

Key Issues with Program Delays and Reliability Growth



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Current Issues in T&E of Defense Programs

- Recent independent assessments of T&E in defense programs
 - DAE review of acquisition processes
 - DOT&E review of causes of program delays
- DOT&E study, “Marginal Costs of T&E”
- Recent trends in reliability
 - DoD steps to improve reliability
 - Services’ implementation



State of Tension between Program Management and T&E

- USD(AT&L) chartered an independent review team to assess Program Management complaints that the Test Community drives undue requirements, excessive cost, and added schedule into programs
- Concurrently, DOT&E conducted a systematic review of recent major programs experiencing delays
- Results of both efforts indicate that testing and test requirements do not cause major program delays
 - Other issues such as manufacturing, development, and budgetary changes cause the majority of the delays
 - The results of testing rather than the testing itself has caused delays
 - Requirements change is frequently seen as a symptom – not a cause – of program delay



Decker Wagner Report on Army Acquisition

- Secretary of the Army commissioned a study of the Army's acquisition system
 - Independent panel chaired by Gilbert Decker and Louis Wagner
- Addressed the failure rate of new development programs
 - Between 1990 and 2010, Army terminated 22 MDAPs (15 of those since 2001)
 - **EXCLUDING FCS**, Army spent >\$1B per year since 1996 on programs that were cancelled before completion
- Many reasons were cited including: unconstrained requirements, weak trade studies, erosion of requirements and acquisition workforce, poor TRL, ...
 - NONE of the reasons cited included T&E
 - In fact, earlier and more robust T&E may have revealed problems and solutions earlier when they would have been less costly to fix



