Synopsis:
This presentation will cover issues that were overcome and the implementation strategy to deploy Earned Value Management (EVM) within the Constellation Program, EVA Systems Project Office, as well as discuss additional hurdles that currently prevent the organization from optimizing EVM.

Abstract:
Earned Value Management (EVM), like project management, is as much art as it is science to develop an implementation plan for a project. This presentation will cover issues that were overcome and the implementation strategy to deploy Earned Value Management (EVM) within the Constellation Program (CxP), EVA Systems Project Office (ESPO), as well as discuss additional hurdles that currently prevent the organization from optimizing EVM. Each organization and each project within an organization needs to mold an EVM implementation plan around existing processes and tools, while at the same time revising those existing processes and tools as necessary to make them compatible with EVM. The ESPO EVM implementation covers work breakdown structure, organizational breakdown structure, control account, work/planning package development; integrated master schedule development using an integrated master plan; incorporating reporting requirements for existing funding process such as Planning, Programming, Budgeting, and Execution (PPBE) and JSC Internal Task Agreements (ITA); and interfacing with other software tools such as the Systems Applications and Products (SAP) accounting system and the CxP winSight EVM analysis tool. However, there are always areas for improvement and EVM is no exception. As EVM continues to mature within the NASA CxP, these areas will continue to be worked to resolution to provide the Program Managers, Project Managers, and Control Account Managers the best EVM data possible to make informed decisions.
Implementing Earned Value Management in the Constellation Program (CxP) EVA Systems Project Office (ESPO)

Project Management Challenge 2010
Galveston, TX
February 9-10, 2010

Les Sorge/SGT, Inc.
ESPO Project Planning & Control
The goal of the EVA Systems Project Office (ESPO) Earned Value Management (EVM) implementation is to utilize existing products and processes where possible or influence them to make them compatible with EVM.

Agenda
- Work Breakdown Structure
- Organizational Breakdown Structure
- Responsibility Assignment Matrix and Control Accounts
- Work Packages / Charge Codes and Planning Packages
- Integrated Master Plan
- Integrated Master Schedule – Primavera PM Tool Implementation
- Deltek Cobra Tool Implementation
- Integration / Interfaces to Other Processes / Tools
- EVM Integration with Prime Contractor
- Future Opportunities for Improvements
- Acronyms and Reference Documents
- Questions & Answers
Work Breakdown Structure (WBS)

- **Summary of WBS requirements defined in NPR 7120.5D, Appendix G**
  - The standard space flight project WBS applies to the entire life cycle of the project
  - Space flight projects will use the standard Level 1/2 WBS elements with level 1 as the Project name
  - Level 3 and lower WBS elements will be determined by the project
  - If there is no work to fit into a Level 1/2 WBS element, then an inactive placeholder element will be established
  - A single WBS will be used for both technical / business management and reporting

- **ESPO Implementation**
  - The technical WBS matches the financial WBS excluding the 6 digit project code
  - The figure below represents the CxP reporting level and the pre-defined Control Account level
Organizational Breakdown Structure (OBS)

- Defining the responsible organization versus the performing organization
  - Ask the question, “How does the Project Manager distribute the budget for control?”

- The Responsible Organization
  - Used to develop the Responsibility Assignment Matrix (RAM) and Cost Performance Report (CPR) Format 2
  - Aligns closely with the Work Breakdown Structure

- The Performing Organization
  - Based on NASA Center, Directorate, and Divisions
    - A budget forecasting requirement does exist for the performing organization for planning purposes

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**NASA Performing Organization**

- JSC - Office of the Director
- BA - Office of Procurement
- CA - Flight Crew Operations Directorate
- DA - Mission Operations Directorate
- EA - Engineering Directorate
- IA - Information Resources Directorate
- JA - Center Operations Directorate
- KA - Astromaterials Research and Exploration Science Directorate
- LA - Chief Financial Officer
- MA - Space Shuttle Program
- NA - Safety and Mission Assurance Directorate
- OA - International Space Station Program Office
- QA - Commercial Crew & Cargo Program Office
- RA - White Sands Test Facility
- SA - Space Life Sciences Directorate
- W-JS - NASA Office of Inspector General
- WE - NASA Engineering and Safety Center
- WR - Department of Defense Payloads Office
- WSS - NOAA-National Weather Service, Spaceflight Meteorology Group
- XA - Extravehicular Activity Office
- ZA - Constellation Program

