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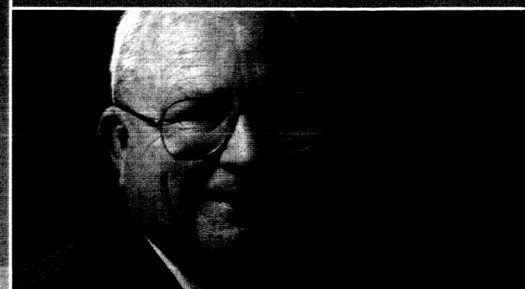
# ASK

ASK Magazine · Issue Seventeen

**APRIL 2004**

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**DELIVERING ON**

**MANAGING CULTURE**

**A PM DEVELOPMENT PL**

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WELCOME TO THE ACADEMY OF PROGRAM AND PROJECT Leadership (APPL) and *ASK Magazine*. APPL helps NASA managers and project teams accomplish today's missions and meet tomorrow's challenges by providing performance enhancement services and tools, supporting career development programs, sponsoring knowledge sharing events and publications, and creating opportunities for project management collaboration with universities, professional associations, industry partners, and other government agencies.

*ASK Magazine* grew out of APPL's Knowledge Sharing Initiative. The stories that appear in *ASK* are written by the "best of the best" project managers, primarily from NASA, but also from other government agencies and industry. These stories contain knowledge and wisdom that are transferable across projects. Who better than a project manager to help another project manager address a critical issue on a project? Big projects, small projects—they're all here in *ASK*.

Please direct all inquiries about *ASK Magazine* editorial policy to Todd Post, EduTech Ltd., 8455 Colesville Rd., Suite 930, Silver Spring, MD 20910, (301) 585-1030; or email to tpost@edutechltd.com.

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# What Makes a Good Manager?

*This issue of ASK we look at several projects that recovered from serious problems after a critical change was made in how they were managed*

NOBODY WILL BE BLINDED BY THE BRILLIANCE OF THIS insight: Projects often get into trouble because of how they are managed. Sometimes they recover; sometimes they don't. When the reason they recover stems directly from changes in management, that begs the question: What happened?

We return to this theme over and over again in *ASK*. You may recall these remarks by Dr. Charles Pellerin in Issue 13, commenting on his tenure as NASA's Director of Astrophysics: "I was frustrated that I couldn't anticipate and recognize the difference between project managers who were going to succeed and project managers who were doomed to fail. We could predict things like sensor performance. We could understand the detectors. We could understand the power systems. But we couldn't understand this one critical, invisible piece: What makes a good manager?"

One approach to answering that question is by looking at cases where project fortunes reversed following a change in managers. In "Bringing Up Baby," Gus Guastaferro remembers being asked to take over a research project in which the project manager he replaced was also the lead researcher. To achieve the promise of the prototype aircraft they were building, Guastaferro not only had to overcome management problems created by his predecessor, but to do it in such a way that did not compromise research goals.

In another story, Alan Zak, a Vice President at Line6, tells of selecting a project manager to produce a new line of guitars. The project manager seemed to have what it takes—the technical smarts, an interest in project management, and, because he was a guitarist himself, an intimate understanding of the product—but he quickly found himself in over his head. Zak's story, "Sounds Clear Enough," may well teach those a level or two above the project manager about how to recognize a problem situation before it unfolds.

Mary Bothwell's story, "Walking the Fine Line," picks up this theme from Alan Zak, but depicts a different approach to solve the problem. A division manager at the Jet Propulsion Laboratory (JPL), Bothwell was concerned that a change in management at a critical point in a project could prove more destructive than constructive. Bothwell's story offers an interesting look at the paradox of how to positively impact what's happening within the project from outside it. How closely can upper management get involved before "micro-management" sets in?

Managers change for reasons other than because projects get in trouble. People move on to other jobs, or they get promoted. In some of those cases, a project manager's job is simply to keep things on track. Such is the type of situation described by Steve Garber in his practice, "History: A Practicum." Garber offers some practical insights on how to be a more effective communicator.

In addition to all this, we have an interview with JPL's Director of Flight Projects, Tom Gavin; a before and after story about a reengineering effort at the Hubble Control Center; and feature writers Terry Little and Scott Cameron return after getting a rest in Issue 16. The APPL spotlight this time is on the Project Management Development Process (PMDP). You may be surprised to find who's talking up PMDP at NASA.

While we may not have the definitive answer to "What makes a good manager?"—we believe this issue of *ASK* will contribute to your conversations about that subject. •

**JOHN BRUNSON** of the Marshall Space Flight Center is a member of the NASA Program Management Council Working Group. He served as project manager for three separate microgravity payloads that flew on various Spacelab missions. His career in the space industry began in 1980 as a technician working on the first Space Shuttle.

**DR. MICHELLE COLLINS** works in the Spaceport Engineering & Technology Research Group at Kennedy Space Center. She has over twenty years experience in aerospace spanning engineering, R&D and project management. She is on the Florida Tech Engineering Accreditation Board, the National Fire Protection Association's Technical Committee for Halon Alternatives, and the United Nations Environmental Programme Halon Technical Options Committee.

