RESULTS OF A NASA KENNEDY SPACE CENTER EARNED VALUE MANAGEMENT PILOT PROJECT

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INTRODUCTION

BACKGROUND

Earned value management (EVM) is a technique used throughout the aerospace industry. An EVM system requires the establishment of a controlled Performance Measurement Baseline (PMB) against which cost, schedule, and technical performance can be integrated and assessed. However, it has only been relatively recently that the rigorous methodologies of EVM have been applied to small projects and/or to in-house Government activities. "Small" projects may be defined as those with a total dollar value of less than $5M, although this is subjective and must be put in the greater context of an individual project and its organizational environment.

A set of NASA Kennedy Space Center (KSC) projects with a dollar range from approximately a few hundred thousand to a few million dollars implemented earned value management as part of a pilot initiative. At least a portion of the work was in-house Government activity. The objectives were to uncover the strengths and weaknesses of EVM for projects of that type and size and to determine what obstacles would stand in the way of EVM implementation.. The pilot would identify solutions to these obstacles, if possible. The value of the KSC pilot was to collect data in a structured way rather than just relying on defining issues anecdotally.

If implemented correctly, an EVM system provides the tools that managers can use to monitor performance and to investigate problems before the cost or schedule penalties are too great. The EVMS when functioning properly provides management with timely, reliable data highlighting new or developing technical, cost and schedule conditions. This permits all levels of management to recognize deviations from plans early enough to be in a position to initiate cost effective corrective actions.

In order to satisfy the intent of EVM, the following minimum conditions must be met:

a. There must be a complete, well-defined, and structured scope of work; this can include research and development type of work where tasks and functions can be defined;
b. The work must be formally assigned to the responsible organization;
c. All work must have an assigned budget;
d. An integrated baseline plan (scope, schedule, and budget) must be completely developed and formally authorized;
e. Timely earned value reports which accurately reflect program progress, status, and problems must be prepared and reviewed by management;
f. Revisions to the integrated baseline must be strictly controlled and formally authorized; and,
g. The application of the EVMS must continually be reviewed to ensure that it meets appropriate standards.

For a more detailed treatment of EVM, the reader is invited to consult the following web site: http://www.acq.osd.mil/pm/ Here, the mechanics, terminology, tools, and best practices of EVM are presented. A generic EMVS is presented in Figure 1.

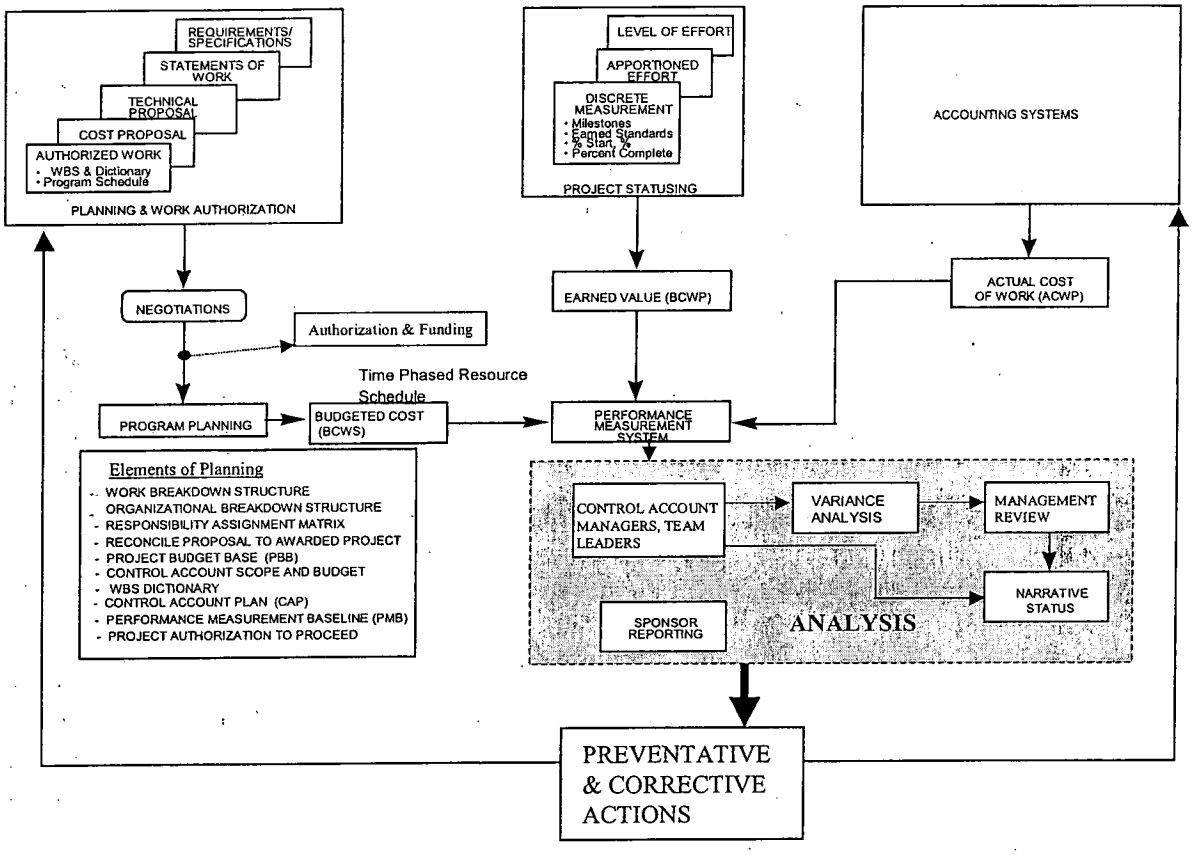

Figure 1. Generic EVMS

PREVIOUS WORK IN THIS AREA

While there has been much verbal discussion on the subject, a literature search produced little dealing explicitly with what size of projects to apply EVM. Government policy and related documents have traditionally dictated total contract value dollar thresholds for the application of EVM and state that it is optional below those thresholds. There is often no discussion as to why the thresholds are what they are versus a lower or a higher value.

Barlow and Klingelhoets, Reference 1, describe a similar EVM implementation to KSC's that took place at Arnold Engineering and Development Center in the late 1990's:

> Using earned value to manage multiple small projects within the context of a contract where projects are just a part of the overall effort has been a challenge. Applying earned value appropriately was the key. The systems in place really were not designed with project management or earned value in mind. Most information and experience with earned value has centered around a single large program with systems and organizations in place explicitly to support project management and earned value. In spite of the

struggle, it has been discovered that earned value can be effectively applied in this manner.

In other words, they found that implementing EVM on smaller projects was a challenge but could be effective. Further, they found that a lack of applicable systems being in place was an obstacle.

Milani and Petro, Reference 2, describe their corporation's rationale for the level of EVM implementation for different programs. Their "Four-Tier" approach is based on the following considerations:

1. Requirements of the contract,
2. Risk of the program,
3. Type of contract incentives,
4. Degree of development and production involved in the program,
5. The program's visibility, and
6. The customer's reporting requirements.

Level 1 is the most stringent EVM implementation with decreasing rigor to Level 4, which "satisfies the ardent minimalist because it provides the benefits of earned value measurement with the least administrative cost."

Christensen, Reference 3, talks about the costs and benefits of an EVM process. While there is no direct treatment of project size, he does state that "ultimately, the decision of whether the marginal benefits of EVMS exceed the marginal cost is subjective." The size of the effort will affect the benefits in relation to the costs and hence will influence the cutoff for EVM implementation. Baker, et al, Reference 4 as well as Mukho and Lisanti, Reference 5, provide further insight into EVM application to smaller projects.

ENVIRONMENT

To understand the conduct and the outcome of the pilot, it is necessary to explain the backdrop against which the projects were implementing EVM. Features of KSC's management environment and supporting infrastructure were in place during the pilot which greatly affected the structure and content of the EVM implementation. It is likely that the degree to which these features are applicable and how much or how little they will affect EVM will vary from organization to organization. Two broad areas for KSC are 1) historical influence and organizational culture and 2) accounting and financial system features, although for KSC the details of each are related and thus will be presented together.

The Kennedy Space Center is known worldwide for launching rockets of all types and sizes, from the massive Apollo Saturn to the reusable space shuttle and a variety of expendable launch vehicles. This is the place where man stepped off to go the Moon, where men and women go to work on the Space Station and in the not too distance future, where we will hopefully go back to the Moon and someday to Mars and beyond. KSC is truly the place where the nation's space vision is launched.

One can say that the KSC environment is "performance driven" mostly in the areas of technical and schedule performance. While the past achievements are something for

which the NASA family can be proud, these successes and the operational environment that spawned them cast in place a mindset that ran counter to the pilot's objectives. Change is often difficult in any organization, but to introduce EVM into the technical/schedule performance culture that reigned at KSC for decades was an extraordinary challenge, especially coupled with the non-full-cost environment described below.

As part of the history, many employees were used to the days of massive programs and large budgets where performance was all-important. However, those days are gone at NASA as well as at all other government agencies. NASA is having to do more with less. NASA as well as the rest of the federal government is answering the mandate described in President Bush's Management Agenda for "Improve Financial Performance" and "Budget and Performance Integration". In order to cope with these demands, NASA is implementing several intitiatives. Since the late nineties and into the new century, NASA has been moving to a new centralized accounting and financial system. Changes to the financial system were being rolled out during the EVM pilot. Also, the Agency has been moving into "full cost accounting" for all aspects of NASA. That is, all elements of cost will be allocated to a project rather than handling them separately. As an example, in the past procurement funding was associated to a project, whereas civil service direct labor funding was provided by another source. Under full cost, all direct cost elements will be planned and paid for by a project.

