



Acquisition Reform: Integrate Technical Performance with Earned Value Management

Paul Solomon, PMP
Performance-Based Earned Value®

www.PB-EV.com

paul.solomon@pb-ev.com

SSTC 2011

Salt Lake City

May 17, 2011

© Copyright 2011, Paul Solomon

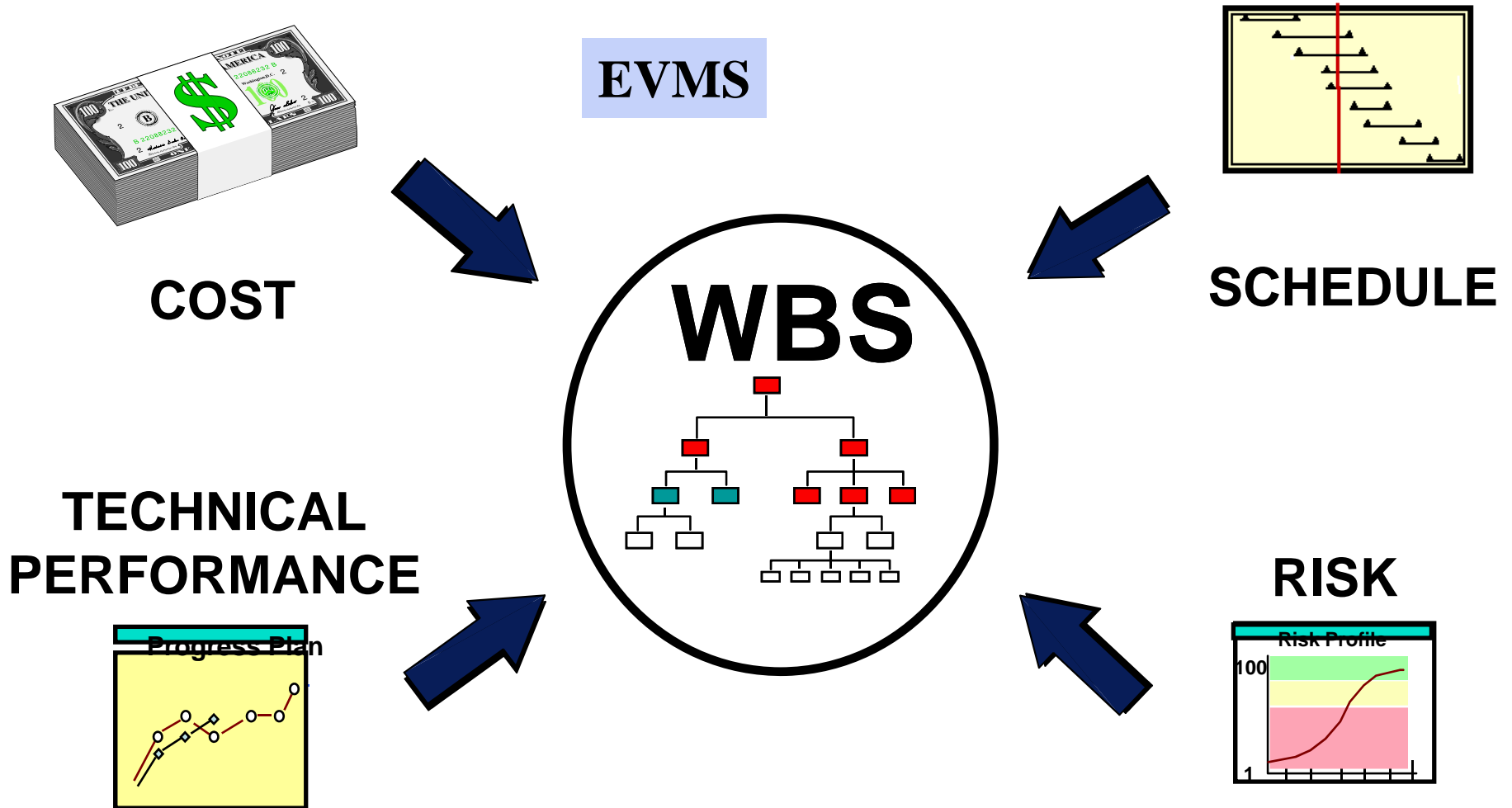


Agenda

- **Link EV to Technical Performance/Quality**
- **Government Needs and Acquisition Reform**
- **Standards, Models and DoD Guides**
- **Practical Application**
- **EVM Acquisition Reform**
- **Framework for Process Improvement**



Does EVMS Really Integrate?





