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

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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

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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

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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  - 6 programs were ultimately canceled (and 1 had MS B rescinded)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
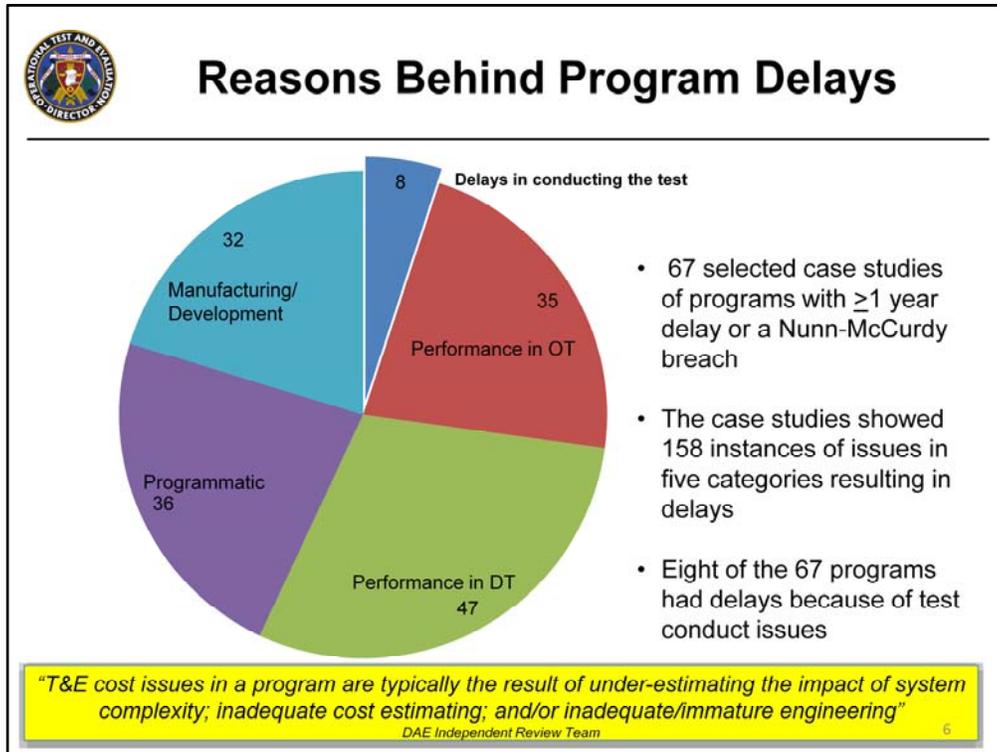- Two of the 36 programs considered in this analysis had NO delays to their schedule

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The canceled programs are:

EFV
VH-71
SADARM
Comanche
Armed Recon Helo
EIBCT

DDG-1000 had MS B rescinded

(47 programs had performance in DT problems, 35 programs had performance in OT problems, 56 programs had performance in in either DT, OT or both.
8 programs had test delays, only 1 program – FBCB2 had ONLY a test delay – because the unit was deployed.)

Longbow Apache and GMLRS had Nunn-McCurdy but did not have any delays

Reasons Behind Program Delays

Delays in conducting the test

- 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"
DAE Independent Review Team

67 programs had 158 delays (many had more than one reason for delay)

The Nunn McCurdy programs had more delays, i.e., 96 problems for 36 programs (2.7 rate) than the programs that did not have a NM (62 problems for 31 programs (2.0 rate)

The Nunn McCurdy programs had mostly early delays in "manufacturing" which includes software development and integration and "programmatic" as opposed to performance issues in testing for the non-NM programs.
Makes sense that many of the NM programs were delayed or canceled vice going to test

