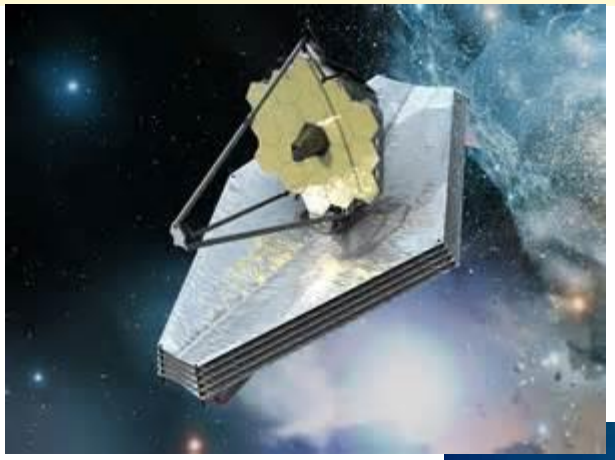
# Cost Analysis, Assessment & Control

*Developing training for NASA workforce*

*Bill Dimmer (and others)*
*NASA Cost Symposium*
*August 2014*

*400% cost increase + repair mission*

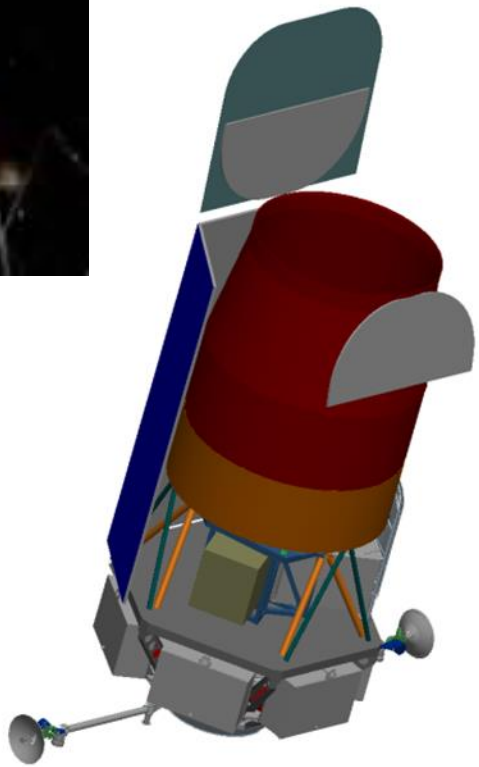


*$3.6B cost increase & 4+ yr slip to LRD*

*$700M cost increase from KDP-C*

*~$10-12 billion cost increase*

# Doomed to repeat?



# Cost Overruns are Everywhere

*A "Worldwide phenomenon that affects both the private & public sectors."*

*Green Book - English Government*

TMCnews

[March 12, 2009]

## US: Big defense programs face cost overruns

(Associated Press WorldStream Via Acquire Media NewsEdge) WASHINGTON_Costs are likely to keep growing for two of the Pentagon's biggest weapons programs as the military pushes to field fighter jets and high tech Army units even before fully proving the technology, according to Government Accountability Office reports released Thursday.

**February 04, 2009**

Fort Worth Star-Telegram

The Pentagon's top weapons buyer says the massive cost increases and delays incurred on the F-35 joint strike fighter program were inevitable because the Defense Department didn't spend enough money up front to build realistic prototypes.

"Confidential project documents from 1995 reveal Bechtel ***willingly hid costs*** **to present a more favorable view of Big Dig's financial picture** at the behest of top state officials seeking a more publicly acceptable bottom line."

*Source - Boston Globe*

## 2010 Olympic village construction cost overruns worry critics

Last Updated: Monday, October 6, 2008 | 10:32 PM PT Comments 40 Recommend 19

CBC News

## $14.6 billion later, Boston's Big Dig wraps up

The last big highway section opens this weekend, but concerns on costs dampen party.

