IDA

Reasons Behind Program Delays

2017 Update

DRAFT FINAL

Overview

- **This analysis examines the reasons behind program delays**
- **As in previous updates of this analysis, five reasons for delays are considered:**
  - Performance problems discovered in DT
    - » System problems identified during developmental testing that program management addressed before the program moved forward
  - Performance problems discovered in OT
    - » System problems identified during operational testing that program management addressed before the program moved forward
  - Programmatic
    - » Funding, scheduling, or management problems
  - Manufacturing, Software Development, and Integration
    - » Manufacturing, software development, integration, or quality control problems
  - Problems in test conduct
    - » Test resources, test instrumentation, or test execution problems that are typically beyond the control of the program manager
- **Additionally, programs that experienced a critical Nunn-McCurdy breach are identified**
- **Next few slides look at:**
  - Overall conclusions
  - Which programs are examined
  - Analysis of results

Summary

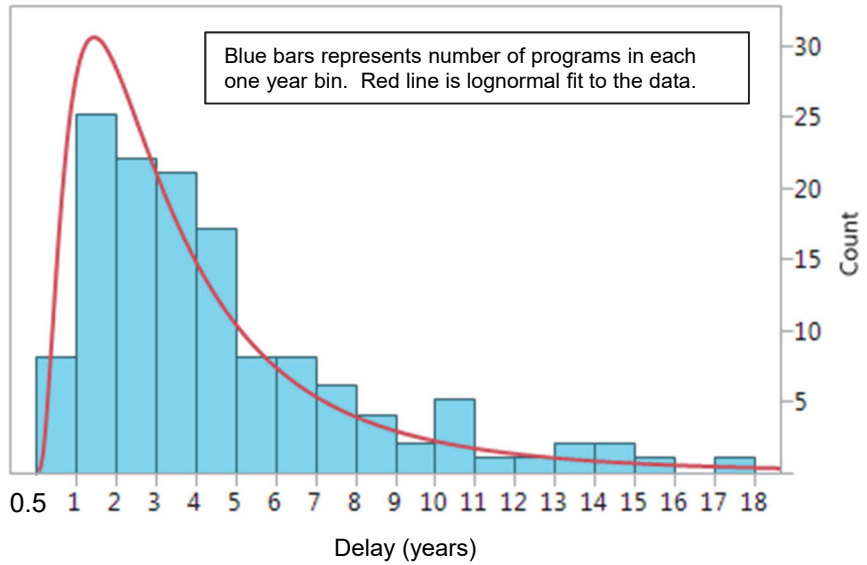
- DOD leadership is concerned that acquisition programs frequently experience delays, but the reasons behind the delays generally are not well understood
- IDA examined 134 programs under DOT&E oversight that have experienced a delay of at least 6 months in the full-rate production decision (or similar milestone) and had or will have a full-rate production decision after 2000
- Of programs with delays, most delays are under 6 years and the longest delay examined is 17 years
- Typically, there are multiple reasons for the delay, and the number of reasons cited correlates with the length of the delay (i.e., more reasons leads to a longer delay)
- Critical Nunn-McCurdy breaches; programmatic problems; and manufacturing, software development, and integration problems are the most significant drivers of program delay lengths
- The most commonly cited reason, but not a statistically significant driver of delay length, is a system performance problem is discovered in testing that the program management decided had to be resolved before the program could proceed
- Problems conducting the test (e.g., test range is not available) is the least frequently cited reason, and also is not a statistically significant driver of delay length
- While some differences are observed between the Services, the average delays are the same

Programs Examined

- **This analysis developed case studies for 134 programs under DOT&E oversight that have experienced a delay**
- **Some of the programs are early in their development, others are mature programs**
- **All programs under DOT&E oversight were examined**
- **Programs for which case studies are developed:**
  - Experienced a delay of 6 months or more
  - And had a full-rate production decision after 2000
- **Programs for which case studies are not developed:**
  - Did not experience a delay of at least 6 months
  - Or had a full-rate production decision in 2000 or before
  - Some programs would have yielded a case study that is classified (small number), and are excluded

