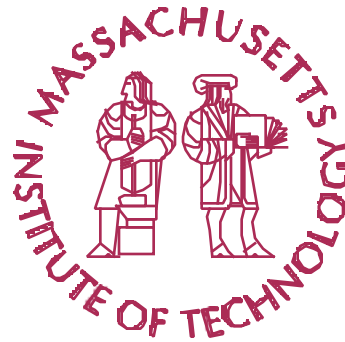


Lean Aerospace Initiative Plenary Workshop

Policy

Economic Incentives: C-17 Case Study



March 31- April 1, 1998

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Research Sponsored By LAI



Economic Incentives Presentation Outline

- **Motivation**
 - Key questions
 - Why the C-17?
 - C-17 Parameters
- **Setting the Stage**
 - Data sources
 - Defense Science Board C-17 Review
 - C-17 Should Cost Exercise
 - Primary environmental factors
- **Data Analysis**
 - Barriers, enablers, incentives
- **Results**
 - The gains
 - Lessons learned
 - Key findings



Motivation



Motivation for Study

- **Cost-based pricing results in reduced profit levels when costs are reduced**
- **In the production of major weapon systems, cost reductions achieved through the implementation of lean practices are frequently “captured” by the government customer**
- **Cost reductions often occur before the contractor received adequate return on investment (ROI)**
- **Evidence: VECP and IMIP**



Key Questions

- **What are the primary strategies, barriers, enablers and relationships of economically incentivized procurement of weapon systems in production?**
- **When production costs are reduced, how can contractors share in the benefits?**
- **What practices motivate defense aircraft contractors to invest more of their resources to become lean?**
- **What are the lessons learned in this study and are they transferable to other procurements?**

Identify practices, strategies, enablers and barriers related to companies' investments and sharing of cost savings



Why the C-17?

- **Considered to be a model of acquisition reform**
 - Innovative contract
- **High Visibility**
 - Congress
 - USAF
 - DoD
 - Public sector
- **System complexity and maturity**
 - Airframe, engine, spares
- **Major weapon system in production phase**
 - Aircraft in service



C-17 Parameters

- **Scope**

- More than 22,000 drawings
- More than 9,000,000 individual parts
- 1,800 assembly workers at Long Beach, CA

- **Investment**

- US Government \$37.3 billion
- Contractor \$ 1.5 billion
- Total \$38.8 billion

- **Production**

- 1,300 suppliers / 42,000 workers
- More than 100 major assembly tools (\$1.0 billion)
- Assembly time: 17 months
- 120 aircraft (FY88-FY03)
- Average unit flyaway cost of P41-P120: \$172 million



Setting the Stage



Case Study Data Sources

- **Literature review**
- **Background interviews (more than 150 people interviewed)**
 - Airframe, engine and electronics sectors
 - SPO, SAF, OSD
- **Case study specific (more than 45 people interviewed)**
 - SPO
 - DPRO
 - Contractor



Defense Science Board C-17 Review

- **DSB C-17 review, 12/93 - Fuhrman/Fain Report**
 - “Extremely negative management environment” between the contractor and the U.S. government
 - Omnibus Agreement recommendation: Combine all issues, claims, deficiencies into a single settlement (12/94)
 - C-17 is basically a sound design
 - Detailed specific recommendations relating to:
 - Range/payload
 - Engineering processes and deficiencies
 - Financial incentives
 - Unit cost
 - Management Information Systems (MIS)
 - Application of CAD/CAM
 - Organization
 - Realistic production and testing schedules



C-17 Ground Breaking Procurement

Year	Event	
1993	Defense Science Board C-17 Review	} Net Unit Cost Reduction: \$100 m/unit
1994	Omnibus Agreement	
1995	Should Cost Exercise	
1996	Multi-Year Contract	

Fundamental change in relationship between contractor and customer concomitant with extraordinary sharing of information and risk



C-17 Joint Should Cost Exercise

- **Should Cost Exercise initiated Summer-1994**
- **Directed by the Service Acquisition Executive**
- **Purpose: determine lowest most probable cost and how to obtain same**
- **Senior Leadership Team**
 - MGEN Scofield, Chairman
- **Executive Review Council empowered to apply results of SCE**
 - SAEs, IG, DCMC Commander, DCAA Director, USAF/CO
- **Buy-out profile established**
- **Joint cost model developed**
- **Three (3) contract-strategy recommended**
 - Production
 - Process improvement
 - Logistics/sustainment