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**DR. OWEN GADEKEN** is a Professor of Engineering Management at the Defense Acquisition University where he has taught Department of Defense program and project managers for over twenty years. He retired last year from the Air Force Reserve as a Colonel and Senior Reservist at the Air Force Office of Scientific Research. He is a frequent speaker at project management conferences and symposia.

**DR. MICHAEL HECHT** has been with NASA since 1982 at the Jet Propulsion Laboratory (JPL). He is project manager and a co-investigator for the Mars Environmental Compatibility Assessment (MECA). In his previous assignment with NASA's New Millennium Program, he was instrumental in defining the "microlander" that was adopted as NASA's New Millennium Program Deep Space 2.

**JODY ZALL KUSEK** is a Senior Evaluation Officer at the World Bank. She is currently involved in supporting the efforts of seven governments to move to a focus of performance-based management. She has spent many years in the area of public sector reform, serving the Vice President of the United States, the U.S. Secretary of the Interior, and the U.S. Secretary of Energy in the areas of Strategic Planning and Performance Management.

**DONALD MARGOLIES** retired from the Goddard Space Flight Center in January 2004. He was Project Manager for the Advanced Composition Explorer (ACE) mission, launched in 1997 and still operating successfully. He received the NASA Medal for Outstanding Leadership for his work on ACE and a NASA Exceptional Service Medal for the Active Magnetospheric Particle Tracer Explorers (AMPTE) mission.

**DR. GERALD MULENBURG** is the Manager of the Aeronautics and Spaceflight Hardware Development Division at the NASA Ames Research Center. He has project management experience in airborne, spaceflight, and ground research projects with the Air Force, industry, and NASA. He also served as Executive Director of the California Math Science Task Force and as Assistant Director of the Lawrence Hall of Science.

**JOAN SALUTE** is the Associate Director for projects in the Information Sciences and Technology Directorate at Ames Research Center. She has managed many NASA projects including those involving flight testing of thermal protection materials, commercial technology, commercial applications of remote sensing, and remote sensing science projects. She has been at Ames for twenty years, and was awarded the Sloan Fellowship to attend Stanford Graduate School of Business.

**HARVEY SCHABES** is currently assigned to the Systems Management Office at the Glenn Research Center. He started his career with NASA in icing research, and since then has served in numerous organizations in support of the Space Station Program.

**CHARLIE STEGEMOELLER** is Manager of the Johnson Space Center (JSC) Human Space Life Sciences Programs Office. He is responsible for the programmatic and tactical implementation of the lead center assignments for Space Medicine, Biomedical Research and Countermeasures, and Advanced Human Support Technology. He began his career at NASA in 1985 with JSC Comptroller's Office as a technical program analyst.

**HUGH WOODWARD** is a Program Manager for Global Business Services with the Procter & Gamble Company. He served as the Chairman of the Project Management Institute (PMI) for consecutive terms in 2000 and 2001. He was elected to the Board of Directors in 1996, and before being elected as the chair, served terms as vice chair and in several other key leadership roles.

# Well on Our Way

*A couple of years ago, I was sitting in my office talking with my Deputy Director Tony Maturo. We were in a contemplative mood, discussing NASA's then-recent run of prominent project failures*

I INDICATED THAT IF THE ACADEMY OF PROGRAM AND PROJECT Leadership (APPL) was going to significantly improve program and project management at NASA, we needed to expand our portfolio of services, including resources that go directly to the project. "We need to be sending experts to the projects, experienced project practitioners, who can respond to the needs of the project manager," I said.

Tony smiled and said, "Okay, I know where you're going with this. But if we do what you want, we need to do it right. I don't want us to offer willy-nilly, do-what-you-want, feel-good stuff that costs a lot and makes absolutely no difference to a project."

I laughed because I knew exactly what he meant. I related a story of mine from nearly twenty years earlier:

In the mid-80s, I was responsible for providing organizational development support to NASA project teams. I was preparing to work with a new team and was conducting general interviews of the "what is working, what is not" variety. A young woman seemed nervous about an upcoming retreat, and I asked about her concern. She blushed and asked me, "When we're at the retreat, will we have to talk to a banana?" I had been prepared for many things in my doctoral program at Columbia University, but they never told me how to respond to the banana question.

She was serious. At a previous retreat, the facilitator had her team talking to bananas: "Speak to the banana as you would a new person joining the team..."

Tony laughed at the story and said, "Exactly; if we're going to support project teams, let's do it in a way that makes a clear difference."