By Seth Stern | *Staff writer of The Christian Science Monitor*

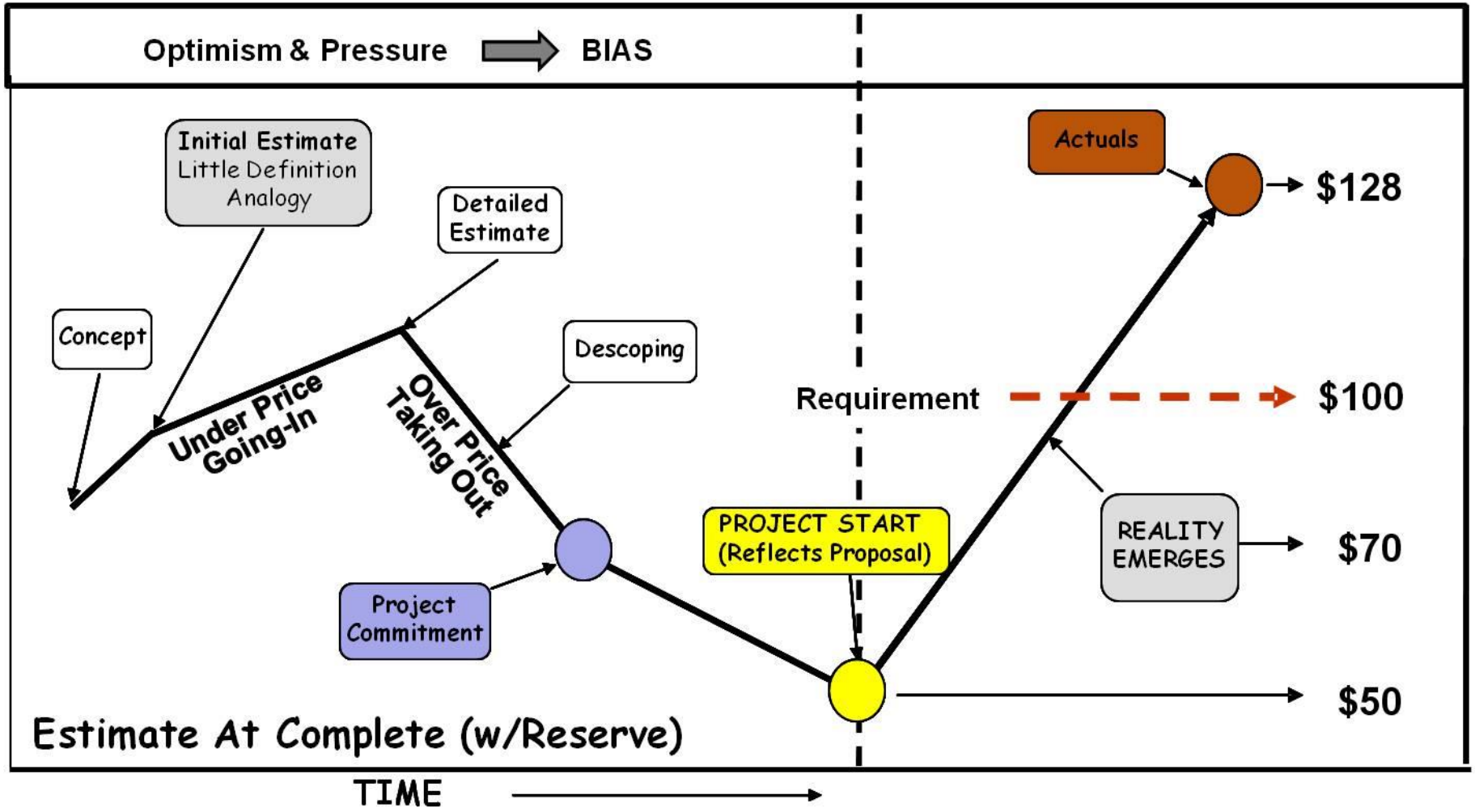
*BENEATH BOSTON –*

With a tellingly simple ribbon-cutting ceremony, the last underground segment of Boston's Big Dig project opens Friday - completing major construction on one of the most complex and controversial engineering projects in human history.