The use of EVM was relatively new to NASA managers and project managers especially as a tool for "in-house" projects. So, it is against a back drop of "change," not only in the philosophical but as well as in the mechanics, administration, and in the implementation of many items, that this pilot took place. It is critical to maintain that perspective.

CONDUCTING THE EVM PILOT

THE PILOT PLANNING STAGE

Prior to executing the EVM pilot, an executive committee was formed in early calendar year 2002. After defining the objectives, a next step was to identify the projects that would participate. The rationale was to pick projects that could flush issues but also that would benefit from implementing EVM. Other criteria for that selection were as follows:

- total project dollar value
- length of time remaining in the project
- customer(s) of the project and external reporting requirements
- type of project (hardware development, software development, laboratory experiment, etc.); the intent was to have a mix of different project types within the pilot
- external partners, interfaces, commitments
- experience of the project manager
- project criticality.

Also, new projects were sought so that EVM could be applied at the beginning of a project, but no new project fit the criteria. Eight projects, ranging in size from tens or hundreds of thousands of dollars to a few million dollars, were chosen that were well into their implementation:

- Advanced Data Acquisition System (ADAS)
- Densified Propellants
- Space-based Telemetry and Range System (STARS)
- Advanced Technology Development Center (ATDC)
- Advanced Checkout, Control, and Monitoring System (ACCMS)
- Liquid Oxygen (LOX) Pump Certification
- Water Offset Nutrient Delivery Experimental Research (WONDER)
- Advanced Umbilicals Developoment.

The titles for the ADAS, STARS, ACCMS, and LOX pump certification projects are self-explanatory in defining the nature of the work. Densified propellant technologies are used to store cryogenic propellant material for launch vehicles in a smaller area than would be required otherwise. Safety of cryogenic fluid handling/operations can also be improved with these technologies. The ATDC project was to design and construct a facility to simulate launch operations for the introduction and testing of new technologies and processes for launch. WONDER was a biological experiment that was to have flown into space. The Advanced Umbilicals Development project was to develop technologies for improved launch vehicle umbilical connections, the hoses, pipes, etc. that bring electrical power, fluids, and other items from the outside into the launch vehicle. The affected project managers were informed of the decision and were told to prepare for EVM.

TRAINING

The pilot kicked off in March, 2002, with one half day of training. EVM basics were provided to the project managers and selected project personnel. The initial process for baselining the projects was presented. Splinter groups were formed immediately following the training for one half day to provide more individual help to each project. Three mentors were identified and stayed involved throughout the pilot to provide guidance, continued training, and consultation to the project managers.

While the half day of training was beneficial, it only allowed time for a quick overview of EVM theory and implementation. There was no time during the training session to allow the participants to practice via exercises or other means the theory and processes that were being presented. In hindsight, hands-on practice/examples/exercises would have been beneficial. Expanded training and practice would likely have eased the baselining, data collection, and analysis processes. By coincidence, KSC did provide a separate three-day course via an outside vendor at about the same time. While only a fraction of the pilot participants attended that course, the material and the dissemination of that training proved useful.

PROJECT SPECIFIC PLANNING/BASELINING

The project baselining process went more slowly than first envisioned for several reasons:

- EVM was new to many of the project managers, and because of perceptions there were varying degrees of cultural resistance.
- A portion of the work of at least one project was being conducted at other NASA Centers, and a great deal of coordination was required.

- Because the project teams had just been trained, most were not proficient with the details of developing a PMB.
- NASA had not yet implemented full cost. There was no automated way to integrate all aspects of the resource-loaded schedules and all the costs, both civil servant and contractor, for planning nor for statusing (collection of actual costs).
- Leadership and management emphasis were both not robust at the beginning of the pilot to provide the accountability for timely baselining. This management commitment was not enforced for several months.

Despite the delays, after several iterations work breakdown structures were turned into resource-loaded schedules. Work packages were defined, and EVM methodologies were chosen to provide as objective a statusing process as possible. To keep things as simple as possible for those new to EVM on these small projects, guidance was provided that work packages and/or milestones should coincide with monthly planning/accounting/reporting periods as much as made sense. WBS Chart Pro from Critical Tools, Inc., was used to automate the process of developing a WBS and a related schedule in Microsoft Project.

Because the financial and scheduling systems were not set up for EVM and because full cost accounting was not yet completely in practice, a composite labor rate was used to plan the direct in-house labor hour effort for each project. This affected data collection and analysis as described below. Some projects had a relatively significant amount of in-house labor for which detailed planning could be accomplished and for which critical project milestones and deliverables could be defined. On the other hand, some projects had only a small amount of in-house labor effort. Usually, this consisted of the civil servant effort to manage a contractor's efforts. In these cases, the majority if not all of the in-house labor effort was planned and statused as level of effort.

For prime contractor effort (versus support contractor effort included in the in-house labor) on some of the projects , the prime contractor developed the baseline for their portion of the effort. In one case, the contractor held a classical Integrated Baseline Review (IBR). Smaller direct material procurements were handled within control accounts on the project-level PMB.

With the projects baselined, the executive committee and higher-level organizational management conducted tailored IBRs. Using a standard presentation template as a guide, the projects presented their WBS, resource-loaded schedules, budgets, work package EVM methodologies, and risks. The projects were ready to collect data.

USING EVM

Data Collection: For the prime contractor effort, as opposed to support contractor effort included with the in-house EVM data, a portion of the contractors supplied a cost performance report (CPR). This obviously made this portion of the data collection effort easier. Other procurements were handled as a pseudo-subcontractor arrangement for direct material with the Government in essence acting in the prime contractor role. Estimated actuals were used to mitigate the billing and other lags associated with the financial system.

The collection of in-house labor (civil servant and support contractor) actual cost proved a much greater challenge. Since the scheduling, financial, and timekeeping systems were not designed to support EVM, the project managers were forced to collect actual data manually for much of the the in-house portions of the projects. Further, a composite labor rate was used. This meant that a labor hours variance could be determined, but a true cost variance was not possible, nor obviously was the determination of usage versus rate variances.

Aids were tested, and the the project managers often used a Microsoft Excel spreadsheet to collect hours per control account per pay period. Some project managers had project personnel submit hours directly onto this form, while some project managers accepted other input such as electronic mail or verbal transmittal and transcribed the data to the form. The manual in-house labor hour data collection often required the project manager to "bug" the project team to supply their data. The teams and the project managers complained that the system required inputting the same set of labor hour information twice – once to the official time and attendance system that let them get paid and once through the EVM data collection process. The project manager after gathering the actual costs would then pass these costs manually to a central collection point who then collated the data with the baseline budget information. Technical progress data (BCWP) was supplied by the project managers to the central data collection point, too.

Analysis: With the data in the system, the project managers performed analysis of their projects. Variances were examined and explained, and trends were analyzed. The mentors worked with the project managers to highlight watch items for data validity, critical cost and/or schedule performance trends, risk, etc. Corrective actions plans were created if necessary. As an example, project managers used schedule performance information (SPI & SV) to adjust where resources would be applied in the near-term and when it was necessary to ask for schedule extensions. Cost performance trend information was used in some cases to reduce scope, where that was warranted and possible. Through training and practice, on those projects in which a contractor supplied a cost performance report the project managers were also able to have the contractors implement corrective actions in order to provide more accurate cost and schedule performance data. For instance, at the outset there were inconsistencies on the contractor cost performance reports such as negative BCWP; credit taken for unopened work packages with no associated cost; unsupportable estimates at completion; and inadequate variance analyses that did not include a treatise of cause, impact, and corrective actions in all cases. Working with the project managers, the contractors corrected these inconsistencies.

Baseline Maintenance and Control: The mentors worked with the project teams to ensure that standard practices for baseline maintenance and control were followed. This would allow the PMB to remain valid and to reflect true performance. This, too, proved a challenge, since the project managers' experience base did not include following these standard practices but rather was in line with monitoring technical performance separate from the spending plan. As the project teams became more familiar with EVM, the concepts of baseline maintenance and control, such as moving budget with scope and controlling the use of management reserve, became clearer. Each project maintained a baseline change log.

Status Presentations: Monthly status to management by each project refined the data collection and analysis processes and ensured that the pilot was staying on track. Process and trend issues

were discussed, and corrective recommendations were put forth. A monthly presentation template is contained in Appendix A. This template is based on the recommendations for what the project managers and their management thought useful.

Corrective Actions: As described above, the projects implemented corrective actions as applicable partially based on the EVM data.

PILOT CLOSURE

After some months of refinements to the process, the required data was in hand. One refinement was to use AMS Real-Time software, which was used to store the baselines (BCWS) and eventually to store data on progress (BCWP) and actual costs (ACWP), although there was still manual submittal of this data to the central collection point. AMS and/or Microsoft Excel were used to generate charts and other information for analysis and reporting. The objectives being met, the pilot was thus concluded in calendar year 2003. Observations and recommendations were summarized and documented.

