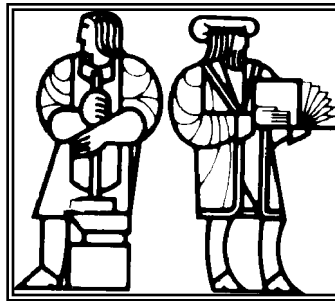


**Lean Aircraft Initiative  
Plenary Workshop  
Policy and External Environment  
Program Instability**



**October 16, 1996**

**Presented by:  
Eric S. Rebentisch  
MIT**

- ▶ **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)**

---

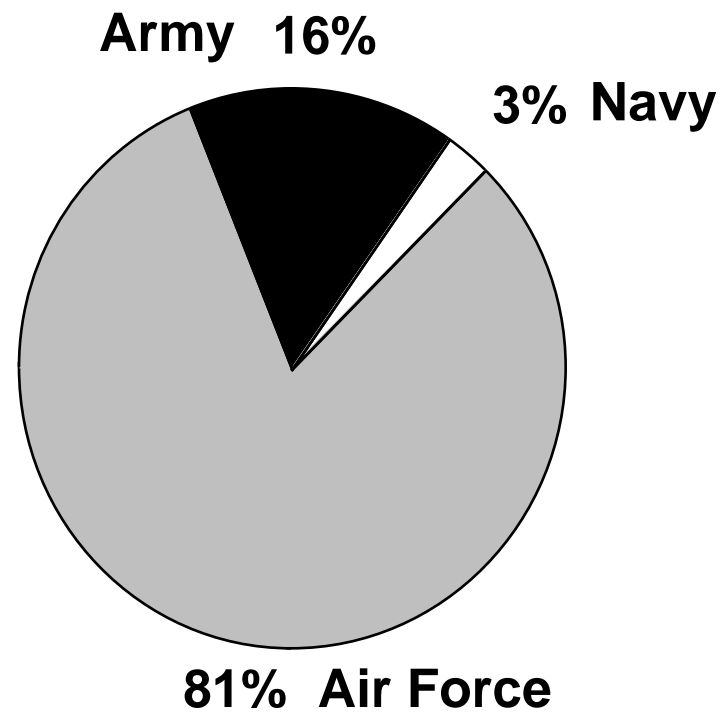
- ▶ **Continue analysis of SPO survey data.**
  - Program/technology characteristics.
  - HR issues.
  - Management strategies.
- ▶ **Integrate Contractor survey data into program instability database and analysis process.**
- ▶ **Validate current findings through interactions with practitioners.**
- ▶ **Continued population of the LEM with findings.**

