And a Great Afternoon to You All
<table>
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<th><strong>Report Type</strong></th>
<th><strong>Dates Covered (from... to)</strong></th>
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**Title and Subtitle**
Earned Value Management as an Implementation Tool for CAIV

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**Abstract**

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Earned Value Management as an Implementation Tool for CAIV

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Objectives

- Program Risk
- Cost as an Independent Variable
- Generally Accepted Management Principles
- Management Principle’s Myths
Engineering Manufacturing Development
Actual Vs. Plan

Actual Cost vs Budget

Completed at Original Schedule
Twice the Original Schedule

Actual Schedule vs Plan Schedule
Engineering Manufacturing Development
Actual Vs. Plan

Actual Cost vs Budget

Risk?

Actual Schedule vs Plan Schedule
Risk
Introduced into the Program

GOVERNMENT
ORD
Risk?
ACQUISITION STRATEGY
Risk?
DEVELOP RFP
Risk?

PROVIDER
DEVELOP PROPOSAL
Risk?

MGT VOLUME
TECH VOLUME
COST VOLUME

Balance
Technical
Cost
Schedule?

ORD
Risk?

ESTABLISH PROJECT BASELINE
ASSESS RISK
DEVELOP MR
ASSIGN BUDGETS

Execution & Performance Measurement
Reports
Cost As the Independent Variable
PM Balancing Act

Produce the Best Product within the Cost Constraint

Must be willing to Trade Requirements for Overall Cost

Generally Accepted Management Principles?
Integrated Program Management

Industry Standard

- Define the work
- Assign responsibilities
- Define indirect procedures
- Establish proper management controls

Planning Scheduling & Budgeting
- Schedule all work
- Authorize all work
- Time-phase the work
- Develop control accounts

Organization

Revisions and Data Maintenance

- Management Systems
- Contract

Analysis and Management Reports
- Material costs
- Unit/lot costs
- Cost Summarization

Accounting Considerations
- Understand contract status
- Use data for decision-making
- Manage Risk

- Schedule all work
- Authorize all work
Integrated Program Management

**Earned Value**

**Organization**

**Revisions and Data Maintenance**

**Planning, Scheduling & Budgeting**

- Define the work
- Assign responsibilities
- Define indirect procedures
- Establish proper management controls

- Schedule all work
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- Time-phase the work
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**Accounting Considerations**

- Material costs
- Unit/lot costs
- Cost Summarization

**Management Systems & Contract**

- Understand contract status
- Use data for decision-making
- Manage Risk

**Analysis and Management Reports**

- Schedule all work
- Authorize all work
- Time-phase the work
- Develop control accounts

**Therefore**
Cost As the Independent Variable
PM Balancing Act

Produce the Best Product within the Cost Constraint

Must be willing to Trade Requirements for Overall Cost

EVM Implements CAIV

COST

SCHEDULE

TECHNICAL PERFORMANCE

Myths?

If the CAIV Thresholds have Not been Met, the Design is Not Complete.
Myths of EVM

- It's not the way we manage
- EVMS is a government reporting requirement
- Data is too old to use
- Looks backward > not to the future
- Variances are bad
- Revising Baselines are Bad
- EVM costs too much
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A-12
The Plane That Never Was
A-12 Lesson Learned

- Too often, earned value insights remain the sole province of the supporting program control staff of both contractors and the government.
  - Earned value must be an integral part of the performing design and manufacturing organizations.
  - Only when program technical staffs are held accountable for earned value analysis, will they begin to understand its implications.

The “Beach” Report
A-12 Administrative Inquiry
28 Nov 1990
A-12 Lesson Learned

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The “Beach” Report
A-12 Administrative Inquiry
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ACAT I Missile: Variances

- CV -$12.5
- SV -$2.6
- KR -$17.1
- PM -$24.8

No Reporting

Time: 96 97 98 99 00

% Variation:
- +30%
- +20%
- +10%
- 0
- -10%
- -20%
- -30%
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COST/SCHEDULE VARIANCE TRENDS

Ship: Variances

3 Years

Cost Variance
Sched Variance
Mgmt Reserve

Cost Var @ Completion
PM
CONTR
Ship: Variances

6 Months

Plenty of Time for Management Action

Cost Variance: -109.5
Sched Variance: -9.7
Mgmt Reserve: 0.0

Cost Var @ Completion
PM: -185.0
CONTR: -216.0
Ship: Variances

Plenty of Time for Alternatives

6 Months

Cost Variance: -109.5
Sched Variance: -9.7
Mgmt Reserve: 0.0

Cost Var @ Completion:
PM: -185.0
CONTR: -216.0
Ship: Variances

6 Months

Plenty of Time for Trades

COST/SCHEDULE VARIANCE TRENDS

Cost: Variances

CAIV

6 Months

Cost Var @ Completion
PM -185.0
CONTR -218.0
Mike Sears:

“Weekly EVM reporting so team leaders have the results of their actions quickly.”