As part of the feedback process at the time the pilot ended, project managers said that their skills were enhanced by going through the process. It provided them with a new technique with which to manager cost, schedule, and technical performance. There was also a general consensus that it would have been better to baseline the projects from the start rather than after the project was into its implementation.

NEXT STEPS

NASA is setting the stage to return to the Moon and to press to the Martian landscape in an era when unlimited funds will not be the norm. The KSC EVM pilot highlighted project management issues that will affect NASA's ability to bring this commitment of renewed exploration to fruition and that are common to most if not all NASA Centers. The Marshall Space Flight Center and the Langley Research Center, for example, have specifically uncovered similar issues. The NASA EVM Focal Point Council (FPC) is championing initiatives that are in various stages of planning and implementation to address these issues. The FPC has formed several teams to address the specific issues of in-house earned value management, EVM training, EVM policy and guidance development, scheduling best practices, and other areas. In order to meet its commitments, NASA is embracing EVM, and the FPC is at the forefront of the charge. The FPC is starting a pilot across the Agency to identify to what depth the issues with the financial system are pervasive and what it will take to correct them. EVM policy and guidance are being revamped, and an in-house EVM policy is forthcoming. Tools are being investigated for Agency-wide analysis and standardization of output where appropriate.

LESSONS LEARNED

The pilot program demonstrated the difficulty in introducing a new method in an environment that is very dynamic. There are many lessons learned that the authors note in order to help future endeavors.

Training:

Although training was given to all project teams, perhaps the time needed and number of examples presented were not sufficient to explain all facets of the subject matter. While the training did provide a background it did not immerse the project managers and their support staffs, many of whom were novices at EVM. The basic terminology and the meanings/nuances of the basic and derived data elements (BCWS, BCWP, ACWP, CPI, SPI, TCPI, EAC, etc.) were new to some of the project personnel. Further, training on performance measurement baseline management and control needed greater emphasis, as did analysis techniques. Rigorous performance measurement baseline (as opposed to funding baseline) control with all associated elements of budget and work scope was a new concpet. Holding the project managers accountable for all aspects of the the in-house portions of the projects was something new.

Perhaps the time for EVM training should be lengthened to at least two and preferably three days from half a day, thus allowing more time for explanation of the concepts and for the students to work sample problems, etc. Given the current state of the practice and the resources available, a two- to three-day introductory course is warranted. The subject material must cover work breakdown structures, EVM basic terminology with meanings and examples, schedule netowrk logic/critical path development, data integrity, baseline maintenance, and introduction to analysis. A shorter course will not let the instructors do the material justice, whilst a longer course may not be warranted given the time constraints on any project manager. Also, allowing the students to digest the material overnight and then return to a dedicated training environment may help to reinforce the subject matter. The curriculum used needs to be clear and organized in a way that is attractive to project managers and shows them the benefits to their work. One critical item that must be reinforced is the fact that the amount of time spent each month collecting and analyzing data is not as much as the amount of time required to set up the baseline initially. This change management reminder may help to mitigate the project's perception of the extra work involved in using EVM.

Data Acquisition/Tools:

This probably proved to be one of the biggest obstacles to overcome. Since the NASA financial system was and is undergoing a major change, a lot of data were very difficult to obtain in a format that would support EVM. Project managers spent a lot of time looking for data, collecting data, and trying to reconcile data. There was much manual as opposed to automated effort.

This portion of the pilot was totally underestimated in terms of difficulty, time spent, and level of frustration, which probably did not aid in project manager acceptance of the EVM process. On the bright side, it clearly identified opportunities for improvement in how data is collected so that it can not only support financial requirements but also project management requirements and above all support the project manager so that he/she can have a good tool to manage the project.

The bottom line on data, especially the collection of actual costs, is to make sure the organization's financial system supports the kind of data that is needed to fully

implement EVM without incurring a high cost in time, effort, or budget to the project. As a minimum, the accounting system must be able to meet the applicable considerations outlined in Reference 7. The financial system and those using it must be able to provide cost data by element of cost allocated to the project's control account level. These control accounts will be based on the project's work breakdown structure, so in addition to other project management requirements the financial system (hardware, software, and processes) must be able to support the right number and fidelity of charge codes per project. While this seems intuitive, the specific requirements for the financial system as well as the mechanics of implementing a financial system that meets these requirements must be defined prior to designing and "going live" with the system. Somewhat famous – or infamous – recent reports have criticized NASA for not doing this initially for the project management community.

Another significant finding was the lack of available off-the-shelf software tools to facilitate conversion of data into an EVM format, although some software does exist. For the most part, the gaps are not in analysis software, and it is even possible to "program" an analysis tool using Microsoft Excel. Rather, the gaps are in the software to generate the data for analysis. In a large part, this is related to the data gathering issue for the finanical system.

While scheduling, baseline establishment and maintenance, accounting, and other tools do exist, many seem more suited for large complex projects. COTS EVM engine software is extremely capable, but along with that capability comes an overhead that is not worth the expenditure to a small project. At least in the KSC pilot, project managers expressed the need for a "magic bullet" software solution that would not tax the project manager. Our experience showed that the level of frustration with the implementation was related to the amount of manual data input that was necessary or required. For this pilot, we resisted the creation of "in-house" software to automate the process other than for minor job aids. We did not successfully recreate a large-scale enterprise solution. If that solution had been in place, perhaps these smaller projects would have been able to piggyback off it. This is the case at many contractor facilities where large contracts drive the system requirements and have warranted the expenditure of funds to implement the systems. Smaller contracts are able to use and derive the benefits of those systems without the penalty of paying for them. In the absence of such a large-scale solution at a given site, the requirements for smaller projects might be an enterprise solution on a smaller scale that integrates the necessary elements less expensively.

Environment:

As stated previously, the NASA environment at the time of the pilot was ever changing; not only was the financial system being overhauled, but also the Agency was moving to "full cost accounting" as well as other significant changes in the way project management was executed. In retrospect, maybe the pilot was asking too much too fast from the project management population. They had to remain focused on delivering the products while working under an ever changing system. Even though the task of the pilot proved to be daunting, the proejct teams gave it their best shot to support the pilot program and

to provide invaluable data as to its merits and areas that required improvement. In summary, change management, mentoring, and feedback/two-way communications – along with training – are key elements of the eventual success of the EVM implementation.

Another aspect of the environment was that most of the projects chosen for the pilot were already well into their implementation phase. That is, they were already well underway. Therefore, the project teams had to fit already existing structures, tools, reporting mechanisms, etc. into a new mold. It would have been easier, and probably more effective for project management in general, if EVM had been introduced to projects that had not yet started but were about to start. This would have enabled a "clean sheet of paper" approach. Certainly, development of the WBS elements and schedules would have been more in line with standard, accepted EVM practices.

EVM to Aggregate Projects:

As one of the questions the pilot was investigating went directly to project size, it is significant to note that the ADAS project was one of several smaller projects all run out of one laboratory. Resources were and continue to be shared amongst all these projects as they start and finish. Although not explicitly tested as part of this pilot, it was thought to make more sense to implement EVM at the laboratory level, which is where these projects are really managed. The individual projects are then each control accounts under the umbrella laboratory project. The lesson in general for project size might be to aggregate certain projects under one umbrella depending on the size of the projects, how the projects are managed, and other related factors. If there is a natural tie to how the projects in total are managed, then the EVM implementation ought to be scoped that way.

CONCLUSIONS

The Earn Value Management Pilot provided a tremendous amount of data on the strengths and weaknesses of the new financial system, the ability to support EVM from many viewpoints, the lack of tools for small to medium projects implementing EVM, and the training and environment necessary to successfully deploy EVM to all projects. This data along with other pilots will prove invaluable.

Deploying EVM should not be taken lightly – a full assessment of capabilities and supporting infrastructure should be done prior to any deployment, and some very basic questions should be asked. For instance, will sufficient training be provided? Can the project managers readily and easily obtain all the necessary data? If EVM is to thrive in all projects regardless of cost, the transition should be as seamless as possible, minimizing cost and effort, and with the end user in mind. In setting up an EVM impelementation, the question, "How does the project manager benefit from this process?" must remain at the forefront. Further research in this area is needed to answer the question,"Is EVM cost effective in small projects?" The authors welcome knowledge sharing with other organizations that are striving to gain the benefits of EVM on small projects.

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5. Mukho, S., & Lisanti, J., "Application of Earned Vlaue for Small Project Control: Panacea or Bane," Ebasco Services, Inc.