Value of Earned Value



“EVM data will be reliable and accurate only if:

- The right base measures of technical performance are selected**
- and**
- Progress is objectively assessed” (a)**

(a) “Integrating Systems Engineering With Earned Value Management”
in *Defense AT&L Magazine*, May 2004

Government Needs and Acquisition Reform



Office of Management and Budget (OMB)

- OMB Circular No. A-11, Section 300
Planning, Budgeting, Acquisition and
Management of Capital Assets
- Section 300-5
 - ***Performance-based*** acquisition management
 - Based on EVMS standard
 - Measure progress towards milestones
 - Cost
 - ***Capability to meet specified requirements***
 - Timeliness
 - ***Quality***



DoD EVM Report to Congress

**Report: *DoD Earned Value Management:
Performance, Oversight, and Governance* (1)**

***”Utility of EVM has declined to a level where it
does not serve its intended purpose.”***

Findings and Recommendations:

- ***Inaccurate*** EVM status data provided by vendors
- Use ***Technical Performance Measures*** (TPM)
- Integrate ***Systems Engineering*** (SE) with EVM

**(1) Required by Weapon Systems Acquisition
Reform Act (WSARA)**



DoD Report : TPM (1 of 2)

Use TPMs

- EV process is reliable and accurate only if
 - ***TPMs*** are identified and associated with completion of appropriate work packages
 - ***Quality of work*** must be verified
 - ***Criteria*** must be defined clearly and unambiguously



DoD Report : TPM (2 of 2)

Use TPMs

- If good TPMs are not used:
 - Programs could report 100 % of earned value..even though ***behind schedule***
 - Validating requirements
 - Completing the preliminary design
 - Meeting weight targets
 - Delivering software releases that meet the requirements
- Program Managers ensure that the EVM process **measures** the **quality and technical maturity** of technical work products **instead of** just the **quantity** of work performed



National Defense Authorization Act for FY 2011

**Sec. Def. to review defense acquisition guidance,
including DoDI 5000.02**

- Consider **“whether measures of *Quality and technical performance* should be included in any EVMS.”**
- Submit report to the House and Senate
 - Changes in acquisition guidance
 - Actions to implement changes.

Recent articles in *Defense AT&L Magazine*:

- Nov./Dec. 2010 issue: **“EVM Acquisition Reform”**
- May/June 2011 issue: **“Path to EVM Acquisition Reform”**



EVMS Quality Gap

EVMS Standard, Federal Acquisition Regulation (FAR) and Defense FAR Supplement (DFARS) are deficient:

No guidance or requirement to **link**

- **Reported EV**
with
- **Progress toward meeting *Quality/technical performance requirements***





EVMS Quality Gap

Quality
Gap

EVMS Standard shortfall (3.8):

- “EV is..measurement of *quantity* of work”
- “*Quality* and *technical* content of work performed are *controlled by other means*” !?





EVMS Quality Gap

EVMS Standard shortfall (Guideline 2.2b):

Identify (ID)

- physical products
- milestones
- **technical performance goals** 

“or” 

- other indicators that will be used to measure progress.

