



2023 RESEARCH INFRASTRUCTURE WORKSHOP

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Project Management Maturation at NSF:
A Guided Tour

Wayne Abba

CREDIT: RUBIN OBSERVATORY/NSF/AURA





Agenda



- Meet your Guide
 - Earned Value Management
- Why bureaucracies change policies and behavior
 - Failure
 - Crisis
- Examples
 - Science Projects
 - Defense Projects
 - Federal Aviation Administration
- Best Practices
 - Government Accountability Office
 - Office of Management and Budget
 - National Science Foundation
- Summary



Wayne Abba

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NSF/AURA

- Army Civilian: Production Control, Procurement, Project Management, Earned Value Management
- Senior Analyst for Contract Performance Management, Office of the Secretary of Defense, 1982-99
- Consultant, Dekker Ltd., 1999-2004
- Independent Consultant specializing in Earned Value Management, 2004-present
 - Social Security Administration
 - Federal Aviation Administration
 - National Nuclear Security Administration
 - Government Accountability Office (volunteer)
 - National Science Foundation (volunteer)
- Board of Directors, Graduate School Japan, 2005-present
 - Ministry of Finance
 - Ministry of Defense
 - Ministry of Economy, Trade and Industry
 - Fukushima Decommissioning
 - Japan Aerospace Exploration Agency – “JAXA”



DoD EVM Experience

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- A-10
- A-12
- B-1
- B-2
- C-17
- DDG-51
- F/A-18E/F
- F-22
- C-130H & J
- CH-47 Chinook
- AH-64 Apache
- Longbow
- UH-60 Blackhawk
- Kiowa
- Seahawk
- Comanche
- T-45
- T-46
- Roland
- CVN-68
- SSN-21
- SSN-688
- SSN-774
- TASS
- NOE-6
- LHD-1
- Crusader
- M1 Abrams
- M2/M3 FVS
- MK-48 ADCAP
- MK-50 ALWT
- SSBN-726
- CG-47
- MH-53
- V-22 Osprey
- P-3 Orion
- RCAS
- LIF Hawk (Australia)
- B-1 Engines
- F-414-GE-400 Engines
- Chemical Munitions Demilitarization
- D-5 TRIDENT II
- Javelin
- Pershing II
- FAMECE/UET
- Satellites
- AN/BSY-2
- THAAD
- Airborne Laser
- Ground-Based Laser

Aggregate overrun 5.5% on 115 largest DoD contracts (\$3.0B on \$84.8B @ 60% complete), adjusted for over target baselines a/o 4/30/2000

OUSD(AT&L)ARA/AM, 1/16/01



Science Project Failures



- Superconducting Super Collider
 - The Dream
 - The world's largest and most energetic particle accelerator in Waxahachie, Texas
 - The Reality
 - After 22.5 km of tunnel had been bored and about \$2B spent, the project was canceled by the US Congress in 1993
- Project Mismanagement
 - In 1989 David Pells was invited to transfer from Idaho to EG&G's SSC team based on EVM background and knowledge of DOE's EVM compliance requirements
 - Led what became the Project Management Reporting System – Job 1 was to help with the project cost estimate
 - Told by deputy SSC director Dr. Doug Pewitt that the WBS “was none of my business”





Science Project Failures (cont'd)

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- “Scientists (including some of the world’s leading physicists at the time) were the easiest to work with. Unlike engineers and bureaucrats, the scientists immediately understood the concepts and issues underlying EVM system and reporting requirements, accepted them as simply part of the job, cooperated and supported our PMRS work. Engineers were less supportive, rather wanting to use the systems and methods they brought from their various companies. Bureaucrats didn’t know anything about EVM.”
- “Several of the senior staff from my PMRS team went on to provide EVM support to other labs and big science projects, including telescopes. You may have run into Bill McVeigh and David Scott, both of whom are both EVM and Primavera expert users.”
- Contrast my experience with Department of Health and Human Services
 - Project Management “demeaning”



Science Project Failures (cont'd)