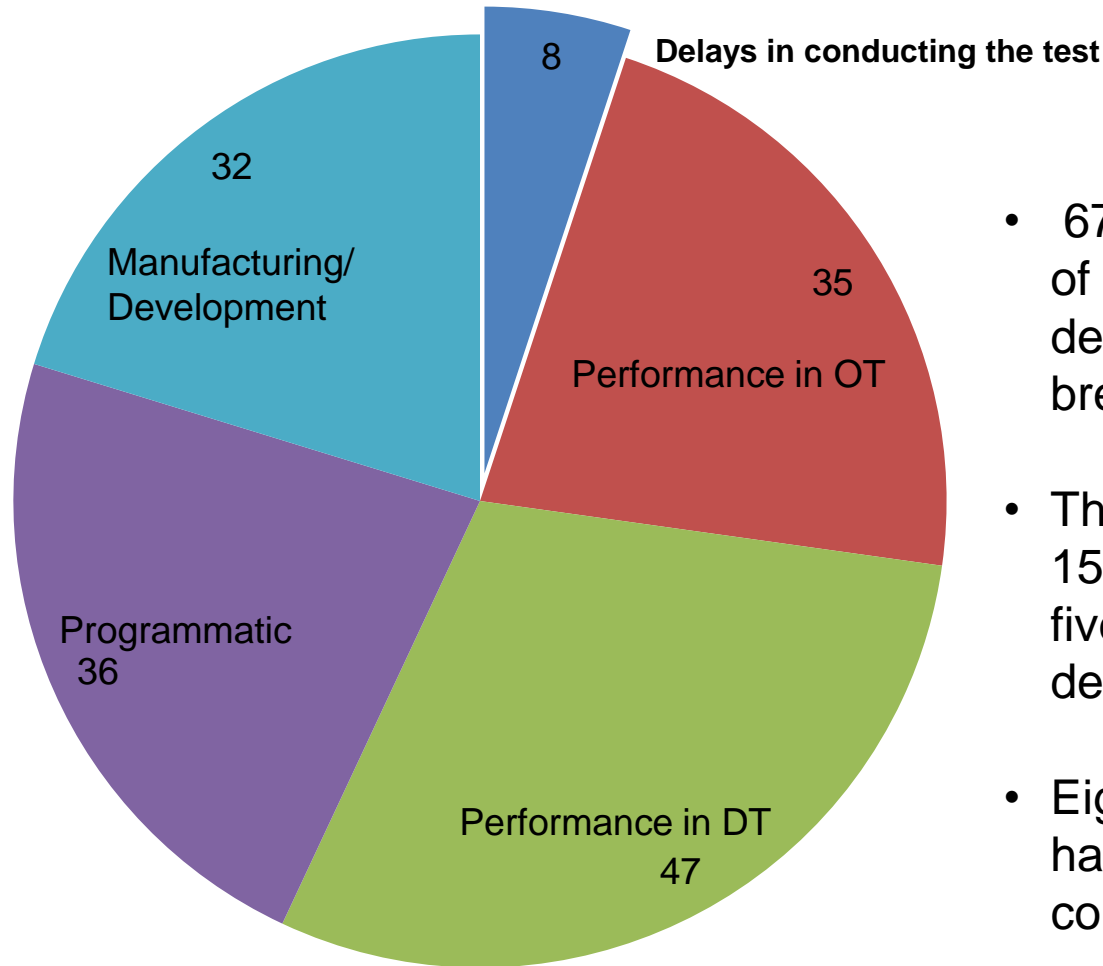
Review of Program Delays

- DOT&E conducted a systematic review of 67 major programs that have experienced significant delays
 - 36 experienced Nunn McCurdy breach*
 - 6 programs were ultimately canceled (and 1 had MS B rescinded)
- 84% of these programs had performance problems in testing that caused major schedule delays while only 12% had issues conducting the tests that led to delays

- * There have been 41 Nunn McCurdy breaches since 1997, this analysis only included MDAPs that had significant or critical breaches and a MS B after 1982
- * Two of the 36 programs considered in this analysis had NO delays to their schedule



