Fast Program Management for Engineers and Scientists

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Abstract: Cost control for Government program managers is specialized. There are laws that demand an understanding of program management as a high level technical initiative involving Earned Value Analysis as the basis of program management (EVM). There are times, however, when EVM takes too long to be useful. Small, specialized projects are an example. Before there was EVM, there were simple engineering methods that were used successfully on small project and programs. The Advanced Communications Satellite program is one of them. It is the author's opinion that this program would have suffered had a Fast Program Management technique described here, not been employed to guide the development of a high data- rate terminal developed jointly by NASA and DARPA. The method is presented here for those engineers and scientists that might benefit from knowing a fast, simple and accurate way to manage technical problems encountered in their special programs.

Much program management at NASA in the 80s and 90s did not involve EVM. EVM had not yet been fully developed. Before Earned Value Management, there were program management techniques that were quite simple and applied equally well to both development and operations. A valuable technique is documented here because it is useful still and may be beneficial for young managers to employ when struggling with program management problems. It is a simple technique that applies equally well to the full life cycle of a program and also to year by year management of operations. It is ideally suited to assessing the progress of a program already in place.

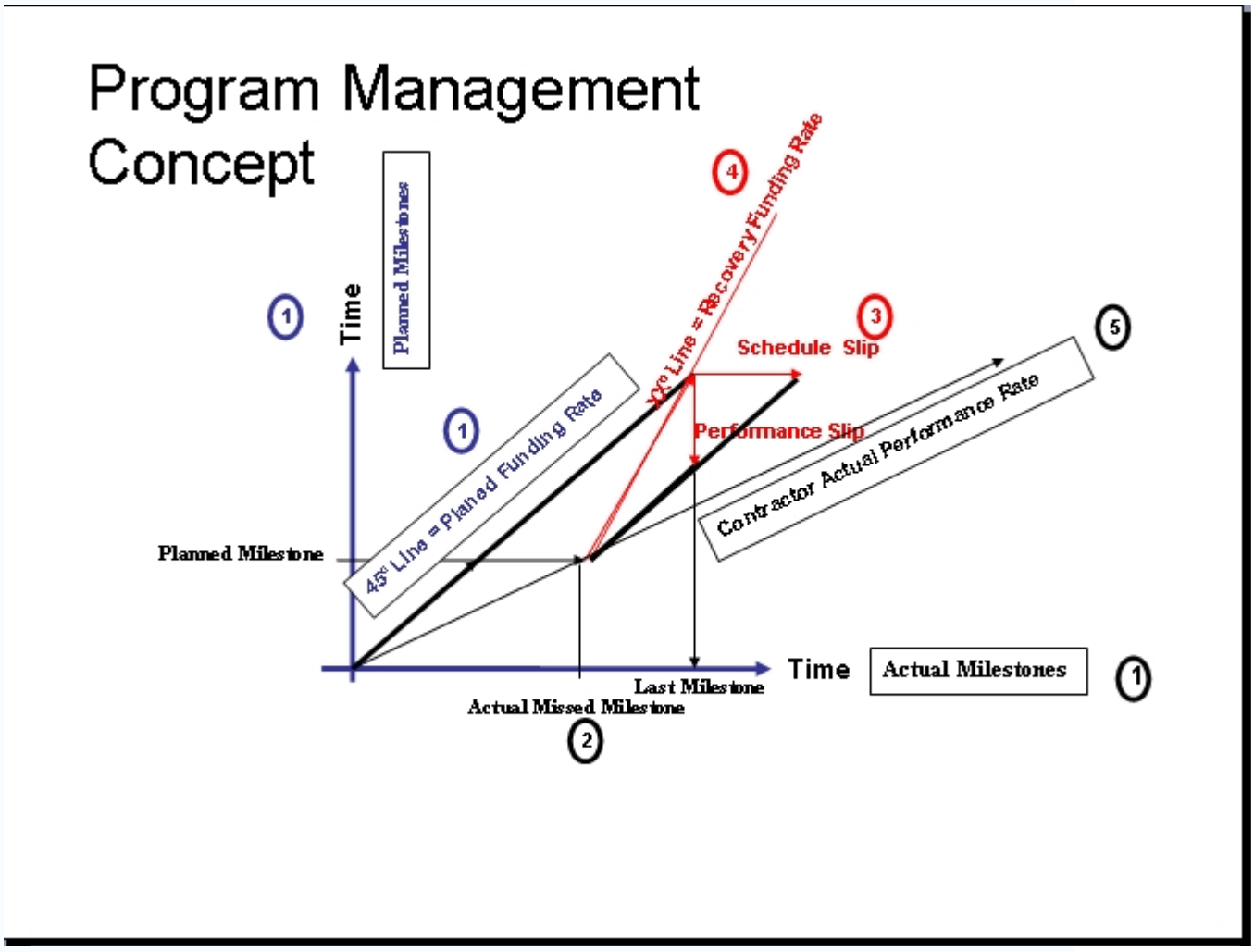
Dan Schniderman, Manager of 1970 NASA's Mars Orbiter Program and the 1960 Pioneer Venus Orbiter programs, taught the author this management technique. This technique has stood the test of time and applications at NASA and is still useful today. It was used recently in the Advanced Communications Satellite Program (ACTS), to help get an experiments operations program together. Initially, the experiments operations were in chaotic disarray. There was no WBS for the program either in the contractor's or NASA organizations. Dan helped by sharing this simple, fast "Program Management on a Single Sheet of Paper" technique. He laid out the principles quickly and conceptually… and he did it on a single sheet of paper.