Primary Environmental Factors

- **Stabilization of the C-17 aircraft design**
 - Positive impact on manufacturing processes
 - Positive impact on suppliers
 - Limited changes to the program management directive (PDM)
- **Non-Developmental Airlift Aircraft (NDAA) program competition**
 - Modified Boeing 747-400 freighter
 - Technical advantages, unit prices compared
- **Omnibus Agreement**
 - DSB recommended
 - Rebaseline program
 - Release parties from liabilities
 - Waive CCPD requirement



Data Analysis



C-17 Program Vision and Key Goals (1995 and Beyond)

- **Price reduction and affordability**
- **Open communications**
- **Mutual trust and respect**
- **Approval to produce aircraft beyond unit 40**
 - Undersecretary of DoD mandated C-17 price reduction
- **Completion of reliability and maintainability assessment**
 - IOC and milestone III B realigned to June 1995
 - Retrofit and evaluate design changes in support of reliability, maintainability and availability evaluation



C-17 Barriers and Enablers to Economically Incentivized Procurement

- **Barriers**

- Budget instability
- Non-value added oversight
- Color of money
- Excessive profit
- USAF spares system
- Acquisition reform

- **Enablers**

- Open communications
- Mutual trust and respect
- Lean leadership
- Should Cost Exercise
- Integrated process teams
- Acquisition reform



C-17 Economic Incentives

- **Multi-year contract**
 - Reasonably-firm government commitment to 120 aircraft
 - Additional contractor-funded investment to reduce cost
- **Award fees**
 - Joint cost model
 - Incentive for cost reduction and sharing of cost savings
- **Performance based payments**
 - Reduced contractor debt service
 - Reduced government oversight burden
- **Three-contract structure**
 - Moved risk to field support
 - Isolates flyaway cost to production contract



C-17 Economic Incentives (cont)

- **NDAA competition**
 - Incentive to reduce cost
- **Economic order quantity (EOQ) funding**
 - Solidify supplier base, reduce cost
 - Government investment to become more lean
 - Commitment of contractor resources to reduce costs through process improvements
- **Future liability limits**
 - Variation in quantity
 - Supplier mortality
 - Program discontinuation reopener

Economically incentivized contract based on extraordinary sharing of information and risk



Results



C-17 Gains

- **U.S. Government**

- Technically sound aircraft
- Reduced cost
- Most competitive product
- More complete understanding of contractors goals and constraints
- Potential for additional cost reduction

- **Contractor**

- Reasonably-firm government commitment
- Reward for accepting additional risk
- Enhanced corporate reputation
- Reduced debt service
- Government assistance in becoming more lean
- Share in cost reduction savings



C-17 Lessons Learned

- High level senior commitment and support enhance program success
- Information and risk, openly shared, precede development of economic incentives
- Reasonably-firm customer commitment, over a finite time period, to the production program reduces mutual risk
- Contractor investment of its resources to reduce unit cost enhance program success
- Innovative use of U.S. government of the following concepts can form foundation of risk-reward balance
 - Multi-year contract
 - Waiver of Certified Cost and Pricing Data (CCPD)
 - Performance Based Payments (PBP)
 - Economic Order Quantity (EOQ) Funding
 - Join Cost Model (JCM)
 - Variations in Quantities (VIQ) options

C-17
unique,
ground
breaking
usage

“From Uncontrolled Chaos to a Win-Win Environment



Key Findings

- **Leadership and use of IPTs increased communication and information flow**
- **Mutual trust and respect enabled internalization of strategic goals and visions**
- **Incentives preceded by risk-reward balance**
- **Specific incentives determined through delicate negotiations**

