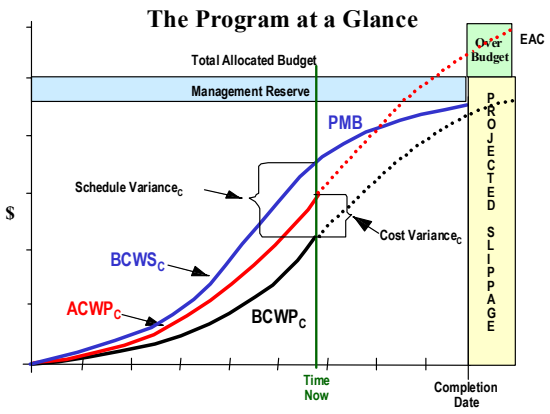
2002
Business Manager's Conference
Earned Value Management "Fundamentals"



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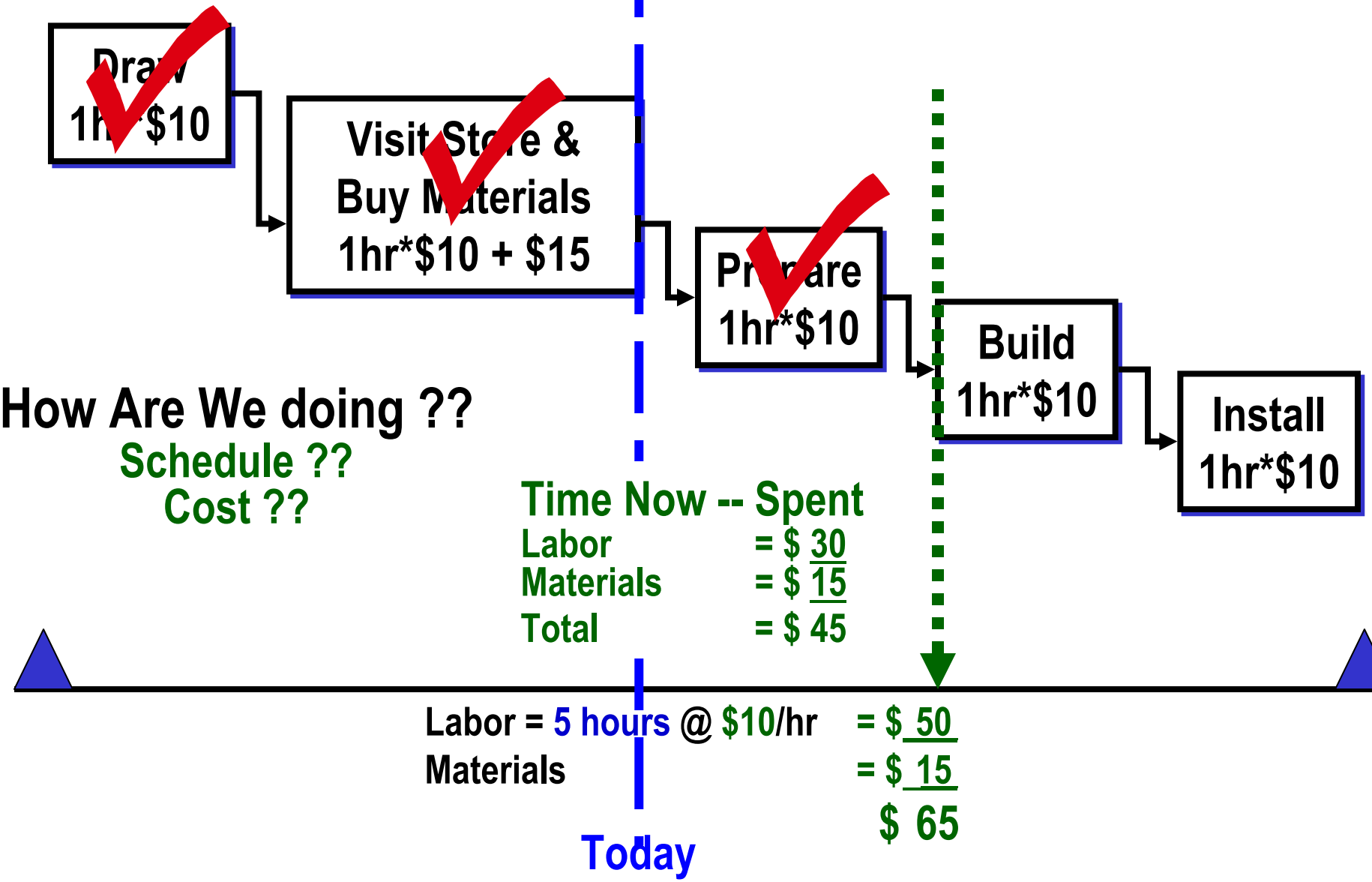
Build A Birdhouse



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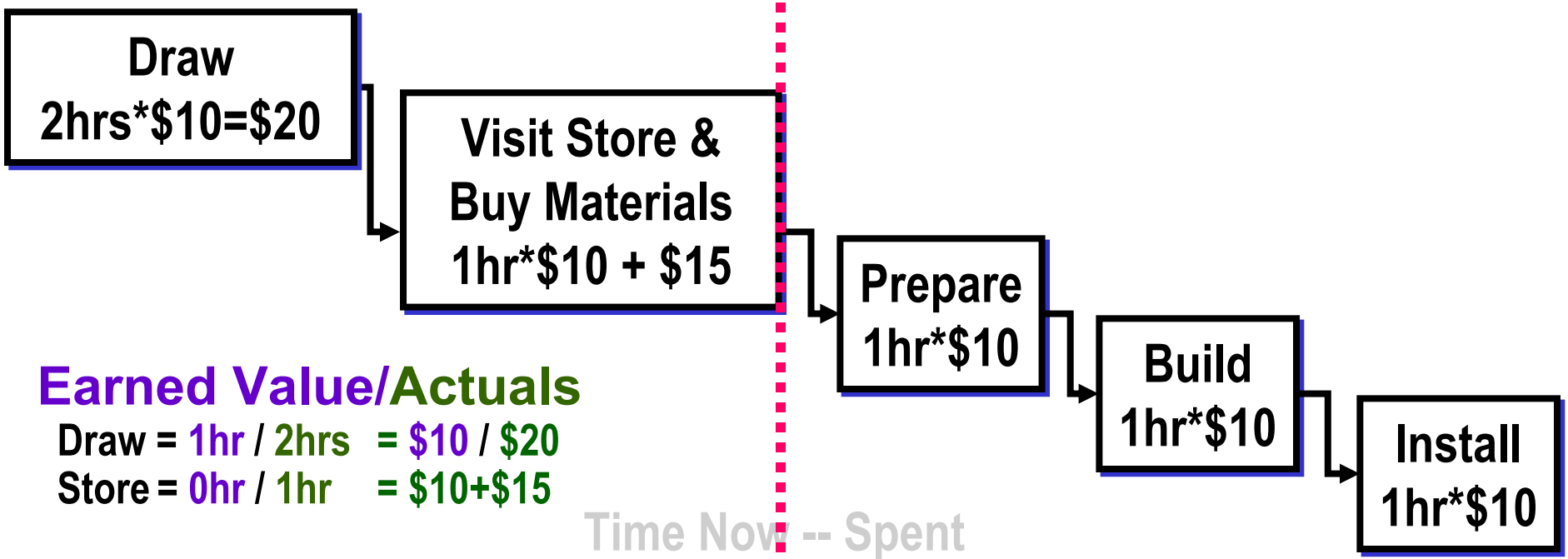