## **SPO Survey Update**

---

**145 responses to date:**

- Air Force: 118
- Army: 23
- Navy: 4



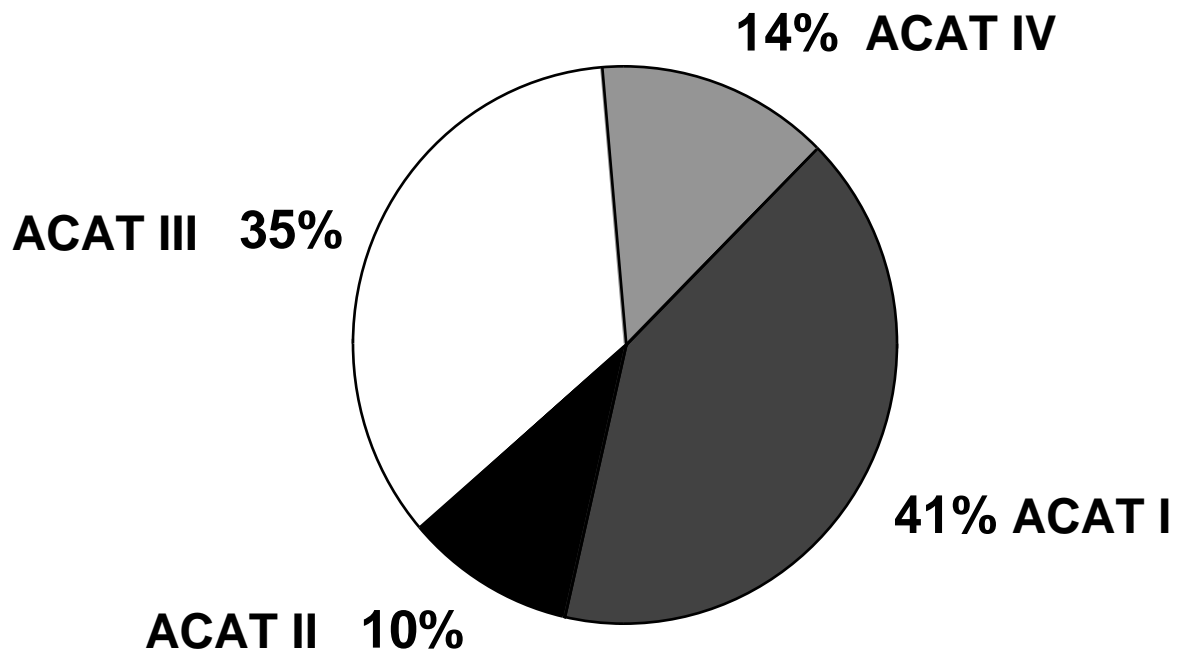
# Survey Sample Demographics

Preliminary - For Discussion Only

## Size:

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

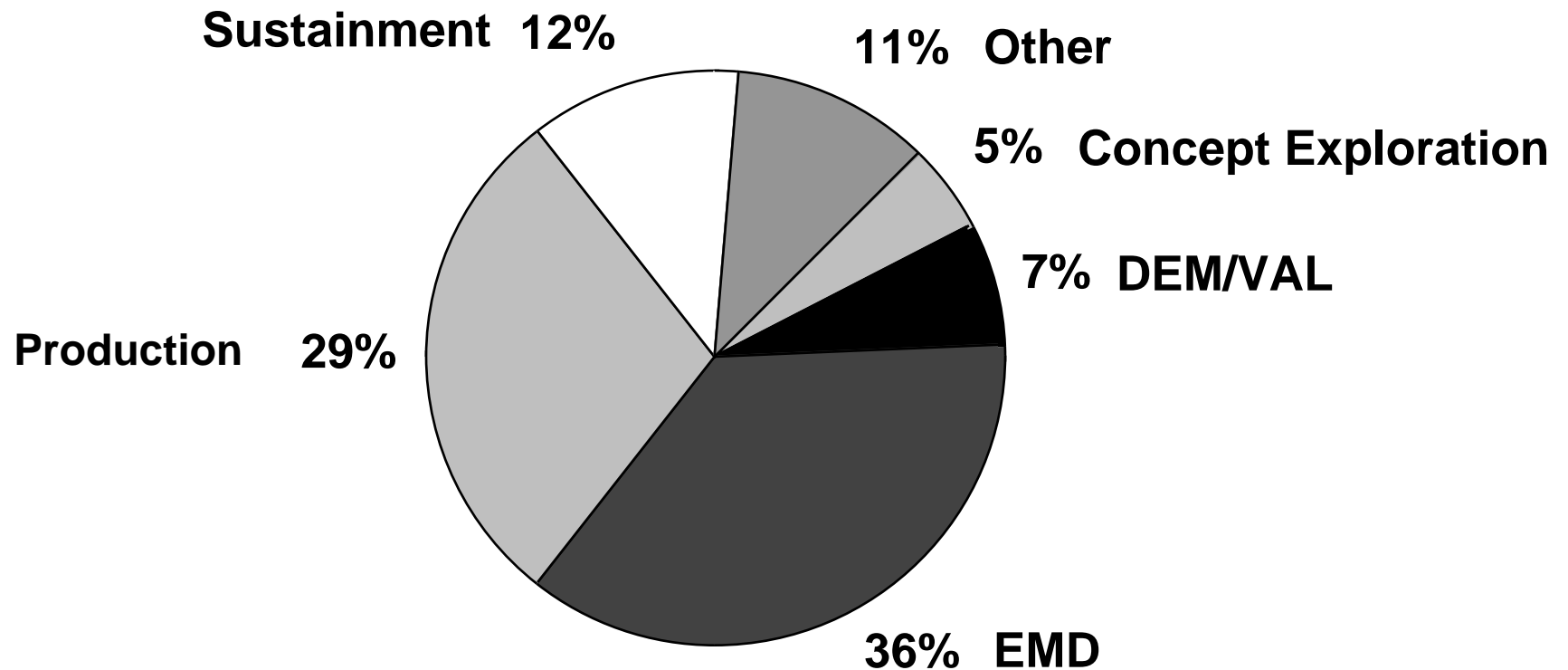
## ACAT Designation:



## Survey Sample Demographics (cont.)

Preliminary - For Discussion Only

Program Phase:

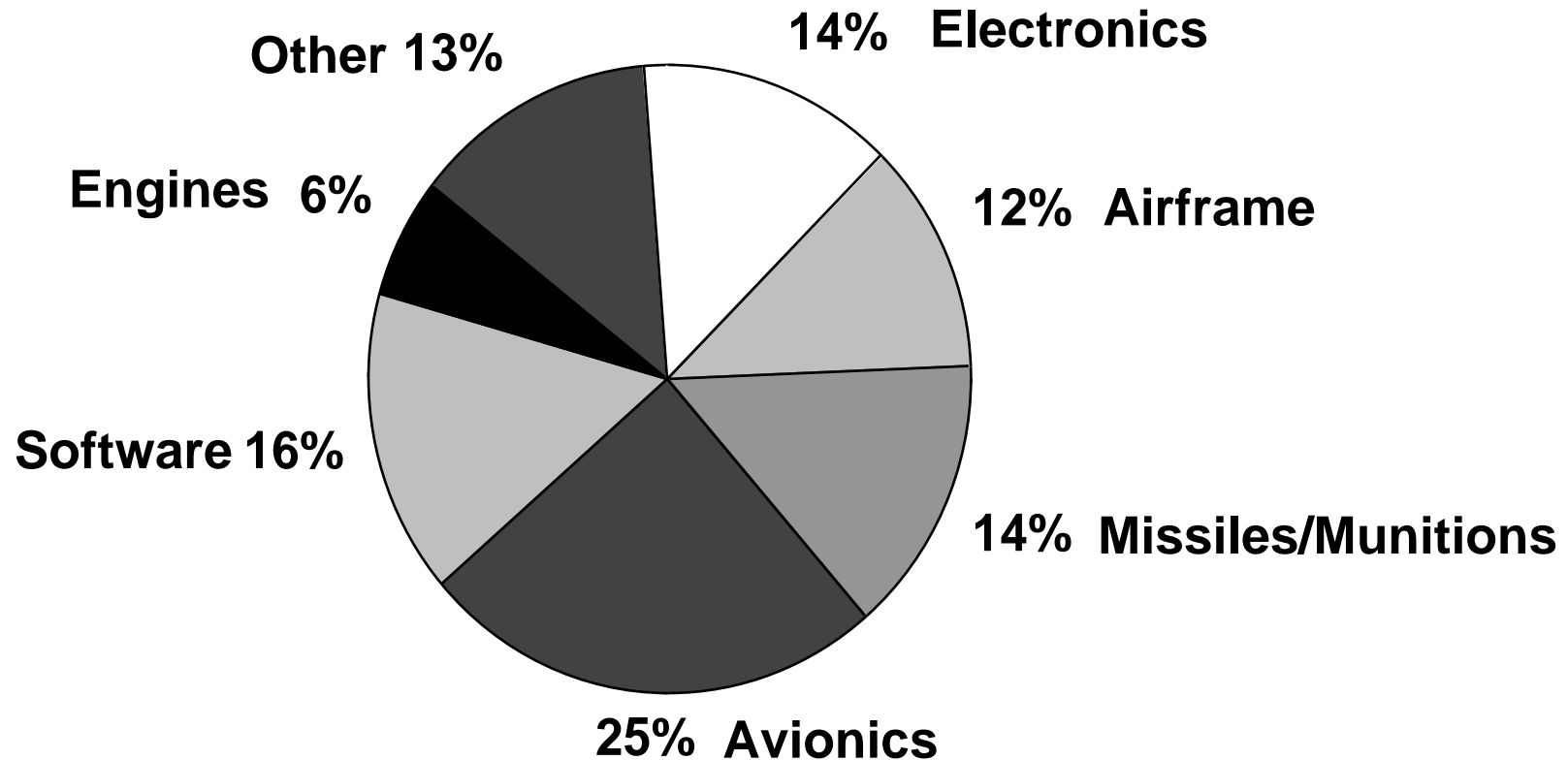


Source: 1996 Government PM survey.

## Survey Sample Demographics (cont.)

Preliminary - For Discussion Only

### System Types (sectors represented)



Source: 1996 Government PM 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***