Quality Gap 

“or” not “and”

Guidance in Standards, Models, and DoD Guides



Guidance in Standards and Models

- **Processes for Engineering a System (ANSI/EIA-632)**
- **Standard for Application and Management of the SE Process (IEEE 1220)**
- **Capability Maturity Model Integration (CMMI[®])**
 - CMMI for Development, Version 1.2
 - CMMI for Acquisition, Version 1.2
 - *Using CMMI to Improve Earned Value Management, 2002*
- **Guide to the Project Management Institute Body of Knowledge (PMBOK Guide[®]), 4th Edition**





PMBOK Guide, Quality Baseline Guidance

- Establish a **quality** baseline as part of the **Performance Measurement Baseline (PMB)**(8.1.3.5)
 - Integrate technical and quality objectives (10.3.1.5)



Product Requirements Baseline




- CMMI[®], PMBOK Guide[®] : Traceability and consistency

Requirements



Work

•Project Plans

Task 1 

Task 2 

Task 3 

•Activities

•Work Products

Source: CMMI Requirements Management Process Area (PA), Specific Practice (SP) 1.5



CDR Success Criteria

IEEE 1220, (6.6): Success Criteria (CDR)

- Design solution meets:
 - *Allocated performance requirements*
 - *Functional performance requirements*
 - Interface requirements
 - Workload limitations
 - Constraints
 - Use models and/or prototypes to determine success



DoD Guides: Integrated Planning

**DoDI 5000.02, Operation of the Defense Acquisition System (POL)
12/08**

Defense Acquisition Guidebook (DAG**)**

Systems Engineering Plan (SEP) Preparation Guide 4/08

WBS Handbook, Mil-HDBK-881A (WBS) 7/30/05

**Integrated Master Plan (IMP) & Integrated Master Schedule (IMS)
Preparation & Use Guide 10/21/05**

**Guide for Integrating SE into DOD Acquisition Contracts (Integ SE)
12/06**

Defense Acquisition Program Support Methodology (DAPS**) V2.0
3/20/09**



Derivation and Flowdown of TPMs

| Source, Baseline, Measures | Technical Review | Parameter |
|---|--------------------------------|-----------------------------------|
| Capabilities Development Document (CDD) | | Key Performance Parameter (KPP) |
| Functional Baseline | System Functional Review (SFR) | Measures of Effectiveness (MOE) |
| Functional Baseline | SFR | Measures of Performance (MOP) |
| Allocated Baseline | Preliminary Design Review | TPM |
| Integrated Master Schedule | | TPM Milestones and Planned Values |
| Work packages | | TPM-based % complete criteria |





DoD: Technical Baselines And Reviews

| DoD Policy or Guide | POL | DAG | SEP | WBS | IMP/IMS | Integ SE | DAPS |
|--|-----|-----|-----|-----|---------|----------|------|
| Technical Baselines in IMP/IMS (Milestones): <ul style="list-style-type: none"> • Functional (SFR) • Allocated (PDR) • Product (CDR) | | X | | | | X | X |
| Technical Reviews: | | | | | | | |
| • Event-driven timing of technical reviews | X | X | X | X | X | X | X |
| • Success criteria of technical reviews | X | X | X | X | X | X | X |
| • Include entry and exit criteria for technical reviews in IMP and IMS | | X | X | | | X | X |
| • Assess technical maturity in technical reviews | | X | X | X | | X | |