Earned Value/Actuals

Draw = 1hr / 2hrs = $10 / $20
Store = 0hr / 1hr = $10+$15

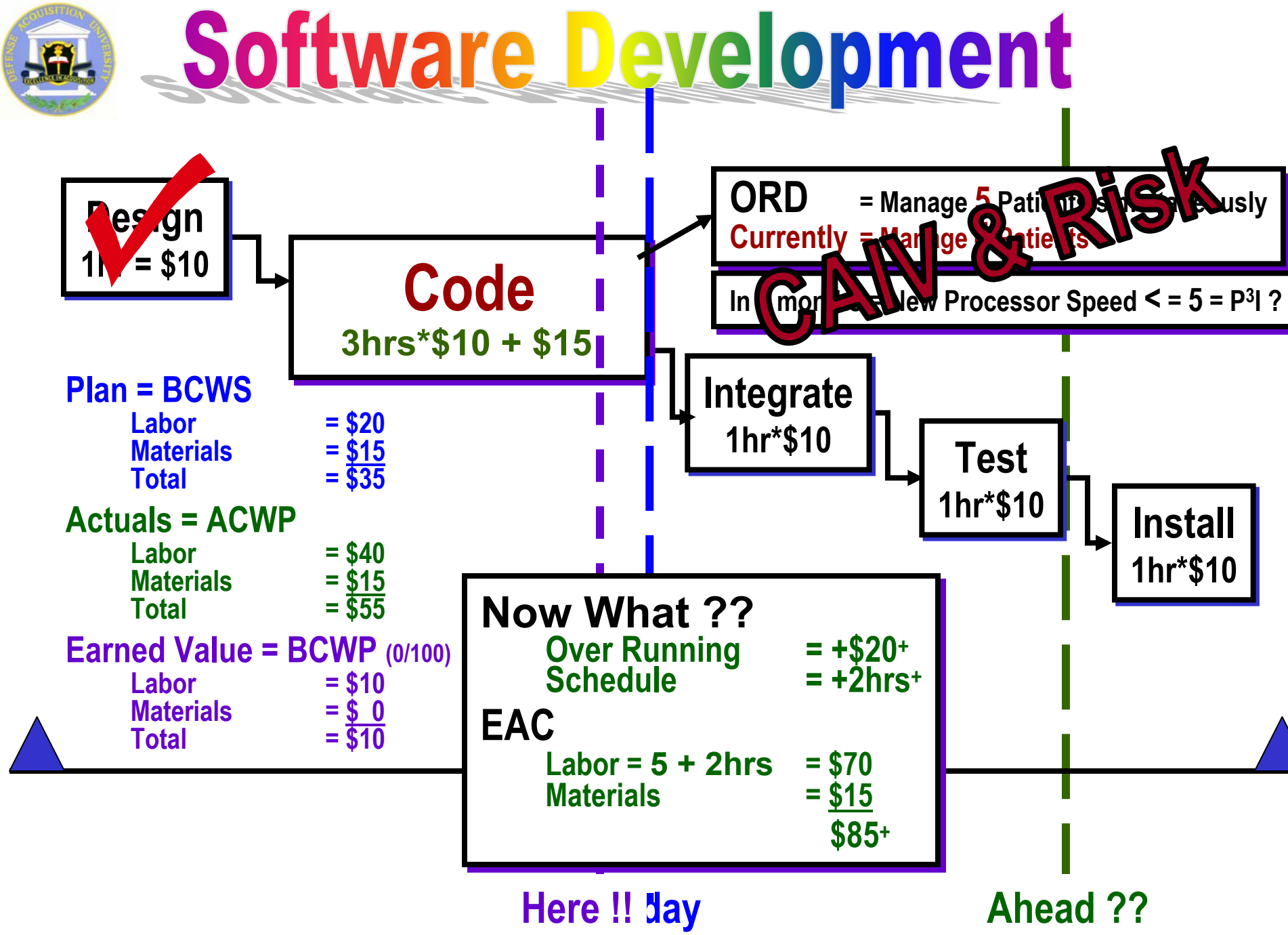
Time Now -- Spent
Labor = $ 30
Materials = $ 15
Total = $ 45

Now What ??

Over Run = $10
Schedule = 6 hrs

Labor = 6 hours @ $10/hr = $ 60
Materials = $ 15
$ 75

Software Development



EARNED VALUE CONCEPT

A Management Technique

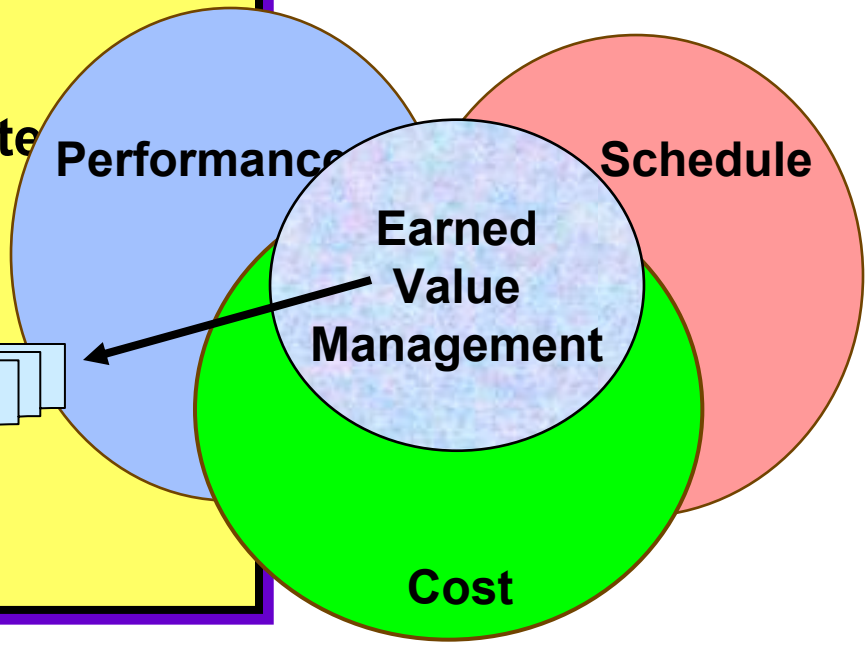
Emphases Disciplined Integration of Technical Performance to Associated Co$t & Schedule

'Objectively' Measures Work Progress
States 'Value of Work' Complete

Provides 'Objective' Cost & Schedule Metrics

Enables Trend Analysis & **CAIV** Trades

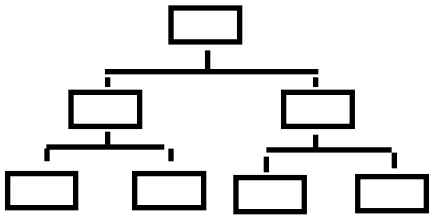
Industry Standard ANSI/EIA-748-1998



DoD & Industry Embrace EARNED VALUE as a Risk Management tool

Integrated Program Management System

Scope



Approved MNS / ORD / **APB**

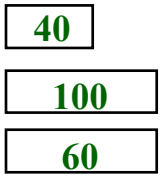
ID 'Contract' Req's

Extend **'Measurable'** WBS **Products** to control account

[Mil Hdbk 881] 'planning & work packages'