# *It's all about*

**Cost**

# Typical Project Reality




Typically as a result of overruns scope must be cut

# How does NASA control costs?

- By practicing Program Planning, Assessment & Control (PP&C)
  - *Cost Estimating*
  - *Scheduling*
  - *Monitoring (EVM, etc.)*
  - *Acquisition & Contract Management*
  - *WBS*
  - *Budget*
  - *Funds Control*
  - *Risk Management*
  - *Configuration Management*
  - *Integration/Analysis*

# What else is NASA doing?

- Once
- REDSTAR
- Cadre
- JCL
- Cost models
- IPAO/SRB
- NPD 7120.5e
- APPEL
- PM (VPM) Challenge
- NASA Cost Symposium

# NASA Cost Symposium Survey

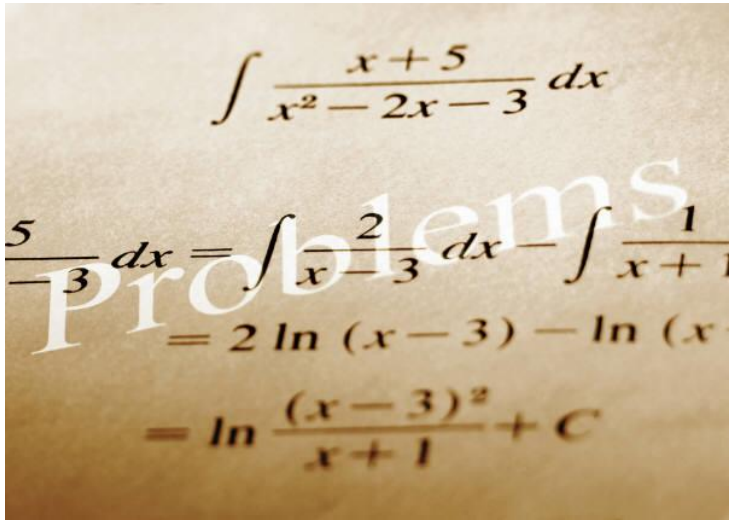
## *WHAT'S THE PROBLEM?*

1. NASA doesn't fully use the tools, personnel, capabilities to manage major development missions?

2. NASA buys into an unrealistic mission cost that cannot be met?

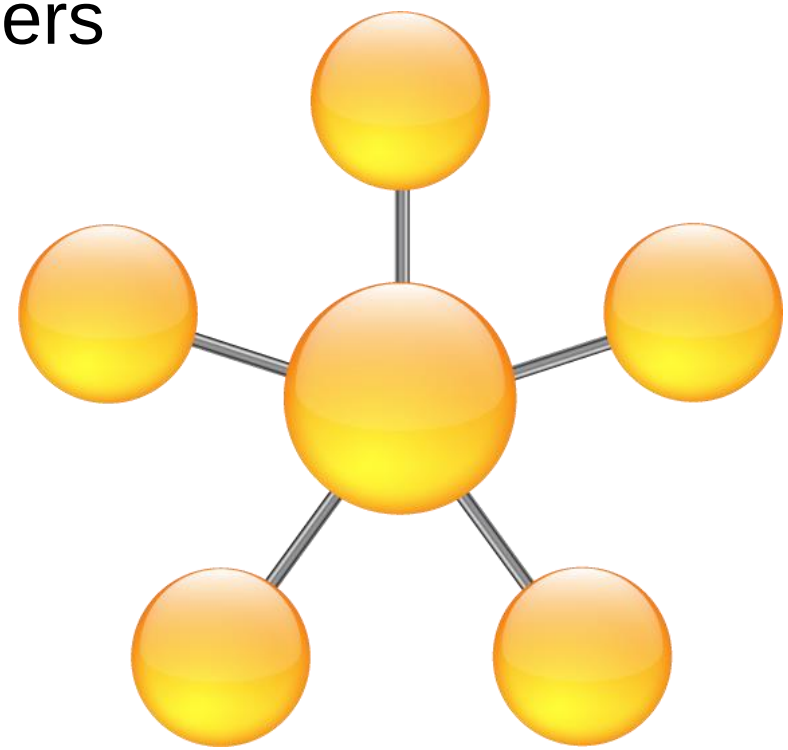
3. NASA keeps changing requirements due to insufficient initial definition?