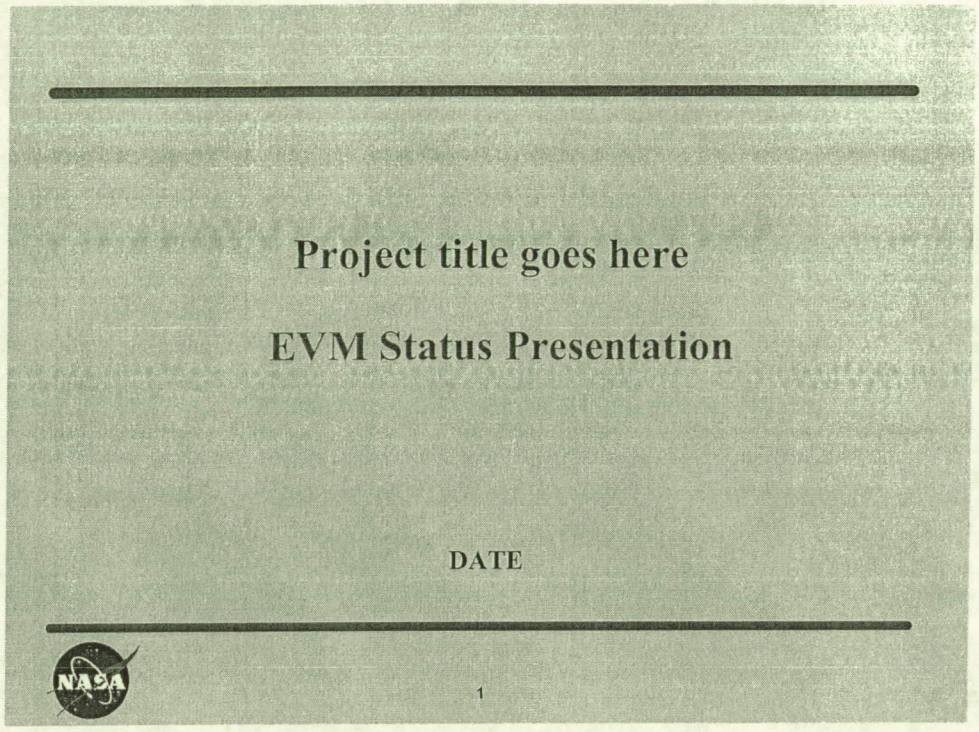
6. Internal KSC presentation, "YA EVM Implementation Status Presented by: YA EVM Steering Committee to YA Senior Management," October 23, 2003.*

7. EIA Standard, EIA-748-A, "Earned Value Management Systems", June 1998.

* YA is the organizational code for the directorate that was responsible for the projects in the EVM pilot.

APPENDIX A: MONTHLY EVM REPORTING TEMPLATE

CLICK ON THIS CHART TO LOOK AT THE ENTIRE SET OF CHARTS. PLEASE NOTE THAT THIS IS SAMPLE DATA.



Project title goes here

EVM Status Presentation

DATE

Presentation Outline

- Project Scope
- Summary of Key Schedule Milestones
- Project Accomplishments and Plans
- EVM - The Project Work Breakdown Structure (WBS)
- EVM – Monthly Performance Report (MPR) form
- EVM - Graphs of monthly and cumulative BCWS and BCWP
- EVM - Graphs of monthly and cumulative CPI and SPI
- Pilot Lessons Learned To Date

Project Scope

keep this brief and limit it to one page

- Scope (distinguish between work performed by civil service, support contractor, and contractor)
- Deliverable(s)
- identify customer
- Funding (fund source(s), amounts (civil service, support contractor, contractor), FY, etc)
- FTEs (civil service, support contractor (EDC), contractor)

Summary of Key Schedule Milestones

Milestone	Date
GSE Installation at SLC-20 Start	7/15/02
Phase 1 Construction Final Inspection	8/14/02
KS	10/01/02
Ex	10/15/02
Ba	10/24/02
KSC/45SW MOA Revision Signed	12/01/02
45SW/FLANG/SMC MOA Signed	12/01/02
Phase 1 GSE Critical Design Review	12/02/02
System Assurance Analysis Complete	12/06/02
GSE Installation at SLC-20 Complete	2/07/03
Activation & Validation Testing Complete	4/23/03
Phase 1 DCR & Turnover to LOX Pump Project	4/30/03

ENTER KEY MILESTONES FOR YOUR PROJECT

Accomplishments and Plans

Accomplishments

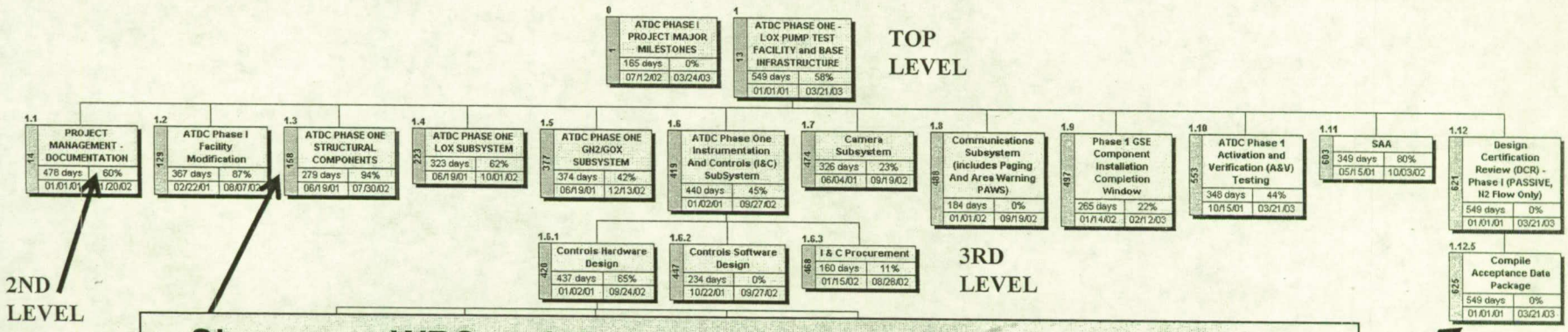
Plans

EVM – Project Work Breakdown Structure

WBS Element Number

Costs Collected at 3rd Level and Summarized at 2nd Level

Excerpts from "WBS Chart Pro" 'Critical Path 2' View of ATDC Phase 1 Schedule



Show your WBS and the level where actual labor costs (ACWP) are being collected

Line
ATL

would fit on the chart)

WBS
ed with a
RED Border

EVM – Schedule & Resource Loading

WBS Tie-in for Every Task

Critical Path Variance for Every Task

Complete Schedule is 636 Tasks

Resources Identified for Tasks

ID	WBS	CP Var.	Task Name	Dur	% Comp.	Start	Finish	Resource
346	1.4.5	57 d	**LOX Dewars - Inspection/Reconditioning/Recertific**	**122 d**	**23%**	**Fri 03/01/02**	**Wed 08/21/02**	
347	1.4.5.1	71 d	**Graver Dewar**	**108 d**	**38%**	**Fri 03/01/02**	**Thu 08/01/02**	
348	1.4.5.1.1	0 d	Vacuum system troubleshooting	40 d	100%	Fri 03/01/02	Thu 04/25/02	
349	1.4.5.1.2	55.8 d	**Vacuum system permanent repairs**	**36 d**	**0%**	**Fri 04/26/02**	**Fri 06/14/02**	
350	1.4.5.1.2.1	55.8 d	Graver Dewar - Procure replacement parts	25 d	0%	Fri 04/26/02	Thu 05/30/02	Wellington
351	1.4.5.1.2.2	55.8 d	Graver Dewar - Replace burst disc with lift	5 d	0%	Fri 05/31/02	Thu 06/06/02	Stroda
352	1.4.5.1.2.3	55.8 d	Graver Dewar - Install vacuum valve on eva	1 d	0%	Fri 06/07/02	Fri 06/07/02	Stroda
353	1.4.5.1.2.4					Mon 06/10/02	Wed 06/12/02	McAmis
354	1.4.5.1.2.5					Thu 06/13/02	Fri 06/14/02	Schieben[25%]
355	1.4.5.1.3					**Mon 05/20/02**	**Thu 06/20/02**	
356	1.4.5.1.3.1					Mon 05/20/02	Mon 05/20/02	Stroda
357	1.4.5.1.3.2					Mon 06/17/02	Tue 06/18/02	Stroda
358	1.4.5.1.3.3	71 d	Drill anchor bolt holes	d	0%	Wed 06/19/02	Wed 06/19/02	Schieben[25%]
359	1.4.5.1.3.4	71 d	Touch up paint on tank	1 d	0%	Thu 06/20/02	Thu 06/20/02	SGS Paint Shop
360	1.4.5.1.4	71 d	**Tank Recertification T**	**28 d**	**0%**	**Fri 06/21/02**	**Thu 08/01/02**	
361	1.4.5.1.4.1	71 d	Inspections	5 d	0%	Fri 06/21/02	Thu 06/27/02	Schieben[25%]
362	1.4.5.1.4.2	71 d	Vacuum decay	10 d	0%	Fri 06/28/02	Mon 07/15/02	Schieben[25%]
363	1.4.5.1.4.3	71 d	Cold shock	3 d	0%	Tue 07/16/02	Thu 07/18/02	Schieben[25%]
364	1.4.5.1.4.4	71 d	Pneumostatic proof test	2 d	0%	Fri 07/19/02	Mon 07/22/02	Schieben[25%]
365	1.4.5.1.4.5	71 d	Leak test (GN2/Ghe mixture)	3 d	0%	Tue 07/23/02	Thu 07/25/02	Schieben[25%]
366	1.4.5.1.4.1	71 d	Inner Vessel Cleaning	5 d	0%	Fri 07/26/02	Thu 08/01/02	Wiltech
367	1.4.5.2	57 d	**Southwest Dewar**	**74 d**	**0%**	**Wed 05/08/02**	**Wed 08/21/02**	
368	1.4.5.2.1	57 d	Southwest Dewar - Vacuum decay test	15 d	0%	Wed 05/08/02	Tue 05/28/02	Schieben[25%]
369	1.4.5.2.2	57 d	Southwest Dewar - Vacuum system permanent re	15 d	0%	Wed 06/05/02	Tue 06/25/02	Schieben[25%]
370	1.4.5.2.3	57 d	Procure replacement parts	20 d	0%	Wed 06/26/02	Thu 07/25/02	Wellington
371	1.4.5.2.4	57 d	Southwest Dewar - Replace check valve with lift	5 d	0%	Fri 07/26/02	Thu 08/01/02	Stroda
372	1.4.5.2.5	57 d	Install vacuum valve on evacuation line	1 d	0%	Fri 08/02/02	Fri 08/02/02	McAmis
373	1.4.5.2.6	57 d	Rrefurbish (3 each) perlite fill ports	3 d	0%	Mon 08/05/02	Wed 08/07/02	McAmis
374	1.4.5.2.7	57 d	Replenish perlite	2 d	0%	Thu 08/08/02	Fri 08/09/02	Schieben[25%]
375	1.4.5.2.8	57 d	Leak test (GN2/Ghe mixture)	3 d	0%	Mon 08/12/02	Wed 08/14/02	Schieben[25%]
376	1.4.5.2.9	57 d	Inner Vessel Cleaning	5 d	0%	Thu 08/15/02	Wed 08/21/02	Wiltech