Action & Reports

Allocate Budgets

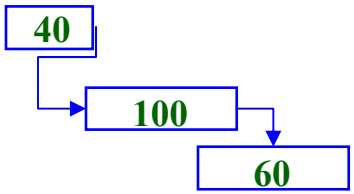


Budget Tasks

Apply 'Appropriate' EV Technique

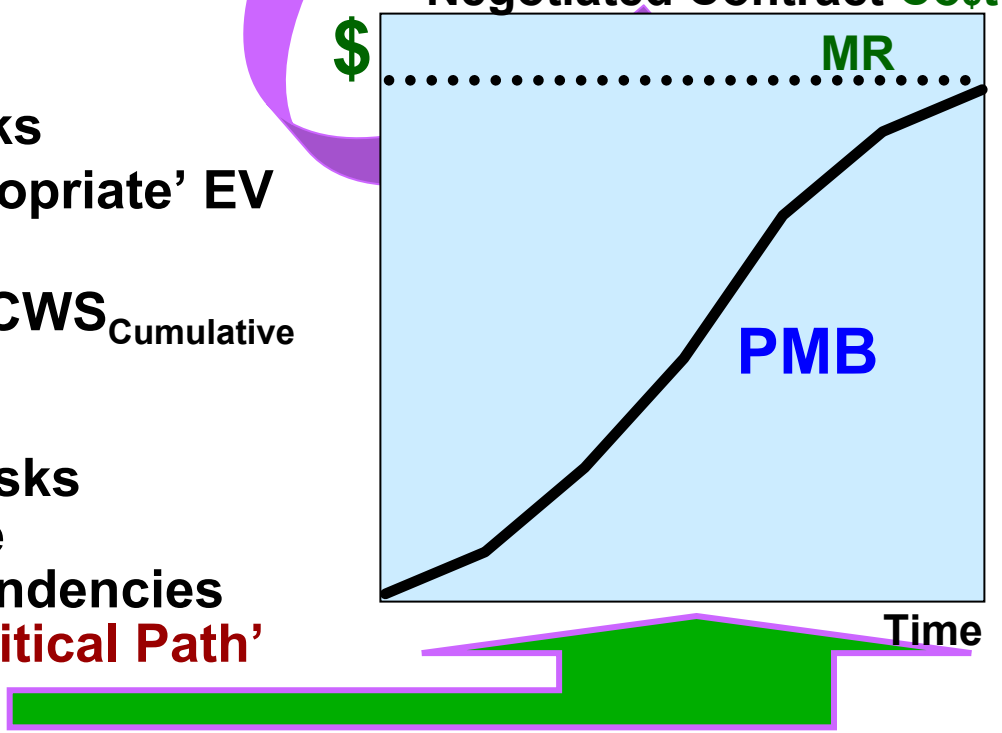
Calculate $BCWS_{Cumulative}$

Schedule Work



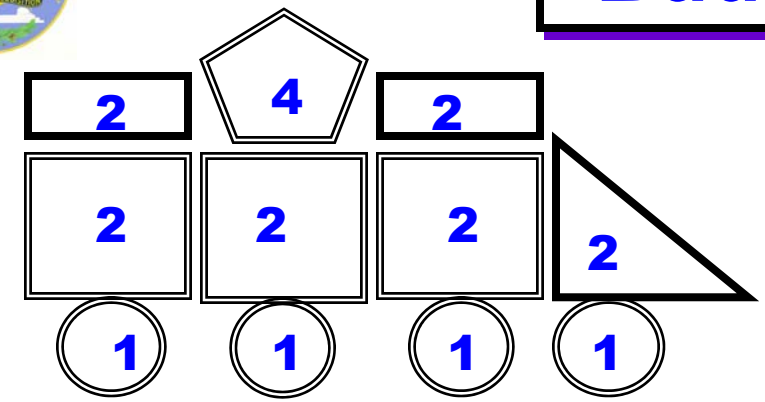
Schedule tasks

- Sequence
- Interdependencies
- Float / **'Critical Path'**

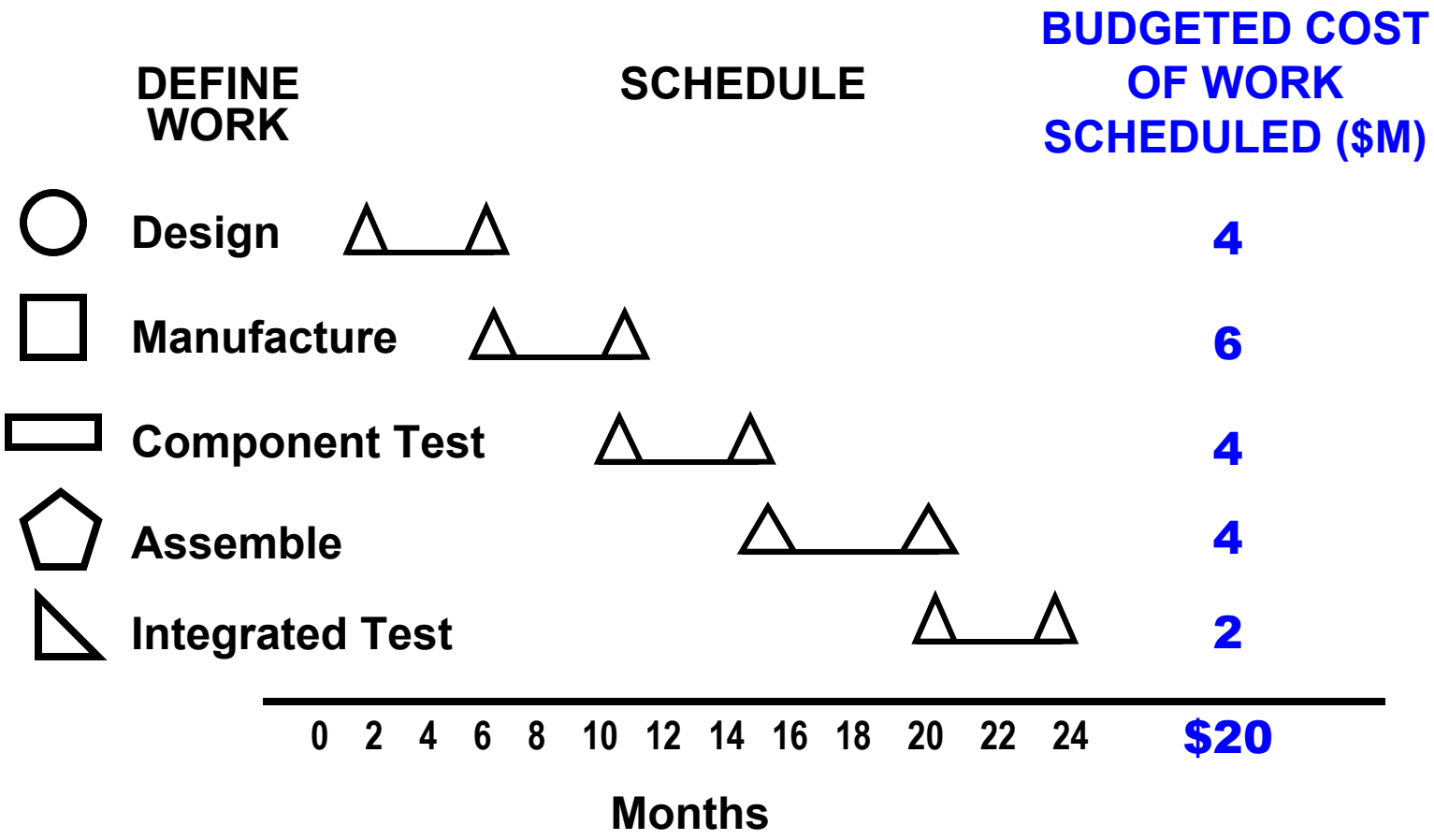


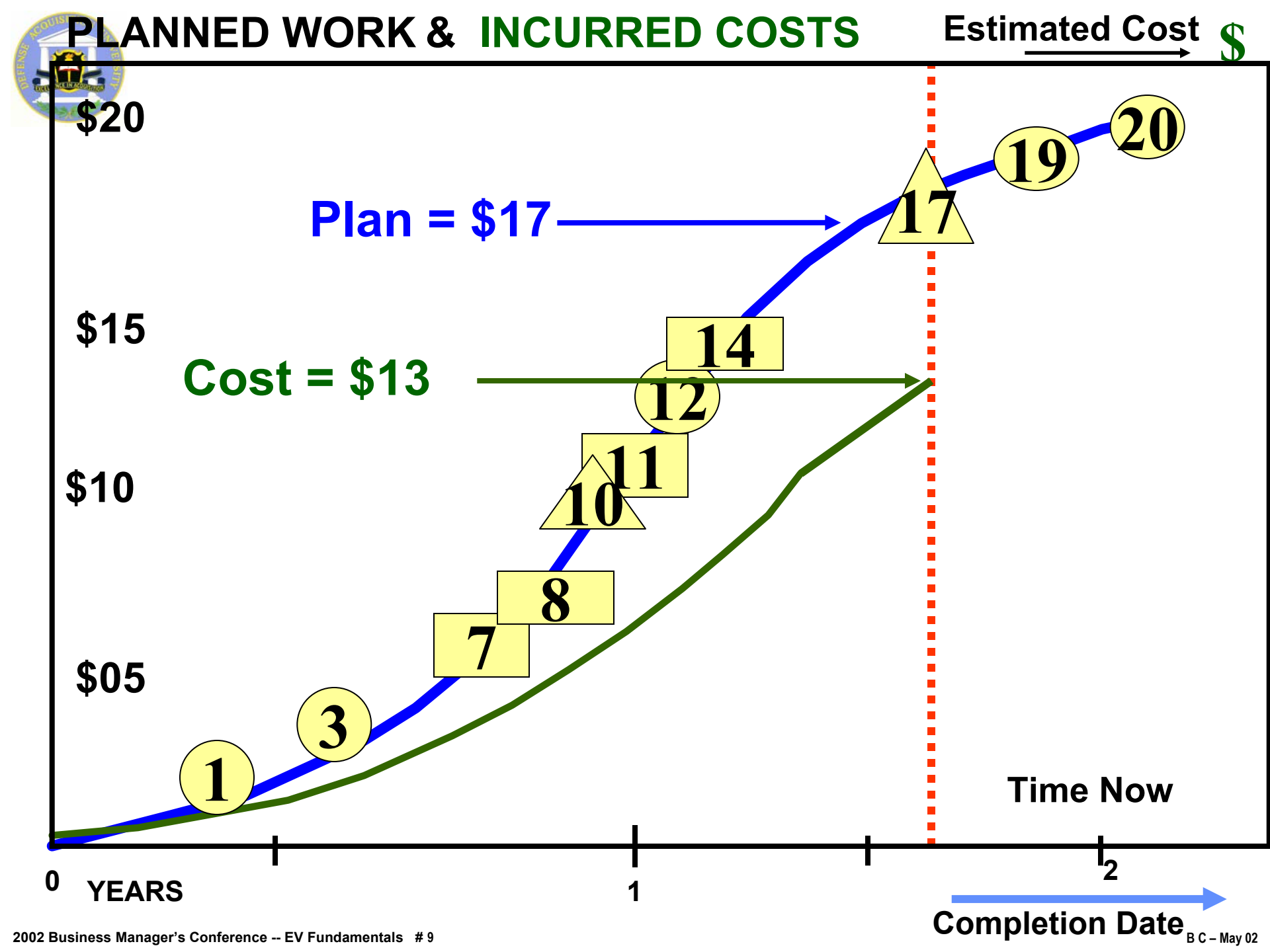
Budget Plan

THE PLAN



The Program Plan

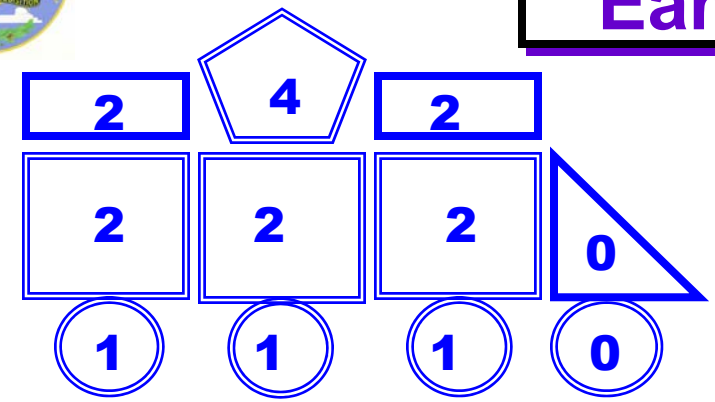



PLANNED WORK & INCURRED COSTS
Estimated Cost
$
$20
$15
$10
$05
Plan = $17
Cost = $13
1
3
7
8
10
11
12
14
17
19
20
Time Now
0
YEARS
1
2
Completion Date

Plan, Actuals & Earned Value

PLAN

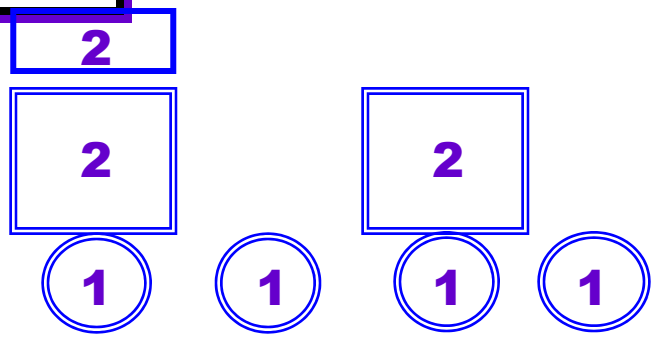
Work scope



$ 17

Time Period

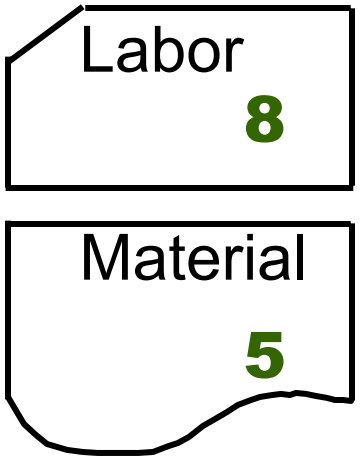
WORK PERFORMED



$ 10

Time Period

ACTUAL COSTS



$ 13

Time Period

VARIANCES

Schedule Variance = Performed - Plan

SV = $10 - $17