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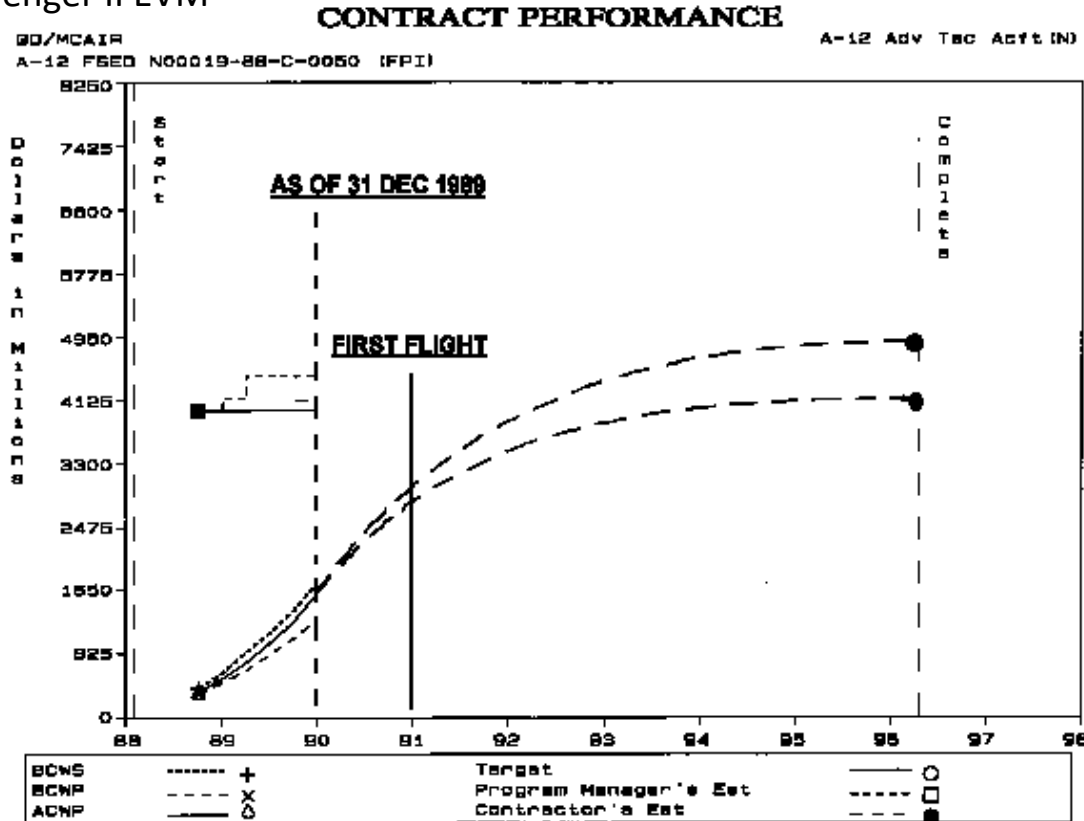
- Doing a lot without getting much done at the Department of Energy (Tristan Abbey, The New Atlantis, Summer 2021) <https://www.thenewatlantis.com/publications/the-demon-of-bureaucratic-chaos>
 - Discusses SSC and “The list goes on”
 - Hanford Site Waste Treatment and Immobilization Plant, scheduled 2002-2007, now 2023-2036, cost \$4.3B to ~ \$40B
 - Princeton Plasma Physics Laboratory’s National Compact Stellarator Experiment, canceled in 2008
 - Livermore’s National Ignition Facility, completed >\$1B over budget and about 7 years behind schedule”
 - “Only elected leadership can exert the necessary force to alter the velocity of an object as massive as the federal government. The very first step must be to govern the ungoverned spaces, to root out the mysterious creature that blocks good things from happening.”
 - I disagree –
 - We know what to do
 - We know how to do it
 - Too often we lack the knowledgeable leadership to do it effectively and efficiently



Defense Project Failure

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- A-12 Avenger II EVM



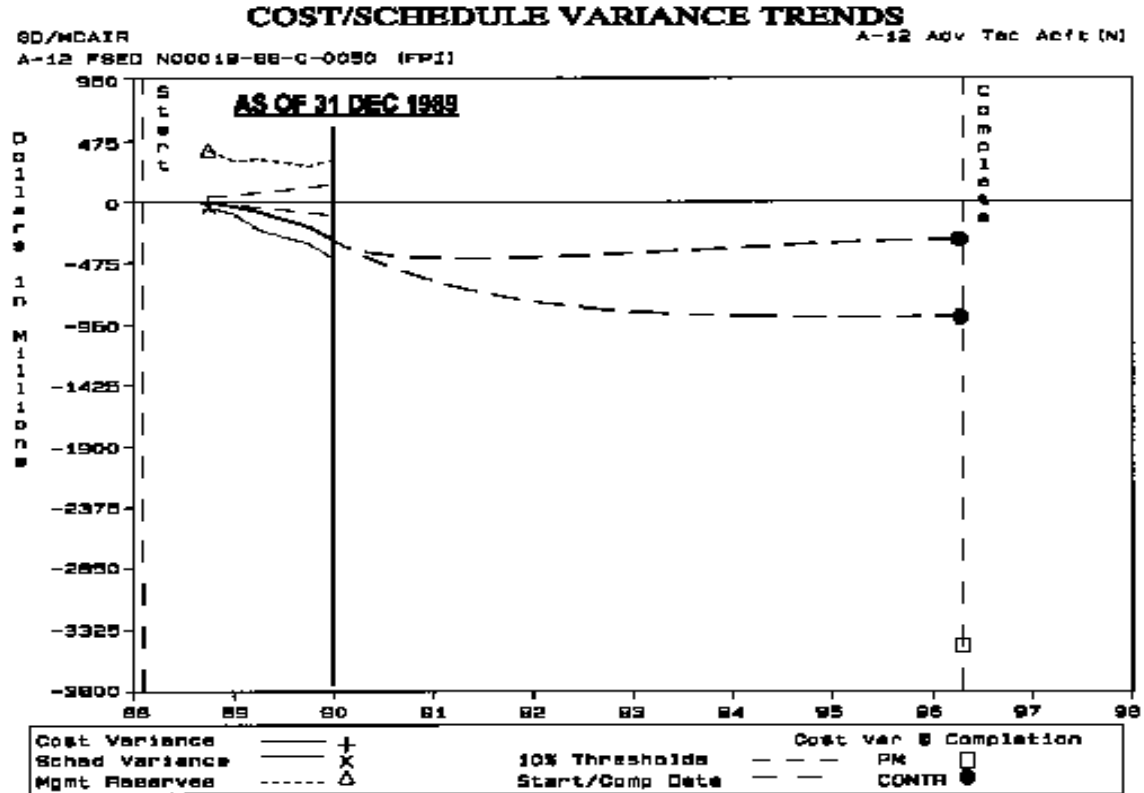
- A-12 Avenger II
- Large negative variances
- Buy-in?
- Delayed EVM reporting
- Good EVM data; not used effectively
- Failure to make progress
- Terminated for Default
- 2 decades of litigation
- Expert witness in 5th trial
- Settled for \$198M from each contractor