“Technical people find detail planning extremely difficult, don’t like to do it. It is hard to do but it is absolutely essential to take that first step.”

“We don’t know all of the detail ahead of time. It is that learning process of pulling the plan together where you find lots of things that you never find if you don’t attack it at the detail level.”

President, McDonnell Douglas
A12 Program
Engineering Manufacturing Development
Actual Vs. Plan

Actual Cost vs Budget

Have $$$$$$ to Overrun?

Actual Schedule vs Plan Schedule
Engineering Manufacturing Development
Actual Vs. Plan

Actual Cost vs Budget

Have Time to Overrun?

Actual Schedule vs Plan Schedule
Myths of EVM

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EAC - Futuristic Perspective:

- When a contract is more than 15% complete & more than 10% overrun:
  - 1. The overrun at completion will be more than the overrun incurred to date
  - 2. The percent overrun at completion will be greater than percent overrun incurred to date

- Based on OSD database of more than 500 major DOD contracts since 1977

**Why is this True?**
Government has Designed a Challenge!

Contractor has Accepted a Challenge!

Risk Introduced into the Program
CONTRACT PERFORMANCE

Missile: PMB

Realism of Estimates versus Uncertainty Greater

<table>
<thead>
<tr>
<th>BCWS</th>
<th>BCWP</th>
<th>ACWP</th>
</tr>
</thead>
<tbody>
<tr>
<td>165.2</td>
<td>162.4</td>
<td>172.4</td>
</tr>
</tbody>
</table>

Target: 171.1
Program Manager's Est: 180.7
Contractor's Est: 177.8
Contractor has Accepted a Challenge

Missile: PMB

High Probability
Less Efficient in Last 50% of Contract
Myths of EVM

• It's not the way we manage
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Helicopter: Variances

Don't Shoot the Messenger

Alternatives?

Trades?

Responsible Management Decisions?

Cost Variance
Scheduled Variance
Mgmt Reserve

7.2 Start/Comp Date

CON R 0  -52.7
Performance Overview

- Ahead of Schedule
- Underspent
  - 1.035
  - 04/99

- Behind Schedule
  - 0.86
  - 07/98

- Overspent
  - 1.025
  - 01/99

- Estimate At Completion

- Total Schedule
- PM’s EAC
- Total Spent
- 04/98
- 04/99
- 01/05
- 01/98

- $510M
- $352M
- $546M
- $310M

- Used by NAE
- Used by DCMA
Cost As the Independent Variable
PM Balancing Act

Produce the Best Product within the Cost Constraint

Must be willing to Trade Requirements for Overall Cost

EVM Implements CAIV

If the CAIV Thresholds have not been met, the Design is Not Complete.
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What happens without Re-baseline?

“... management systems were closely aligned with . . . C/SCSC compliance; they could not be reset without contractual relief. Without a reset, large variances occurred between existing contractual requirements and actual plans. The system could not handle such variances, and ad hoc systems began to evolve . . . ad hoc systems could not keep pace and disconnects resulted, significantly impacting the Production Plan.”

- CEO to USD(A&T) June, 1993
What happens without Rebaseline?

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Whose Management System?

• Contractor’s Management System
  – Need to Manage the Contract Effort is Paramount to All other Considerations!
  – Contractor must have the Ability to Use its Own Management Systems!