SV = - $7

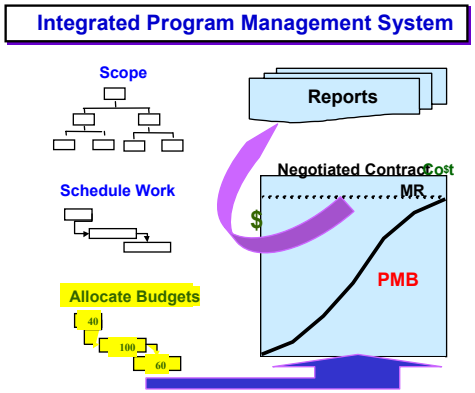
Cost Variance = Performed - Actuals

CV = $10 - $13

CV = - $3

The 'Control' Account

A key management control point:
- **lowest level of management accountability for 'integrated' performance measurement**
  - **BCWS - established**
  - **BCWP - determined**
  - **ACWP - collected**
  - **Variances - assessed**
  - **Estimates - revised**
  - **Work Around Plans devised**



WORK CATEGORIES

Discrete Effort

- Specific End Product or Result

Apportioned Effort

- Effort Directly Related to Discrete Tasks, w/ a Historical Dependent Relationship

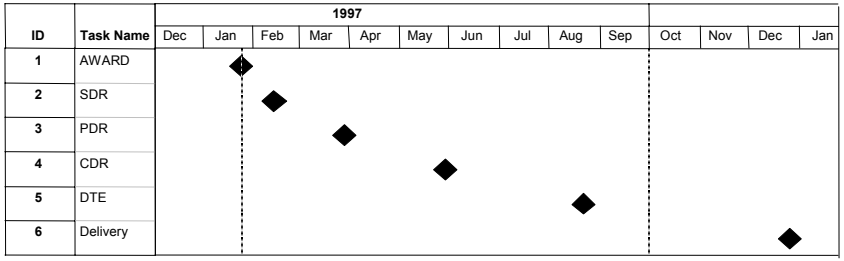
Level of Effort

- No Final Product; Continuing Support (T&M)

EARNED VALUE TECHNIQUES

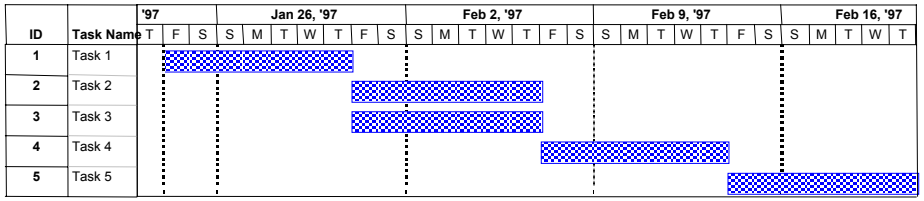
METHOD	LENGTH	BCWP CALCULATION
0 / 100 %	1 Mth	
50 / 50 %	2-3 Mths	
% Complete	Varies	
Variant Milestone	3 or More Mths	
Level of Effort	Varies	
Apportioned Effort	Varies	