Again, out of the 8 programs delayed for test issues (targets, range availability, telemetry, users/unit for test)
FMTV, FBCB2, LPD-17, Virginia, P-8, MALD, SM-6, NCES,
Only FBCB2 was delayed entirely due to test conduct issues - the test unit was deployed
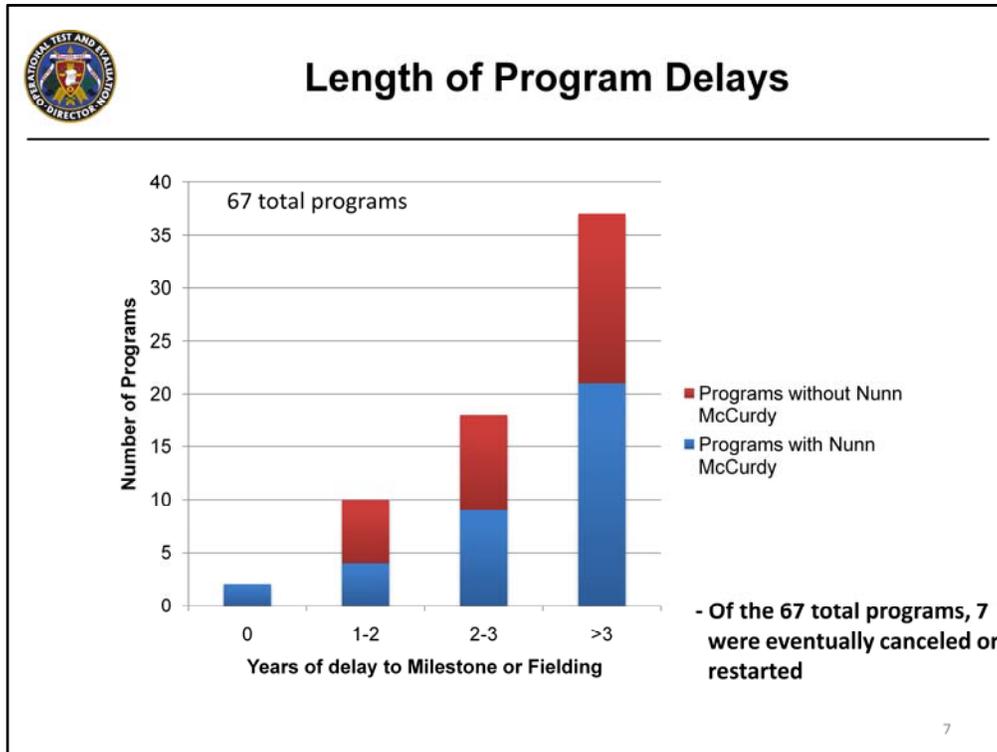
37 programs had > 3 year delay (55%)

The delays were counted against the most recent prior published schedule – so in a sense the total delays could be much larger

The canceled programs are:

EFV
VH-71
SADARM
Comanche
Armed Recon Helo
EIBCT

DDG-1000 was restarted

36 NM programs: 2 had NO delay, 21 had >3 year delay (58%) - 6 were canceled or restarted
31 programs without NM: 16 had > 3 year delay (52%) – 1 was canceled (EIBCT)

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

Few programs (7 out of 76) required more than 1.51% of program acquisition costs for OT&E
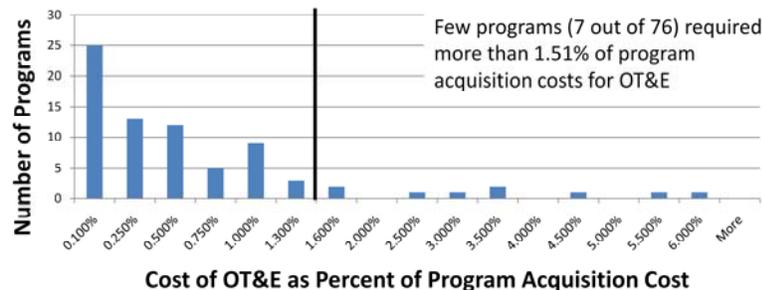
OT&E is usually 1% ± 0.5% of Program Acquisition Cost

The 8 programs above 1.5% were:
AIM-120C Electronic Protection Improvement Program (AIM-120C EPIP) [$87M PAC; 5.1% OTE]
Modular Aircrew Helmet (MACH) [$8.3M; 4.1% OTE]
Hard Target Void Sensing Fuze (HTVSF) [$147M; 3.4% OTE]
ALR-69A Radar Warning Receiver (ALR-69A) [$168M; 2.8% OTE]
F-22 Incr 3.1 [$1.3B; 2.4% OTE]
Airborne Signals Intelligence Payload 2C (ASIP 2C) [$55M; 2.0% OTE]
Miniature Air Launched Decoy (MALD) [$501M; 1.51% OTE]
Vulnerability Lifecycle Management System Spiral 1.5 (VLMS) [$26M; 1.51% OTE]