4. Something else/combo of all 3?



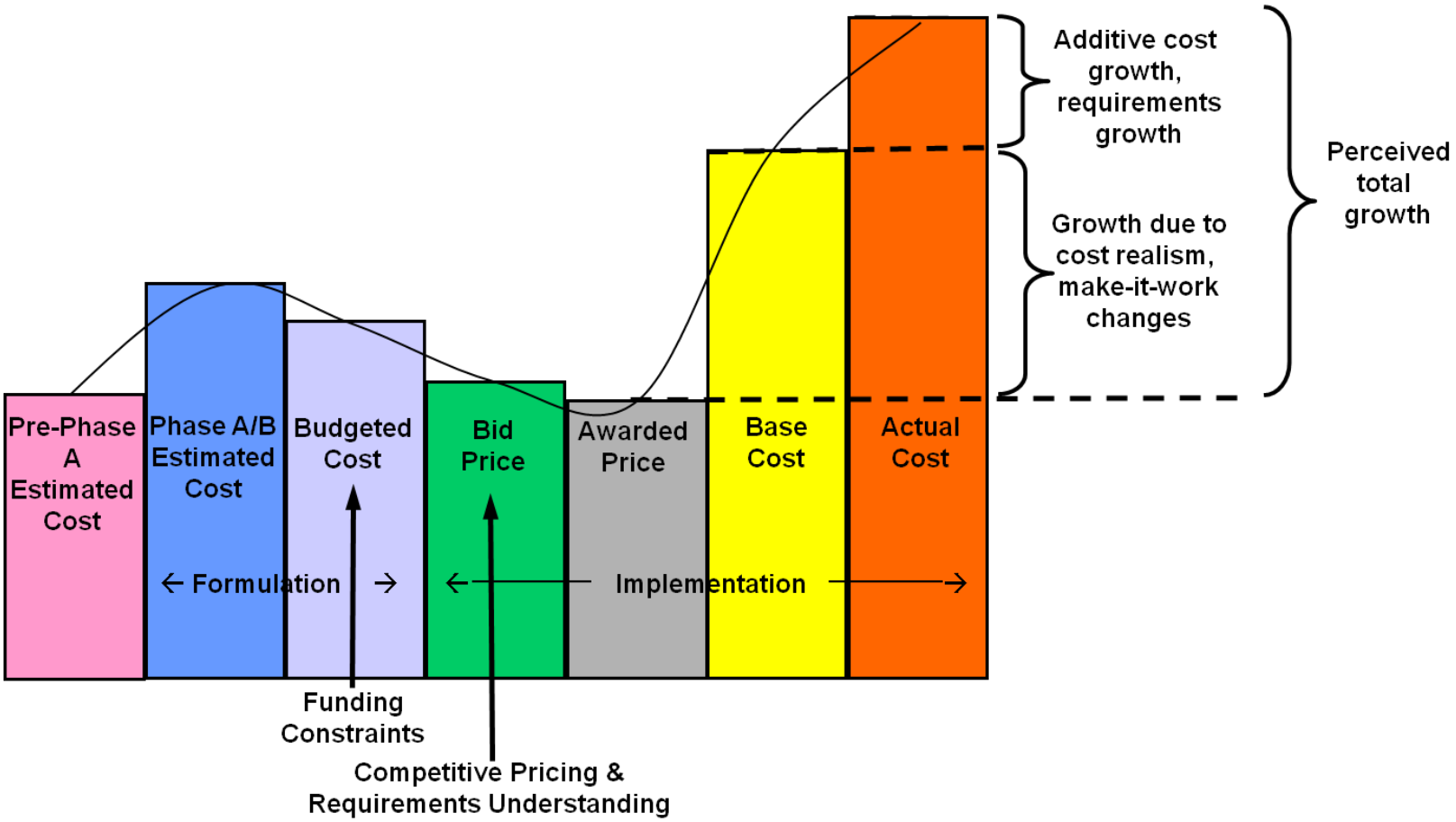
# One more solution…

- Practical training
- In the hands of the practitioners
- Offering
  - Tools
  - How to's
  - What if's
  - Common pitfalls
  - Formats
  - Models