Defense Project Failure (cont'd)

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- A-12 Avenger II EVM





Defense Project Success

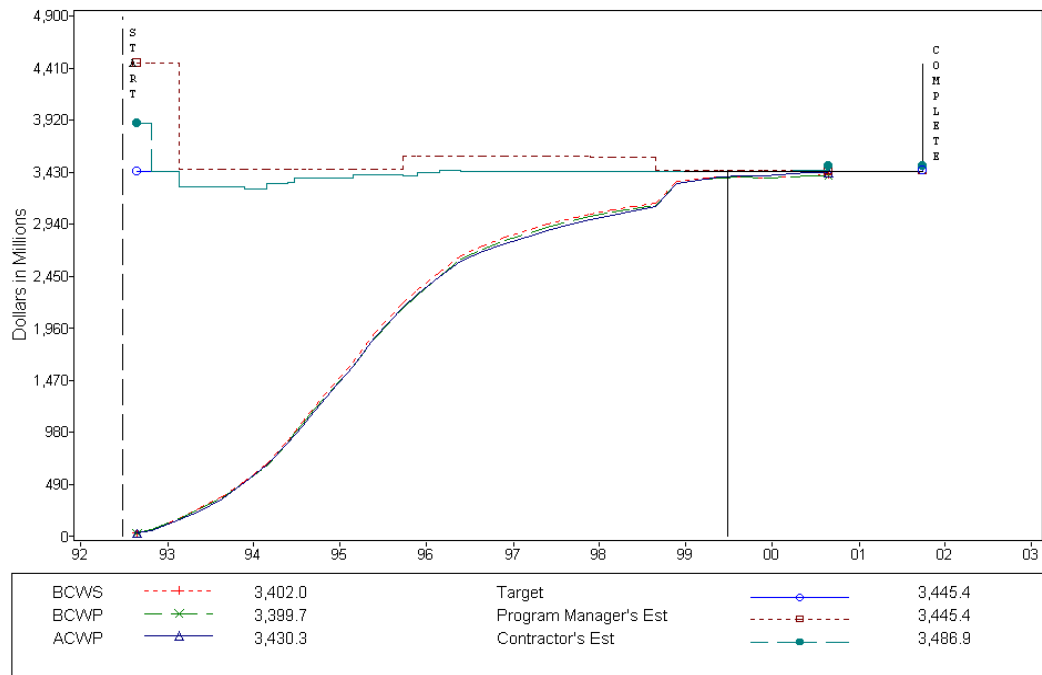
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CONTRACT PERFORMANCE

MCDONNELL DOUGLAS
Airframe EMD N00019-92-C-0059 (CPAF/IF)

F/A-18 E/F
As of 7/31/2000



- **F/A-18 E/F Super Hornet**
- **No major variances**
- **Scope control**
- **Effective planning**
- **EVM used weekly (labor only; coordinated with schedule statusing)**
- **Excellent performance**
- **Award-winning program**



DoDI 7000.2 Original Purpose

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- **Performance Measurement for Selected Acquisitions**

1. To provide an adequate basis for **responsible decision-making by both contractor management and DoD components**, contractors' internal management control systems must provide data which (a) indicate work progress, (b) properly relate cost, schedule and technical performance accomplishment, (c) are valid, timely and auditable, and (d) **provide DoD managers with information at a practicable level of summarization.**



EVM System Definition

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- **EIA 748-98 Earned Value Management Systems**
- An EVMS for program management will effectively integrate the work scope of a project with the schedule and cost elements for optimum program planning and control. **The primary purpose of the system is to support program management.** The system is owned by the organization and is governed by the organization's policies and procedures.