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**ESPO Responsible Organization**

- EVA Systems Project Manager
  - Deputy Project Manager
  - Technical Authority
  - Chief Engineer
  - Chief Safety Officer
  - Health & Medical Discipline Expert

- Technical Staff
  - Contracting Officer
  - Contract Specialist
  - Glenn Research Center Lead
  - Strategic Communications Lead
  - Operability Lead

- Stakeholders
  - Crew Office Operations

- Level 3

- Project Planning and Control Manager/COTR
  - Deputy Manager
  - 1.0

- Systems Engineering and Integration Manager
  - Deputy Manager
  - 2.0

- SR&QA Manager
  - 3.0

- Testing and Facilities Manager
  - 10.0

- Level 4

- Suit Element Manager
  - Deputy Manager, Planning
  - 6.4.1

- Tools and Equipment Element Manager
  - 6.4.2

- Vehicle Interface Element Manager
  - Deputy Manager
  - 6.4.3

- Production, Processing and Sustaining Engineering Manager
  - 6.36.5

- Technology Development Manager
  - 4.0
Responsibility Assignment Matrix (RAM) & Control Accounts (CA)

- Prime added as an organization in the OBS per ANSI-748 guidance
  - This structure allows budgets to be segregated between prime and non-prime work while still reinforcing the “integrated project – NASA and Prime” philosophy of ESPO
- CA nomenclature used: .29 for historical, .31 for NASA/non-prime, .32 for Prime
  - .31 used for all NASA/non-prime organizations for easy recognition in SAP financial system
  - Nomenclature works since multiple organizations don’t support a WBS element

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<th>WBS</th>
<th>Description</th>
<th>Historical CA</th>
<th>Project Mgmt.</th>
<th>Project Planning &amp; Control</th>
<th>SEI</th>
<th>SEMQA</th>
<th>Technology Development</th>
<th>Materials Element</th>
<th>Vehicle Interface Element</th>
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Control Accounts identified in the RAM create a natural extension to the project WBS
Although the WBS expanded to a lower level, the summary level was requested as the control point

- Control points/CAMs identified as the ESPO WBS Leads
- The EVM implementation added “subsystem” summary lines between the Control Accounts and the Work Packages to match the expanded WBS
  - Each subsystem has its own unique codes
  - Allows easier summation of performance / costs at the subsystem level

The implementation strategy works, but in hindsight, it may have been better to use the lowest level of the WBS as the Control Account level

- CAMs would have multiple Control Accounts
- Budget changes between subsystems would be more closely tracked
Work Packages (WP) / Charge Codes & Planning Packages (PP)

♦ The financial WBS / charge codes are maintained in SAP financial tool
  ▪ Over 400 charge codes previously existed in SAP prior to EVM implementation due to multiple re-builds (most codes never used)
  ▪ A “fresh” start was required for EVM
    - Several ideas were explored
    - Preferred option was an easily recognizable unique numbering for the CA
    - All “old” codes collected in the historical CA

♦ For CxP ESPO a WP equals a charge code equals the lowest WBS level

♦ Adhere to SAP rule that charge codes cannot cross NASA centers

♦ PP identified as a letter in the code and are not in the SAP financial tool
  ▪ During rolling wave planning, a request for a new charge code will be submitted for the next sequential number to be opened in SAP

Excerpt of ESPO WP / PP

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Integrated Master Plan (IMP)

- NASA Project life cycle defined in NPR 7120.5D, starting point used to define the ESPO IMP
- CxP ESPO defined as two separate Projects, Initial Capability and Lunar Capability, that are linked
- IMP needs to capture all work content of the entire Project
  - IMP events added for work content that is not readily defined by the life cycle phases
  - IMP jointly developed with the Prime