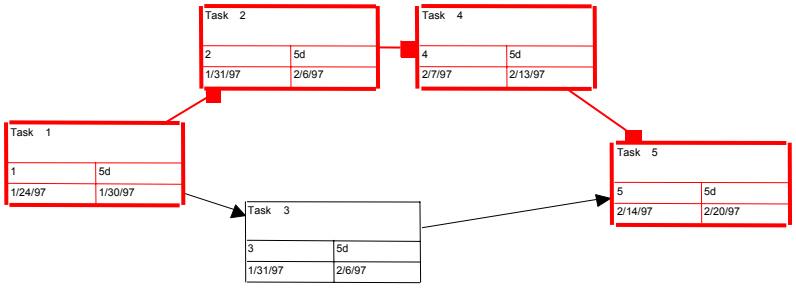
COMMON SCHEDULE PRESENTATIONS



Milestone Chart: Provides Key Events or Activities' Completion Points. Used As Objectives or Network Output. Needs to Show Baseline & Current Projection.

Gantt Chart: Provides Duration & Relative Time Location of Activities. Used to Show Progress Against Tasks & Projected Slips.





Network (Pert): Shows Order of the Activities. Generally Does Not Clearly Show Time Location or Amount Completed (Start / Finish). CRITICAL PATH = '0' days FLOAT

MS Project 'Combines' These Features.

Basic Performance Data Analysis

Determine Current Status

Where Are We Today?

Identify Trends

Where Are We Headed?

Any Cost, Schedule Surprises ?

Forecast the Future

What Is the Estimated Cost at Completion?

Is It Achievable = TCPI

Indicate Areas for Management Action

What Should We Do Now?

Cost Performance Index (CPI)

Cost Performance Index Is a Measure of Contractor cost efficiency, i.e., Indicates the Value of the Work Performed for Each Dollar Actually Spent

$$CPI = \frac{\text{Value of the Work Performed}}{\text{Actual Cost of the Work Performed}} = \frac{BCWP}{ACWP}$$

A Number < 1.0 Indicates an Overrun.

Schedule Performance Index (SPI)

Schedule Performance Index Is a Measure of Ktr's schedule efficiency, i.e., Indicates the Value of the Work Performed for Each Dollars Worth of Work Scheduled

$$SPI = \frac{\text{Value of the Work Performed}}{\text{Value of the Work Scheduled}} = \frac{BCWP}{BCWS}$$

A Number < 1.0 "Indicates" an Slip.

EAC Methods

METHOD	FORMULA *
CPI_{Cum}	$\frac{BAC}{CPI_C}$
Composite	$ACWP_C + \frac{BAC - BCWP_C}{CPI_C \times SPI_C \text{ or 6, Cur}}$
3 MO AVG	$ACWP_C + \frac{BAC - BCWP_C}{CPI_3 \text{ or 6, Cur}}$
COST & SCH	$ACWP_C + \frac{BAC - BCWP_C}{(.4 \bullet CPI_{factory}) + (.4 \bullet CPI_{test}) + (.2 \bullet CPI_{quality})}$

* Sub CBB for BAC = Assumes Ktr Uses ALL MR
Reminder: wInsight Uses CBB to Determine EAC

OSD Position on EACs

When a Contract Is More Than 15% Complete:

- **The Overrun at Completion Will Be > the Overrun Incurred to Date**
- **The % Overrun at Completion Will Be > the % Overrun Incurred to Date**

Based on OSD Database of > 500 DoD Contracts Since 1977

To Complete Performance Index
(EAC, LRE, or BAC)

$$TCPI_{EAC\ (LRE/BAC)} = \frac{\text{Work Remaining}}{\text{Budget Required to Achieve EAC}}$$

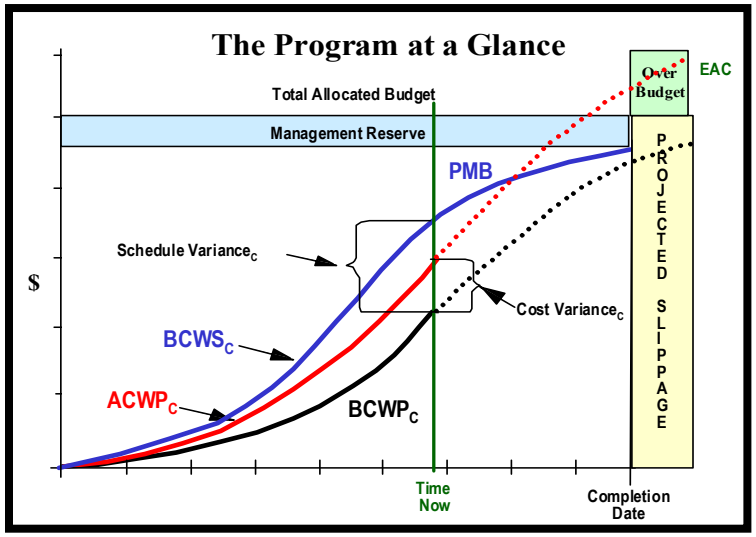
$$= \frac{BAC - BCWP_{Cumulative}}{EAC\ (\text{or LRE / BAC}) - ACWP_{Cumulative}}$$

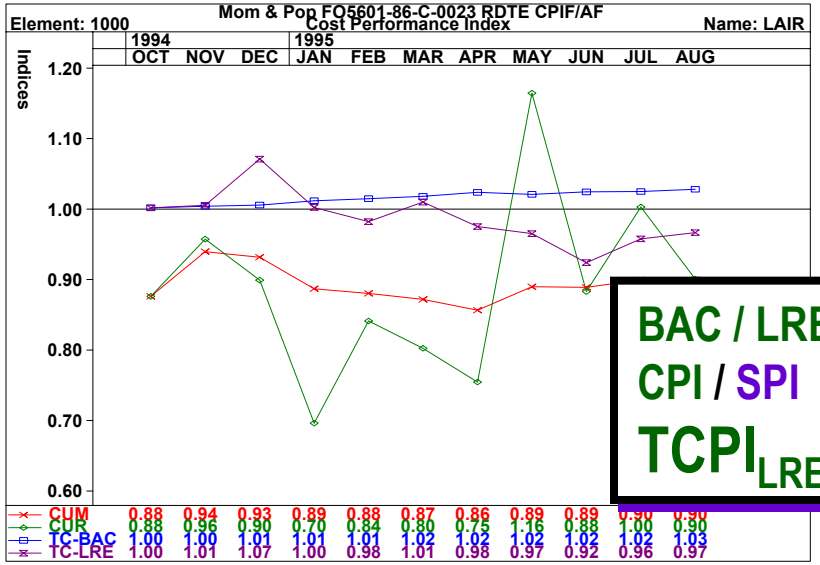
Efficiency Required to Achieve the EAC / LRE / BAC.

An Achievability Index !!!

EVM = Program / Engineering Management

A Picture Is Worth….