While a training director in the Navy, Tony had been responsible for establishing rapid response support capability. His successful experience then provided us with many lessons that we could use in our current situation.
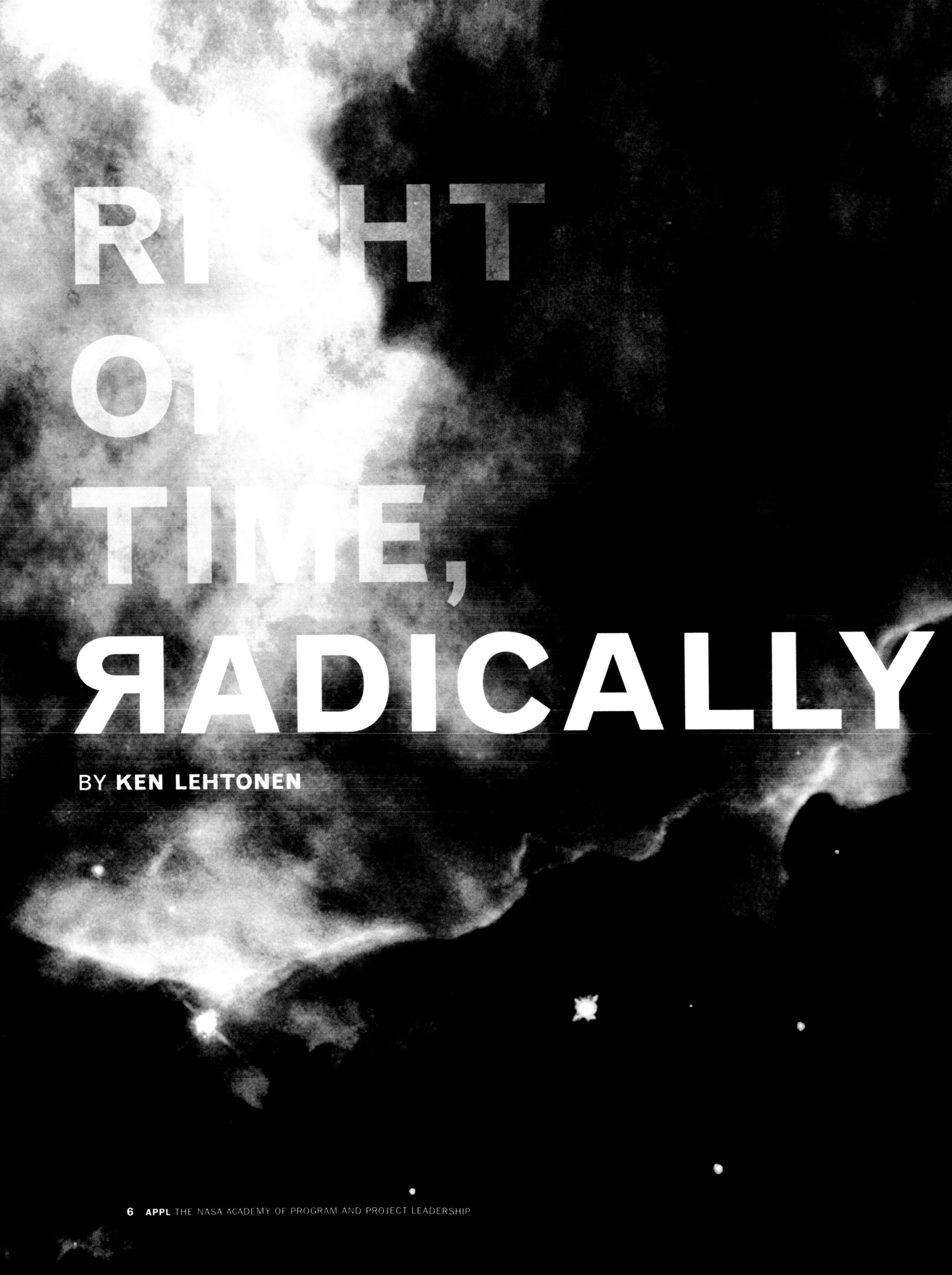
We outlined how we wanted to do this: First, we would gather a team of expert practitioners with top-gun status. I'm talking about experts with the ability to address all aspects of a project during any phase in its lifecycle. Second, we would work only to improve project capability and competence—we were not going to supplement project staffing. Third, we would show we were serious by responding within 48 hours to any request for our support and by following through on requests only when the project manager and team were committed to change.

Moreover, we didn't want to impose another layer of bureaucracy on projects, so we needed to establish simple procedures for obtaining our support. We also felt we had to measure project improvement in real terms, with data that could stand up to scientific scrutiny.