---

Preliminary - For Discussion Only

- ▶ **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

## **Cost of Instability Update (cont.)**

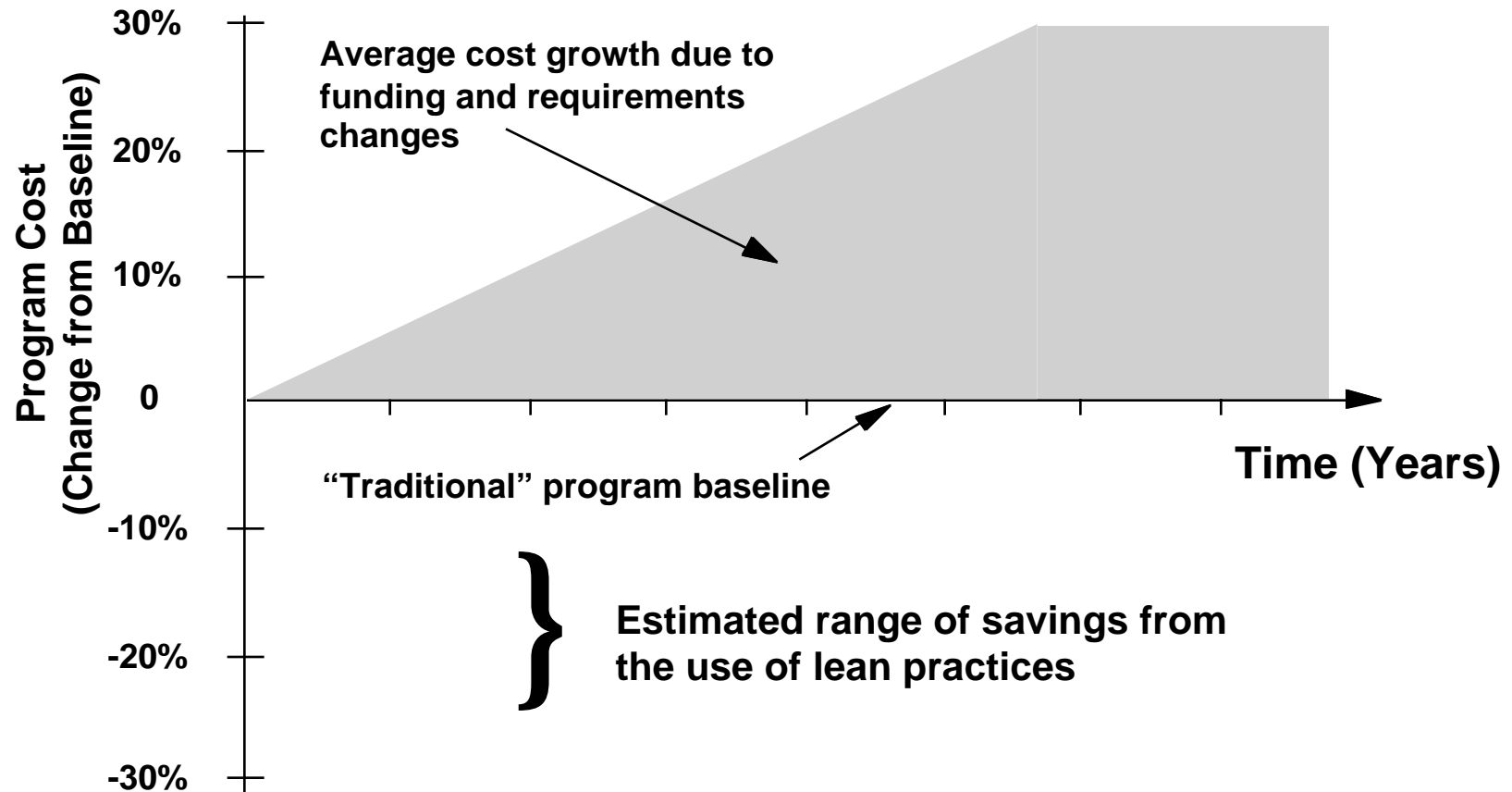
---

Preliminary - For Discussion Only

- ▶ **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.**

# Cost of Instability in Perspective

Preliminary - For Discussion Only



## ***The Role of Uncertainty***

---

### **A fundamental tenet of leanness:**

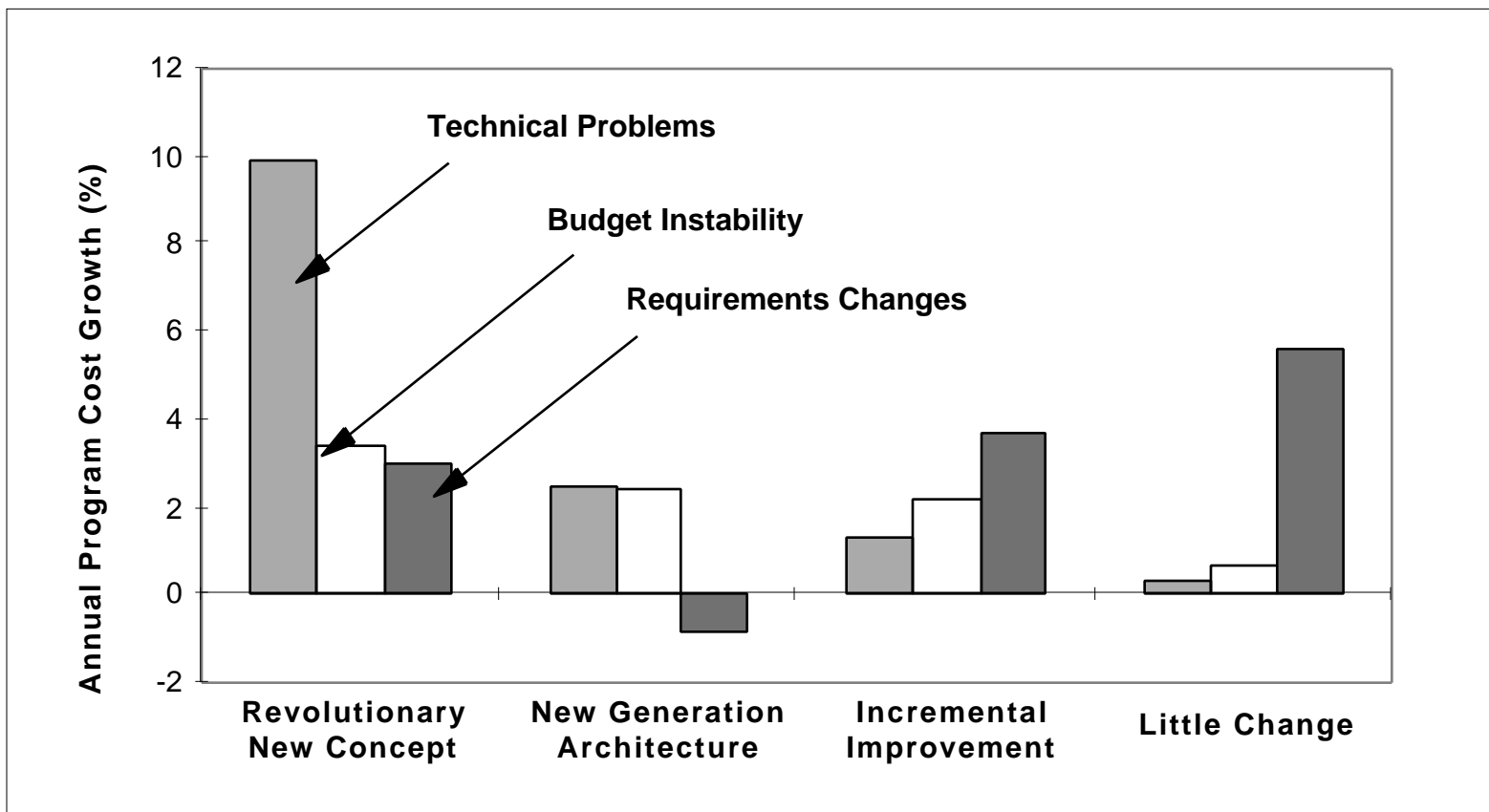
- Reduce uncertainty (uncontrolled variance) where possible.