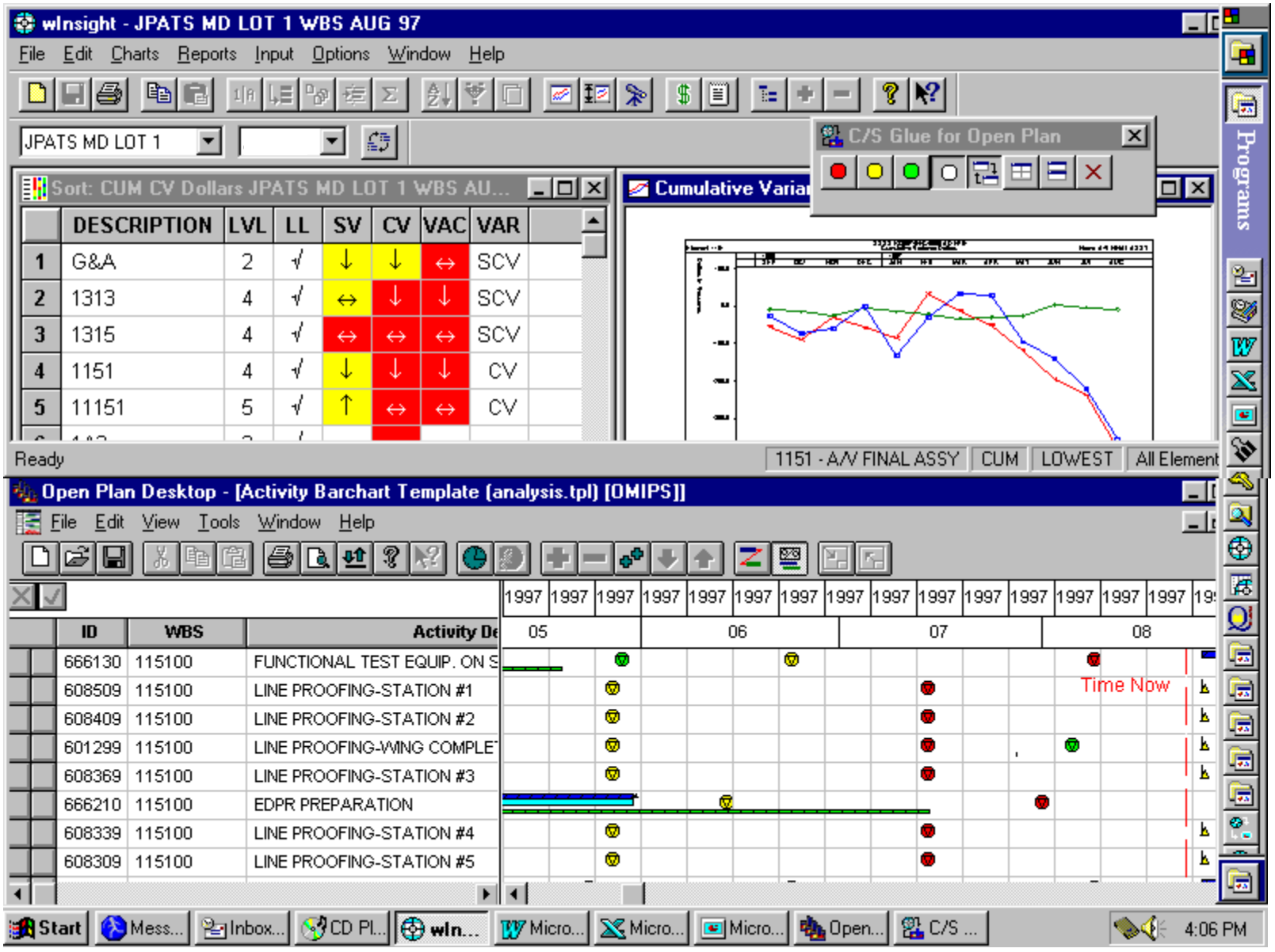
BAC / LRE / EAC
CPI / SPI
TCPI$_{LRE / EAC / BAC}$

REQUIREMENTS MNS / ORD / **APB** / Contract
"RISK MANAGEMENT" Customer / PO / Ktr
ACQ STRATEGY w/ PPB$ (POM / BES / PB)
OBL & EXP
EXIT CRITERIA
ISSUES w/ PRIORTIZED SOLUTIONS
IMPLEMENTATION [Plan] ??

CONSIDER

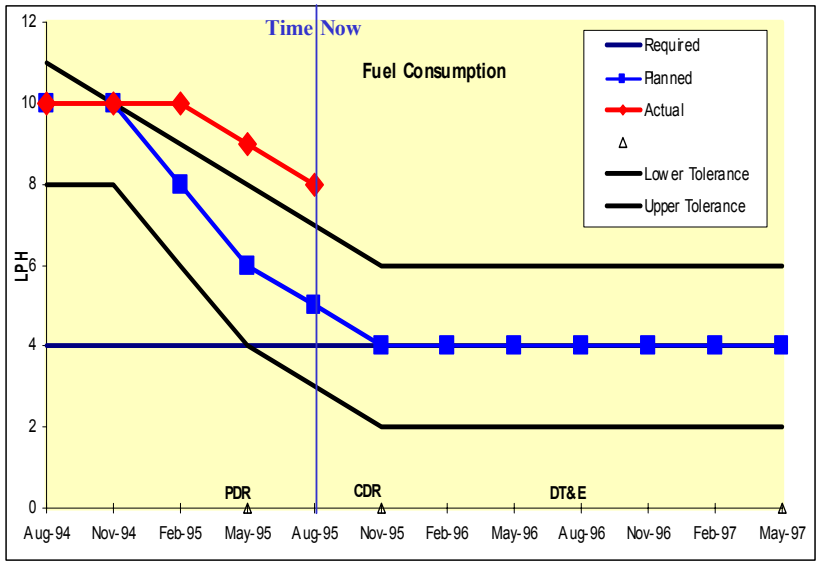
DCMA	= Assistance = Past Performance / Sub-Ktrs
Insight	= Trends / Problem(s) / Cause(s) / Fixes
Reporting	= CARS / DAES / SAR / UCR
Risks	= Customer / User / Ktr's
Affordability	= CAIV = Trades -- Perf / Sch / Cost
PPBS	= Obl & Exp / PPB$ = POM & BES
Congress	= Reelection / Jobs / DoD / TOA / FMS
OMB	= No Supplementals