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- IMP events added for work content that is not readily defined by the life cycle phases
- IMP jointly developed with the Prime
Integrated Master Schedule (IMS)
Primavera PM Tool Implementation

- The Primavera IMS developed with Resource Loaded (RL) activities linked to the budget WP / PP in Deltek Cobra
  - Activities were originally resource loaded in the Primavera IMS
    - Discovered resource loading easier to customize in Deltek Cobra as compared to Primavera
    - Resources removed from IMS and only the activity dates and % completes are now linked
  - Additional schedule detail added to the IMS by the rolling wave method
- All activities are also tagged with an IMP code for an event-driven view
Deltek Cobra Tool Implementation
WBS / OBS / CA Structure

Control Accounts (CA) match RAM

Multiple WP make up each CA

.00 WBS created to track budget funding marks
EVM Integration with Prime Contractor

- Driving requirement is NOT to replicate Prime EVM data within Project data
- Utilize Deltek wInsight tool to integrate Prime EVM data with ESPO EVM data
- Items that must be addressed to integrate data:
  - Management Reserve (MR)
  - Undistributed Budget (UB)
  - Summary Level Planning Packages
  - Prime Award Fee
  - IDIQ content
  - Differences between Cx PAD and Prime contract periods of performance
  - Differences between Prime contract value and Government probable cost
Future Opportunities for Improvement

♦ NASA financial systems (SAP) not fully compatible with EVM
  • SAP set up as a cost collection system, not necessarily a performance measurement system
    – Requires obligation of funds at the lowest level of detail, i.e. the charge code for ESPO
    – System cumbersome on Procurement personnel to de-obligate & re-obligate funds from old to new charge codes
    – System sometimes creates situations of lagging actuals due to obligations at the lowest level, i.e. cost over obligations
    – System cumbersome with regards to timely creation and inability to close charge codes and does not limit access to charge codes
    – These issues have forced the creation of long duration work / planning packages (multiple years)

♦ Continued training for understanding of Earned Value concepts, in particular, separation of budget versus funding
  • Existing NASA processes (PPBE, JSC ITA, etc.) are funding processes that are being used synonymously with EVM budget processes
    – They should be linked to EVM funding processes (ETC / EAC)

♦ Not all organization support contracts structured to collect and report data to support Cx Project EVM requirements
  • Contract structure forces organizations to "guess" on the monthly costs collected against charge codes by applying estimates since data reported at a summary level
  • Manual entry process of support contract data into SAP precludes detailed data due to the time requirements to enter the data
Acronyms and Reference Documents

♦ Acronyms
  • CA – Control Account
  • CAM – Control Account Manager
  • CIRR - CxP Integrated Resources Report
  • CPR – Cost Performance Report
  • CxP – Constellation Program
  • ESPO – EVA Systems Project Office
  • EVA – Extravehicular Activity
  • EVM – Earned Value Management
  • EVMS – Earned Value Management System
  • IBOT - Integrated Budget Office Toolkit
  • IDIQ – Indefinite Delivery, Indefinite Quantity
  • IMP – Integrated Master Plan
  • IMS – Integrated Master Schedule
  • IRMA – Integrated Risk Management Application
  • ITA - Internal Task Agreement
  • JCL - Joint Confidence Level
  • JSC – Johnson Space Center
  • NPR - NASA Procedural Requirements
  • OBS – Organizational Breakdown Structure
  • PAD – Project Authorization Document
  • PP – Planning Package
  • PPBE - Planning, Programming, Budgeting, and Execution
  • RAM – Responsibility Assignment Matrix
  • RL – Resource Loaded
  • SAP – Systems Application and Products
  • WBS – Work Breakdown Structure
  • WP – Work Package

♦ Reference Documents
  • NPR 7120.5D – NASA Program and Project Management Processes and Requirements
  • CxP 72179 – CxP ESPO Project Plan
  • CxP 72179 Anx01 – CxP ESPO EVM Implementation Plan
  • CxP 72179 Anx03 – CxP ESPO IMP/IMS Implementation Plan
  • ANSI/EIA-748 – Earned Value Management Systems
Questions & Answers