Delays Vary Over Wide Range

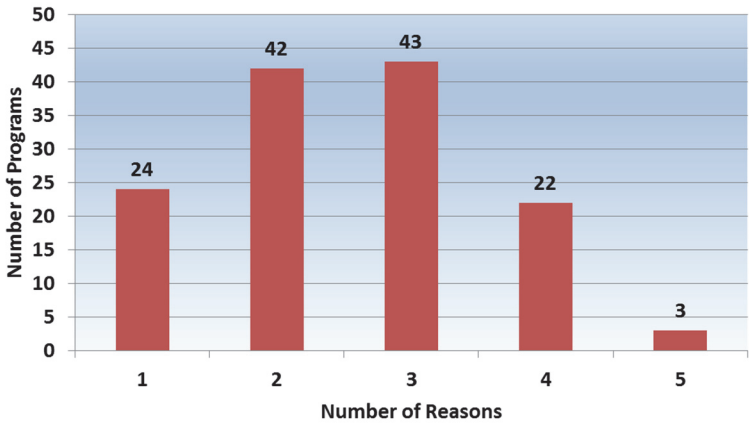
- **Consistent with previous analyses, program delays vary over a wide range from 6 months to 17 years**
- **80% of delays are under 6 years**
- **50% of delays are under 3 years**
- **14 programs were cancelled after experiencing a delay**



As observed in the figure, delays are frequently lognormally distributed and the relationship observed here is not surprising. As examples, lognormal distributions are used to describe the time between failures in reliability analysis, transportation delays, and survival times in medicine.

Multiple Reasons Led to Delays

- **Generally, the delay is attributed to multiple reasons with just over 50 percent of the case studies having 3 or more reasons**
- **Not surprisingly, programs with a larger number of reasons cited are correlated with longer delays**
- **The most cited reasons are a system performance problem that is identified during testing that the program management addressed before the program moved forward**
- **Programmatic and manufacturing, software development, integration, or quality control problems also are common**
- **The least cited reason is a problem conducting the test**



Reason that contributes to the delay	Number of programs affected[a]
System performance problems identified during DT or OT that program management addressed before the program moved forward: • During developmental testing only (42) • During operational testing only (16) • During developmental and operational testing (44)	102
Programmatic problems: funding, scheduling, or management problems	88
Manufacturing, software development, integration, or quality control problems	73
Problems in test conduct: problems with test resources, test instrumentation, or test execution that are typically beyond the control of the program manager	33

a. The total number of programs affected is more than 134 because most programs had more than one reason for a delay

Success-Oriented Schedules Contributed to Delays

- Data indicate that success-oriented schedules are a significant problem
- The least commonly cited reason is a problem conducting the test
- The most commonly cited reason for a delay is a system performance problem that is identified during testing that the program management addressed before the program moved forward
- This indicates that programs generally schedule enough time to conduct the tests, but they don't schedule enough time to fix the problems that they inevitably discover in testing
- Programs should schedule for the “fix” phase of test-analyze-fix

Two Reasons Plus Nunn-McCurdy Breaches Drive Delay Length

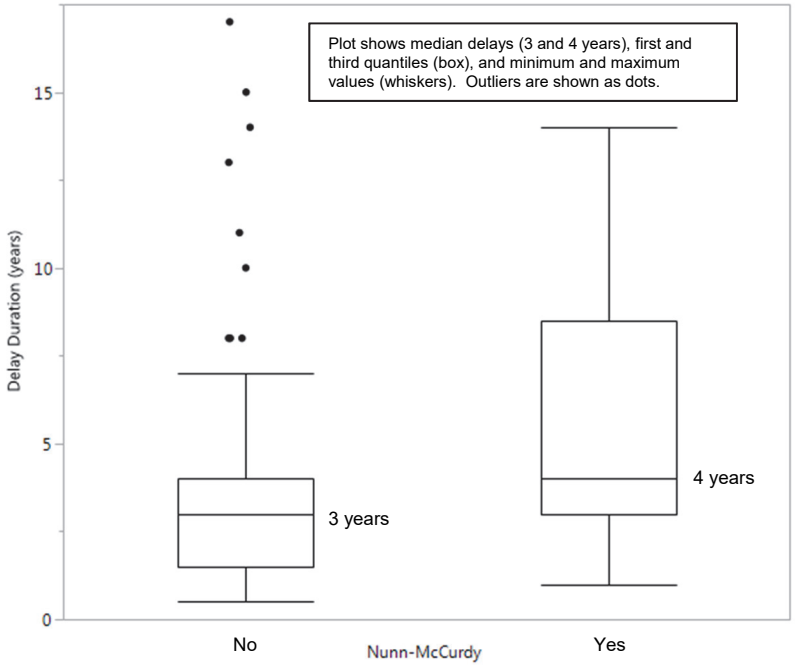
- **Statistical analysis reveals that three factors are the most significant drivers of delay length:**
  - Programmatic problems
  - Manufacturing, software development, integration, or quality control problems
  - Critical Nunn-McCurdy breaches*
- **Problems conducting tests and system performance problems discovered during testing are not significant drivers of delay length**
  - As noted on the previous slide, while a system performance problem identified during testing is the most cited reason for a delay, it is not a driver of delay length
  - Similarly, problems conducting the test is the least frequently cited reason, and it does not drive delay length