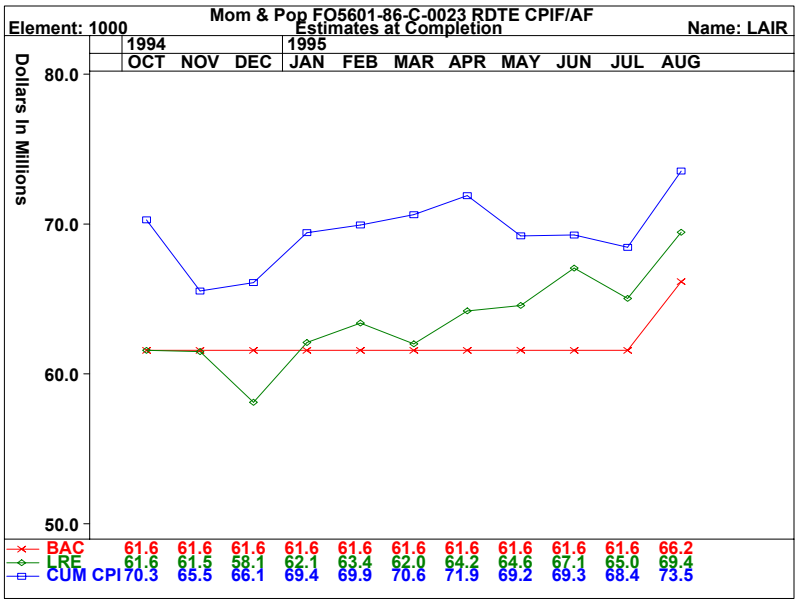
C/S Glue = Integration



Synthesize Cost, Schedule, & Technical Performance Into an EAC

Fuel Consumption TPM

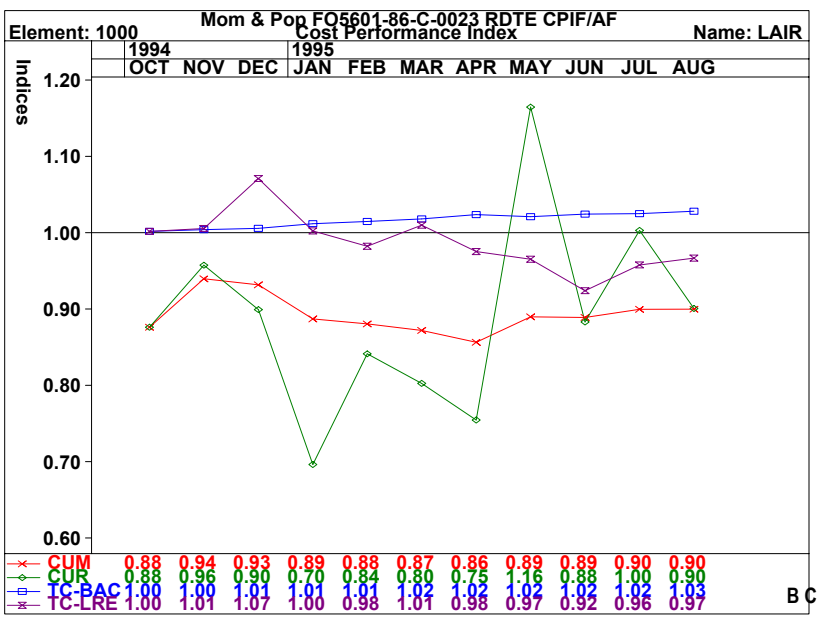




CPR Data

Cumulative-To-Date Data

BCWS	983	1684	1847	2508	2688	3215
BCWP	1027	1472	1604	2258	2502	2741
ACWP	1204	1886	2108	2961	3212	3470
SCH VAR $	44	-213	-243	-249	-186	-473
SCH VAR %	4.45	-12.62	-13.17	-9.94	-6.92	-14.72
SPI	1.044	0.874	0.868	0.901	0.931	0.853
COST VAR $	-177	-414	-504	-703	-710	-729
COST VAR %	-17.26	-28.13	-31.43	-31.13	-28.40	-26.58
CPI	0.853	0.780	0.761	0.763	0.779	0.790
Completion Data						
TCPI-BAC	1.013	1.033	1.040	1.061	1.063	1.066
TCPI-LRE	1.307	0.936	1.040	0.886	0.882	0.894
BAC	14553	14553	14553	14553	14553	14553
LRE	11553	15855	14553	16842	16874	16685
VAC $	3000	-1302	0	-2289	-2321	-2132
VAC %	20.61	-8.94	0.00	-15.73	-15.95	-14.65
% SCHED	6.75	11.57	12.69	17.23	18.47	22.09
% COMP	7.05	10.11	11.02	15.52	17.19	18.84
% SPENT	8.27	12.96	14.48	20.35	22.07	23.84
SLIP IN WKS	0.40	-1.60	-3.00	-2.10	-2.40	-4.50
Statistical and Independent Forecasts						
3 MO AVG	17065	18647	22230	20503	18731	17614
6 MO AVG	17065	18647	19126	19083	18685	19384
CUM CPI	17065	18647	19126	19083	18685	18421
CUR CPI	21840	21927	23873	18992	15635	16180
COST & SCH	16383	18256	18659	18520	18104	18187
LINEAR REG	21840	21900	22138	20846	20089	19533
PERF FACTOR	14730	14967	15057	15256	15263	15282
SEA 90 EAC	14874	15425	15605	15916	15912	16001
MICOM EAC	14553	15855	14553	16842	16874	22132



F-16 (ACAT II -- R/D/P/S)

PEO ASSESSMENT		
COST	SCHED	KPPs
Y →	G →	R →

Key Program Parameters (Fleet)

METRIC	Std	Jun	Jul	Aug	Sep	Oct	Nov	Nov-99
Aircraft Availability	957	N/A	N/A	N/A	N/A	R	R	936.0
MC Rate	77.3%	R	R	R	R	R	R	72.8
TNMCS Rate	11.4%	Y	R	R	R	R	R	14.8
TNMCM Rate	17.1%	R	R	R	R	R	R	20.5
CANN Rate	7.9%	G	G	Y	Y	Y	Y	8.6
BREAK Rate	9.1%	Y	G	G	Y	G	G	8.5

- Aircraft availability decreased in November due to a large increase in NMCM jets. (This new metric began in Oct 99).
- MC rate for Nov decreased 1.2% from Oct
- TNMCS remained the same as Oct
- TNMCM increased 1.3% from Oct
- CANN rate decreased .8% from Oct
- BREAK rate increased by 1.2% from Oct

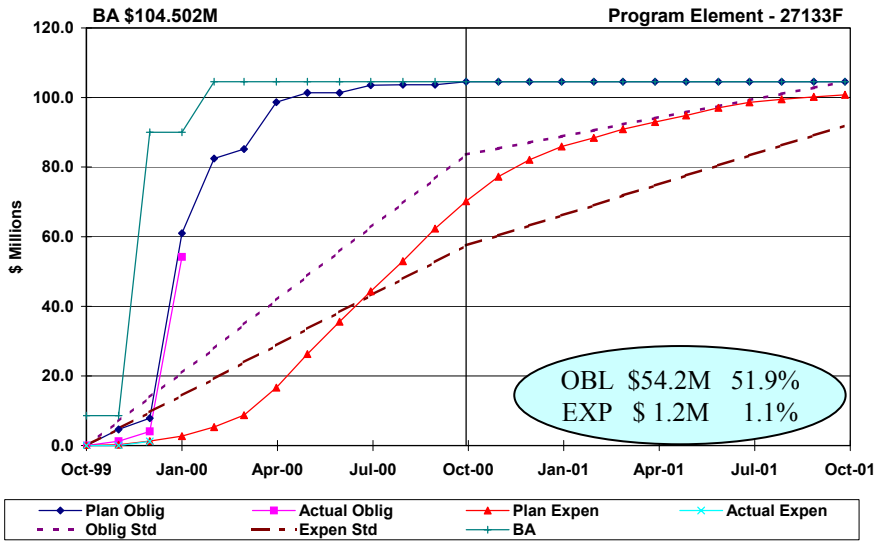
Key Issues/Risks

Sustainment Issues

- 60 and 10 KVA generators are primary fleet drivers for TNMCS
- Underfunding of Fleet Support: Directly impacts our ability to provide the fleet adequate support for APG-68 RADAR, ALQ-184 ECM Pod, and Diminishing Manufacturing Sources.
- Engine Availability: Remains the primary fleet driver for TNMCM rates.