That was the foundation for APPL's Performance Enhancement business line, which presently accounts for just over half of all APPL business. Entering 2004, we were supporting 29 program and project teams in such areas as program control, project planning and scheduling, systems management, risk management, project leadership, and culture/team improvement. Each project has been tracked with specific measures to indicate the value of our support. I have seen the initial measures and we will soon be unveiling findings indicating statistically significant improvements that should lead to wider discussions of how to develop and improve project teams and individuals.
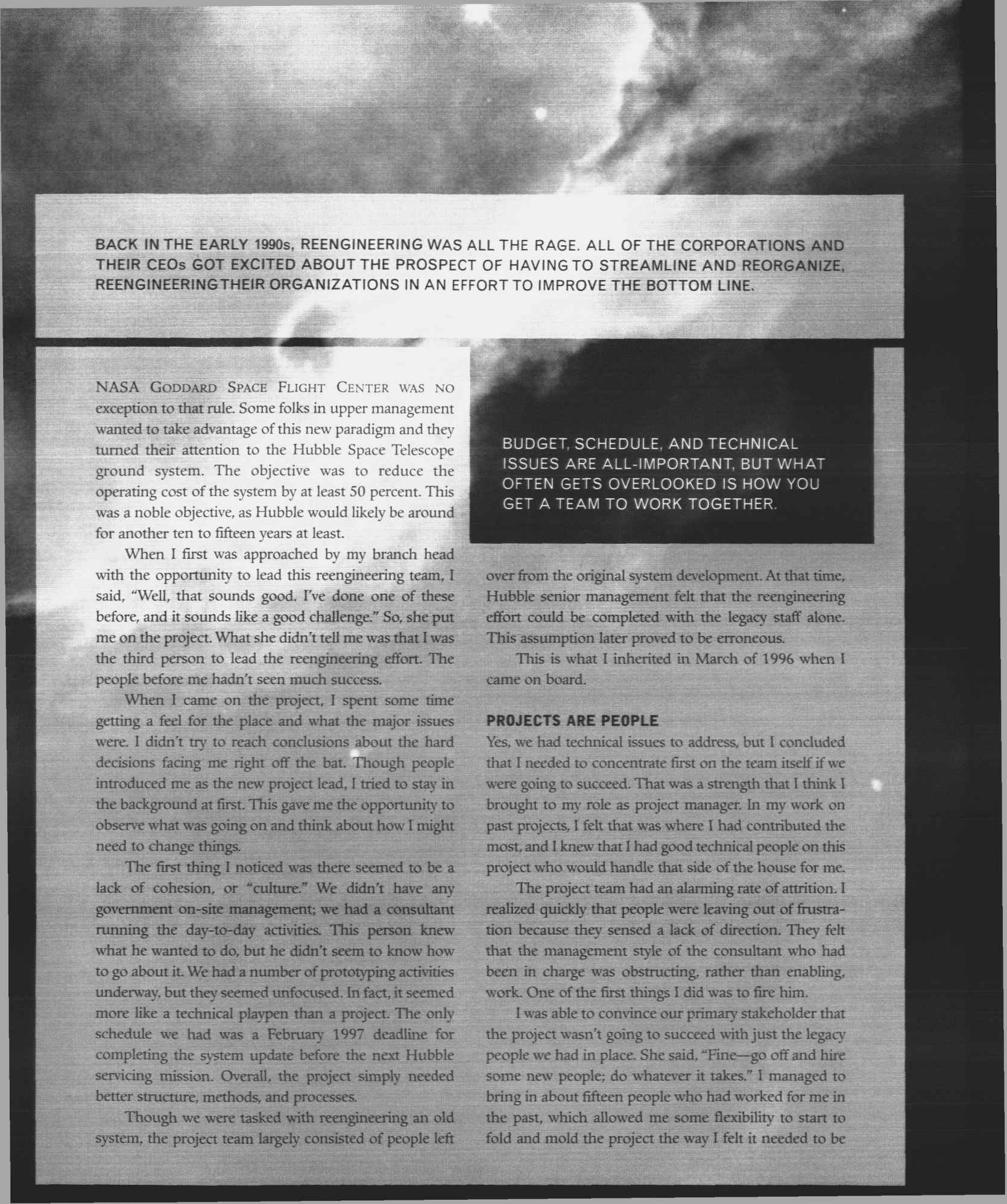
It is exciting and gratifying to see and hear the reaction of the NASA project community who has used these services. Based on customer reaction, increasing demand, and measurement of results, I think we're well on our way to improving project management at NASA.

And no one has to talk to a banana.    •

# RIGHT ON TIME, RADICALLY

BY **KEN LEHTONEN**

BACK IN THE EARLY 1990s, REENGINEERING WAS ALL THE RAGE. ALL OF THE CORPORATIONS AND THEIR CEOs GOT EXCITED ABOUT THE PROSPECT OF HAVING TO STREAMLINE AND REORGANIZE, REENGINEERING THEIR ORGANIZATIONS IN AN EFFORT TO IMPROVE THE BOTTOM LINE.

NASA GODDARD SPACE FLIGHT CENTER WAS NO exception to that rule. Some folks in upper management wanted to take advantage of this new paradigm and they turned their attention to the Hubble Space Telescope ground system. The objective was to reduce the operating cost of the system by at least 50 percent. This was a noble objective, as Hubble would likely be around for another ten to fifteen years at least.

When I first was approached by my branch head with the opportunity to lead this reengineering team, I said, "Well, that sounds good. I've done one of these before, and it sounds like a good challenge." So, she put me on the project. What she didn't tell me was that I was the third person to lead the reengineering effort. The people before me hadn't seen much success.

