and integrated testing involvement throughout the lifecycle of the system
  - Agile analysis and reporting at Key Decision Points (KDP)
  - Focus on system of system evaluations
- Early operational assessments include
  - Launch range compatibility testing
  - Launch and early orbit operations





# Enterprise Approach for Ship Air Defense

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- OSD Directed Navy to take a “Big Picture” look at testing ship self-defense against cruise missiles
  - Navy doesn’t buy combat systems, it buys pieces of combat systems, each program office develops its own test program, created in isolation
  - Should consider test requirements from all sources and organize test program for evolutionary development of self-defense systems
- DOT&E endorsed the Enterprise approach combining data from various venues

## Focus on Combat System Families

Self-Defense Test Ship

Lead Ship

Modeling and Simulation

Probability of Raid Annihilation



# Observations

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- Program Managers decide how much and where DT is done
  - Often contractor DT not as realistic as government DT and many times it has far greater limitations
  - Can be a recipe for failure – system less prepared for IOT&E
- Developmental testing has not been sufficient or adequate
  - OT&E results indicate a Department-wide problem
  - Seeing more weapons systems not ready for IOT&E and combat.
  - Congress recently created a Director of Developmental Test and Evaluation
- DOT&E is concerned with mission accomplishment, demonstrated performance, in an operationally realistic environment versus a realistic threat.
- Today, the operationally realistic environment is **JOINT**.



# Suggestions for SE and T&E Communities

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- Do not skimp on prototypes or LRIP items – major issue
- DT generally does not focus on identifying operational consequences of weapon system performance
- Realistically stress a weapons system in developmental testing – operational testing to confirm
- Understand rationale for requirements and KPPs, but do not regard them as inviolate
- Comparative or baseline test and evaluation protects the program
- Test against a realistic, living, breathing threat intent on winning – *the enemy has a vote*