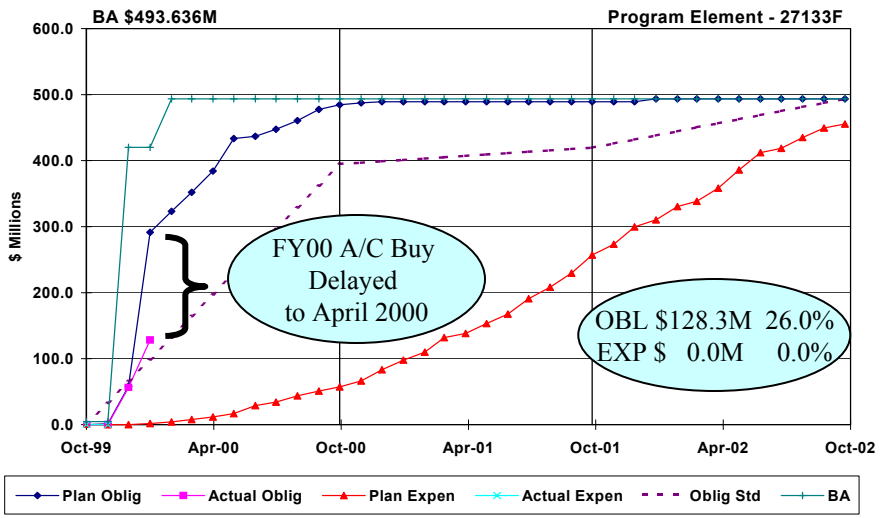
OBLIGATIONS & EXPENDITURES

USAF Programs - 3600 (672671) / FY2000



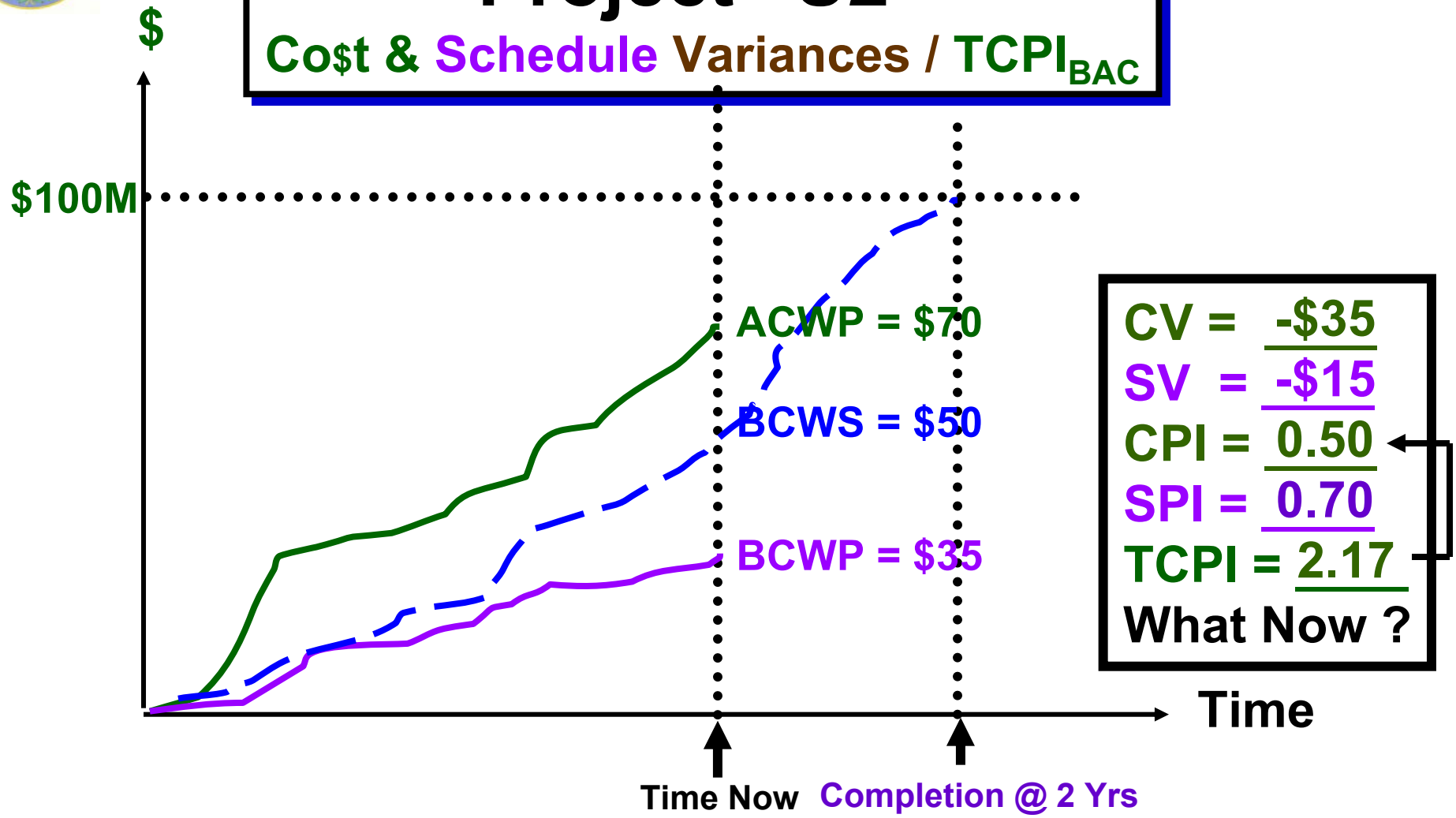
OBLIGATIONS & EXPENDITURES

USAF Programs - 3010 / FY2000



Project "U2"

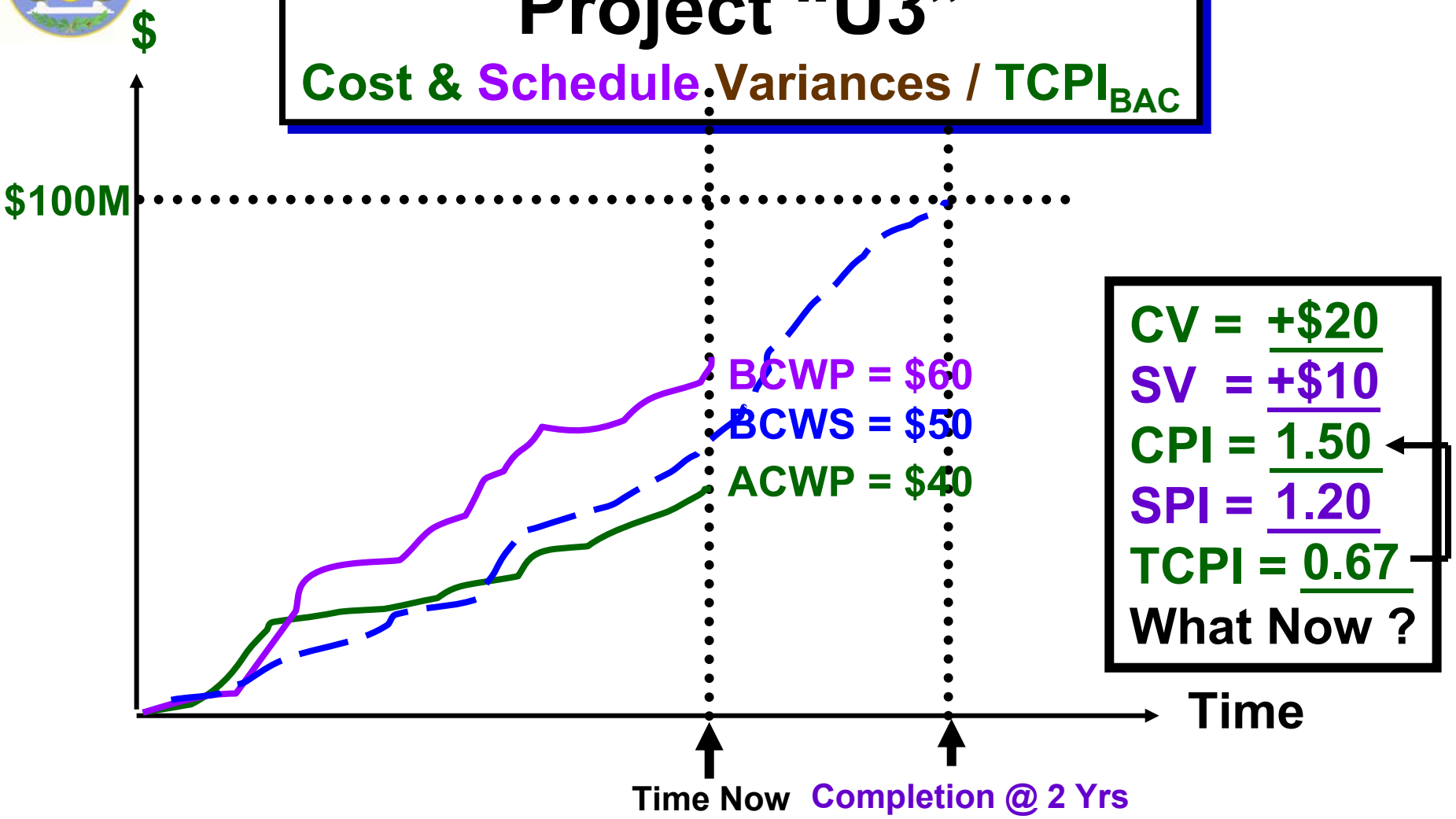
Co$t & Schedule Variances / $TCPI_{BAC}$



CV = -$35
SV = -$15
CPI = 0.50
SPI = 0.70
TCPI = 2.17
What Now ?

Project "U3"

Cost & Schedule Variances / $TCPI_{BAC}$




QUESTIONS ??