Show one of the pages from your schedule with the resources identified

EXAMPLE

EVM – Reporting Templates

MONTHLY PERFORMANCE REPORT — July 2002

PROJECT NAME: ATDC PHASE ONE

REPORT PERIOD: June 27, 2002 thru July 29, 2002

ORIGINAL CONTRACT TARGET COST
NEGOTIATED CONTRACT CHANGES
CURRENT TARGET COST
ESTIMATED COST OF AUTHORIZED UNPRICED CONTRACT BUDGET BASELINE
PM EAC
VAC
PM NAME: Randy Eastman
Dollars = 1

WORK BREAKDOWN STRUCTURE (WBS) ELEMENT	CUMULATIVE TO DATE: BUDGET BCWS	EARNED VALUE BCWP	ACTUAL COSTS ACWP	SCHEDULE VARIANCE SV	COST VARIANCE CV	AT COMPLETION: BUDGET BAC	LATEST ESTIMATE LRE	VARIANCE AT COMPLETE VAC
1.1 PROJECT MANAGEMENT	2,769,000	1,758,094	1,950,997	-1,010,906	-192,903	3,446,800	3,446,800	0
Civil Service			19,175					
EVM Effort			30					
Support Contractor			24,882					
EVM Effort			117					
Material			115,443					
1.2 ATDC PHASE I FACILITY MODIFICATION	318,200	335,800	319,700	17,600				
Civil Service			1,500					
Support Contractor			0					
1.3 ATDC PHASE 1 STRUCTURAL COMPS	226,960	219,760	382,461	-7,200	-1			
Civil Service								
Support Contra								
Material								
1.4 ATDC PHASE 1 LOX SUBSYSTEM								
Civil Service								
Support Contra								
Material								
1.5 ATDC PHASE 1 GN2/GOX SUBSYS								
Civil Service								
Support Contra								
Material								
1.6 ATDC PHASE 1 INST & CONT (I&C) SUBSYS	290,912	177,000	233,535	-121,652				
Civil Service			19,050					
Support Contractor			37,825					
Material			0					

Show your project's latest Monthly Performance Report (MPR)

Most projects will have only one sheet to show

MONTHLY PERFORMANCE REPORT — July 2002

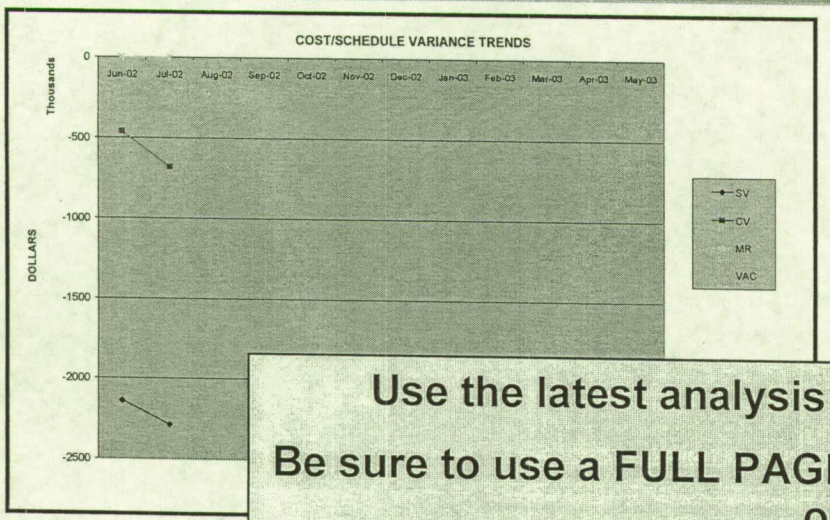
PROJECT NAME: ATDC PHASE ONE (page 2)

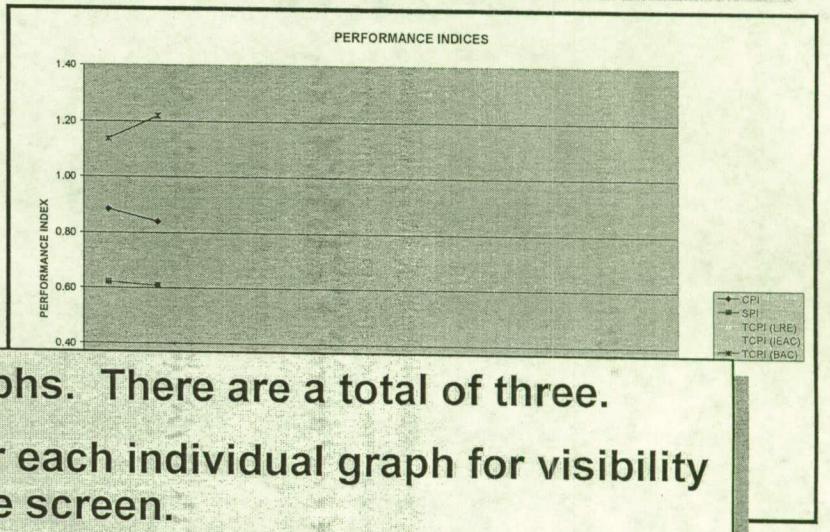
REPORT PERIOD: June 27, 2002 thru July 29, 2002

ORIGINAL CONTRACT TARGET COST
ESTIMATED COST OF AUTHORIZED UNPRICED CONTRACT BUDGET
VAC

1.9 PHASE 1 GSE COMP INST COMPLETE	434720	109472	110172	-325248	-700	659120	659120	0
Civil Service			700					
Support Contractor			0					
1.10 ATDC PHASE 1 ACTIV and VERIF TEST	160720	109200	111600	-51520	-2400	212240	212240	0
Civil Service			2400					
Support Contractor			0					
1.11 SAA	378040	175403	175803	-202637	-400	418040	418040	0
Civil Service			400					
Support Contractor			0					
1.12 DESIGN CERT REV - PHASE I (N2 FLOW)	0	0	50	0	-50	4000	4000	0
Civil Service			50					
Support Contractor			0					
COST OF MONEY (non add)								
G & A (non add)								
UNDISTRIBUTED BUDGET								0
PM BASELINE	5849072	3562322	4243710	-2286750	-681388	7353224	7353224	0
MANAGEMENT RESERVE								0
TOTAL	5849072	3562322	4243710	-2286750	-681388	7353224	7353224	0

EVM – Graphical Representation



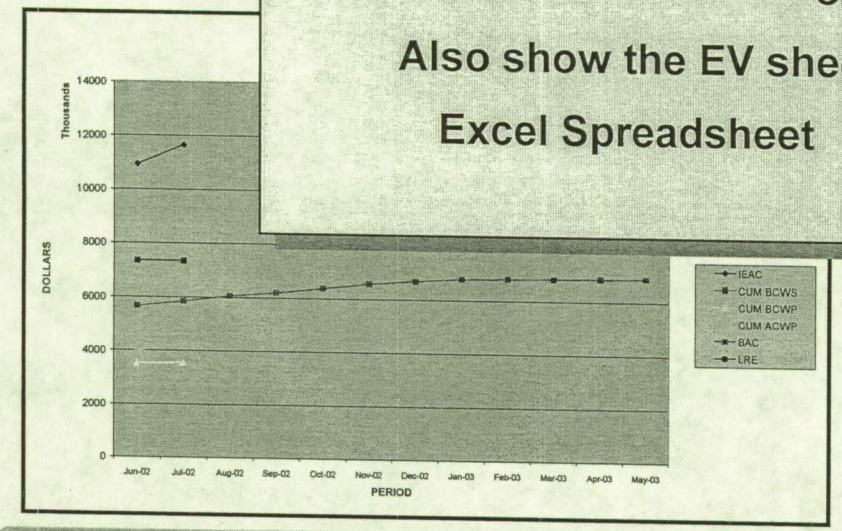


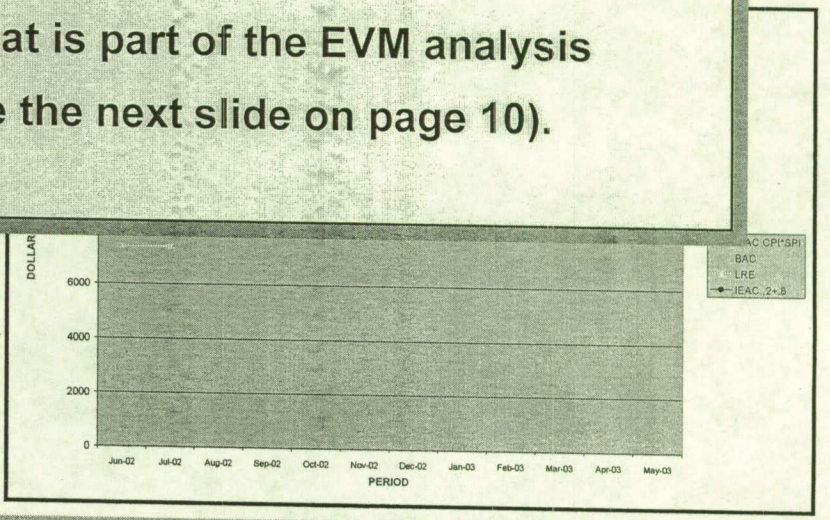
Use the latest analysis graphs. There are a total of three.