### **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



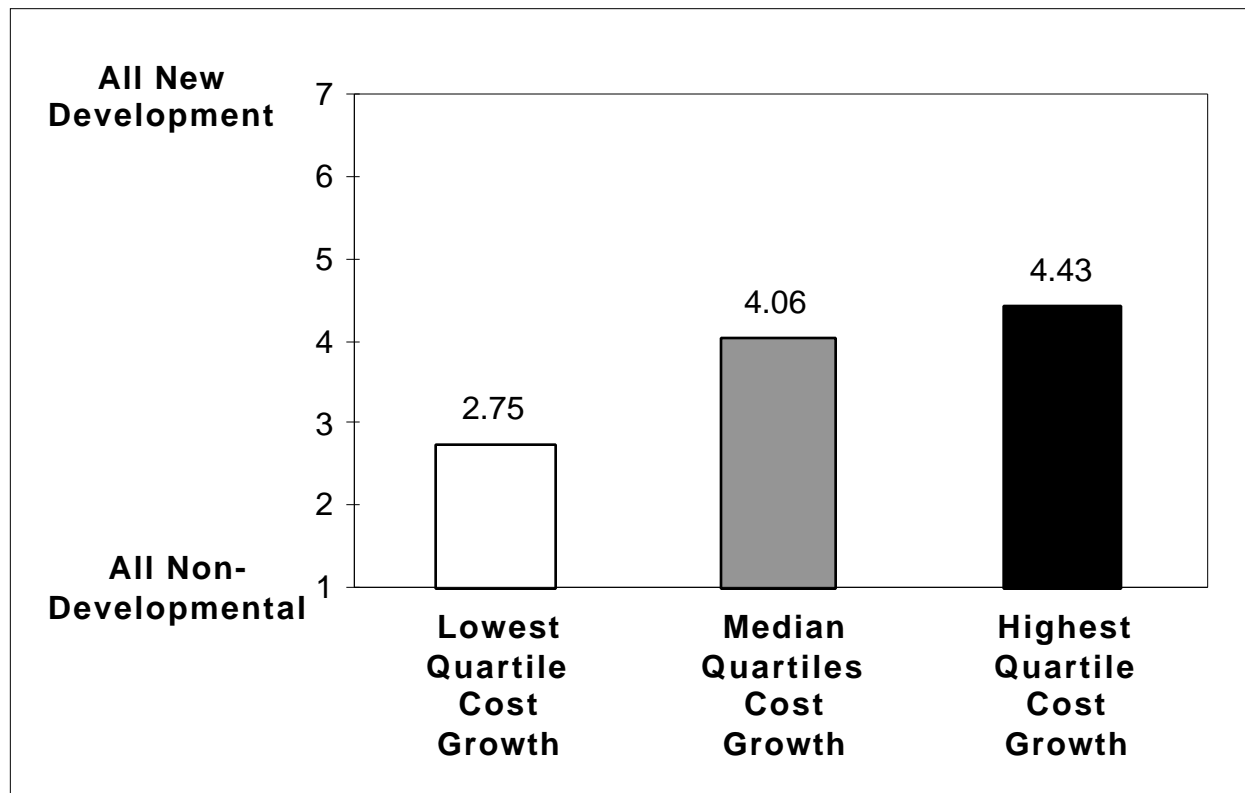
Source: 1996 Government PM survey.



# Subsystem-Level Technical Advance

Preliminary - For Discussion Only

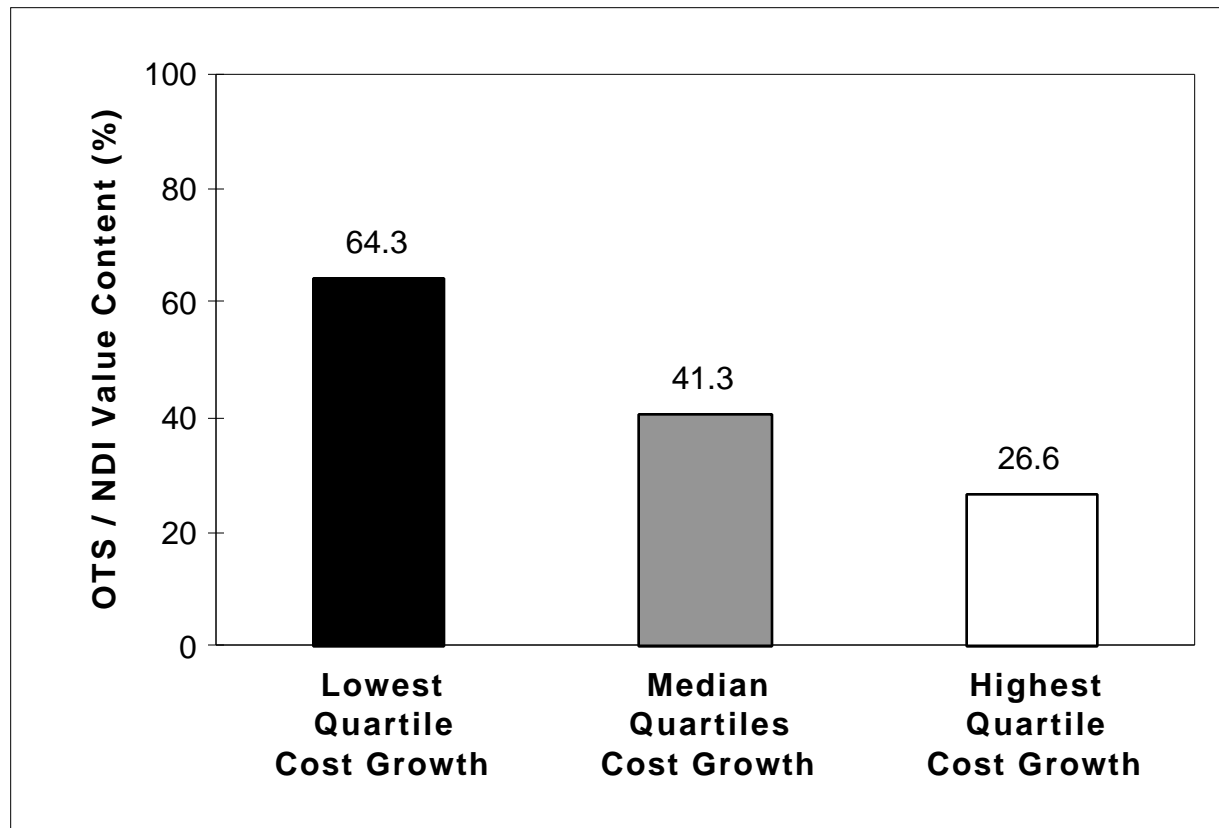
Level of Technical Advance Required in Critical System Components:



Source: 1996 Government PM survey.