Reasons Behind Program Delays

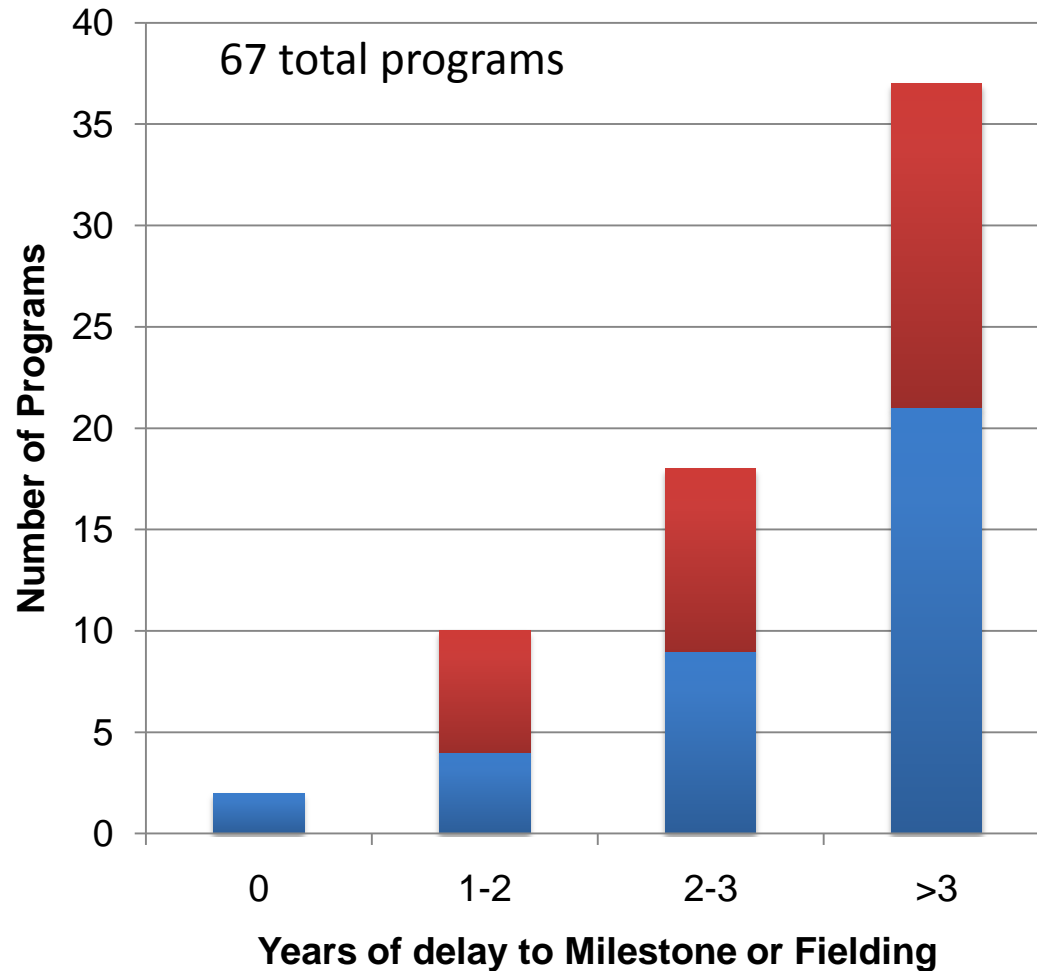


- 67 selected case studies of programs with ≥ 1 year delay or a Nunn-McCurdy breach
- The case studies showed 158 instances of issues in five categories resulting in delays
- Eight of the 67 programs had delays because of test conduct issues

“T&E cost issues in a program are typically the result of under-estimating the impact of system complexity; inadequate cost estimating; and/or inadequate/immature engineering”



Length of Program Delays



- Programs without Nunn McCurdy
- Programs with Nunn McCurdy

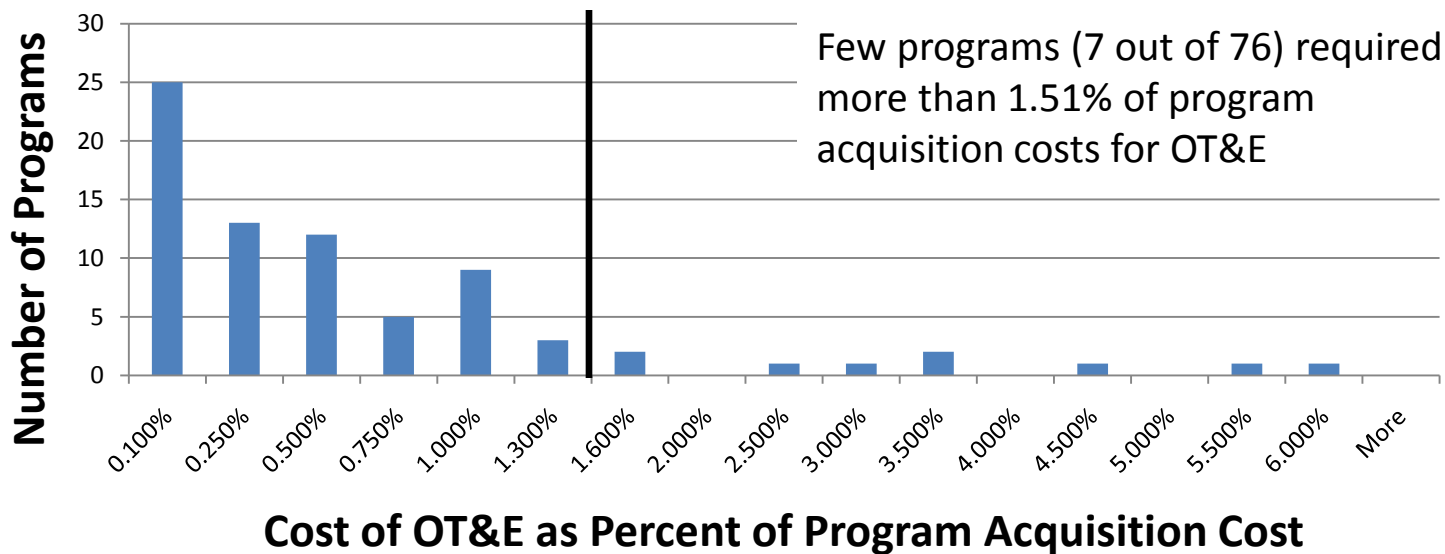
- Of the 67 total programs, 7 were eventually canceled or restarted



Cost of OT Relative to Program Cost

"...the cost of [testing] is a small portion of the overall program budget; it is a large percent of the budget in the year(s) in which it occurs...[and] by being at the end of the development process, testing occurs when the program has few degrees of freedom left to work issues."