Meanwhile, Back at the Pentagon



- EVM emphasis declined in early 2000's after Clinton-Gore Acquisition Reform era ended
 - Leadership changes and inertia
 - Industry missed the opportunity to govern itself under EIA-748
 - Reverted to audit/reporting system
 - Related skills declined
 - Systems engineering (MIL-STD-499)
 - Oversight relaxed in favor of contractor responsibility
 - Problems emerged in programs
 - EFV, ARH, Ships, Presidential Helo, JSF, etc.
 - Nunn-McCurdy breaches
 - EVM misapplied
 - Government – Perverse contract reporting incentives, Undefined Contract Actions
 - Contractors – Gaming the system – Baseline integrity, Management Reserve





Naval Audit Service Report

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“DCMA, the executive agent for EVM, has yet to take any significant actions to address the weaknesses of the implementation and oversight of EVM within DoD and DON identified by our audits and other audit agencies’ reports. As noted in this and other reports, the lack of action continues to impact key aspects of integrated management processes and practices necessary for successful management of cost, schedule, and performance of Naval acquisition programs. **These continuous and long standing performance issues can also be attributed to USD (AT&L) not providing sufficient guidance and oversight to DCMA, as the executive agent for EVM.”**

**N2007-0002 (October 24,
2006) “Oversight of Earned
Value Management for Naval
Acquisition Programs”**



Pentagon Response

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- Beefed-up Defense Contract Management Agency (DCMA) EVM Center
- More reviews, more data, more bureaucracy, more cost
 - Aggressively undid Clinton-Gore reforms
 - Reverted to oversight with no industry input
 - “New Sheriff in Town”
 - Lost in Transition -
 - Executive understanding & involvement
 - Integrated management – systems engineering, cost estimating, contracting, risk management
 - Holding contractors responsible and accountable with minimal oversight
 - Meeting project managers’ needs for timely, reliable, actionable information





2008 DoD EVMS Review

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- *GREATLY disappointing . . .*
 - . . . Abuse -- I'd offer that DCMA comes to all companies, regardless of size or evolutionary station (from non-traditional, to small, to medium, to "eisenhower" size company) with only one approach.
 - There is no tailoring,
 - no consideration, and
 - a set of interpersonals that remind one of the bullies from the elementary school playground.
 - I lost the lady that was my software lead for our largest program following the last audit. A quote for you from her,
 - ***“Those people are coming back. I shall not be working here when that happens.”***



2008 DoD EVMS Review (cont'd)

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- The thing that bothered me the very most is that the "visitors" were
 - Pure mechanics
 - Deep understanding of what we (DoD) tried to accomplish w/EVMS, was sadly missing.
 - little interest in the quality of the cost estimation at the get-go
 - not much interest in the accuracy of the planning
 - it was all about collecting data, turning the crank, and
 - ***A desire for administration that would have more labor applied to EVMS than we had going into design!***

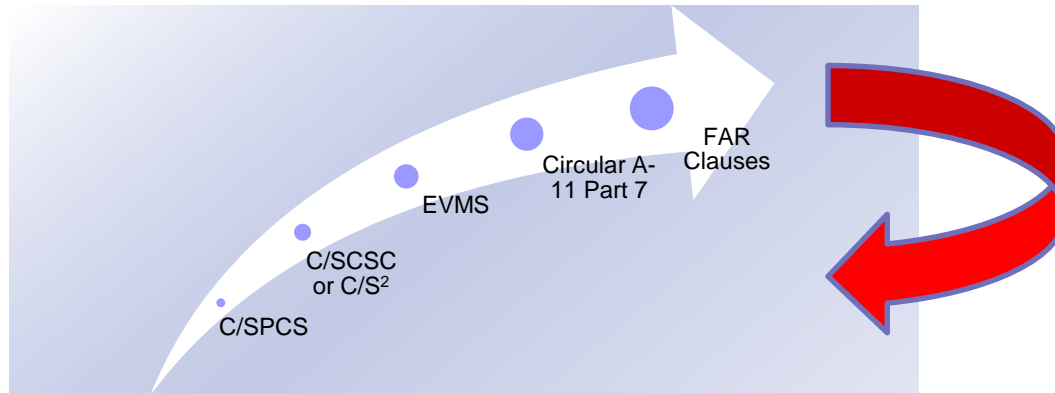
**Vice Admiral Joseph W. Dyer (US Navy, Retired)
Chief Operating Officer and Chief Strategy Officer, iRobot Corp.
April 2, 2008**



US Government EVMS Policy

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- 1966 – Air Force Cost/Schedule Performance Control Specification (C/SPEC)
- 1967 – DoD Cost/Schedule Control Systems Criteria (C/SCSC or CS²)
- 1996 – Office of Management & Budget adopts C/SCSC in Circular A-11, Part 3
- 1997 – DoD adopts EVMS; OMB follows suit in A-11 Part 3 (now Part 7)
- 2006 – Federal Acquisition Regulation Clauses issued
- **2011 – DFARS Business System Rules issued**





Redefining Purpose of EVMS

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- DFARS 252.242-7005 Contractor Business Systems.
 - (1) Accounting system
 - **(2) Earned value management system**
 - (3) Estimating system
 - (4) Material management and accounting system
 - (5) Property management system
 - (6) Purchasing system
- Payment Withholding:
 - (A) Five percent for one or more significant deficiencies in any single contractor business system; and
 - (B) Ten percent for significant deficiencies in multiple contractor business systems.