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

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These are the conclusions from the joint Carter/Gilmore memo signed out June 3, 2011
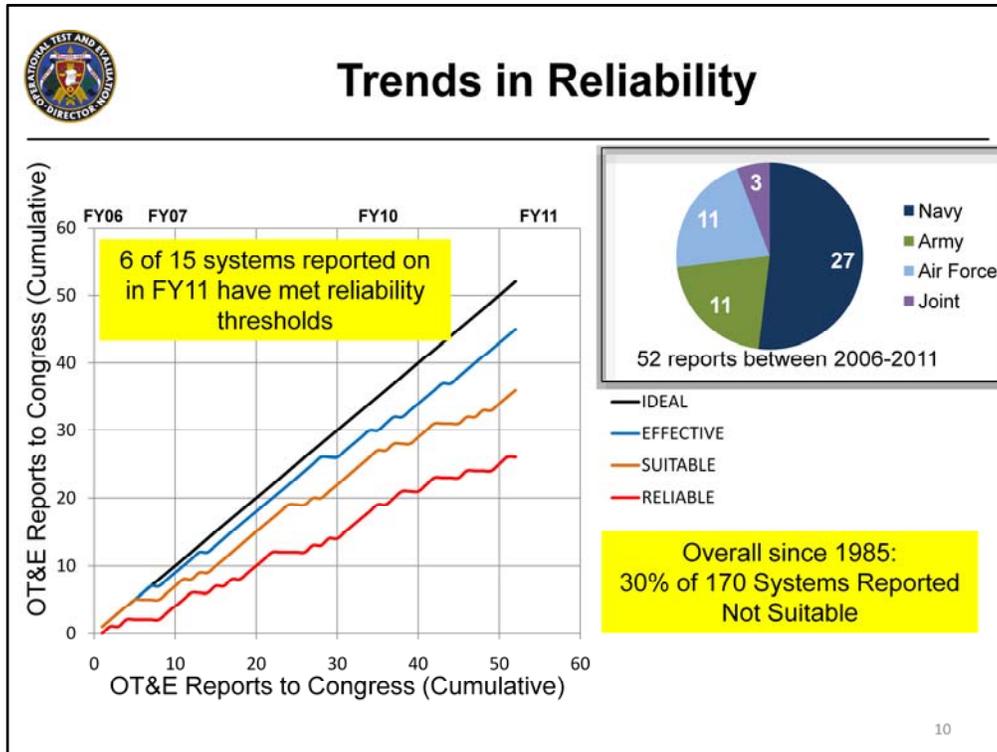
This chart is somewhat different than the one we have previously been showing.

This is only the last 6 years (2006-2011) a total of 52 reports.
Previously we showed the fall off of suitability – which is not always because of reliability.
A system can be reliable but not suitable because of safety, human factors, etc…
Conversely, a system could be not reliable but still be suitable because failures were easily repaired, there was redundancy in the system, or the reliability requirement was excessive.

I scored each of the 52 reports to Congress as "reliable" or "not reliable" based on whether they met their reliability threshold.

36 out of 52 reports were suitable
26 out of 52 reports were reliable – and only 6 of the 15 reports so far this year have met reliability threshold

If we look at all the OT&E (IOT&E or FOT&E) reports (NOT OA or EFR) that we have sent to Congress since 1985, 30% of those systems were not suitable - - most likely even fewer than 30% were reliable

The pie chart just shows which Services for the systems of the reports…. All 3 joint reports were chem-bio systems

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 Group

Army 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

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These are the events in calendar form that have occurred in DoD to improve reliability

(I used different colors for the triangles to show whether it was DOT&E, AT&L, Congress, or a Service action)

We note that in addition to the life cycle costs of the repairs and spare parts for unreliable systems, there is also a burden to the warfighter in unscheduled downtime of their systems

DOT&E has emphasized improving reliability since 2006 – McQueary top priority and he re-instated the Rel Imp Working Group

A primary finding of the DSB in 2008 was that reliability growth methodology had been discontinued by the dept over 15 years and that the solution would be to ensure that programs are formulated and funded to execute a viable systems engineering strategy that includes robust reliability growth plan from inception

This is just a review of where we are wrt to reliability mil std and handbooks.

The DSB said we really need a standard so the defense contractors can put the language in their proposals.
The old standard was canceled in 1998 – and it was mostly reactive in nature.