Be sure to use a FULL PAGE for each individual graph for visibility on the screen.

Also show the EV sheet that is part of the EVM analysis

Excel Spreadsheet (see the next slide on page 10).





EVM – Graphical Representation

EV SUMMARY DATA (in thousands)

ACCMS EFFORT

C/ SSR No	DATE	Cum BCWS	Cum BCWP	Cum ACWP	Cum SV	Cum CV	Monthly SV	Monthly CV	BAC	CPI LRE	VAC
1	Apr-02	171	172	152	1	20	1	20	2792	2468	324
2	May-02	371	387	393	16	-6	14	-26	2792	2836	-44
3	Jun-02	576	593	580	18	13	2	19	2789	2728	61
4	Jul-02	786	787	779	0	7	-17	-6	2789	2763	26
5	Aug-02								2789		
6	Sep-02								2789		
7	Oct-02								2789		
8	Nov-02								2789		
9	Dec-02								2789		
10	Jan-03								2789		
11	Feb-03								2789		
12	Mar-03								2789		
13	Apr-03								2789		
14	May-03								2789		
15	Jun-03								2789		

		MR	LREMR	MRVAR	%SV	%CV	Monthly CPI	Monthly SPI	Cum CPI	Cum SPI	
1	Apr-02	0	0	0	1%	12%	1.13	1.01	1.13	1.01	
2	May-02	0	0	0	4%	-2%	0.89	1.07	0.98	1.04	
3	Jun-02	0	0	0	3%	2%	1.10	1.01	1.02	1.03	
4	Jul-02	0	0	0	0%	1%	0.97	0.92	1.01	1.00	
5	Aug-02										
6	Sep-02										
7	Oct-02										
8	Nov-02										
9	Dec-02										
10	Jan-03										
11	Feb-03										
12	Mar-03										
13	Apr-03										
14	May-03										
15	Jun-03										

		%COMP	%SPENT	IEAC CPI*SPI	EAC .2 .8	TCPI (BAC)	TCPI (LRE)	TCPI (IEAC)			
1	Apr-02	6%	5%	2453	2520	99%	113%	114%			
2	May-02	14%	14%	2737	2807	100%	98%	103%			
3	Jun-02	21%	21%	2665	2725	99%	102%	105%			
4	Jul-02	28%	28%	2763	2767	100%	101%	101%			
5	Aug-02										
6	Sep-02										
7	Oct-02										
8	Nov-02										
9	Dec-02										
10	Jan-03										
11	Feb-03										
12	Mar-03										
13	Apr-03										
14	May-03										
15	Jun-03										

Pilot Lessons Learned To Date

- ATDC participating in EVM "Pilot" Program
  - Learning EVM techniques
  - Gaining experience
  - Will fully implement EVM into Phase 2
- C

Use your own words to explain what you have learned from this pilot project

  - Many assumptions (labor rates, civil service, etc.)
- ATDC project seems to be the right size/scope/complexity to benefit from EVM
- Recommendations

RESULTS OF A NASA KENNEDY SPACE CENTER EARNED VALUE MANAGEMENT PILOT PROJECT

The International Society of Parametric Analysts Conference 2004
Frascati, Italy
10-12 May 2004

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INTRODUCTION

BACKGROUND

Earned value management (EVM) is a technique used throughout the aerospace industry. An EVM system requires the establishment of a controlled Performance Measurement Baseline (PMB) against which cost, schedule, and technical performance can be integrated and assessed. However, it has only been relatively recently that the rigorous methodologies of EVM have been applied to small projects and/or to in-house Government activities. "Small" projects may be defined as those with a total dollar value of less than $5M, although this is subjective and must be put in the greater context of an individual project and its organizational environment.

A set of NASA Kennedy Space Center (KSC) projects with a dollar range from approximately a few hundred thousand to a few million dollars implemented earned value management as part of a pilot initiative. At least a portion of the work was in-house Government activity. The objectives were to uncover the strengths and weaknesses of EVM for projects of that type and size and to determine what obstacles would stand in the way of EVM implementation.. The pilot would identify solutions to these obstacles, if possible. The value of the KSC pilot was to collect data in a structured way rather than just relying on defining issues anecdotally.

PREVIOUS WORK IN THIS AREA

While there has been much verbal discussion on the subject, a literature search produced little dealing explicitly with what size of projects to apply EVM. Government policy and related documents have traditionally dictated total contract value dollar thresholds for the application of EVM and state that it is optional below those thresholds. There is often no discussion as to why the thresholds are what they are versus a lower or a higher number.

Barlow and Klingelhoets, Reference 1, describe a similar EVM implementation to KSC's that took place at Arnold Engineering and Development Center in the late 1990's:

> Using earned value to manage multiple small projects within the context of a contract where projects are just a part of the overall effort has been a challenge. Applying earned value appropriately was the key. The systems in place really were not designed with project management or earned value in mind. Most information and experience with earned value has centered around a single large program with systems and organizations in place explicitly to support project management and earned value. In spite of the struggle, it has been discovered that earned value can be effectively applied in this manner.

In other words, they found that implementing EVM on smaller projects was a challenge but could be effective. Further, they found that a lack of applicable systems being in place was an obstacle.

Milani and Petro, Reference 2, describe their corporation's rationale for the level of EVM implementation for different programs. Their "Four-Tier" approach is based on the following considerations:

1. Requirements of the contract,
2. Risk of the program,
3. Type of contract incentives,
4. Degree of development and production involved in the program,
5. The program's visibility, and
6. The customer's reporting requirements.

Level 1 is the most stringent EVM implementation with decreasing rigor to Level 4, which "satisfies the ardent minimalist because it provides the benefits of earned value measurement with the least administrative cost."

Christensen, Reference 3, talks about the costs and benefits of an EVM process. While there is no direct treatment of project size, he does state that "ultimately, the decision of whether the marginal benefits of EVMS exceed the marginal cost is subjective." The size of the effort will affect the benefits in relation to the costs and hence will influence the cutoff for EVM implementation. Baker, et al, Reference 4 as well as Mukho and Lisanti, Reference 5, provide further insight into EVM application to smaller projects.

ENVIRONMENT

The Kennedy Space Center (KSC) is known worldwide for launching rockets of all types and sizes, from the massive Apollo Saturn to the reusable space shuttle and a variety of expendable launch vehicles. This is the place where man stepped off to go the Moon, where men and women go to work on the Space Station and in the not too distance future, where we will go back to the Moon and someday to Mars and beyond.

One can say that the KSC environment is "performance driven" mostly in the areas of technical and schedule performance. However, the days of massive programs and large budgets are gone and NASA as well as all other government agencies have had to do more with less. In order to cope with these demands, NASA is implementing several intitiatives. Since the late nineties and into the new century, NASA has been moving to a new accounting centralized system. Also, the Agency has been moving into "full cost accounting" for all aspects of NASA.

NASA as well as the federal government is answering the mandate described in President Bush's Management Agenda for "Improve Financial Performance" and "Budget and Performance Integration". The use of Earn Value Management (EVM) is relatively new to NASA managers and project managers especially as a tool for "in-house" projects. So, it is against a back drop of "change," not only in the philosophical but as well as in the mechanics, administration, and in the implementation,that this pilot took place.

CONDUCTING THE EVM PILOT

THE PILOT PLANNING STAGE

Prior to executing the EVM pilot, an executive committee was formed in early calendar year 2002. After defining the objectives, a next step was to identify the projects that would participate. The rationale was to pick projects that could flush issues but also that would benefit from implementing EVM. Other criteria for that selection were as follows:

- total project dollar value
- length of time remaining in the project
- customer(s) of the project and external reporting requirements
- type of project (hardware development, software development, laboratory experiment, etc.); the intent was to have a mix of different project types within the pilot
- external partners, interfaces, commitments
- experience of the project manager
- project criticality.

Also, new projects were sought so that EVM could be applied at the beginning of a project, but no new project fit the criteria. Eight projects were chosen that were well into their implementation. The affected project managers were informed of the decision and were told to prepare for EVM.

TRAINING

The pilot kicked off in March, 2002, with one half day of training. EVM basics were provided to the project managers and selected project personnel. The initial process for baselining the projects was presented. Splinter groups were formed to provide more individual help to each project. Three mentors were identified and stayed involved throughout the pilot to provide guidance, continued training, and consultation to the project managers.