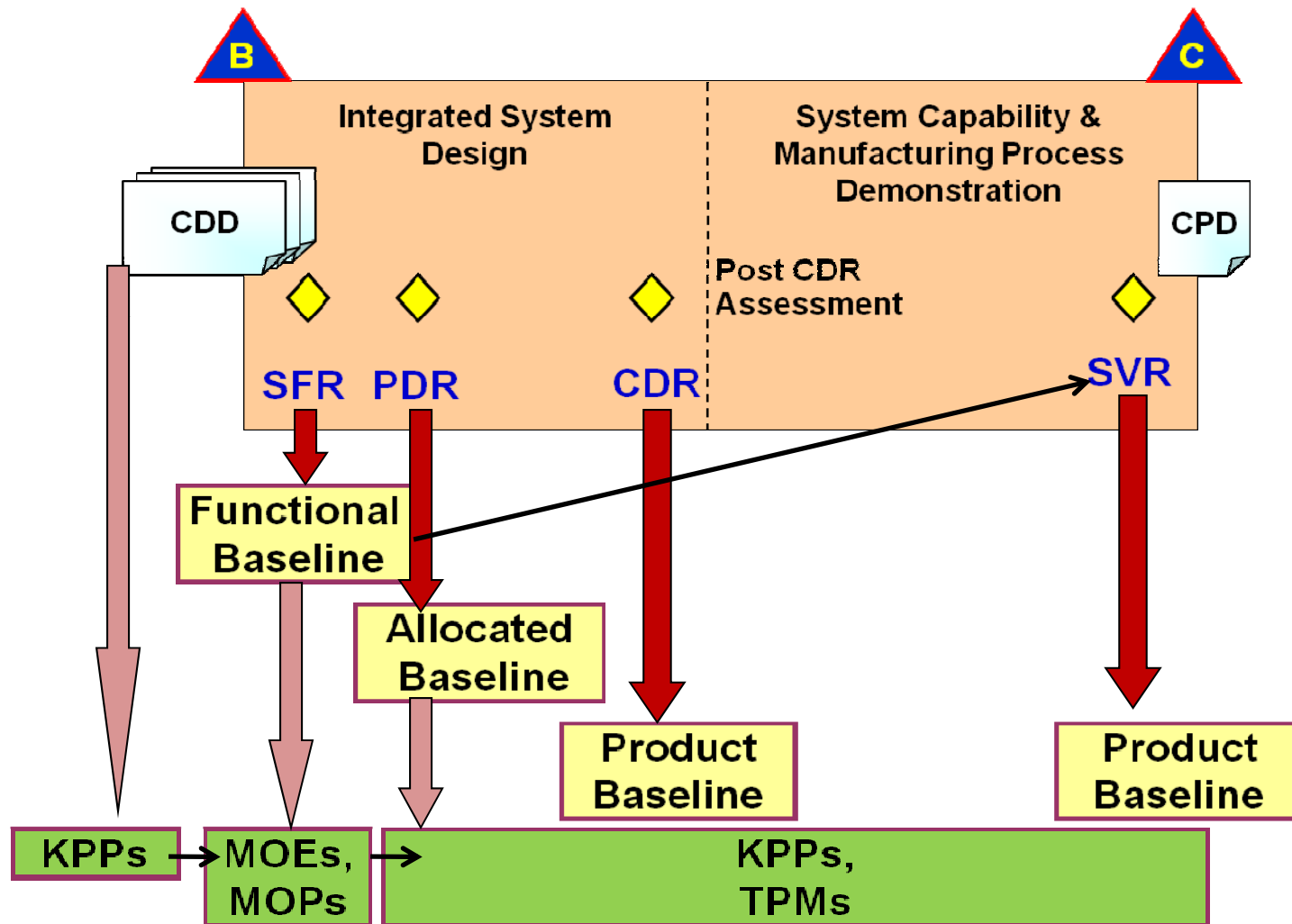


DoD: Integrated Plans

| DoD Policy or Guide | POL | DAG | SEP | WBS | IMP/IMS | Integ SE | DAPS |
|--|-----|-----|-----|-----|---------|----------|------|
| Integrate SEP with: <ul style="list-style-type: none"> • IMP/IMS • <i>TPMs</i> • EVM | | X | X | | X | X | X |
| Integrate WBS with <ul style="list-style-type: none"> • <i>Requirements specification</i> • Statement of work • IMP/IMS/EVMS | | X | | X | X | X | X |
| Link risk management (including risk mitigation plans), technical reviews, <i>TPMs</i>, EVM, WBS, IMS | | X | | | | X | X |



