

# The Booz Allen 'Earned Schedule' Experience

How we've applied it; what we've learned

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# **Discussion Points**

- Introduction How Booz Allen Was Introduced to Earned Schedule
- Brief Over view of What Earned Schedule Is
- Initial Case Studies (Previously Presented)
- Named Case Studies: NRO
- Samples of How to Report the Data
- Implementation Tips

# **Earned Schedule Introduction**

- December, 2007 PMI SeminarsWorld, San Diego
  - Course regarding IT EVM included an introduction to Earned Schedule
- February, 2009 Brought Mr. Kym Henderson to Booz Allen corporate headquarters to introduce Earned Schedule to client-based staff
- March, 2009 Booz Allen began introducing ES to its major government clients

### What is Earned Schedule – In Brief

- A non-traditional EVM metric
- Basis for Schedule metrics in months, vice dollars
- Added Value without extra data collection
- A technique designed as an early warning of schedule slip
- Intended to enable EVM users to compensate for inherent weaknesses of the SPI metric
- Intended to provide further validation of Critical Path Analysis
- Basic Earned Schedule terminology
  - AT: Actual Time (number of months since project start)
  - PDWR: Planned Duration for Work Remaining
  - IEAC(t): Independent Estimate at Complete in months
- Data validity is critical. Earned Schedule, as well as traditional EVM metrics and forecasts rely on the quality of the inputs

### Earned Schedule Model Outputs



### Earned Schedule Basic Concept



PMB at which PV equals the EV accrued at month 7.

### **Earned Schedule Basic Metrics**

#### Required measures

- Performance Measurement Baseline (PMB) the time phased planned values (PV) from project start to completion
- Earned Value (EV) the planned value which has been "earned"
- Actual Time (AT) the actual time duration from the project beginning to the time at which project status is assessed
- All measures available from EVM

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# Initial Case Study Findings

#### As previously presented at IPM in 2009:

- Executed ES on both Civil and DoD organizations
  - Earned Schedule projected the delay before the IMS did
  - Earned Schedule is useful, even if the project schedule is not robust
  - For analysis and reporting purposes, we need to calculate Earned Schedule at the project level. For management and accountability purposes, we need to calculate it at the task area level
  - Earned Schedule is only as good as your Earned Value data. If the data does not accurately represent the state of the project, it will not be a provide an accurate Estimate At Complete
  - Earned Schedule calculations by task area require an Excel Spreadsheet, and are not supported by EVM tools... yet

#### NATIONAL RECONNAISSANCE OFFICE

#### Earned Schedule Case Study

This research was jointly sponsored by Booz Allen and the National Reconnaissance Office Cost Analysis Improvement Group (NRO CAIG). However, the views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the NRO CAIG or any other organization of the U.S. government.



## **Objective and Contents of the Presentation**

- Objective: Use NRO CAIG Earned Value Management Data to test Earned Schedule Model, and to draw conclusions as to when it is a value-added indicator
- Earned Schedule Definition
- Program Case Studies
  - Program Case Studies include high risk, advanced technology systems.
  - The PMB can be an aggressive plan with minimal cost and schedule reserves. Additional cost and schedule reserves are held at the organization level rather than the contract level, at which we use our earned schedule model to forecast contract completion dates.
- Conclusions and Recommendations



# Summary of Program Case Studies

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Program Case Studies	/	Insile		Nije da	
Program W - year 6	x			Quantitative measure, supporting controversial ICE	
Program W - year 10		х		Consistent with other program metrics	
Program X	x			Early warning of schedule problems	
Program Y			х	Indicated slip, but extent of slip diluted by LOE in EVM baseline	
Program Z	x			Early warning sign of major schedule delay	
Additional Earned Schedule Data					
Program M		х		Earned schedule forecasts on-time performance for a program being managed to schedule	
Program N		х		Earned schedule consistent with other metrics	
Civil IT Project	x			Early warning of a schedule slip	
Civil Shipbuilding Program	x			Accurate projection of a 6-month delay in delivery	