- Review of 76 recent programs showed an average marginal OT&E cost was 0.65%
- Low Program Acquisition Cost is dominant source of high relative OT&E cost
- Expense of test articles and their expendability is a major driver



OT&E is usually 1% ± 0.5% of Program Acquisition Cost

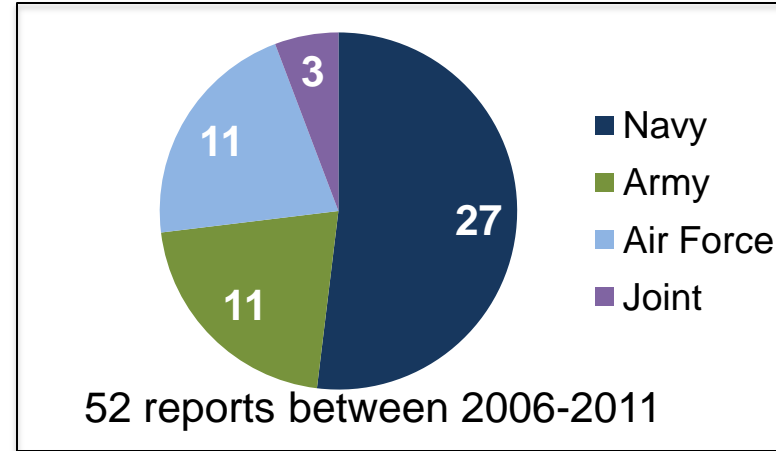
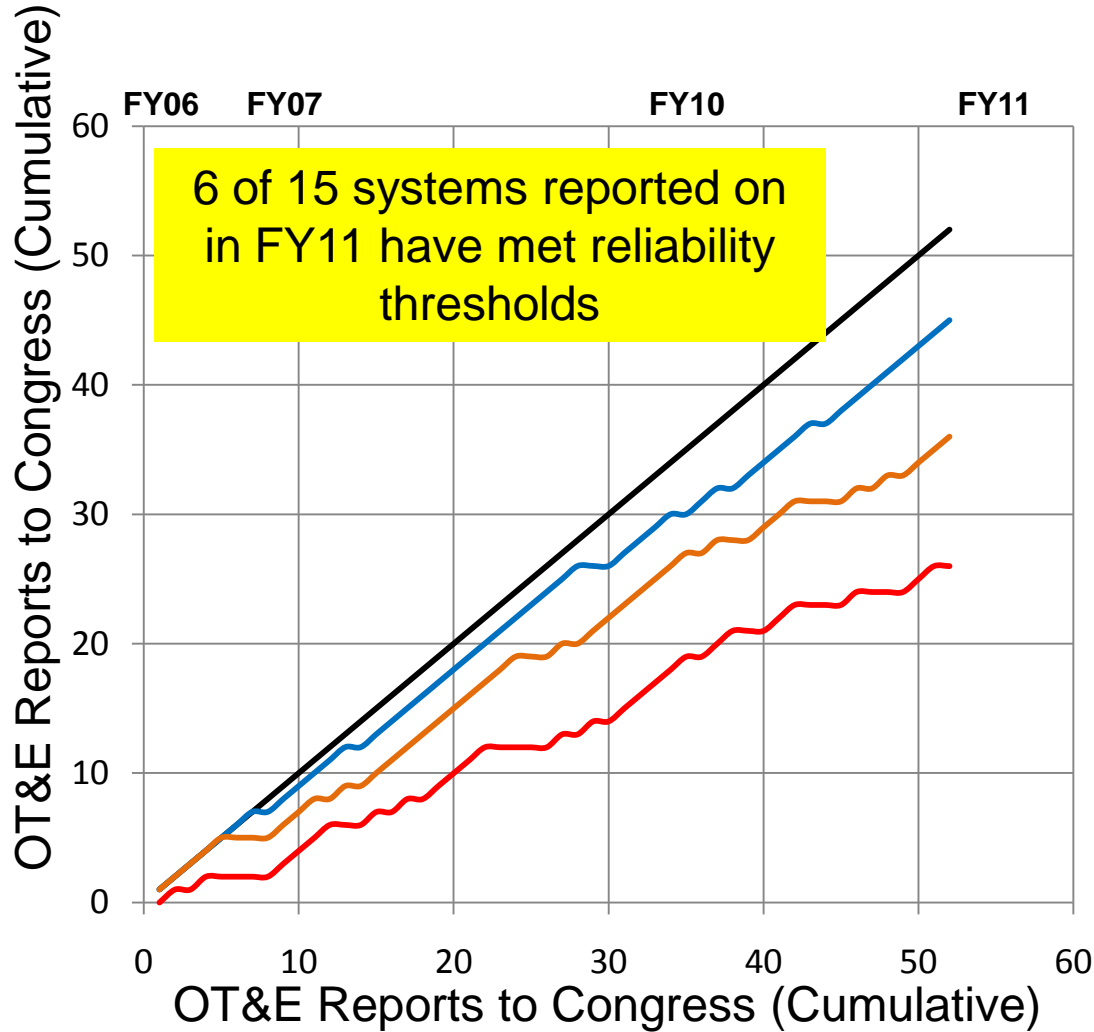