Technical Reviews, Baselines, Measures



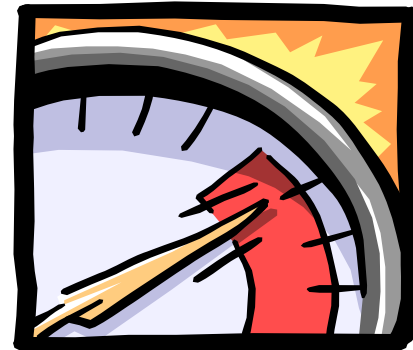


Practical Application



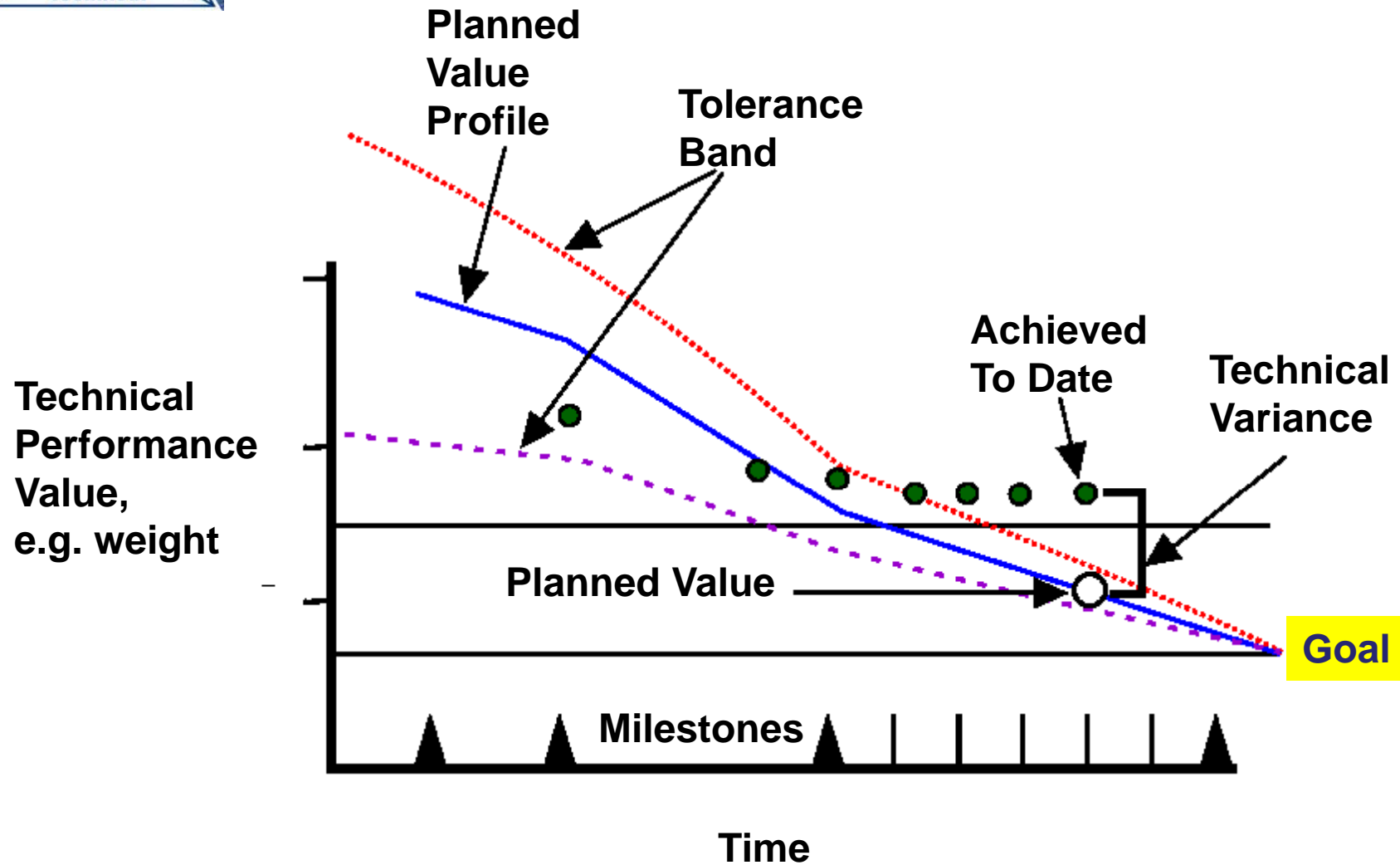
TPM

- **How well a system is achieving performance requirements**
- **Use actual or predicted values from:**
 - Engineering measurements
 - Tests
 - Experiments
 - Prototypes
- **Examples:**
 - Payload
 - Response time
 - Range
 - Power
 - Weight