• **Insightful**: Earned schedule metrics and forecast are a leading indicator of schedule performance or highlight something missed by other analytical techniques

• **Consistent**: Earned schedule metrics and forecast are consistent with the other program data

• **Misleading**: Earned schedule metrics and forecast are inconsistent with other program status indicators



#### Program W – year 6 Background

#### Program Background

 Hardware program with multiple deliveries. In year 6, the Cost Analysis Improvement Group (CAIG) did an Independent Cost Estimate for the program. The Program office was projecting a 2 year schedule slip compared to the program office plan.

#### Earned Schedule Challenge

- Would earned schedule have been an indicator that the program delivery would be later than the program office launch date?
- CPR data (PMB at 75% complete): Cumulative EVM data at the PMB level does not indicate a schedule problem with the program.



#### Program W – year 6 Earned Schedule



Earned Schedule Metrics							
Actual Time (AT)	Earned Schedule (ES)	SV[t]	Planned Duration Work Remaining	Baseline Duration	SPI(t)	TSPI	
84.93 Months Elapsed	72.62 Months Worth of Work Complete	-12.31 Months Behind Schedule	84.46 Months of Work Remaining	72.15 Months Until Original Scheduled Delivery	0.86	1.17	

• SPI(t) has a downward trend that was not apparent in SPI(\$). Earned schedule forecasts show a problem that was not apparent in other program metrics.

• In the Cumulative SPI(t) vs. SPI(\$) chart, the SPI(t) data points drop to zero in months that the program reported ACWP, but not BCWS or BCWP.



### Program W – year 10 Background

- Program Background
  - Hardware program with 5 deliveries. In year 10, the first delivery was made.
- Earned Schedule Challenge
  - Are Earned Schedule metrics accurate in a well-performing program?
- **CPR data (PMB at 87% complete):** Cumulative EVM data at the PMB level does not indicate a schedule problem with the program.



## Program W – year 10 Earned Schedule



Earned Schedule Metrics							
Actual Time (AT)	Earned Schedule (ES)	SV[t]	Planned Duration Work Remaining	Baseline Duration	SPI(t)	TSPI	
41 Months Elapsed	40.07 Months Worth of Work Complete	0.93 Months Behind Schedule	37.95 Months of Work Remaining	37.02 Months Until Original Scheduled Delivery	0.98	1.03	

 The program is on target, according to both traditional EVM and Earned Schedule metrics



#### Program X Background

- Program Background
  - Hardware program with one delivery
  - Program experienced major delays
- Earned Schedule Objective
  - Could an analyst forecast a schedule slip with earned schedule more accurately than with traditional EVM measures?

• CPR Data (PMB at 50% complete): At that time, there was a schedule variance of less than 5%, a slight cost variance, and the contractor was projecting no variance at complete. There are 3 spikes in the cumulative data, which were corrected in subsequent months.



# Program X Earned Schedule



- + The program experienced major delays. Completion was 4 years later than the baseline date.
  - At 50% complete (based on BCWP/BAC), the earned schedule model indicates that program delivery will be ~15 months late using the 3 month SPI(t) average calculation.
  - At 75% complete earned schedule indicates a program delivery ~36 months , although the program office still projected an earlier delivery.
  - Long lead items purchased at the beginning of program kept the SPI(\$) close to 1.0 even though the SPI(t) schedule slipped.
  - At this point in time, TSPI indicates that 1.03 efficiency is needed to deliver on time, whereas efficiency has been at 89% to date. An improvement of that magnitude is unlikely, based on industry-wide historical data.

# Program Y Background

#### + Program Background

 Program Y is an IT System. The baseline contains a high percentage of Level of Effort (vice Discrete) work packages. The program experienced an 11-month schedule delay and an OTB situation one month after the status date presented.