When I came on the project, I spent some time getting a feel for the place and what the major issues were. I didn't try to reach conclusions about the hard decisions facing me right off the bat. Though people introduced me as the new project lead, I tried to stay in the background at first. This gave me the opportunity to observe what was going on and think about how I might need to change things.

The first thing I noticed was there seemed to be a lack of cohesion, or "culture." We didn't have any government on-site management; we had a consultant running the day-to-day activities. This person knew what he wanted to do, but he didn't seem to know how to go about it. We had a number of prototyping activities underway, but they seemed unfocused. In fact, it seemed more like a technical playpen than a project. The only schedule we had was a February 1997 deadline for completing the system update before the next Hubble servicing mission. Overall, the project simply needed better structure, methods, and processes.

Though we were tasked with reengineering an old system, the project team largely consisted of people left

BUDGET, SCHEDULE, AND TECHNICAL ISSUES ARE ALL-IMPORTANT, BUT WHAT OFTEN GETS OVERLOOKED IS HOW YOU GET A TEAM TO WORK TOGETHER.

over from the original system development. At that time, Hubble senior management felt that the reengineering effort could be completed with the legacy staff alone. This assumption later proved to be erroneous.

This is what I inherited in March of 1996 when I came on board.

## PROJECTS ARE PEOPLE

Yes, we had technical issues to address, but I concluded that I needed to concentrate first on the team itself if we were going to succeed. That was a strength that I think I brought to my role as project manager. In my work on past projects, I felt that was where I had contributed the most, and I knew that I had good technical people on this project who would handle that side of the house for me.

The project team had an alarming rate of attrition. I realized quickly that people were leaving out of frustration because they sensed a lack of direction. They felt that the management style of the consultant who had been in charge was obstructing, rather than enabling, work. One of the first things I did was to fire him.

I was able to convince our primary stakeholder that the project wasn't going to succeed with just the legacy people we had in place. She said, "Fine—go off and hire some new people; do whatever it takes." I managed to bring in about fifteen people who had worked for me in the past, which allowed me some flexibility to start to fold and mold the project the way I felt it needed to be

in order to get our work completed. The remainder of the revamped staff was provided by existing Hubble contractors, cold interviews, and "word of mouth." At the peak of the project, we had over 150 people from fifteen different companies, plus NASA civil servants. It was a diverse group of people—from old to young and everything in between—and we were co-located, which was a good idea.

I wanted to create a "badgeless" team. I know the word gets thrown around frequently, but we took it to extremes. Since we were co-located away from the main NASA Center, Goddard, it was easier to do. We were able to have people working together who hadn't worked together before because they were from different contractors. In a couple of cases we even had government people reporting to contractors. In the past, their management had said, "You can't work together." Well, we let them work together. That was a start. However, it wasn't achieved overnight and took a lot of energy and convincing by my management team and me before it stuck.

We also flattened the organization. We got away from the hierarchical approach. We developed a series of product development teams, who were tied into the architecture that we developed. We then developed a work breakdown structure to start putting some process, structure, and schedules in place. The rewards quickly came; we started to look and feel like a cohesive project.

As we did this, I walked around and talked to the people working on the project, so that I could find out what they needed. Budget, schedule, and technical issues were all-important, but what often gets overlooked is how you get a team to work together. How do you create order out of chaos? I hoped we could create, over time, a tight-knit community much like the old *Cheers* slogan, "A place where everybody knows your name." One of my earliest initiatives to accomplish this was to have biweekly barbecues, which allowed folks to have a place to unwind a bit and to talk about things that had nothing to do with work. The idea was that in six months, when they would be delivering key components in a stressful integration environment, there would be an esprit de corps to carry us through those difficult times.

Another of my initiatives I called the "kudos" program. After each major release produced by the team,

I made a trip to my local grocery store to stock up on about twenty boxes of Kudos® bars. Then, I went to each individual personally and congratulated him or her on his contribution to our work. I would do that for all 150 people. This became something of an "end job," if you will, or an in-process, as far as the relationship that I had with my team. In fact, people started bringing me coupons for the next round of Kudos that I would be buying.
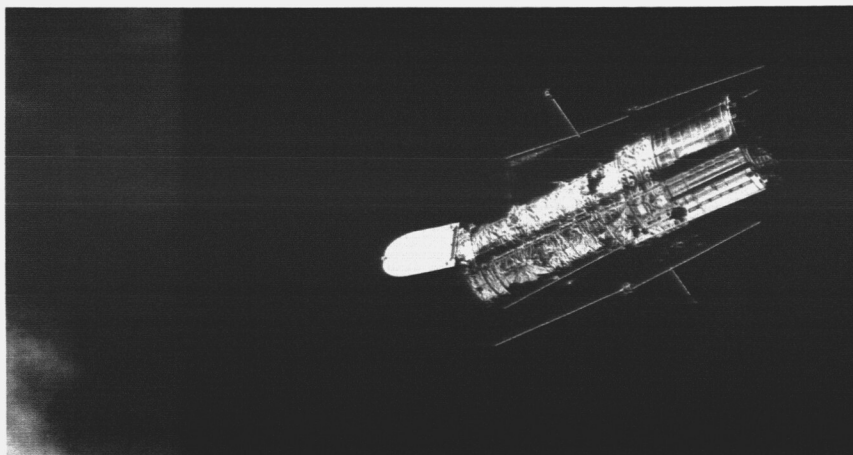


Mission accomplished: the Hubble Space Telescope as seen by the Space Shuttle Discovery after servicing in February 1997.