USD(AT&L) and DOT&E Memo: Four areas to be addressed

- Rapid adaptation to emerging facts
 - Requirements, acquisition, and test communities need to be less resistant to change
- Requirements process needs to produce well-defined and testable requirements
- Acquisition strategies and test strategies are misaligned
 - Programs lack budgetary and contract flexibility necessary to accommodate discovery
- Open communications between programs and testers
 - Early and often
 - Constructive involvement of senior leaders



Trends in Reliability



- IDEAL
- EFFECTIVE
- SUITABLE
- RELIABLE

Overall since 1985:
30% of 170 Systems Reported
Not Suitable



DoD Steps Taken to Improve Reliability

| 2007 | | | | 2008 | | | | 2009 | | | | 2010 | | | | CY 2011 | | | |
|---------------------------------|------------------------|--------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------|-----|-----------------|-----|-------|-----|---------------------------------|-----|------------------------------------------|-----|-----|-----|---------|-----|-----|---------------------------------|
| 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th |
| ▲ | | ▲ | | ▲ | ▲ | ▲ | | ▲ | ▲ | ▲ | | ▲ | ▲ | | | | | | ▲ |
| McQueary DOT&E Priorities | CJCS 3170.01C JCIDS | Reliability Improvement Working Army Group Acquisition Policy (Bolton memo) | | USD(AT&L) RAM (Young) Memo (in response to DSB) | | DODI 5000.02 | | WSARA | | Gilmore DOT&E Initiatives | | DOT&E State of Reliability Memo | | | | | | | USD (AT&L) DTM 11- 003 |

- Reliability (MTBF) is a key factor in O&S costs of systems
 - Additional burden to user in unscheduled maintenance and down time
- DOT&E top priority since 2006 has been to improve suitability of fielded systems, in addition:
 - Army Acquisition Policy
 - Joint Staff Directive
 - Defense Science Board Study
 - Congressional Language
 - USD (AT&L) policy updates

DoD needs systems that are effective when needed,
not just effective when available



Reliability Program Standard

- In 1998, DoD canceled Mil-Std-785B: *Reliability Program for Systems and Equipment Development and Production*
 - Originally written in 1969, last updated 1980
 - Industry continues to follow -785 tasks (reactive vice proactive)
 - Approx 30% reliability from design
 - Approx 70% reliability from growth tests (after design is completed)
- In 2008, OSD/DDR&E(SE) adopted the ANSI/GEIA-STD-0009, which promotes four objectives:
 - Understand customer/user requirements and constraints
 - Design for Reliability (DfR) and re-design for reliability
 - Produce reliable systems
 - Monitor and assess user's experienced reliability



Reliability Growth in TEMPS

- Review of all 353 Programs on 2010 T&E oversight
 - Including 151 programs with approved TEMPS
 - 90% programs with TEMPS approved since 2008 plan to collect and report reliability data
- Comparison of programs that completed a TEMP before vs after June 2008 (when OSD began initiatives to improve reliability) indicate improvement in several areas. Since 2008, programs are more likely to:
 - Have an approved System Engineering Plan
 - Incorporate reliability as an element of test strategy
 - Document reliability growth strategy in the TEMP and include reliability growth curves in TEMPS
 - Establish reliability-based milestone or OT entrance criteria
 - Collect and report reliability data.
- No significant improvement yet in systems meeting reliability thresholds
 - No evidence of programs using reliability metrics to ensure growth is on track
 - Systems continue to enter OT without demonstrating required reliability



