

# What Makes an Effective NASA Project Manager?

BY VERN WEYERS

The varied responsibilities of NASA project managers include technical, cost, schedule, and team management aspects of their projects. The PM must deal with people and problems continuously and must evaluate the risk involved with each decision. Some project managers consistently meet these challenges more effectively than others. In my thirty-five years at NASA and nine years of consulting for NASA and commercial aerospace companies, I consider myself fortunate to have participated in more than fifty space flight projects that ranged from \$100,000 studies to multi-billion dollar projects such as the Hubble Space Telescope. As a project manager myself and then as the Director of Space Flight Projects at Glenn Research Center and Goddard Space Flight Center, and as a member of independent review teams for Goddard, Langley, and Jet Propulsion Laboratory missions, I have had the opportunity to observe, work with, advise, and learn from many excellent NASA project managers.



There is no standard recipe for outstanding project management, but the twenty or so project managers I consider among the most effective I have seen have had important traits in common. Without exception, they were capable, respected, and charismatic. Here are some examples from my experience and observations that show why these traits matter.

### Being Capable

In addition to being at least reasonably well-organized, the capable project manager is knowledgeable, decisive, persistent, and a good risk manager.

The PM must understand all aspects of the project, its goals, requirements, challenges, and risks. That is not to say that she must be an expert in every area. Rather, she needs to have a broad understanding of the technical subsystems involved in order to understand their functions, interfaces, and risks. She must be sufficiently *knowledgeable* about technical aspects, financial management, and scheduling to ask the right questions, evaluate the risks, and make valid trade-offs and decisions. Virtually all the effective aerospace PMs I have known have considerable expertise in at least one technical area, most often the area in which they worked prior to becoming a PM or an area in which they previously resolved a major problem. Most PMs will admit that, from early in their careers, they were interested in the broader picture of the entire spacecraft, launch vehicle, or system and not only in their particular field of expertise. This desire to understand the overall system serves the project manager well. The effective PM is a fast learner who can quickly gather enough information about any system to be able to make prompt and reasonable decisions in response to challenges or problems.

Secondly, the effective PM must be *decisive*. One of the most effective PMs in my experience often said, “There is no such thing as a bad decision, except one which is not made promptly. The important thing is to make

the decision and move on. If it is not the best course of action, that will soon become obvious and then another decision must be made to change direction.”

Unless there is more relevant information pending, a test to be completed, or another credible opinion to be solicited, delaying a decision has only disadvantages. Many decisions involve choosing the best among two or more options. Often the very fact that the decision comes to the PM indicates that all the options are feasible and none will be catastrophic. Some of the most difficult decisions involve contractors who are not performing well. In those cases, the PM must lead the effort to fix the problem. If working with the contractor’s team and its management to improve the situation is not successful, then key people need to be changed or the contract terminated and the work transferred elsewhere.

Early in my career as a director, I was involved in the decision to terminate a major contractor on an important project whose primary source of profit was its work on classified programs. The contractor personnel assigned to our project were mostly new hires who had not yet received security clearances. Once their clearances came through, the better performers would be quickly transferred to a classified project and replaced on our team by another inexperienced person who needed to be trained. Terminating this contractor was a big decision but the right one because we could not be confident that the contractor’s assigned team could do the job. Delaying the decision would only have harmed the project. Several of the contractor’s vice presidents visited us and pleaded for one more chance. It was too late.

Any decision is likely to be questioned and challenged, but even questions from well-meaning, dedicated stakeholders should be raised and resolved before a decision is made. Afterward, it is important for all parties to accept the decision and for the PM to remain firm and not second-guess himself. Good ideas always arise during a project that would make it better—more reliable, more capable, more robust—but, as has often been said, “better is the enemy of good enough.” The PM



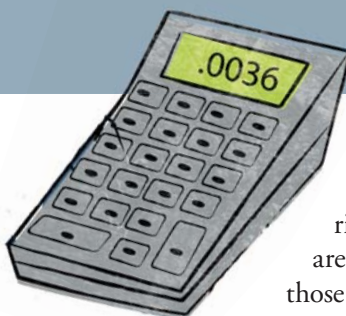
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must hold the line on requirements and keep the work moving forward on the accepted design.

During development of one of the Great Observatories, it became obvious that a filter on one of the major instruments had partially delaminated during ground testing. The science community wanted to remove the instrument from its cryogenic container, replace the damaged filter, reinstall the instrument, and retest the observatory. After determining that the instrument could meet all its requirements in its existing condition and that the filter replacement would cost around \$50 million and cause a six-month launch delay, the project manager stood firm and obtained Headquarters' approval of his decision to launch with the degraded filter. Excellent performance after launch confirmed the decision as correct.

