Lean Aircraft Initiative
Plenary Workshop
Policy and External Environment
Program Instability

October 16, 1996
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Outline

- Research overview
- Progress update
  - SPO survey
  - Contractor survey
- Recent findings
  - Cost of instability
  - Influence of technical advance
  - Impact of specific practices
- Summary
Near-term Research Strategy (CY 96)

- Continue analysis of SPO survey data.
  - Program/technology characteristics.
  - HR issues.
  - Management strategies.
- Integrate Contractor survey data into program instability database and analysis process.
- Validate current findings through interactions with practitioners.
- Continued population of the LEM with findings.
145 responses to date:
- Air Force: 118
- Army: 23
- Navy: 4

- Army: 16%
- Navy: 3%
- Air Force: 81%
Survey Sample Demographics

Size:
- Mean total program budget $3.7B (median $237M).
- Mean program length to IOC 7.75 years (median 6.4 years).

ACAT Designation:
- 41% ACAT I
- 35% ACAT III
- 14% ACAT IV
- 10% ACAT II

Source: 1996 Government PM survey.
Program Phase:

- EMD: 36%
- DEM/VAL: 7%
- Concept Exploration: 5%
- Other: 11%
- Sustainment: 12%
- Production: 29%

Source: 1996 Government PM survey.
System Types (sectors represented)

- **Avionics**: 25%
- **Missiles/Munitions**: 14%
- **Electronics**: 14%
- **Airframe**: 12%
- **Engines**: 6%
- **Software**: 16%
- **Other**: 13%

Source: 1996 Government PM survey.
Contractor Survey

Preliminary - For Discussion Only

- ~320 surveys distributed.
- 76 responses (~24% response rate) to date
  - 1 Sept. deadline.
  - Follow-up underway.
- No analysis performed yet
  - First looks by CY97.
Cost of Instability Update

Cost growth (average annual*):
- Budget changes: 2.4%
- Changes in user requirements: 2.7%
- Technical difficulties: 2.6%
- Total: 7.8%

Budget and requirements changes account for 66% of average annual program cost growth.

* Mean baseline period 60 months; median 43 months

Source: 1996 Government PM survey.
Schedule slip (total program):
- Budget changes: 9.1%
- Changes in user requirements: 11.9%
- Technical difficulties: 9.4%
- Total: 34.3%

Budget and requirements changes account for 61% of total program schedule slip.

Source: 1996 Government PM survey.
Cost of Instability in Perspective

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Average cost growth due to funding and requirements changes

"Traditional" program baseline

Estimated range of savings from the use of lean practices

A fundamental tenet of leanness:

- Reduce uncertainty (uncontrolled variance) where possible.

Problem:

- Aggressive technological advance introduces uncertainty into program planning and programming.
- Excess uncertainty may inhibit successful overall movement towards leanness.
Types of Cost Growth Associated with System-level Technical Advance

Preliminary - For Discussion Only

Source: 1996 Government PM survey.
Level of Technical Advance Required in Critical System Components:

Preliminary - For Discussion Only

Source: 1996 Government PM survey.
Preliminary - For Discussion Only

Source: 1996 Government PM survey.
Response to the statement: “The technologies used in this program have more demanding requirements than commercial technologies and therefore this system should take longer to develop and field.”

Source: 1996 Government PM survey.
Summary

Unplanned cost growth from aggressive technological advance suggests:

- uncertainty associated with very advanced products presents significant challenges to the current planning/budgeting process.

- use of “buffers” to compensate for uncertainty (which is inconsistent with lean paradigm).

- overall levels of uncertainty in the system may have to be traded against goals for attaining leanness.
Another tenet of leanness:

- Increase responsiveness (adaptability) where possible.
  - Compensate for uncertainty.
Data collected:

- Use of various practices to avoid the onset and mitigate the negative impact of program instability.
  - Uncertainty reducing
  - Responsiveness enhancing

- Program plan sensitivity to unplanned budget changes.
Use the following practices?

- Contractor involved in requirements generation
- High-risk developments off critical path
- Schedule interdependent activities in same budget year
- Designs validated using prototypes
- Use staff from other offices
- Design based on incremental technology steps
- Short cycle time

Source: 1996 Government PM survey.
Cost Impacts of Requirements Changes

Preliminary - For Discussion Only

Use the following practices?

- **Use CAM**
- **Use TEMs Personnel as Needed**
- **Use Flexible Assembly**
- **Major Subsystems Managed in Different SPOs**
- **Multi-year Procurement**

Source: 1996 Government PM survey.
Influence of OTS / NDI Content

Use the following practices?

- Aggressively Advocate Support for your Program
- Designs Validated Using Prototypes
- Design Validated Using Simulation and Modeling
- Design Based on Incremental Technology Steps
- High-risk Developments Scheduled off Critical Path
- Use CAM
- Use Flexible Assembly
- Use 3-D Modeling

Source: 1996 Government PM survey.
Summary

Increasing responsiveness to change:
- Tolerance to budget variance improved by reducing dependence on critical technologies or resources (risk management) and increasing responsiveness.
- Practices that increase program responsiveness decrease the premium paid for changing requirements.

A Tradeoff:
- Use of risk management, responsiveness practices an apparent substitute for using more OTS / NDI technologies.
Observations

- Program instability factors account for the major part of both program cost growth and schedule slip.

- Magnitude of the cost of program instability may equal or exceed that of expected cost savings from “lean”.
• Increased uncertainty associated with high levels of technical advance a potential barrier to realizing the full benefits of leanness:
  – Tradeoff between accepting cost of uncertainty or developing increased responsiveness to unplanned changes.
Next Steps

- Validate findings through discussions with practitioners.
- Integrate contractor data into on-going analysis of SPO data.
- Continued population of the LEM with findings.
Other Policy Focus Team Activities

- Economic incentives:
  - Two case studies well underway.
  - Two more case study sites under negotiation.

- Use of commercial practices:
  - Research begun to catalogue “lessons learned” from commercial practice pathfinder and pilot programs.
  - Focus team defining additional research topic.

- Modeling the acquisition process:
  - Model development progressing.

- Role of “Lean User” in requirements generation:
  - White paper written.