TPM Performance vs. Baseline







Example 1: EV Based on Drawings and TPMs

- **SOW: Design a subsystem with 2 TPMs:**
 - Maximum (Max.) weight
 - Planned Value (PV): 200 lb. (May)
 - Max. diameter
 - PV: 1 inch (when 80% drawings complete, April)
- **Enabling work products: 50 drawings**
- **BAC: 2000 hours**
 - Drawings: 40 hours/drawing @ 50 2000
 - If TPM PVs *not* met on schedule:
 - **Negative** adjustment to EV
 - Weight: -100
 - Diameter -200



Example 1: EV Based on Drawings and TPMs

| Schedule | Total | Jan | Feb | Mar | Apr | May | Total |
|---------------------------|-------|-----|-----|-----|---|---|-------|
| <u>Drawings</u> | | | | | | | |
| Drawings/ period | 50 | 8 | 10 | 12 | 10 | 10 | 50 |
| Meet requirements: | | | | | | | |
| Weight | 1 | | | | |  | |
| Diameter | 1 | | | |  | | |



Example 1: Status

| Date | April 30 | May 31 |
|---------------------------|-----------------|---------------|
| Drawings completed | 41 | 49 |
| Weight met | No | No |
| Diameter met | Yes | Yes |



Example 1: EV Based on Drawings and TPMs

| Design (drawings) | Jan. | Feb. | Mar. | Apr. | May | Total |
|-------------------------------|------|------|------|------|------|-------|
| Planned drawings cur | 8 | 10 | 12 | 10 | 10 | 50 |
| Planned drawings cum | 8 | 18 | 30 | 40 | 50 | |
| BCWS cur | 320 | 400 | 480 | 400 | 400 | 2000 |
| BCWS cum | 320 | 720 | 1200 | 1600 | 2000 | 2000 |
| Actual drawings completed cur | 9 | 10 | 10 | 12 | 8 | |
| Actual drawings completed cum | 9 | 19 | 29 | 41 | 49 | |
| EV (drawings) cum | 360 | 760 | 1160 | 1640 | 1960 | |
| Negative EV Reqs cum | | | | 0 | -100 | |
| Net EV cum | 360 | 760 | 1160 | 1640 | 1860 | 1860 |

SV = - 140



Example 1: Variance Analysis

May variance analysis (drawings and requirements):

- 1 drawing behind schedule - 40
 - Diameter requirement met - 0
 - Weight requirement *not* met: - 100
- Schedule variance - 140



EVM Acquisition Reform



Revise Federal and DoD Policy

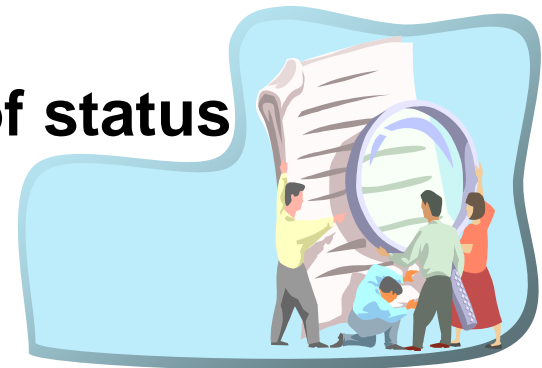
- **Federal**
 - OMB policy and FAR
- **DoD**
 - DFARS
 - DoDI 5000.02
 - DoD acquisition and SE guides





Program Management Tips

- **Require SE and Project Management best practices in Request for Proposal**
- **Confirm contractor's proposal includes integration of SE work products, success criteria, and TPMs with EVM**
- **Verify integration in Integrated Baseline Review (IBR)**
- **Confirm achievement of success criteria in technical reviews**
- **Monitor consistency and validity of status reports, variance analyses, EAC**