Service Actions Since 2008

Defense Science Board Report

Army

- Reliability Growth Planning Curve goes into EMD contracts
- Execute DfR program before MS B
- Early EMD reliability test threshold
- AMSAA Reliability Center of Excellence and training

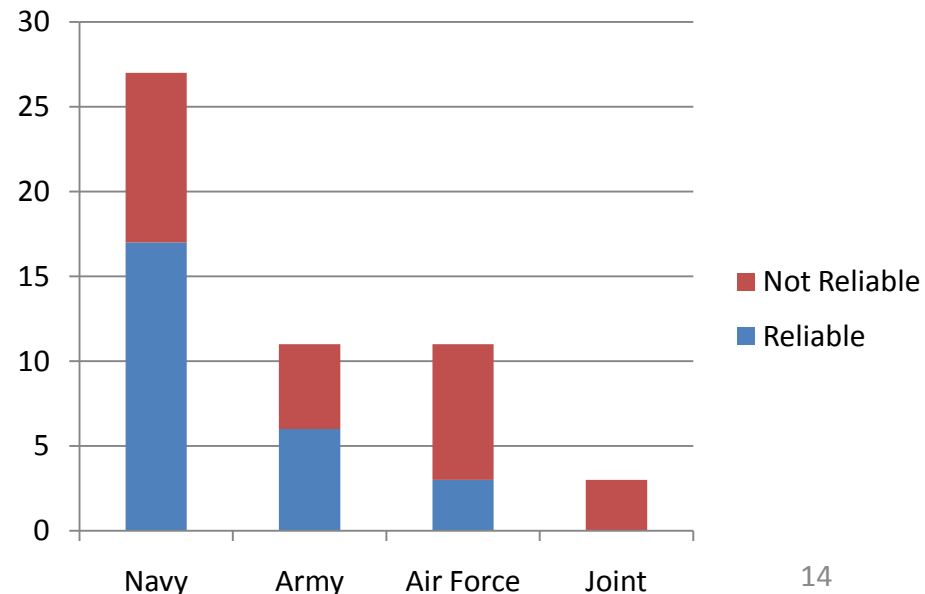
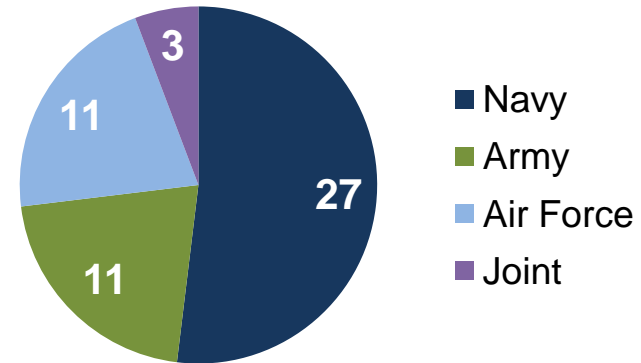
Navy

- Review of all SECNAV Instructions for implementation of new DOD 5000.02
- Reliasoft license and training for all System Commands
- NAVAIR - maintained reliability competency (4.0)
- NAVSEA - established R&M engineering working group

Air Force

- AFMC sponsored training short courses in reliability and DOE
- System Engineering Plans and procedures for analysis and classification of potential failure modes
- Risk Identification, Integration, and ilities (R3I) guidebook

Distribution of 52 DOT&E reports to Congress between 2006-2011





Summary

- Testing and test requirements do not cause major program delays
 - The results of testing rather than the testing itself has caused delays
- Testing doesn't cost – it pays!
 - Provided with insight into weapon system true performance, decision makers can restructure, cancel or give more resources to programs
- Reliability growth planning has improved since 2008
 - All Services' have taken steps to increase understanding of reliability engineering and testing
 - No improvement seen yet in systems meeting reliability thresholds
 - Evidence of the need for the use of reliability growth curves to show program is on track