PROJECT SPECIFIC PLANNING/BASELINING

The project baselining process went more slowly than first envisioned for several reasons:

- EVM was new to many of the project managers, and there were varying degrees of cultural resistance.
- A portion of the work of at least one project was being conducted at other NASA Centers, and a great deal of coordination was required.
- Because the project teams had just been trained, most were not proficient with the details of developing a performance measurement baseline (PMB).
- NASA had not yet implemented full cost. There was no automated way to integrate all aspects of the resource-loaded schedules and all the costs, both civil servant and contractor, for planning nor for statusing (collection of actual costs).

After several iterations, work breakdown structures were turned into resource-loaded schedules. Work packages were defined, and EVM methodologies were chosen to provide as objective a statusing process as possible. With the projects baselined, the executive committee and higher-level organizational management conducted tailored Integrated Baseline Reviews (IBR). Using

a standard presentation template as a guide, the projects presented their WBS, resource-loaded schedules, budgets, work package EVM methodologies, and risks and were ready to collect data.

USING EVM

Data Collection: Since the scheduling, financial, and timekeeping systems were not designed to support EVM, the project managers were forced to collect actual data manually for much of the the in-house (civil servant and direct support contractor) portions of the projects. Aids were developed, and the process was refined during the pilot. Noting what seemed to work the best, the final process was to gather the actual costs by the most effective means for a given project and to pass these costs to a central focal point who then collated the data with the budget and technical progress data.

Analysis: With the data in the system, the project managers performed analysis of their projects. Variances were examined and explained, and trends were analyzed. The mentors worked with the project managers to highlight watch items for data validity, critical cost and/or schedule performance trends, risk, etc. Corrective actions plans were created if necessary.

Baseline Maintenance and Control: The mentors worked with the project teams to ensure that standard practices for baseline maintenance and control were followed. This would allow the PMB to remain valid and to reflect true performance. This, too, proved a challenge, since the project managers' expereince base did not include following these standard practices but rather was in line with monitoring technical performance separate from the spending plan.

Status Presentations: Monthly status to management by each project refined the data collection and analysis processes and ensured that the pilot was staying on track. Process and trend issues were discussed, and corrective recommendations were put forth.

Corrective Actions: The projects implemented corrective actions as applicable partially based on the EVM data.

PILOT CLOSURE

After some months of refinements to the process, the required data was in hand. The objectives being met, the pilot was thus concluded in calendar year 2003. Observations and recommendations were summarized and documented.

As part of the feedback process at the time the pilot ended, project managers said that their skills were enhanced by going through the process. It provided them with a new technique with which to manager cost, schedule, and technical performance. There was also a general consensus that it would have been better to baseline the projects from the start rather than after the project was into its implementation.

NEXT STEPS

The KSC EVM pilot highlighted issues that are common to most if not all NASA Centers. The Marshall Space Flight Center and the Langley Research Center, for example, have specifically uncovered similar issues. The NASA EVM Focal Point Council (FPC) is championing initiatives that are in various stages of planning and implementation to address these issues. In order to meet its commitments, NASA is embracing EVM, and the FPC is at the forefront of the charge. The FPC is starting a pilot across the Agency to identify to what depth the issues with the financial system are pervasive and what it will take to correct them. EVM policy and guidance are being revamped, and an in-house EVM policy is forthcoming. Tools are being investigated for Agency-wide analysis and standardization of output where appropriate. NASA is setting the stage to return to the Moon and to press to the Martian landscape in an era when unlimited funds will not be the norm.

LESSONS LEARNED

The pilot program demonstrated the difficulty in introducing a new method in an environment that is very dynamic. There are many lessons learned that the authors note in order to help future endeavors.

Training:

Although training was given to all project teams, perhaps the time needed and number of examples presented were not sufficient to explain all facets of the subject matter. Perhaps the time should be lengthened to at least two days from half a day, thus allowing more time for explanation of the concepts and for the students to work sample problems, etc. The curriculum used needs to be clear and organized in a way that is attractive to project managers and shows them the benefits to their work.

Data Acquisition:

This probably proved to be one of the biggest obstacles to overcome. Since the NASA financial system was and is undergoing a major change, a lot of data were very difficult to obtain in a format that would support EVM. Project managers spent a lot of time looking for data, collecting data, and trying to reconcile data. There was much manual as opposed to automated effort.

This portion of the pilot was totally underestimated in terms of difficulty, time spent, and level of frustration, which probably did not aid in project manager acceptance of the EVM process. On the bright side, it clearly identified opportunities for improvement in how data is collected so that it can not only support financial requirements but also project management requirements and above all support the project manager so that he/she can have a good tool to manage the project.

The bottom line on data is to make sure the financial system supports the kind of data that is needed to fully implement EVM without incurring a high cost in time, effort, or budget to the project.

Tools:

Another significant finding was the lack of available off-the-shelf software tools to facilitate conversion of data into an EVM format, although some software does exist. However, they seem more suited for large complex projects. At least in our pilot, project managers expressed the need for a "magic bullet" software solution that would not tax the project manager. Our experience showed that the level of frustration with the implementation was related to the amount of manual data input that was necessary or required. For this pilot, we resisted the creation of "in-house" software to automate the process other than for minor job aids. We did not successfully recreate a large-scale enterprise solution.

Environment:

As stated previously, the NASA environment at the time of the pilot was ever changing; not only was the financial system being overhauled, but also the Agency was moving to "full cost accounting" as well as other significant changes in the way project management was executed. In retrospect, maybe the pilot was asking too much too fast from the project management population. They had to remain focused on delivering the products while working under an ever changing system. Even though the task of the pilot proved to be daunting, in true NASA tradition the proejct teams gave it their best shot to support the pilot program and provide invaluable data as to the merits of the pilot.

CONCLUSIONS

The Earn Value Management Pilot provided a tremendous amount of data on the strengths and weaknesses of the new financial system, the ability to support EVM from many viewpoints, the lack of tools for small to medium projects implementing EVM, and the training and environment necessary to successfully deploy EVM to all projects. This data along with other pilots will prove invaluable.

Deploying EVM should not be taken lightly – a full assessment of capabilities and supporting infrastructure should be done prior to any deployment, and some very basic questions should be asked. For instance, will sufficient training be provided? Can the project managers readily and easily obtain all the necessary data? If EVM is to thrive in all projects regardless of cost, the transition should be as seamless as possible, minimizing cost and effort, and with the end user in mind. In setting up an EVM impelementation, the question, "How does the project manager benefit from this process?" must remain at the forefront. Further research in this area is needed to answer the question,"Is EVM cost effective in small projects?" The authors welcome knowledge

sharing with other organizations that are striving to gain the benefits of EVM on small projects.

REFERENCES

1. Barlow, Michael J., & Klingelhoets, Thomas A. (Major USAF), Arnold Air Force Base,"Earned Value Supports Enterprise-Wide Project Management", 1997.

2. Milani, Ken (CPA/Ph.D.), & Petro, Tom, "Northrop Grumman's Four-Tier Apporach to Earning Value", Management Accounting Quarterly, Summer 2000.

3. Christensen, David S. (Ph.D.), "The Costs and Benefits of the Earned Value Management Process", paper accepted for publication in Acquisition Review Quarterly, Fall 1998.

4. Baker, Bud, Ph.D., "EVM: How Small is Big Enough," PM Network, September, 2003, pg. 22.

5. Mukho, S., & Lisanti, J., "Application of Earned Vlaue for Small Project Control: Panacea or Bane," Ebasco Services, Inc.

6. Internal KSC presentation, "YA EVM Implementation Status Presented by: YA EVM Steering Committee to YA Senior Management," October 23, 2003.*

* YA is the organizational code for the directorate that was responsible for the projects in the EVM pilot.