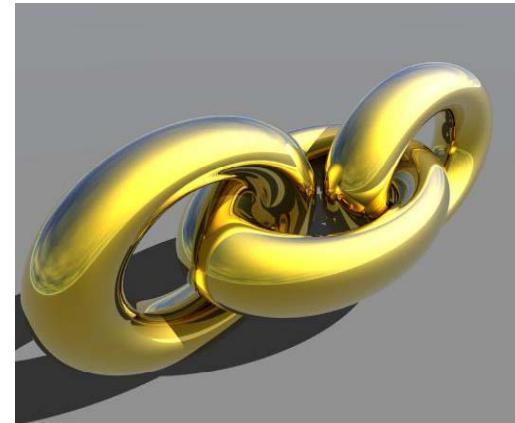


Framework for Process Improvement



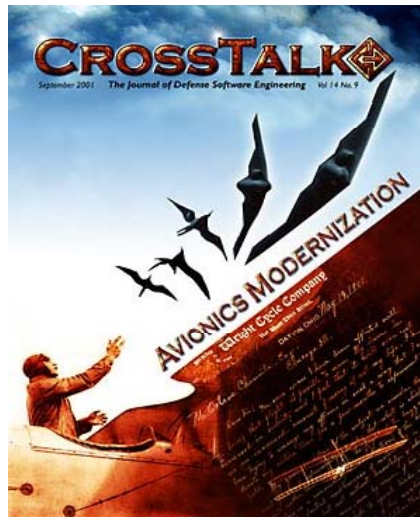
Close the EVMS Quality Gap

- **PMB includes technical/quality parameters**
- ***Valid* contract performance reports**
 - Objective technical/schedule status
 - Credible EAC
- **Early detection of problems**
 - Program performance
 - EV measurement and compliance

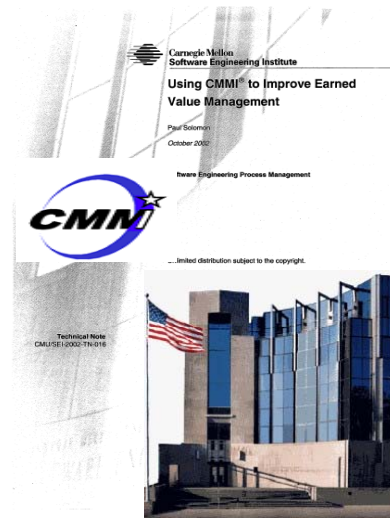




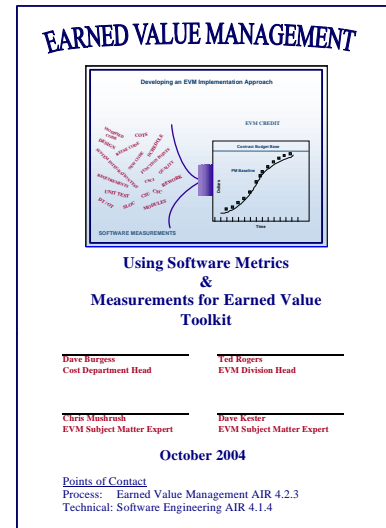
Resources Online



DOD



SEI



NAVAIR



DOD



ICFAI U.
Press, India



PMI College of
Performance Mgt.,
"Measurable News"



www.PB-EV.com

© Copyright 2009, Paul Solomon



Trademarks, Acronyms

CMMI® Is Registered by Carnegie Mellon University in the U.S. Patent and Trademark Office.

Performance-Based Earned Value® is registered by Paul Solomon in the U.S. Patent and Trademark Office. PBEV is a service mark of Paul Solomon.

PMBOK Guide® is registered by the Project Management Institute in the U.S. Patent and Trademark Office

CDR: Critical Design Review

EAC: Estimate at Completion

EVM: Earned Value Management

IBR: Integrated Baseline Review

IMP: Integrated Master Plan

IMS: Integrated Master Schedule

KPP: Key Performance Parameter

MOE: Measure of Effectiveness

MOP: Measure of Performance

OMB: Office of Management and Budget

PDR: Preliminary Design Review

PMB: Performance Measurement Baseline

SE: Systems Engineering

SFR: System Functional Review

TPM: Technical Performance Measure (or Measurement)