In regression analysis, statistical significance is examined using p-values, which measure the probability that the statistical relationship between the length of the delays and the reasons could have occurred by chance. Low p-values indicate that the relationship is not accidental. The analysis provides p-values of 0.002 for manufacturing software development, integration, or quality control problems; 0.077 for programmatic issues; and 0.019 for critical Nunn-McCurdy breaches. The p-values for problems discovered in DT, problems discovered in OT, and problems in test conduct are well above these values, and are not statistically significant.

*A critical Nunn-McCurdy breach occurs when the program acquisition unit cost or the procurement unit cost increases by at least 25 percent over the current baseline estimate or at least 50 percent over the original baseline estimate

Critical Nunn-McCurdy Associated With Longer Delays

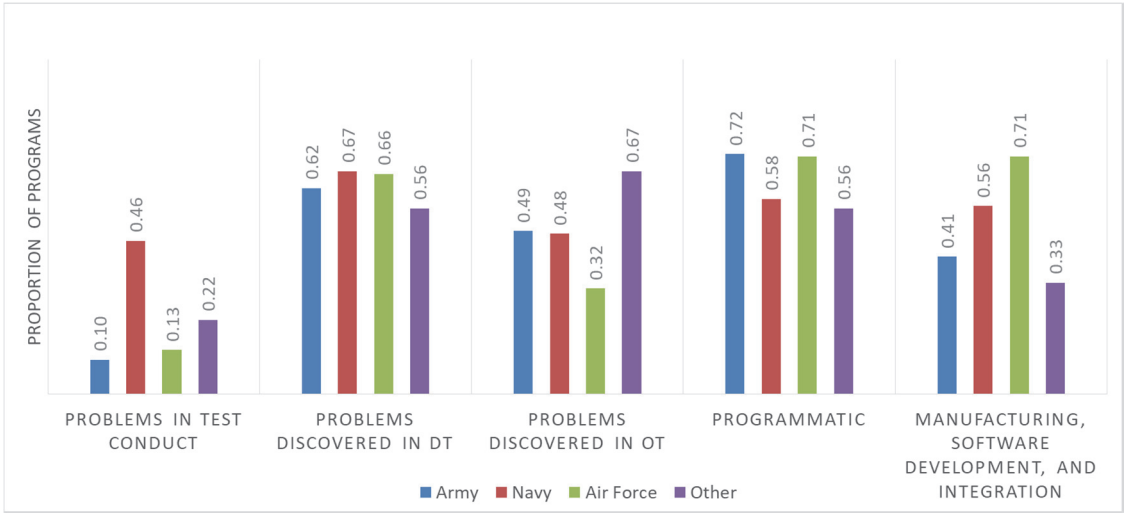
- **Median delays for programs with a critical Nunn-McCurdy breach are one year longer than those without**
- **A critical breach occurs when the program acquisition unit cost or the procurement unit cost increases by at least 25 percent over the current baseline estimate or at least 50 percent over the original baseline estimate***
- **37 of 134 case studies had a critical Nunn-McCurdy breach**
- **Critical Nunn-McCurdy breaches are correlated with programmatic and manufacturing problems**
- **Conclusions are consistent with the March 2011 GAO report, *Trends in Nunn-McCurdy Cost Breaches for Major Defense Acquisition Programs***



"Our analysis of DOD data and SARs showed that the primary factors responsible for the unit cost growth that led to Nunn-McCurdy breaches are engineering and design issues, schedule issues, and quantity changes [number of units to be procured]. Major defense acquisition programs that breached Nunn-McCurdy cost growth thresholds often cited multiple, interrelated factors for the breaches." – March 2011 GAO report