**THE MISTAKE OR CERTAINLY THE LESSON I LEARNED HERE IS THAT ONE NEEDS TO CONTINUE TO MANAGE EXPECTATIONS TO NEXT-GENERATION STAKEHOLDERS, AND TO DO IT RIGHT AWAY.**

### WE SEE RESULTS

Did it all work? I find it interesting that near the end of the summer, a little less than six months since I'd arrived, I was sitting quietly in my office, which was centrally located and always open, when I became aware of the hum and the vibration of energy out in the hallways. I could literally hear the team's cohesiveness. It was something of a mystical moment, I suppose, because I knew then, without a doubt, that the project was going to succeed. I was convinced of it based on the energy flow, the pulse, and the conversations that were occurring in the hallways on this particular day.

In retrospect, when I look back on what was happening there, I can see that we had become the badgeless team I was aspiring for. We had gone from a hierarchical, structured environment, to teams who

had the trust, confidence, and openness to stop in the hallways to discuss problems and make decisions without having to worry about any repercussions if they didn't pass everything through their management team each time.

An interesting side note to all of this was that over time the vocabulary of the project changed. Initially, there was a lot of "I" and "you." Over time, we noticed a subtle shift in the vocabulary to "us" and "we."

Not only did we meet our original milestone, but we had five major releases completed on time and on schedule. During that period, we delivered over one million lines of code. We were producing something on the order of fifteen lines of code an hour, where the accepted norm is closer to five. Our defect metrics were a third of the normal industry rate. This seemed great to me, but I wanted to be certain these metrics were real.

I went to a group at Goddard who study software development. I asked them to take a look at the code we had produced. They spent a couple weeks analyzing our work, and came back and said that our team's work was some of the best they'd ever seen. So, technically, we were in good shape, which was what I figured.

What about programmatically? Maybe there is a direct correlation between high technical productivity and the type of organization and team that you put together. That would be nice to know. I got hold of another group who was putting together a project team development survey. I said, "Why don't you take a look at our team? Come on over and give the survey to our team." We did that for a couple of days. They came back and said, "We have ten major criteria for very high successful teams. The average that we've seen so far is about three. Well, you guys have seven." Even programmatically, we were off the charts.

## MANAGING EXPECTATIONS

Despite all of the success that I've talked about, in August of 1998 I was replaced. We had a release due in June of that year, which we delivered on time and on schedule. Two months later, an organizational chart appeared, and I was gone.

What happened is that the original stakeholder—the key supporter of the "radical management" philosophy—retired. New stakeholders came in, including a new program manager who had a background in management rather than systems. I didn't think much about the change in stakeholders until the day my new boss came in and said, "We're

going to review why you have failed to deliver; the project is now in stand-down mode." Evidently, there was a disconnect between what we had been asked to deliver by our former stakeholder, and what our new stakeholder expected to find. The mistake or certainly the lesson I learned here is that one needs to continue to manage expectations to next-generation stakeholders, and to do it right away. Don't assume that they know what you know.

Perhaps I could have done a better job in presenting the case for our project team to the new stakeholders. If I had done a better job bringing my key people in to meet the stakeholders—presenting what we had done to-date, what the challenges ahead were, how we had accomplished what we had, and how effectively we worked—perhaps they might have had second thoughts and would have allowed us to continue.

I'm not convinced that would have helped, though. It was clear that their expectations were very different than my expectations. They wanted to go back to the old way of doing business, one they felt comfortable with, specifically with the prime contractor managing a more traditionally structured project team. If the change had occurred a few months earlier, it would likely have had a devastating effect on productivity levels—but the change came when our initial development phase was almost completed.

In retrospect, I can see that the project had reached a point where exceptional productivity wasn't the highest priority anymore. We've all heard, again and again, that you have to know when things are good enough. It's true in engineering—we don't put twenty-nine bolts in where we need twelve—and it's true in project management. •

LESSONS
• Nurturing a collaborative culture on a project can go a long way towards achieving tangible costs and schedule results.
• Manage expectations, not only from the people working for you, but for the key people, i.e. stakeholders, that are above you.