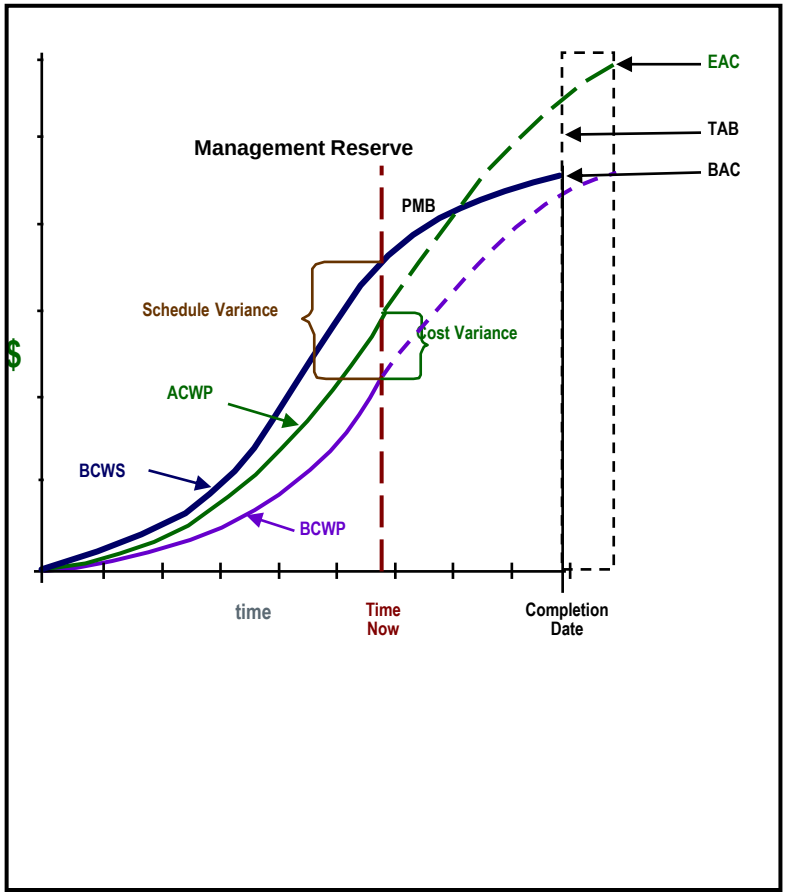
- ALL FOCUSED ON COST, including…

# Cost estimating, analysis & assessment



# Cost control tools, processes and systems

## Earned Value Management
## 'Gold Card'




## VARIANCES

Favorable is Positive, Unfavorable is Negative

Cost Variance CV = BCWP – ACWP CV % = (CV / BCWP) *100

Schedule Variance SV = BCWP – BCWS SV % = (SV / BCWS) * 100

Variance at Completion VAC = BAC – EAC

**PERFORMANCE INDICES** Favorable is > 1.0, Unfavorable is < 1.0

Cost Efficiency CPI = BCWP / ACWP

Schedule Efficiency SPI = BCWP / BCWS

**OVERALL STATUS**

% Schedule = ($BCWS_{CUM}$ / BAC) * 100

% Complete = ($BCWP_{CUM}$ / BAC) * 100

% Spent = ($ACWP_{CUM}$ / BAC) * 100

**ESTIMATE AT COMPLETION** #

EAC = Actuals to Date + [(Remaining Work) / (Efficiency Factor)]