# Non-Developmental Content

Preliminary - For Discussion Only

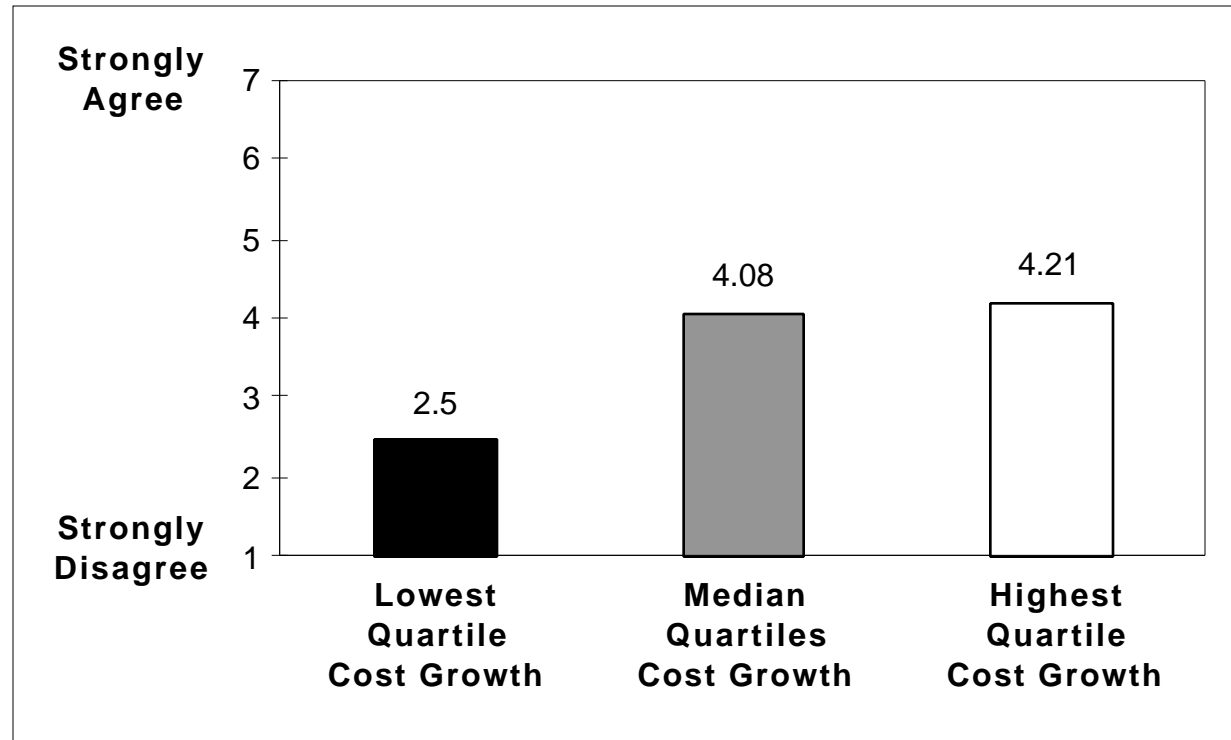


Source: 1996 Government PM survey.

# Military-Unique Characteristics

Preliminary - For Discussion Only

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."