Weaponized EVMS



Penalizing Contractor Cash Flow

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- [Pentagon spokesman] Urban said the agency was withholding payments ranging from 2 percent to 5 percent from two Lockheed units, two United Technologies units, Northrop, and AAI Corp, a unit of Textron Inc TXT.N, for problems with their respective "earned value management systems," or EVMS.
 - **Penalties imposed in \$ hundreds of millions**
 - **How has that helped assure successful outcomes?**
 - **How do people perceive EVMS in government and industry?**
 - **What are the measures of effectiveness?**
 - It isn't EVMS compliance...

REUTERS BUSINESS
NEWS

October 16, 2013



Meanwhile, at the FAA...

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- **CRISIS!**
 - GAO “High Risk List” mid-1990s
 - OMB FAA budget reduction 2004
- Major transformation 2005 announced by Administrator
 - Policy
 - Guidance
 - Training
 - Program assessments
- EVM at Program Level
 - Prime, sub and support contractors
 - Government employees
- Working teams
 - Systems Engineering, Risk Management, Cost Estimating, Contracting, Finance, Operations
 - EVM Council reporting to Executive Group
- **Building on DoD Experience**





FAA EVM Assessment Summary (Baseline 2005)

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Guideline	Organizing					Planning										Performing & Accounting								Analysis & Reporting					Change Management								
	WBS	OBS	WBS/OBS Integration	WBS/OBS Reporting	Average	Schedule / Interdependencies	Schedule Milestones	Time Phased Budget Baseline	Budget Elements of Cost (EOC)	Control Account WP & PP	Control Account budgeting	LOE budgeting	MR & UB	Program budgeting	Average	Overhead responsibility	Overhead budgeting	Record direct costs	Summarize CAs into WBS	Summarize CAs into OBS	Record indirect costs	Identify unit costs	MMAS	Indirect Cost Variances	Average	Cost & Schedule Variances	Variance Analysis Reports	WBS/OBS Variances	Corrective Actions	Estimates at Completion	Average	Timely Change Planning	Reconcile Change	Control Retroactive Changes	Limit to Authorized Changes	Document PMB Changes	Average
Prog 1																																					
Prog 2																																					
Prog 3																																					
Prog 4																																					
Prog 5																																					
Prog 6																																					
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Prog 26																																					
FAA Average																																					

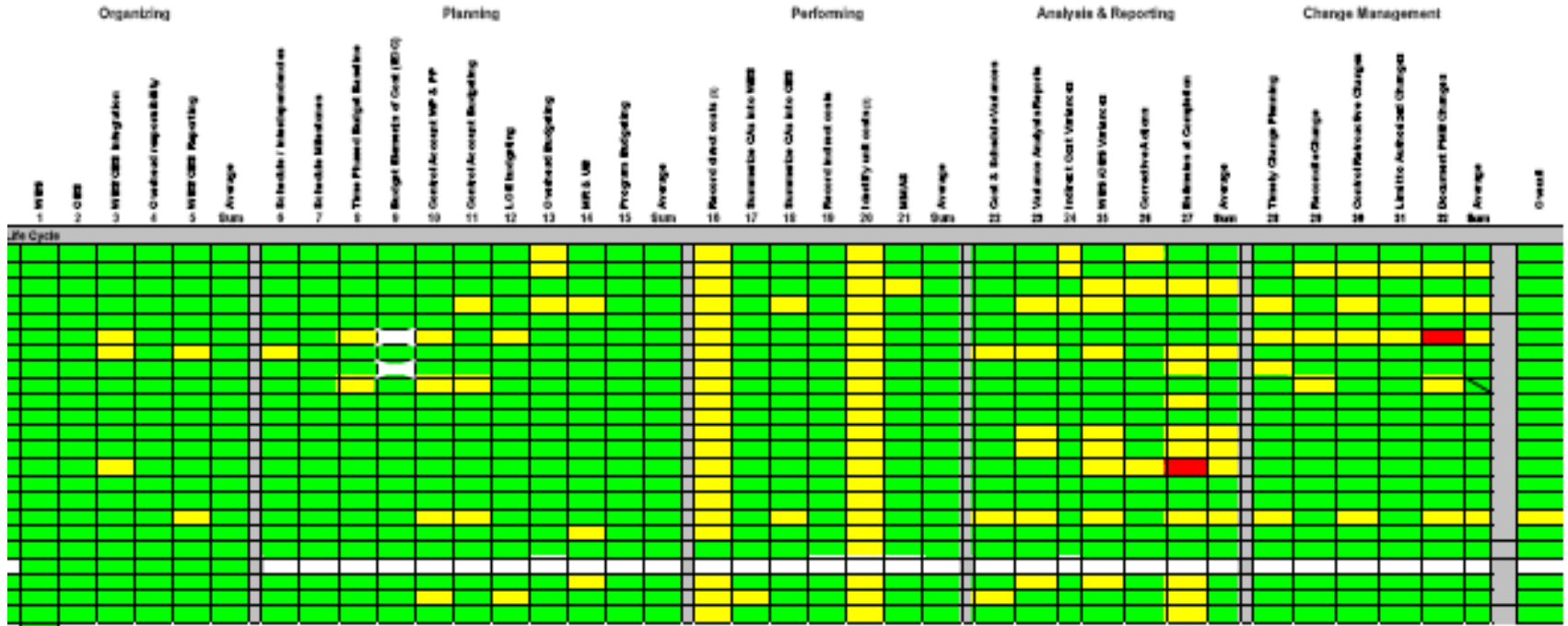
Agency-Level Guideline not assessed at the Program Level
 Based on Unique Aspects of the Program this Guideline was Not Applicable
 Program Completely in Either the Planning or O&M Phase of the Life Cycle (Guidelines Not Assessed- Transition Plan Provided)
 This Pattern Indicates that the Program is Between a Green and Yellow Assessment Rating
 Assessment has NOT been completed