$EAC_{CPI}$ = $ACWP_{CUM}$ + [(BAC – $BCWP_{CUM}$) / $CPI_{CUM}$] = BAC / $CPI_{CUM}$

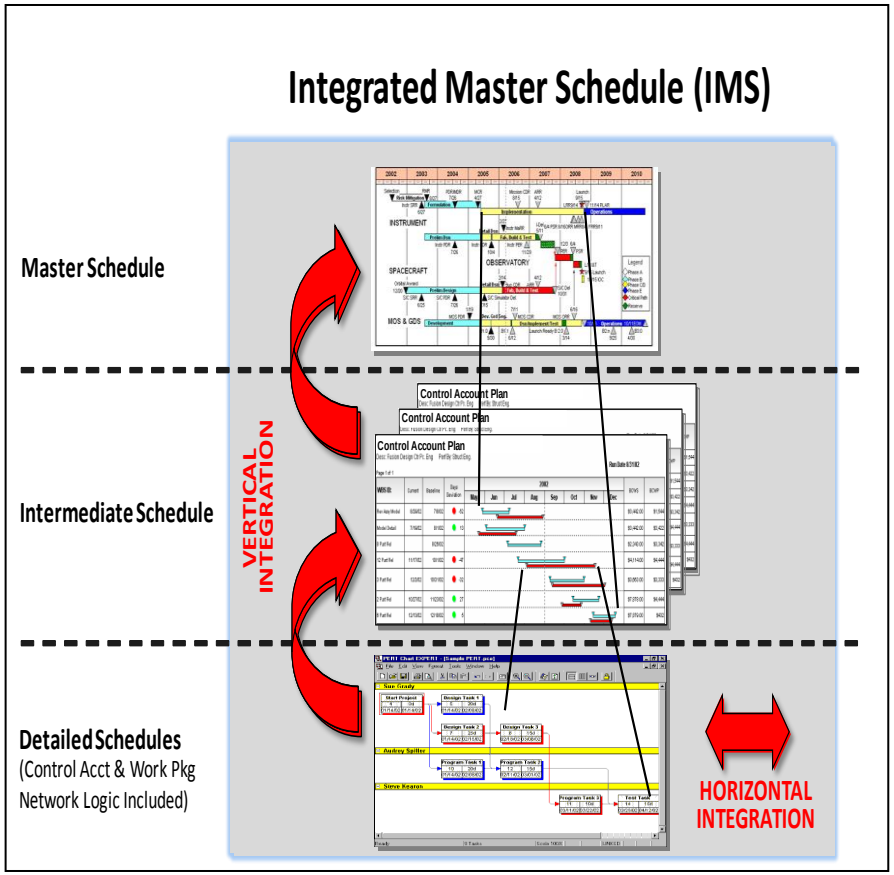
$EAC_{Composite}$ = $ACWP_{CUM}$ + [(BAC – $BCWP_{CUM}$) / ($CPI_{CUM}$ * $SPI_{CUM}$)]

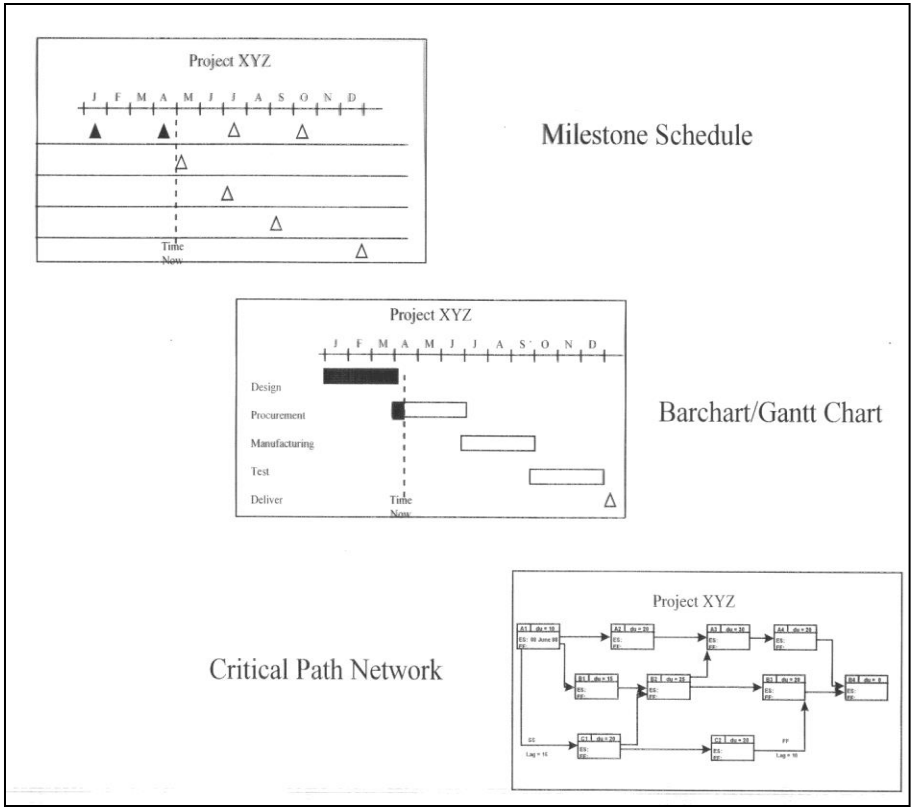
**TO COMPLETE PERFORMANCE INDEX (TCPI)** #