## **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.**



# *The Role of Responsiveness*

---

## **Another tenet of leanness:**

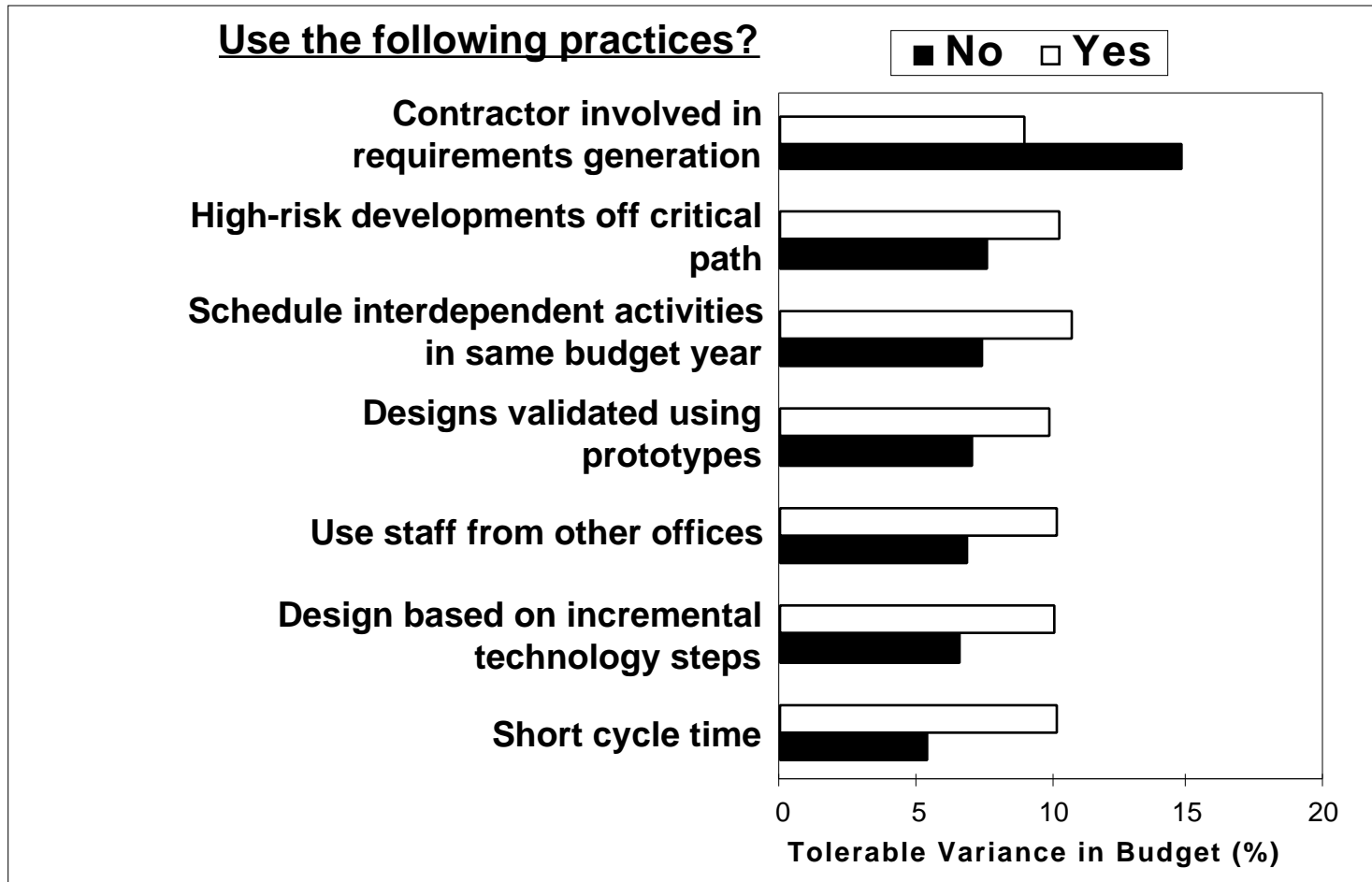
- **Increase responsiveness (adaptability) where possible.**
  - **Compensate for uncertainty.**