QUESTION
*When would you prefer the collaborative leadership style depicted here, and when not?*

# RADICAL

BY **LARRY BARRETT**

I SUSPECT THAT EVEN IF KEN HAD STAYED ON, WE WOULD HAVE EVOLVED TO THE STATE WE'RE IN RIGHT NOW. IN TERMS OF THE NATURE OF THE WORK THAT WE'RE DOING, WE'VE GONE FROM DEVELOPMENT TO MAINTENANCE, AND SO THE PROJECT TEAM NEEDED TO EVOLVE TO REFLECT THAT CHANGE.

THE ANALOGY I USE TO DESCRIBE HUBBLE IS A DATA factory, and we provide the factory controller. The telescope takes in light and produces pictures, and we're the ones sending all of the control signals and monitoring the temperature, power, and voltages in the factory to make sure the production line is doing its job and that it's not reaching some sort of a stress point. That's basically it. We maintain the Hubble command and control system.

I think we're still putting out a good quality product. We still meet our schedule and cost milestones. Every time we make a change to the ground system, we run a suite of tests to make sure that the system still runs as expected, and that it correctly controls the spacecraft. Other than that, provided the interfaces are controlled, everything is okay.

**BUT BEFORE THIS**

As Ken was saying, we achieved a remarkable level of productivity and quality during the time we developed the new code. In my experience, it was exceptional—and it was something I hope to see repeated.

What made it work so well? For one thing, we had a stakeholder who decided that Hubble needed a new ground system, and she was willing to do whatever it took to get it done quickly. To achieve this goal, she was willing to allow Ken to run things the way he wanted to, including demolishing a hierarchical decision structure. From my perspective, any project demands a bounty of decisions to be made in a proximate order. What we were trying to do on this project was to get those decisions made not only well, but also quickly.

All swords have two edges. In the flat organization you can get decisions made quickly. Sometimes you are missing information and have to go back and unmake them, but in the long run I think you still save time. This is definitely the way to go when speed is paramount. In

WE JUST HAD TO BEAR DOWN AND DO IT, AND THE ONLY WAY WE WERE GOING TO GET THERE WAS BY WORKING TOGETHER.

a hierarchical organization, decisions have to go through two or three levels of management to get approval. You tend to defer decisions as long as possible so you get the best answer with the most information. It takes longer, but by the time the decision is made there is usually no doubt that everyone has had a chance to comment.

Under Ken, instead of taking days or weeks to walk up the chain-of-command with a here-is-our-recom-mendation presentation and to walk back down with a here-is-our-answer document, everyone who had an interest in the selection of this capability, or this software product, sat down at one meeting and said, "Okay here is everything that we know. Here is how we want this thing to work. Here is how it fits in the system." In a two-hour meeting, an Integrated Product Team of ten to fifteen people could come together to make key project decisions.

Before Ken, I recall people quitting the project because of the lack of progress. There were several conscientious and technically competent people who couldn't deal with the lack of progress—feeling stale-mated or blocked in our attempts to move forward. The consultant who was leading the effort had assumed absolute control, to the point that individual initiative was actively discouraged.

Another reason for our change in productivity, I believe, was that the culture of the organization was completely revitalized when Ken took over. Meetings

were non-confrontational. Ken worked to make sure they weren't. Questions came up, but there were fewer hostile challenges, like "Why the hell did you do that?" The questions were more along the line of, "Well, what else did you look at? Did you consider this?" This cultural change wasn't an easy thing to do, since it is always easier to be a critic than a contributor.

We had one guy, in particular, who was an excellent engineer, but who loved to play devil's advocate. People like that can play a useful role on a project, but he simply came across as arrogant. People didn't want to talk when he was at a meeting. He impeded decision-making unintentionally, I believe, by intimidating people into not expressing their views. If you have someone who is constantly challenging a decision, you slow the process down. As a result, Ken had him removed from the project, which was probably the right thing from a productivity standpoint. The skill was there, but unfortunately his personality was damaging to the group effort.

Ken didn't allow any one individual to stand in the way of getting the job done. We were in a phase where we knew what we had to do: reengineer an existing system. We just had to bear down and do it, and the only way we were going to get there was by working together.

## ONE PHASE ENDS
It is the nature of project work that teams evolve and move on. As new development slowed, our budget and staffing were reduced, and we went from 150 people to around 40. A lot of the top performers gradually left the project. With the technical challenges on the project diminished, the need for creativity was no longer paramount. You can't keep highly enthusiastic people around if there's not enough for them to get excited about. Many wouldn't have been happy in a mainte-nance mode anyway.

In the transition from development to maintenance, we also ended up losing many of those exceptional characteristics of the project that enabled our high decision rate and productivity. Had Ken stayed around, we might have retained, who knows, more functionality in the system. As it stands, we're still doing some technical upgrades because changes in the ground

system are needed to support servicing missions and technology keeps changing, too. We try to fold in some new products and new capabilities, as well as implement some elements that were deferred earlier in the project because they were too costly. (Today, products exist that have made some of our former wish-list items feasible.) In a few cases, products we originally used in the system are no longer supported and must be replaced with current technologies.