$TCPI_{EAC}$ = Work Remaining / Cost Remaining = (BAC – $BCWP_{CUM}$) / (EAC – $ACWP_{CUM}$)

# To Determine Either TCPI or EAC; You May Replace BAC with TAB

# Integrating cost with schedule

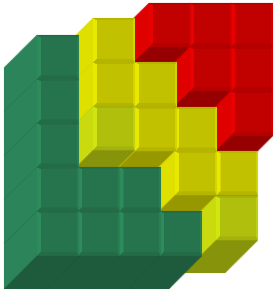



Source: NASA Scheduling Handbook

# The cost associated with risk

*Risk data is converted into useable information for determining priorities, budgets and decisions*



**Risk Statement**
- Condition
- Consequence
- Context

**Risk statement**
- Context
- Impact
- Probability
- Timeframe
- Classification
- Rank

**List of risks**

- Validate
- Evaluate
- Classify/ Organize
- Prioritize

**Classification**

| Class 1 | Class 2 |
|---|---|
| Risk | Risk |
| Risk | Risk |
| Risk | Class 3 |
| Risk | Risk |

NASA & Industry
Project Requirements
Project Data

# Managing and monitoring cost contracts

# About This Training

- Course objective: to provide PP&C/Cost Control personnel an understanding of
  - Cost in NASA terms
  - Elements which drive cost
  - How tools and systems help us estimate and control costs
  - Analysis which can be conducted on typical NASA projects
    - Leads to better program control and a successful outcome

- We have organized instruction over 2 ½ days into emphasizing <u>Cost</u> and <u>Assessment</u> of elements which impact cost

# Course delivery

- Conducted under CFO University
  - http://www.ksc.nasa.gov/nasa-only/finance/CFOU/cfou7.htm
  - Sponsored by NASA OCFO
- Curriculum of vendor-provided, online and NASA developed and delivered training
- Nearly 5,000 participants to date

**CFO University**
**Founded 2008**

# Topics include (not necessarily in this order)…

- NDP 7120.5e
- NASA Cost & Cost Planning
- Cost estimating
- Integrating cost & schedule
- Risk assessment
- EVM
- Cost contract mgmt
- Elements of cost
- Statistics
- Data sources
- Cost research
- Trends
- Fixed/variable cost
- Basis of estimate (cost/sched)
- EVM analysis
- Quality risk assessments
- Contract analysis
- Schedule analysis
- Pareto
- Excel analysis tool
- JCL
- Reporting
- Communicating the story
- “One Pager”

# Who’s involved?

- Bill Dimmer / KSC
- Glenn Butts / KSC
- John Biddix / KSC
- Trey Reilly / KSC
- Cathy Claunch / JSC
- Jonathan Bryson / GSFC
- Kevin Rice / JPL
- Jon Fleming / MSFC
- Other Contributors
  - Fred Lim / GSFC
  - Lesley Young / GSFC
  - Gary Rawitscher / HQS

# What do we need?

- Your input…
  - something we should include
  - peer review / dry run participants
- Your contributions…
  - Tool, model, format you're willing to share
- Your support…
  - Gather participants and schedule class at your Center

# And some more NASA isms for the collection

- I'll throw my badge on table
- That's how we always do it
- That's how shuttle did it
- It will be different this time
- We can always get a waiver
- You can't fix stupid
- That's what the contractor told me
- We got some workarounds for that
- It will fix itself next month
- It's within family
- We're waiting on the contract to be definitized
- We're working the issue
- Looks like an accounting error
- It was a small sample size
- That was a bad plan

# Summary

- Objective:  provide a set of knowledge, tools, and techniques to NASA practitioners of project management and cost control
- Expect to have initial rollout in early 2015
- Delivered by NASA personnel
- Will be available to all Centers, upon request
- We solicit your support