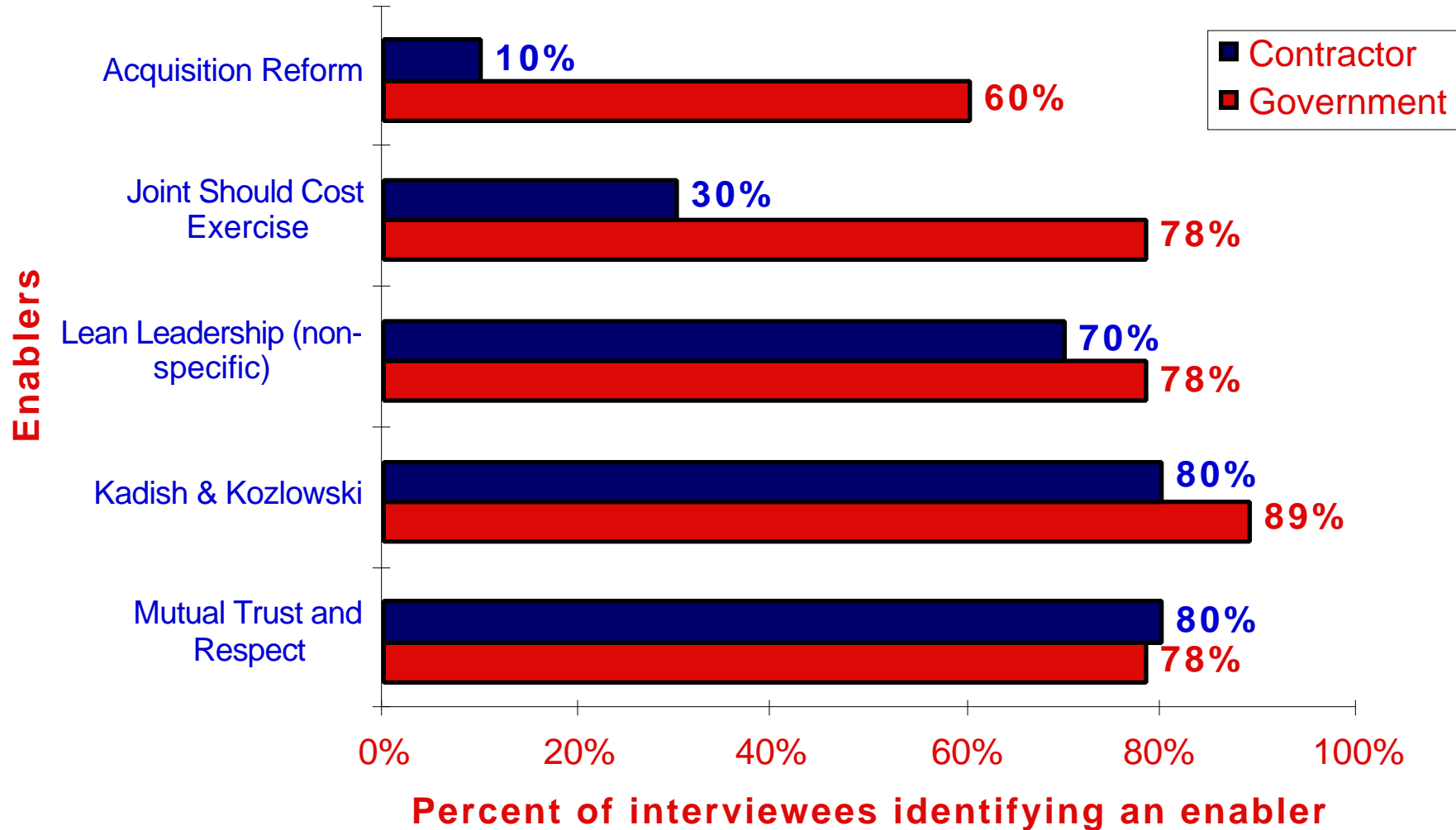
Economically incentivized procurement is possible in today's environment



- **Interview stakeholders to determine status of C-17 Acquisition**
 - DSB review
 - Should Cost Exercise
 - Joint cost model
 - Lean practices
 - Risk-reward balance
 - Affordability
 - Quality
- **Report, briefings to LAI, C-17 stakeholders (10/98)**
- **LEM datasheets**
- **“How-To” model for economically incentivized procurement**

Economically Incentivized Procurement: Enablers

C-17 CASE STUDY ENABLERS



Economically Incentivized Procurement: Barriers

C-17 CASE STUDY BARRIERS