RESULTS OF A NASA KENNEDY SPACE CENTER EARNED VALUE MANAGEMENT PILOT PROJECT

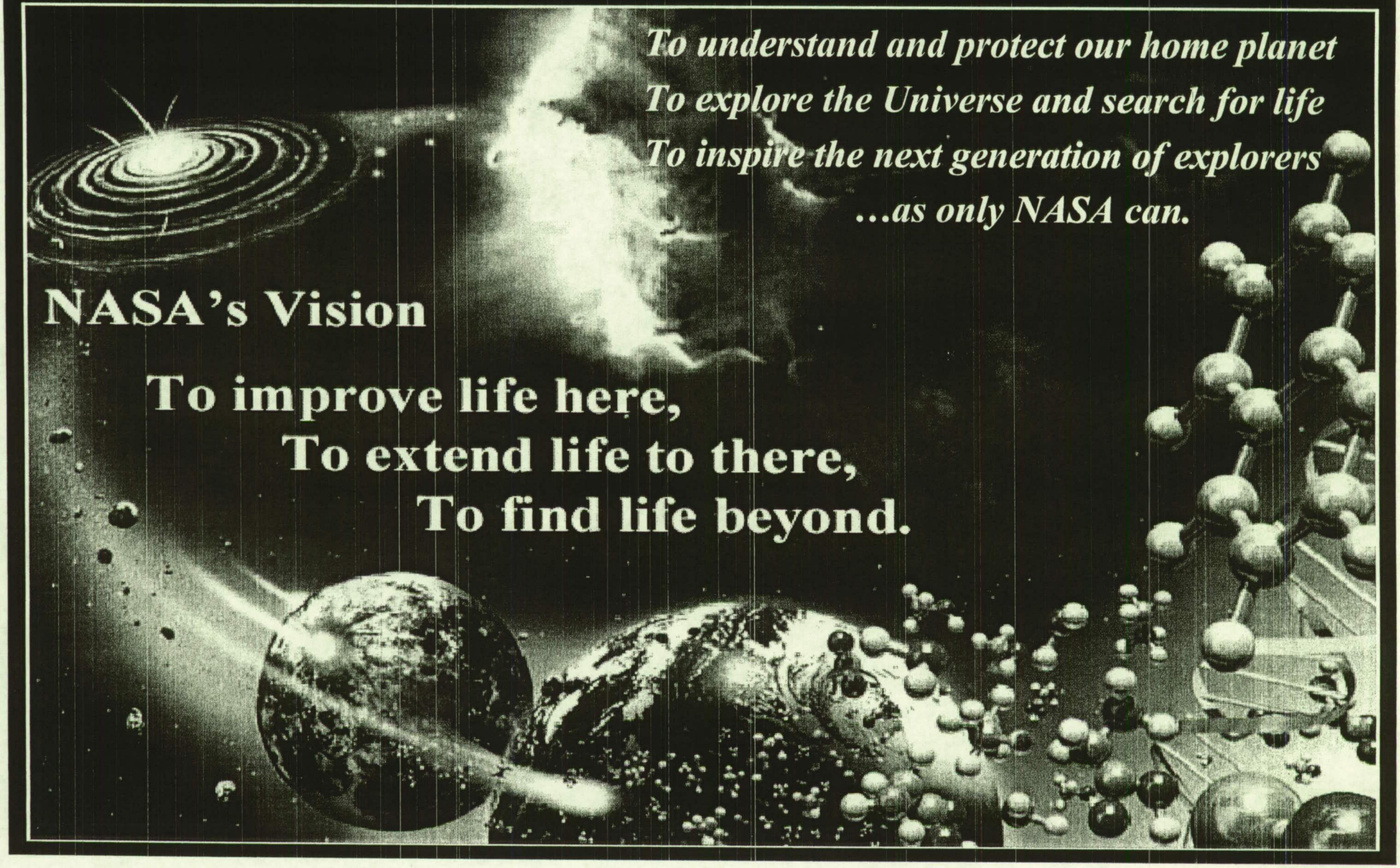
ISPA 2004

FRASCATI, ITALY

HECTOR N. DELGADO

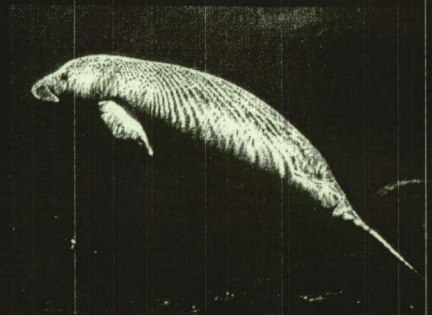
GLENN R. RHODESIDE

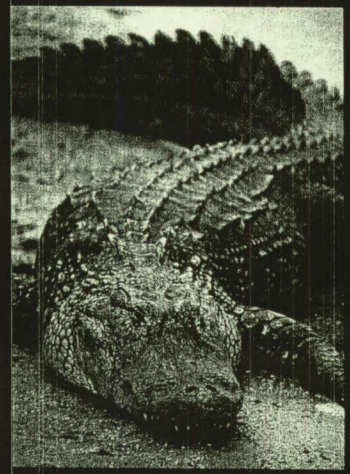
NASA's Mission

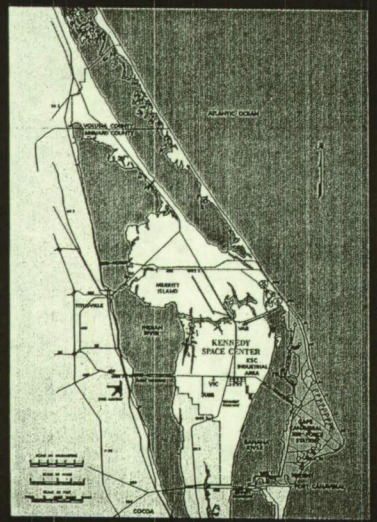


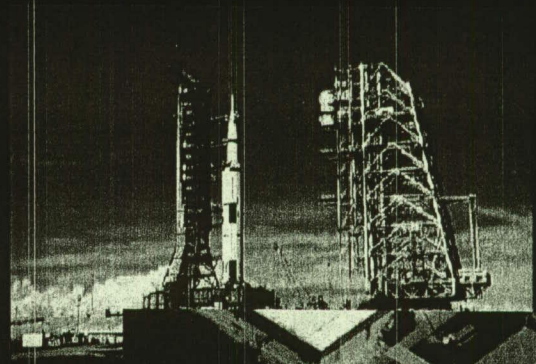
KENNEDY SPACE CENTER

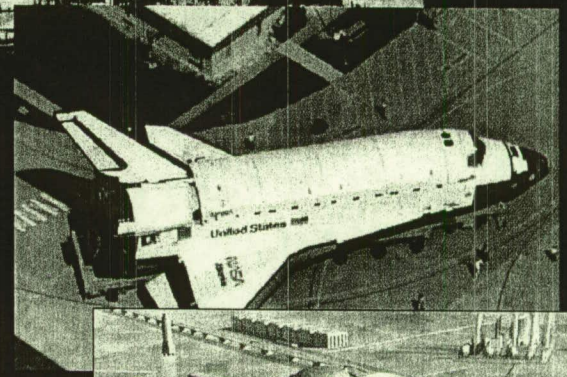
ROCKETS & ALLIGATORS

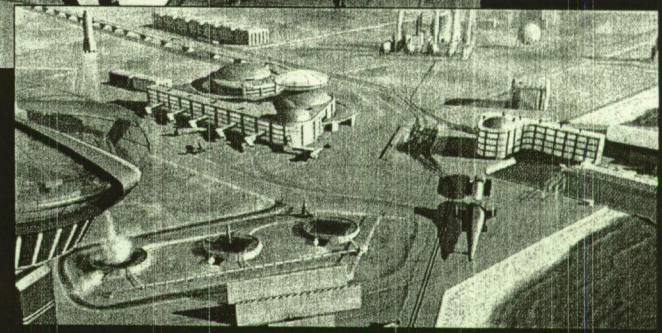






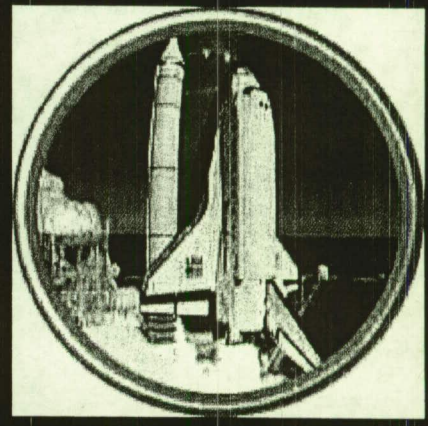






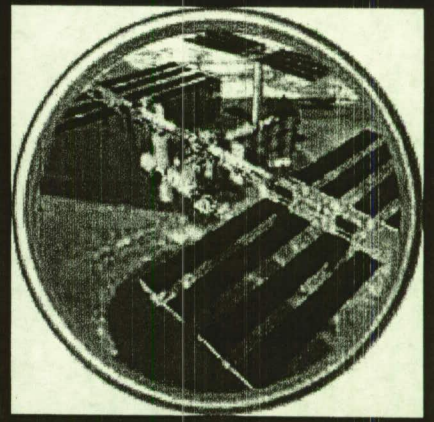
BACKGROUND

- EVM WIDELY USED & ACCEPTED IN INDUSTRY
- ONLY RECENTLY ON "SMALL" PROJECTS
- KSC EVM PILOT
  - DOLLAR VALUE
  - IS EVM APPLICABLE?
  - OBSTACLES?
  - SOLUTIONS



PREVIOUS WORK

- ARNOLD ENGINEERING DEVELOPMENT CENTER
- NORTHROP-GRUMMAN "FOUR-TIER" APPROACH



- FEW IF ANY RIGOROUS TREATMENTS OF EVM PROJECT SIZE THRESHOLD

KSC ENVIRONMENT

- PRESIDENT'S MANAGEMENT AGENDA
- NASA/KSC EVM POLICY & GUIDANCE
- CULTURE
- FINANCIAL SYSTEM

CONDUCTING THE PILOT

- PLANNING
- TRAINING
- PROJECT BASELINING & INTEGRATED BASELINE REVIEW
- USING EVM
  - DATA COLLECTION
  - ANALYSIS
  - BASELINE MAINTENANCE & CONTROL
  - PRESENTATIONS
- PILOT CLOSURE

LESSONS LEARNED

- TRAINING
- TOOLS
- FINANCIAL SYSTEM
- CULTURE/ENVIRONMENT

CONCLUSIONS

- WEALTH OF DATA FROM PILOT
- ONE DATA POINT --- WHAT'S HAPPENING ELSEWHERE

NEXT STEPS

- NASA EVM CHIEF ENGINEER & FOCAL POINT COUNCIL
- AGENCY PILOT
- TOOLS
- POLICY & GUIDANCE
- TRAINING

TO THE MOON & MARS!!!!