The new standard – developed by subject matter experts from industry, DoD, academia, and the Services

It has four simple objectives that cannot be argued with – the one criticism that may hold is that it is not specific enough. It doesn't tell HOW to do these things – just that they must be done.
The -0009 standard also reflects guidance from the DOD 2005 "RAM GUIDE"

This is a summary of the review that IDA did for all the oversight programs.

There has been significant improvement in TEMPS (approved after 2008) documenting reliability growth plans.
However, the results have not yet been seen yet in systems under test. They continue to enter OT without demonstrating required reliability and are not using the growth curve to ensure the program is on track.

Service Actions Since 2008
Defense Science Board Report
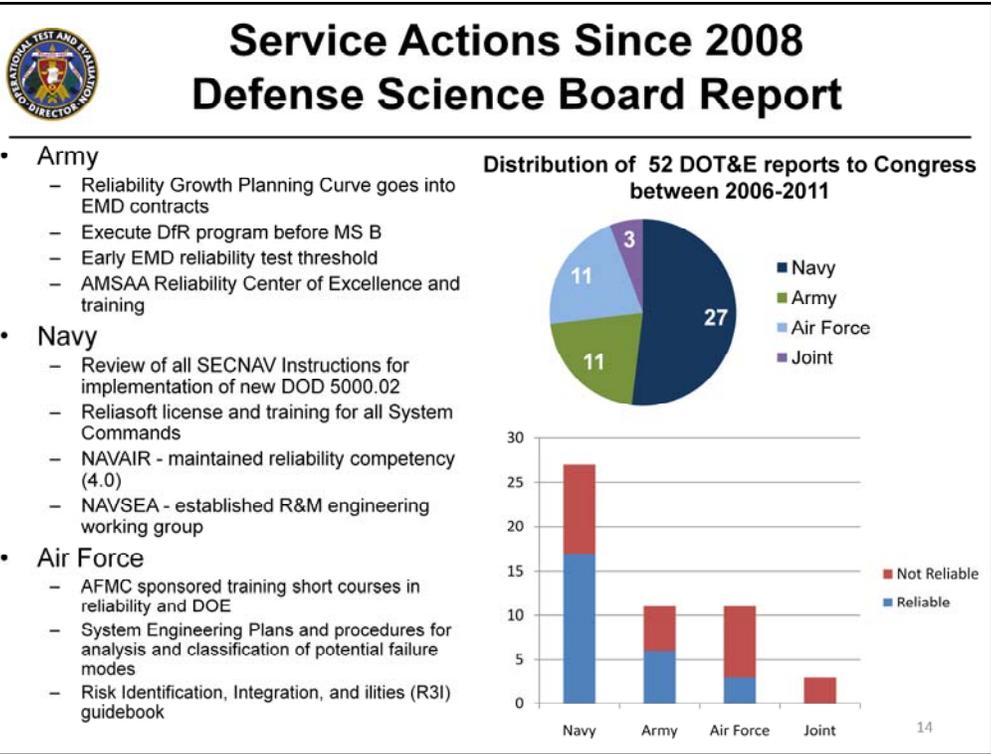
The chart here shows the fraction of reports that were reliable and not reliable broken out by each Service.
There is also some information as to what each of the Services is doing in response to the DSB and DOD guidance.
NAVY
63% - 17/27 – reliable – I would note that the majority of the reliable systems were aircraft or aircraft related systems developed in NAVAIR – H-1 upgrades, MH-60R,S, CV-22, and some submarine systems Virginia, Ohio, TB-34
Ships and software intensive systems did not do so well:
LPD-17, T-AKE, F-18 AESA radar, MIDS JTRS, ARCI, LCCA, …

ARMY
55% - 6/11 – reliable – Previously Army reported 4/5 not reliable, so this may be an improvement
Helicopters and trucks did pretty well (H-47, H-72) MRAP and GMLRS
Excalibur, WIN-T, UAVs did not do well

Air Force
27% - 3/11 – reliable – Only B-2 RMP, SBSS, and C-5 RERP (!!!) met reliability threshold - and note C-5 was not suitable because of a host of other reliability/availability problems.
SDB, GBS, JMPS, MQ-9, MALD, JCA, and Global Hawk – all not reliable!

Joint
All 3 chem bio systems did not meet reliability thresholds

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

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