#### + Earned Schedule Challenge

- Could earned schedule have forecasted the schedule delay necessitated by the OTB?
- + CPR Data (PMB at 74% complete): shows unfavorable cost and schedule performance.





- + SPI(t) was less favorable than SPI(\$), and the schedule forecast is 3 months late. However, the OTB added 11 months to the schedule. Earned Schedule was diluted by the high percentage of LOE in the baseline.
- + The negative TSPI indicates the schedule variance is not recoverable.



# Program Z Background

#### Program Background

 This program communicated a favorable forecast up until the month an OTB was announced. An independent cost estimate was completed the month prior to the OTB, based on the favorable information

#### Earned Schedule Challenge

- Could earned schedule have provided an early warning of a problem?
- CPR Data (PMB at 84% complete): The month the Independent Cost Estimate was complete, schedule performance was on target and CPI was 0.98.



### **Program Z Earned Schedule**



- + The 3 month earned schedule indicator shows a 10-20 year slip, which indicates current baseline cannot be used to forecast the rest of the program. This should not be taken as a precise forecast of a 20 year slip, but an indication that the program needs to rebaseline, which it did.
- + The underlying cause of schedule underperformance is extensive internal replanning; within each rolling wave period the program moved near-term future work further into the future without extending end date. As a result, the program met its targets each month, but would need to perform at TSPI 1.32 to meet the baseline date.
- + Data continue to show continued negative trends
- + SPI(t) is indicating a major schedule problem although SPI(\$) is between 0.99 and 1.00 for the last 24 months of the contract.



# **NRO Case Study Conclusions**

- For programs with major schedule delays, earned schedule can highlight schedule problems using EVM data, to a greater extent than traditional EVM metrics. SPI(t) has been shown to exceed reporting thresholds before SPI(\$), providing earlier indication of schedule problems.
- For programs without major schedule variance, earned schedule metrics were consistent with other program metrics.
- If a program contains a significant amount of LOE, Earned Schedule analysis should be performed at a lower level of the WBS, or the forecast will be diluted.







#### **Presenting ES Data**



Reminder: PDWR stands for "planned duration of work remaining"

## Presenting ES Data

Estimate at Complete (EAC <sub>\$</sub> )	Estimate at Complete (EAC <sub>time</sub> )
BAC <sub>\$</sub> : 3,360,686.78	Planned Duration: <i>21 Months</i> Planned End Date: <i>November 2010</i>
EAC <sub>1</sub> = 1,040,000	Status Date: 7 Months
$EAC_2 = 1,080,000$	Earned Schedule: 4 Months
EAC <sub>2</sub> = 1,134,000	
$EAC_3 = 1,081,970$	IEAC1(t) = 34 Months – May 2012
	IEAC2(t) = 51 Months – December 2012
LRE: 1,100,000	IEAC3(t) = 28 Months – January 2011
	Project End Date: 25 Months – December 2010

Critical Path Analysis: Data Conversion is forecasted to be 2 months late, and is on the critical path. Therefore, it will push the go-live date out 2 months.

### **Resources for Adopting Earned Schedule**

- Earned Schedule Website, including papers and training resources
  - http://www.earnedschedule.com/Home.shtml
- Wikipedia Site
  - http://en.wikipedia.org/wiki/Earned\_ScheduleThird tier bullets

# Earned Schedule Implementation Tips

- Educate your client or customer
- Make take time for adoption
- Even if you don't present ES metrics, they could contribute to better variance analysis
- Needs solid EVM data and a well constructed project schedule
  - LOE Tasks, Material Costs can dilute ES Data
- Run time before presenting to your client or customer is helpful
  - Helps detect IMS/EV integration problems
- Needs to be used in context of all PM tools
- When project is rebaselined you must set ES back to 0

### What We Discussed

- How Booz Allen Was Introduced to Earned Schedule
- Brief Over view of What Earned Schedule Is
- Case Studies
- Data Reporting
- Implementation Tips

# **Any Questions?**

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