FAA EVM Assessment Summary (October 2008)

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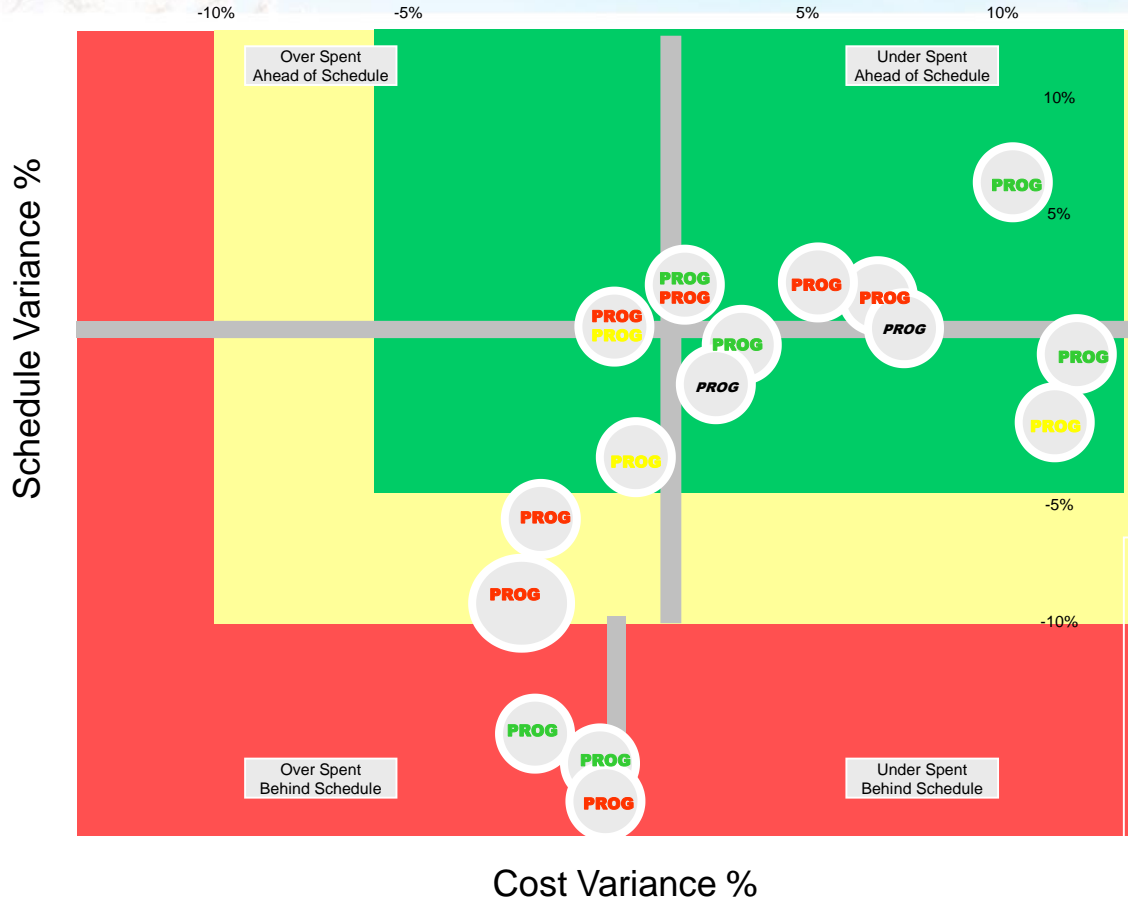
FAA Major Programs - EVM Assessment Summary
(October 2008- Final)