Often, an effective PM must be *persistent*. One project I directed for a number of years required extraordinary persistence on the part of the PM who reported to me. Every year, NASA zeroed the budget for the half-billion-dollar technology project. Just as reliably (although not quickly enough), Congress reinstated the funds needed for the next fiscal year. Every year, the project was in limbo. By expressing his optimism and confidence that the money would be forthcoming, the PM managed to keep his team in place, motivated, and enthusiastic. Each year, he would ensure that enough funds remained from the previous fiscal year to allow the work to proceed, albeit at a reduced level, during the months of uncertainty. The launch date slipped a number of years as a result, but eventually the project met its cost cap, flew, far outlived its planned lifetime, and succeeded beyond expectations.

An effective PM is also a *risk manager*. I have heard good project managers say that project management is nothing more than risk management. All projects involve risk. Many of them—often technical risks due to the use of unproven technology or a technology in a new application or environment—can be



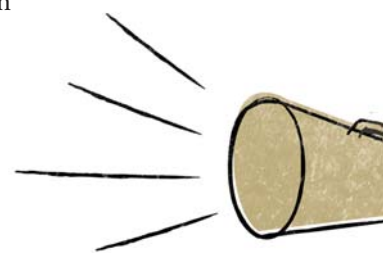
identified early. Insufficient reserves and major technical problems cause financial and schedule risk. Weakness or a key vacancy in the project team are sources of risk. The hardest risks to deal with are those that are unknown at the start of the project; when they eventually do become apparent, there is little time to understand and mitigate them. An effective project manager will identify, plan for, and mitigate risk in all areas. The risks must be tracked, reported, and addressed on a continual basis throughout the project. Brainstorming among the project team is often effective in identifying mitigation steps.

### Being Respected

Unless most of the people comprising a team respect the project manager, he will have a difficult time motivating the kind of coordinated and cooperative effort needed to achieve success. To be respected, a project manager must be capable, but there is more to earn in respect than competence.

After hearing a former supervisor address a NASA Project Manager training session, I remember telling some of my classmates, “I would follow him anywhere.” He knew his project, its challenges, and its goals and had a clear vision of how to accomplish them. He was enthusiastic about its eventual success but realistic in evaluating the challenges that stood in the way of achieving it. He was convinced it was a valuable undertaking and that he could lead the effort to make it happen. He inspired his team and made each individual proud to be included. And he respected his team members.

Respect is reciprocal. A project manager who desires respect from his team must treat team members fairly and with respect. That does not mean always agreeing with them. It means being willing to listen to what each stakeholder has to say, honestly





considering that input in making his decision, and then conveying his reasons for choosing the selected approach. A person whose ideas are sometimes rejected but who knows that he has been heard and has been treated fairly will continue to respect the decision maker and perform well.

### Being Charismatic

Webster defines charisma as “a special, inspiring quality of leadership.” A charismatic project manager makes the team not only willing but excited to have her as its leader. Some elements of charisma are hard to define, but others are fairly clear. Probably the most important trait contributing to a PM’s charisma is being a *good communicator*. As the spokesperson for the project, she must be able to articulate her position, decisions, and expectations. It is critical for a PM to be able to communicate clearly, succinctly, persuasively, and openly.

A *positive (but realistic) attitude* is also important. NASA is known as a “can do” organization, and the history of NASA is rich with examples of successful outcomes of projects that faced daunting challenges.

In the first months after discovering the spherical aberration in the lens of the Hubble Space Telescope, it was difficult to feel positive about the likelihood of recovering planned performance. But the PM assigned to lead preparations for the repair mission was greatly respected based on his leadership of a previous successful in-space repair mission. He eloquently communicated his certainty that such a mission would succeed. He expressed nothing but full confidence in his team members and their abilities. He encouraged a broad solicitation of ideas on how to approach the task and led the effort to carry out the selected approach. The flawless repair mission resulted in better-than-design performance and the most productive telescope in the history of mankind.

Last, but probably not least, most of the many effective PMs I

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have known have had a *sense of humor*. All projects are challenging and face low points. Being able to step back, take a broad perspective, and share a laugh with the rest of the team is important. If a project is fun to work on, the team’s enthusiasm and performance will reflect that, to the benefit of the overall effort.

Part way through a two-stage launch vehicle project, someone from another part of the managing center was assigned as project manager. He was a virtual unknown to the team and some members doubted his ability to lead the project. When a critical decision was required and the participants were clearly grim and doubtful, the new PM would ask, “Now tell me again, which of the stages goes on top?” That would invariably break the tension and lead to substantive discussion and a decision. Within a very short time, the team felt comfortable with the new PM and worked hard to help him succeed.

### The Complete Project Manager

I have described a broad and impressive range of traits that make some project managers especially capable, respected, and charismatic. Not all successful project managers possess all those qualities and abilities in equal measure, but the challenge and complexity of most NASA projects requires their managers to call on most of them in the course of their work. That is why effective project management is so demanding and why it is important to observe the best project managers in action and learn from their examples. ●



**VERN WEYERS** spent 35 years with NASA at Lewis (now Glenn), Headquarters, and Goddard. He was Director of Flight Projects at Goddard during the Hubble Space Telescope repair mission, launch of the GOES-I weather satellite, and numerous other flight projects.