*Significant breaches, which are not examined in this analysis, occur when the program acquisition unit cost or the procurement unit cost increases by at least 15 percent over the current baseline estimate or at least 30 percent over the original baseline estimate

Some Differences Between Services



- **While some differences between the Services exist, their average delays are the same**
- **The Navy is significantly more likely to encounter problems in test conduct; these problems are typically related to the ships, targets, and the systems under test not being available to conduct the test (e.g., ship is sent on deployment)**
- **The occurrence of manufacturing, software development, and integration problems vary significantly among the Services, with the Air Force experiencing this issue most frequently**
- **While occurrence of system performance problems discovered in OT varies between the Services, the differences are not significant**

In contingency table analysis, statistical significance is examined using p-values, which measure the probability that the statistical relationship between the Service and the reasons cited could have occurred by chance. Low p-values indicate that the relationship is not accidental. Using Pearson Chi-square, manufacturing problems has a p-value of 0.03, and problems in test conduct has a p-value of 0.0003. All other p-values are much higher indicating that there is no statistical difference between the Services in those categories .

Problems Conducting a Test Typically Are Resource Problems

- **While testing is frequently blamed for delays, conducting a test is not a significant driver of delay lengths**
- **All programs that cited a problem conducting a test as a reason for delay are shown in table**
- **While infrequently cited as a reason, when delays are attributed to test conduct, it is generally due to a resource limitation (e.g., range is unavailable due to testing of other programs)**

Program	Problem Observed Conducting Test
THAAD	Target unavailability
WIN-T Inc 2	Test unit unavailability
FBCB2	Test unit unavailability
Q-53	Test unit unavailability
AMNS	IOT&E delayed until LCS MCM mission package IOT&E
AN/AQS-20 Minehunting Sonar	Ship unavailability
ALMDS	LCS MCM mission package unavailability
VTUAV	System unavailability
COBRA Block I	Range and VTUAV unavailablility
JPALS Inc 1	Ship unavailability
DoN LAIRCM ATW	New software certification delays
CEC AN/USG-2	Ship unavailability
LHA 6	Targets and JSF unavailability
LPD 17	Targets and Marines unavailability
AARGM	Target unavailability
ECH	Improper test procedures
MUOS	Ground terminal unavailability
RAM	Target unavailability
SM-6	Telemetry induced failures
UISS	LCS MCM mission package unavailability
Virginia	Target unavailability
SMCM UUV	LCS MCM mission package unavailability
P-8A Poseidon	Improper instrumentation during DT
CANES	Ship unavailability
DCGS-MC	Test unit unavailability
CEC AN/USG-3B	FAA clearance, test unit, spare parts, and targets unavailability; data collection
Global Hawk	Test unit unavailability
GPS-III	Constrained satellite component test resources
MALD	Range unavailability
MALD-J	Range unavailability
QF-16 FSAT	Range testing facilities unavailability
PKI Incr 2	Delays issuing SIPRNet tokens
Net-Centric Enterprise Services	Lack of user base

Army Navy Air Force Other

Update of 2011 and 2014 Analyses

- **This analysis is an update of previous examinations of program delays conducted in 2011 and 2014**
- **The 2017 update includes 20 new case studies, 72 updates of previous case studies, and 42 case studies carried over unchanged**
  - Unchanged case studies are mature programs well past their full-rate production decision, so no further delays occurred
- **Key conclusions discussed in earlier slides including the length of delays, how frequently various reasons are cited, the factors driving delay lengths, and the differences between the Services are consistent with the earlier analyses**
- **There are two exceptions:**
  - In earlier analyses, problems discovered in OT was a marginally significant factor driving the delay length, in this analysis, it is no longer significant
  - In earlier analyses, the Army was more likely than the other Services to experience delays due to programmatic problems, this relationship is no longer significant

Reasons Behind Program Delays: Program Details

- **For each of the 134 case studies, an individual slide is included in the appendix that provides:**
  - Timelines at two or more points in time that illustrate how the delays affected the program schedule
  - Reasons for the delay and, if applicable, the Nunn-McCurdy critical breach
  - Additional details on specific reasons for program delays
- **Program slides are grouped by Service or Agency**
  - Army Programs
  - Navy Programs
  - Air Force Programs
  - Other Programs (DOD, DISA, NSA, DLA)
- **Within each Service, case studies are ordered by the length of the program delay**