FAA Major Programs – EVM Metrics

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NSF/AURA



Program Name Color & Font Code:

- Green: EVMS Quality Meets
- Yellow: EVMS Quality Partially Meets
- Red: EVMS Quality Does Not Meet
- Black: Assessment Not Complete

- Italics: Preliminary Results
- Bold: Final Results



Major Milestone for the FAA

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- January 2009 – after 14 years, GAO removed Air Traffic Control Modernization program from its list of high risk programs and operations
 - Significant progress
 - Fewer overruns and schedule delays
 - Going forward – emphasize effective and efficient management
- The only program removed from the list
- EVM played a significant role



National Science Foundation

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- Conversation with Jack Matthewman re NSF policy
 - No overruns!
 - Contingency not allowable per auditors
- Met with NSF leadership
- Facilitated presentation by leader of Government Accountability Office team
 - **Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs** <https://www.gao.gov/products/gao-20-195g>
 - **GAO Schedule Assessment Guide: Best Practices for Project Schedules** <https://www.gao.gov/products/gao-16-89g>
 - **Agile Assessment Guide: Best Practices for Agile Adoption and Implementation** <https://www.gao.gov/products/gao-20-590g>

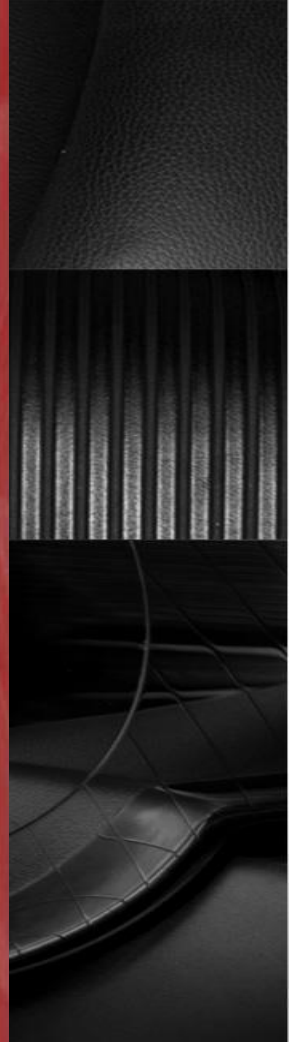
Management Reserve & Contingency

National Science Foundation

December 18, 2012

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National Science Foundation

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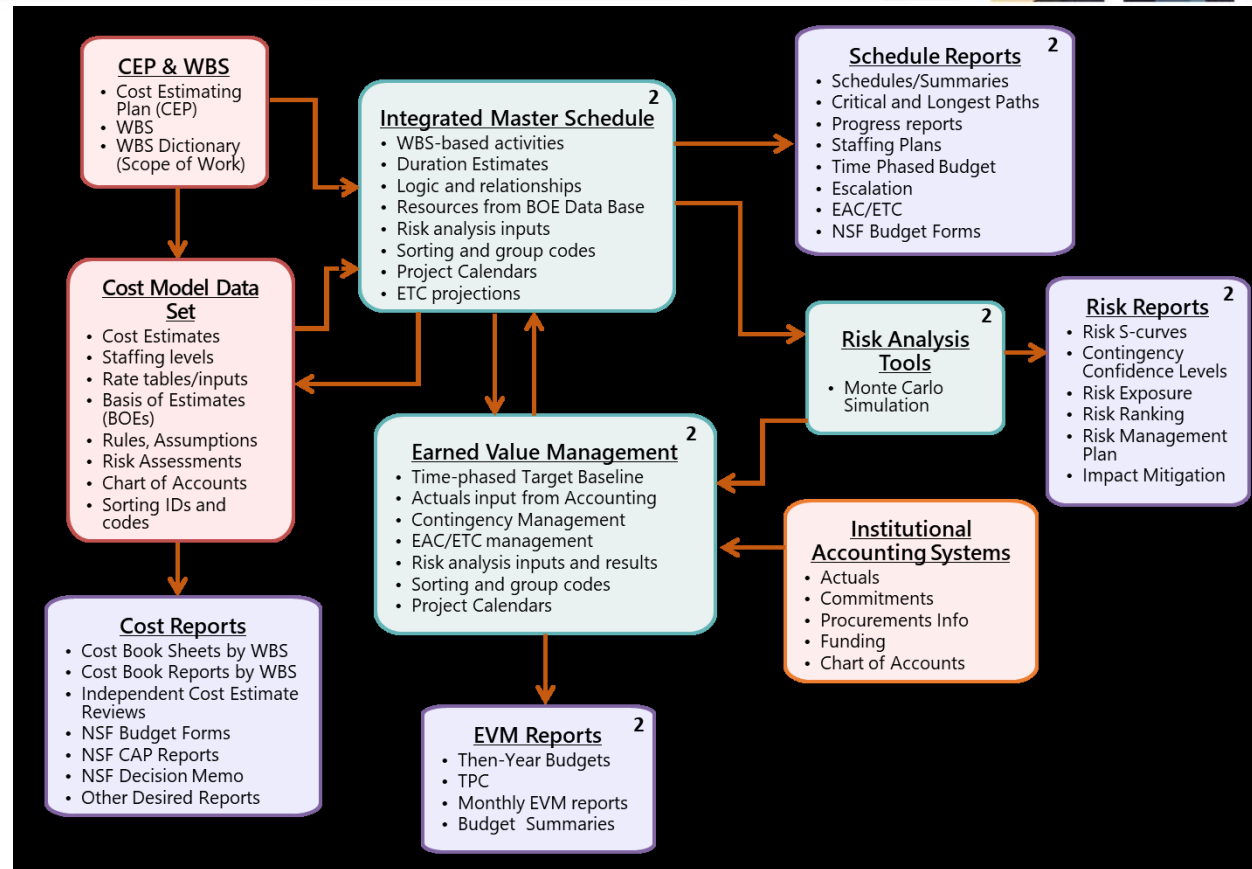
- Policy revised to establish appropriate level of contingency
- Invited to Peer Review Panels
 - Advanced Technology Solar Telescope (now Daniel K. Inouye Solar Telescope)
 - Laser Interferometer Gravitational-wave Observatory
 - ATLAS & CMS Experiments at CERN Large Hadron Collider
 - Dept. of Energy scope
 - Giant Magellan Telescope
 - Thirty Meter Telescope
- Follow GAO “Best Practice” Guides
- EVM incorporated in planning and review process in Research Infrastructure Guide
- Research Infrastructure Office
 - Striking a balance between assistance and oversight
 - **Objective is to achieve a successful project outcome**