This technique served the ACTS program whenever we had a serious management problem. Example: NASA had a problem with the Defense Advanced Research Projects Agency's (DARPA) delivery of the Ka-band High Data Rate Terminal, a major milestone in the program. Because the technology was so advanced, the delivery date was delayed

leaving us with the possibility that the program would have to slip beyond the funding available. By that time, NASA had invested about $700M in the program. It was a large R&D program that was spread out over many Government agencies and many Industry users. It was COMPLEX. We did not want to lose this terminal's capability. We employed this Management technique and worked our way out of the problems, got the program back on schedule and successfully completed the program, on time and on budget. I attribute this to this Management technique because the options for recovering from the delays became easy to understand, easy to discuss among the many users and simple to implement.

This short report documents how to deal with these, and other types of problems encountered in real programs and complements (thought not requiring) an understanding of Earned Value Management.

The program management concept is shown in the following diagram:



The concept involves five steps a program manager can do quickly to visualize program problems and what can be done to solve them.

Step 1 begins with the milestone chart, drawn to scale to illuminate the problem. The scale can be a month, year or the life of the program. The chart shows the program milestones drawn on both the horizontal and vertical axis. Planned milestones are shown on the vertical axis and actual milestones on the horizontal axis. The 45 degree line symbolizes the funding rate for the program or project (See 1 in the diagram). If the program is on track, the plot of planned and actual milestones crawl right up that line and the program is complete within the planned program cost. Calculate the funding rate by dividing the estimated total program cost divided by the time to the last program milestone. This is the rate at which funds for the program are being consumed.

Step 2 shows what happens when an actual milestone is missed and must be slipped in time due to some technical or financial or other resource problem (See 2 on the diagram). If funding continues at the same rate as originally planned (The parallel line from the end of the milestone slip) to the planned end of the program (the last milestone), the program will end having a slip in the program performance (See 3 on the diagram) and having less capability (performance) than planned. This is the case when no additional funding is invested in the program.

If, however, the program final milestone is allowed to slip in time, a full capability program ends, just delayed by the schedule slip (See 3 in the diagram). In this option, additional investment is needed to cover the cost of the schedule slip. The funds will be added to the program at the end of the planned program. The investment cost can be roughly estimated by multiplying the planned funding rate times the time of the schedule slip. So the program takes a longer time to produce the last milestone at the expense of the additional cost.

Step 3 shows another investment alternative which will enable program to recover on the planned end of the program with full capability (See 4 in the diagram). By adding the additional funds at the end of the time the milestone is slipped, the program can be put back on the track of the planned program. In this alternative the recovery funding rate is shown on the diagram as a line with increased slope as compared with the original funding rate line. The additional cost of the recovery program can be estimated the same way as shown in Step 2.

Step 4 is to assess the performance of the program team (See 5 in the diagram). In the diagram I call this the performance of the contractor because a contractor is usually hired to do the work. The diagram shows that the contractor, without additional creative management and production talent is likely to continue to miss milestones thus warranting change either in the technologies employed, the workforce employed or the management of the contractor team.

Step 5 is to use this diagram to discuss management problems, options and alternatives. This takes away the finger pointing that can accompany program problems and keeps the participants squarely focused on the possible solutions and which to employ.

Not mentioned yet is the genius of management to revise the program plan, motivate the program team, and hire the local production genius to put the program back on track. Creative management can go a long way to bending the funding line back in the right direction to get the program completed on schedule, within budget and with full performance.

So what happened with the ACTS program, you might ask. No additional funds were needed because the management brought in the production genius to finish the development of the Earth Station.

Later, the NASA ACTS program was sited as one of the best managed program at NASA as evidenced by being inducted into the Space Industry Hall of Fame. This is an honor that industry bestows on its own and some Government programs that produce remarkable results for America. I attribute this recognition to the genius of NASA technologists on the program and their willingness to ponder our options with simple diagrams such as you see here. It was making the right management decisions on the options we had regarding the deployment of NASA communications technology.