• EVMS is not:
  – A Government System
  – Reporting System
  – Contract Administration
  – Accounting
  – Cost Analysis
  – A Method of Punishment
The Re-baseline Dilemma

• Failure to Re-baseline leads to:
  – Two Sets of Books
  – Loss of Control

*BUT*

• Re-baseline without Discipline leads to:
  – Rubber Baseline
  – Loss of Control

*And*

• Re-baseline does NOT change a Contract from “Red” to “Green”!!
Regaining Control
Without Losing Visibility

Cost/Schedule Variance Trends

Re-baseline 1
Re-baseline 2

Cost Variance
Sched Variance
Mgmt Reserve

Cost Var @ Completion

-64.4
-6.6
23.2

10% Thresholds
Start/Comp Date

PM
CONTR

-846.4
-787.9

Dollars in Millions

92 93 94 95 96 97 98 99 00 01 02
Myths of EVM

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## A-12: The Human Cost

<table>
<thead>
<tr>
<th>Position/Person</th>
<th>Action</th>
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<tbody>
<tr>
<td>USD(A)</td>
<td>Resigned</td>
</tr>
<tr>
<td>COMNAVAIR</td>
<td>Early Retirement</td>
</tr>
<tr>
<td>PEO</td>
<td>Censured; Reassigned</td>
</tr>
<tr>
<td>Program Manager</td>
<td>Censured; Reassigned</td>
</tr>
<tr>
<td>McAiR Program Manager</td>
<td>Reassigned</td>
</tr>
<tr>
<td>GDFW Program Manager</td>
<td>Reassigned</td>
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</table>
C&L/TASC Cost Drivers: Cost Without a Requirement

- C/SCS Cost Premium is 0.9%
  - Nearly 75% is in Engineering/Program Mgmt.
  - Written Control Account Variances
  - Most of Remainder is in Administrative and External Reporting Activities

Management does cost $$

Misuse of EVMS cost more $$

Coopers & Lybrand/TASC Study:
“The DoD Regulatory Cost Premium: A Quantitative Assessment”
December, 1994
Cost As the Independent Variable
PM Balancing Act

- Produce the Best Product within the Cost Constraint
- Must be willing to Trade Requirements for Overall Cost

EVM Implements CAIV

Variance are Good if not covered up.

If the CAIV Thresholds have not been met, the Design is Not Complete
A Great Day to You All
Program at a Glance

Price - Profit = Contract Budget Base / TAB / NCC

Management Reserve

Schedule Variance

BCWS

BCWP

ACWP

PMB

Cost Variance

Beyond Performance

Time Now

Completion Date

Over Budget

EAC

Critical Path
Airplane: PMB

Contract Performance Graph

- BCWS: 3,402.0
- BCWP: 3,399.7
- ACWP: 3,430.3
- Target: 3,445.4
- Program Manager's Est: 3,445.4
- Contractor's Est: 3,486.0
Ship: PMB

Contract Performance

- BCWS: 265.1
- BCWP: 275.4
- ACWP: 384.9
- Target: 635.5
- Program Manager's Est: 820.5
- Contractor's Est: 851.5
Contractor Radio Commercial: 
“Program on Cost and on Schedule”

Sched Variance: $-46.8
Mgmt Reserve: $162.3

Cost Var @ Completion: $-4.5B
Aircraft: PMB

Contract Performance

- BCWS: 11,813.4
- BCWP: 11,768.6
- ACWP: 12,080.2
- Target: 12,928.9
- Program Manager's Est: 13,326.0
- Contractor's Est: 13,193.6
OTB Approval
A Management Decision

• Need to Manage the contract effort is Paramount to All other Considerations!
• Three Conditions:
  – Problem is Understood
  – New Plan is Ready
  – Contractor needs OTB to effect Proper Management Control
• Issue goes to the Heart of EVMS Ownership and Reform
"In summary, the PM underestimated the cost implications of adverse engineering and manufacturing process data...." p.12

"The PM testified that when he noted that the contract was funded to ceiling, all interest in FSD cost evaporated." p.23

"The CAIG cost analyst...memo concludes: 'The A-12 FSD contract is a fixed price incentive contract, and the Navy has budgeted to its ceiling, so the government's liability is covered'." p.25

"...it is apparent that MAR participants at the working group level did not share a clear vision of the relationship between cost and schedule risk and the contractor team's ability or willingness to perform within the FSD contract." p.28
Roadmap - Requirement to Competitive Advantage

- Common Business Processes are at the Core of EVM
  - Suppliers are Realizing Savings, Efficiencies
  - Management Systems are a Competitive Advantage
- “Good Management Effect”
  - LM study: Relationship Between Effective Management Practices and Desired Results such as Re-win Rate, Good CPARS and Award Fee Ratings and Higher Return on Sales

Program by program application isn’t good enough