NSF Integrated Program Management

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- RIG Figure 4.2.2-1 Sample Project Control Systems Relationship Diagram
- Shared scope with DOE
 - Labs use “High End” EVM
 - P6
 - COBRA
 - Tailoring & Scaling
- Mid-Scale Research Infrastructure 1





DOE EVMS Initiative

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- Integrated Project/Program (IP2M) Maturity and Environment Total Risk Rating (METRR)
- Journal of Management in Engineering/Volume 38 Issue 3 - May 2022
 - University of Arizona “Forward-Looking State-of-the-Art Review on Earned Value Management Systems: The Disconnect between Academia and Industry”
 - “One interesting finding is that EVMS maturity, although being a critical topic, is only discussed in one publication.”
 - **GAO Cost Estimating and Assessment Guide is not included in the literature review**
 - GAO 2009: “companies that do establish a good EVM system realize better program management decision making and have fewer cost and schedule overruns and potentially greater repeat business”
 - DOE is reinventing the EVMS compliance model by assessing EVMS “Maturity”
 - 56 Attributes, rating scale 1 – 5, 1,000 point maximum – illusion of objectivity?
 - > 550 considered “High Maturity”; <550 “Low Maturity”
- EVMS “Compliance” bureaucracy mismanagement triggered 1990s DoD reform



OMB – FAA Collaboration

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- Program Management Improvement Accountability Act ([Public Law No: 114-264](#))
 - The Program Management Policy Council is established within OMB to act as the principal interagency forum for improving agency practices related to program and project management.
 - Acquisition Management Committee
 - Formed in 2020 under the PMPC to identify program management issues and work on specific tasks that will help advance program management in the Federal government.
 - Meets about five times per year and several agencies participate voluntarily. Activities include the development of a program management maturity model to help facilitate agency reviews and promoting standards such as Earned Value Management (EVM)
 - Working with National Science Foundation on EVM case studies/articles – counterpoint to DoD/DOE processes
 - “Reboot EVM” article distributed April 5, 2023



Further Reading

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**IT'S TIME TO "REBOOT"
EARNED VALUE MANAGEMENT**
Wayne F. Abba
Defense Acquisition March-April 2023

<https://www.dau.edu/library/defense-atl/blog/Reboot-Earned-Value-Management>



Further Reading (cont'd)

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PLANNING FOR THE FUTURE OF EARNED VALUE MANAGEMENT

Chad Reynolds

Defense Acquisition March-April 2023

<https://www.dau.edu/library/defense-atl/blog/PlanningfortheFutureofEarnedValueManagement>



Summary

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- We've come a long way
- NSF has learned from experience and improved on it
 - DoD
 - DOE
 - GAO
- Implementing EVM-based integrated program performance management appropriately considering project size, complexity, risk
 - Does not necessarily require high-end tools
- A leader among government agencies

Thank You!