## **► 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.**

# Tolerance to Budget Variability

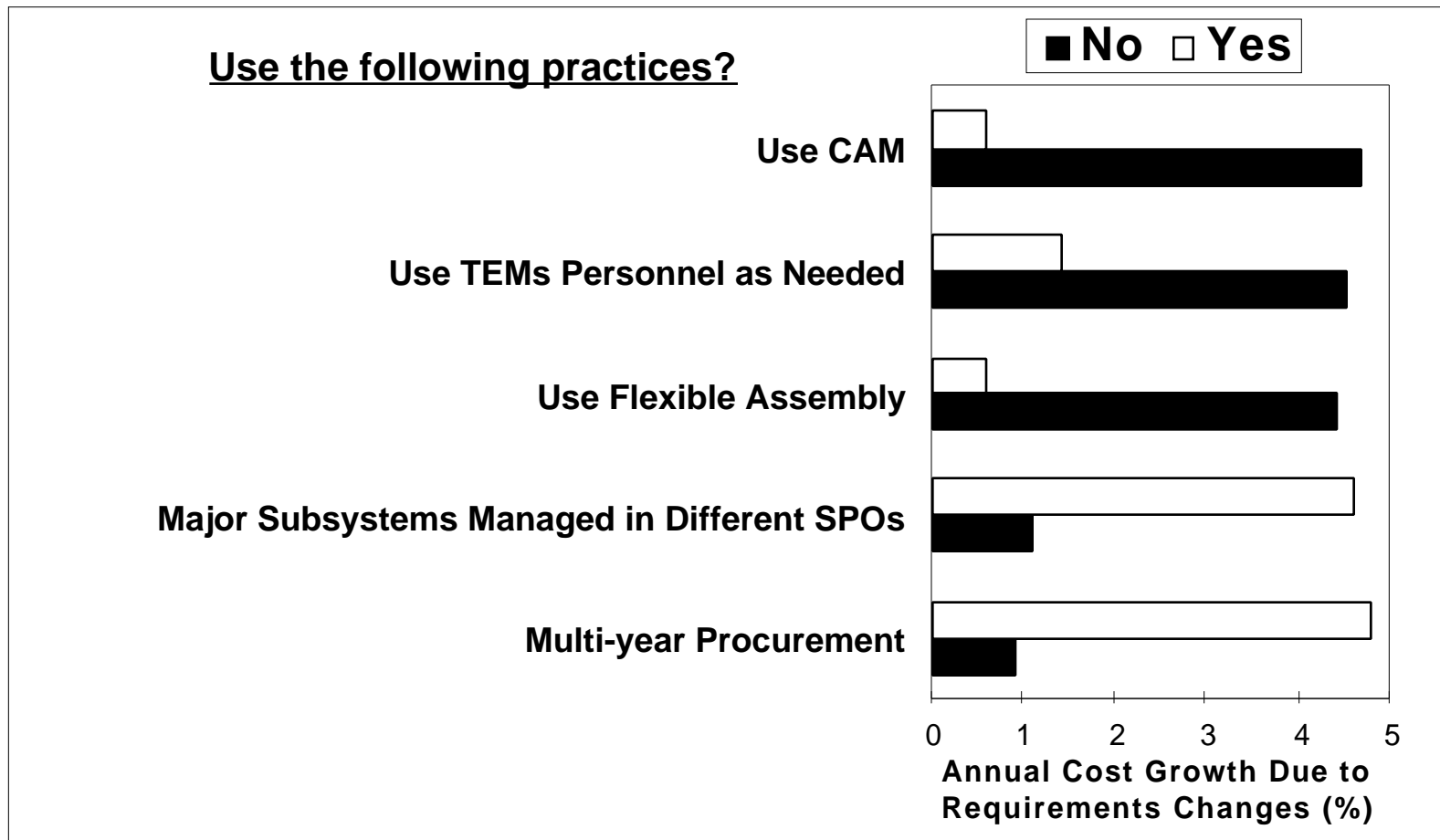
Preliminary - For Discussion Only





# Cost Impacts of Requirements Changes

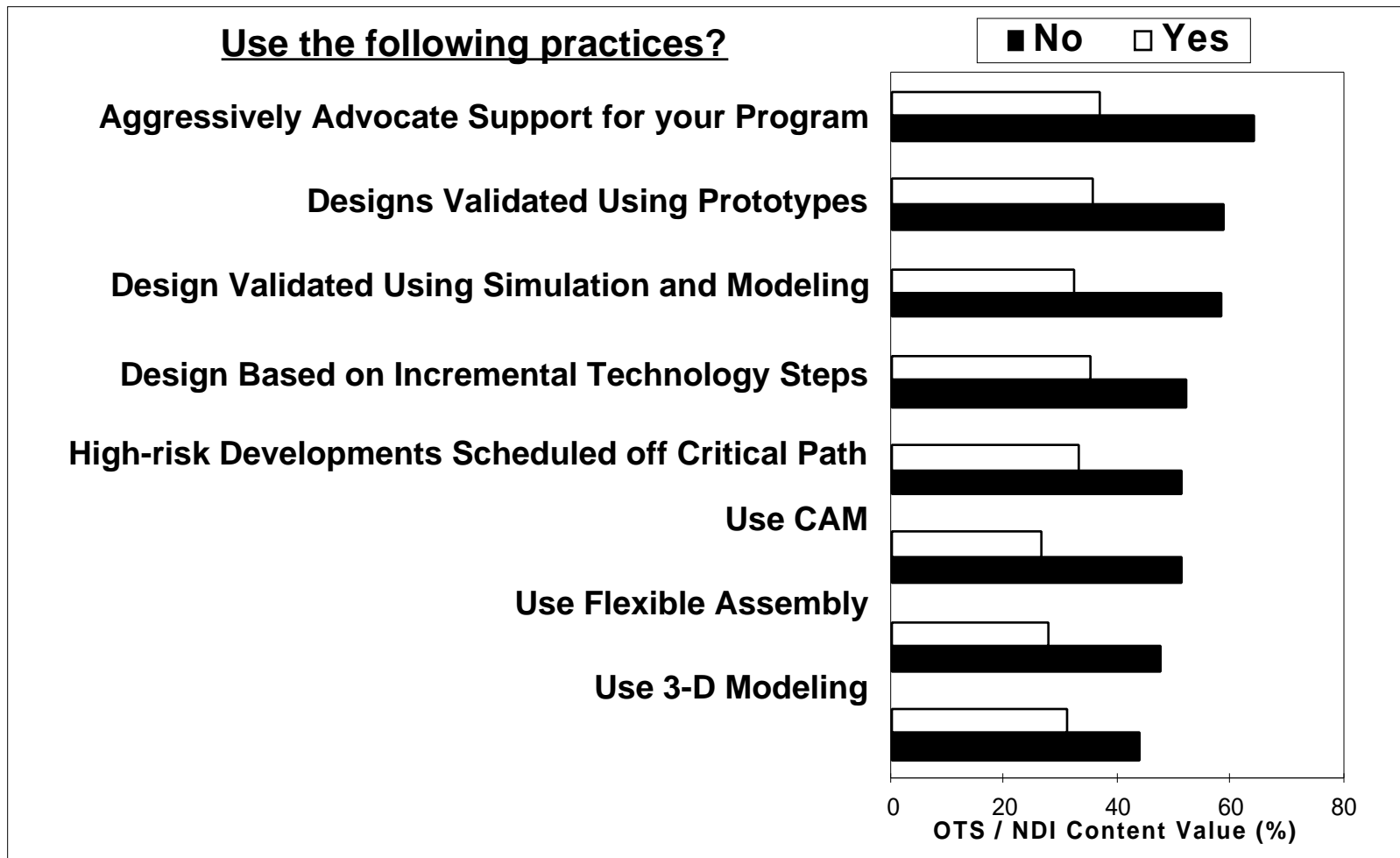
Preliminary - For Discussion Only



Source: 1996 Government PM survey.

# Influence of OTS / NDI Content

Preliminary - For Discussion Only



Source: 1996 Government PM survey.

- ▶ **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.

- ▶ **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.**
  - **Support PD/SR investigation of benefits of modular/platform-based product development concepts.**

- ▶ **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.