As Ken said, when our major stakeholder retired, the new stakeholders didn't have the same goals as the old stakeholder. They weren't willing to accept the risk of keeping a radical project management approach in place. We all have our comfort zones, and it takes a great deal of courage to work outside of them. In all fairness, "radical" was understandably less acceptable in their career paths than it was in the career path of our former stakeholder, who knew that her next career move was retirement. We were lucky to have such a stakeholder in place at such a critical phase of the project's life cycle. Could we have accomplished what we did without the radical changes to our management structure? I don't think so.

We were on an aggressive schedule in development and, in response, we took aggressive steps to achieve our goals. A radical management approach may be something you can only sustain temporarily. But I think the results that came out of our experience on this project demonstrate the potential impact of adjusting management style to suit the real-time demands of a project. Our real challenge is making that possible.  •

LESSONS
• During a project life cycle, you must examine and question what management approaches are appropriate in the current phase.
• To get maximum value out of meetings, make sure that the tenor of the group is cooperative enough so that everyone feels like they can express their views.

QUESTION
*For what type of decisions would you prefer a flat organization with quick informal processes?*

OUR RESULTS DEMONSTRATE THE POTENTIAL IMPACT OF ADJUSTING MANAGEMENT STYLE TO SUIT THE REAL-TIME DEMANDS OF A PROJECT.

## YE SHALL NOT BREAK HUBBLE

"On occasion, we would remind folks, 'By the way, this is a $2-billion national asset, and if something fails, you're going to get more visibility and more attention than you ever wanted,'" says **KEN LEHTONEN** of the Goddard Space Flight Center. Making certain that no one "broke" the Hubble Space Telescope may have been his primary responsibility—but Lehtonen was intent on accomplishing far more than that. And as these stories attest, he indeed proved to be a talented "fixer" during his tenure as project manager on the reengineering effort of the telescope's control center.


LEHTONEN

In addition to managing the reengineering of the Hubble control center, Lehtonen has served as the project lead on the development of the International Solar-Terrestrial Physics ground and science data processing systems and, most recently, as the mission readiness manager on the Aqua, ICEsat, and Aura missions. Lehtonen has more than 35 years of experience in software engineering, including 20 years of "hands-on" experience developing software applications in the fields of orbit determination, image processing, real-time data capture, and data communications.


BARRETT

**LARRY BARRETT** works for Orbital Sciences Corporation. He has more than 25 years of experience in all aspects of the system and software engineering life cycle. For the past six years, he has been the chief systems engineer for the Hubble control center system.

Lehtonen and Barrett's stories in this issue of *ASK* are not the first time the two have publicly shared their experiences working together on the Hubble Space Telescope ground system. In 1999, they delivered a paper, "Culture Management on the Hubble Space Telescope Control Center Reengineering Project," at the 30th Annual Project Management Institute Seminars and Symposium, and earlier in 2004 they published an article, "Managing a Product Development Team," in *Program Manager*. Their stories in *ASK* were based on an August 2003 presentation at the APPL Masters Forum.

Lehtonen can be reached by email at ken.lehtonen@nasa.gov, and Barrett at lbarrett@hst.nasa.gov.

My division was charged with building a suite of cameras for the Mars Exploration Rover (MER) project. We were building the science cameras on the mass assembly, the microscope camera, and the hazard and navigation cameras for the rovers. Not surprisingly, a lot of folks were paying attention to our work—because there's really no point in landing on Mars if you can't take pictures.

# Walking a Fine Line

## BY MARY BOTHWELL

IN SPRING 2002 THINGS WERE NOT LOOKING GOOD. The electronics weren't coming in, and we had to go back to the vendors. The vendors would change the design, send the boards back, and they wouldn't work. On our side, we had an instrument manager in charge who I believe has the potential to become a great manager, but when things got behind schedule he didn't have the experience to know what was needed to catch up.

As division manager, I was ultimately responsible for seeing that all my project and instrument managers delivered their work. I had to make the decision whether or not to replace him.

### Insight from oversight

After talking with the instrument manager's immediate supervisor, I could see that he was doing an excellent job of keeping people motivated and working despite the challenges. For the morale of the team, I decided not to replace him—but I knew that he needed a little more horsepower behind him.

I began working with the instrument manager and got the deputy section manager involved as his day-to-day mentor. The deputy section manager actually took over running the schedule and realigned it to meet the MER project's needs.

I met with the instrument manager and the deputy section manager every day for a while. We would go around the table and discuss the schedule. We had it on an 11x17 piece of paper that the deputy section manager had put together. We went over every item. We would say, "Okay camera number three—are you really going into thermal vacuum today? Are you really ready to do the calibration on camera number four today?"

With 650 people in my division, and a half-dozen to a dozen projects to track at any given time, I don't usually get involved at this level on a project. I have neither the time nor inclination for this sort of heavy-handed management, but because the cameras were so important, I had to get involved.

The instrument manager probably felt bad for a month, but he knew that changes needed to be made. Let me make something clear here: We didn't say, "You're doing a terrible job." We never used words like, "If you don't get these things done, you're fired."
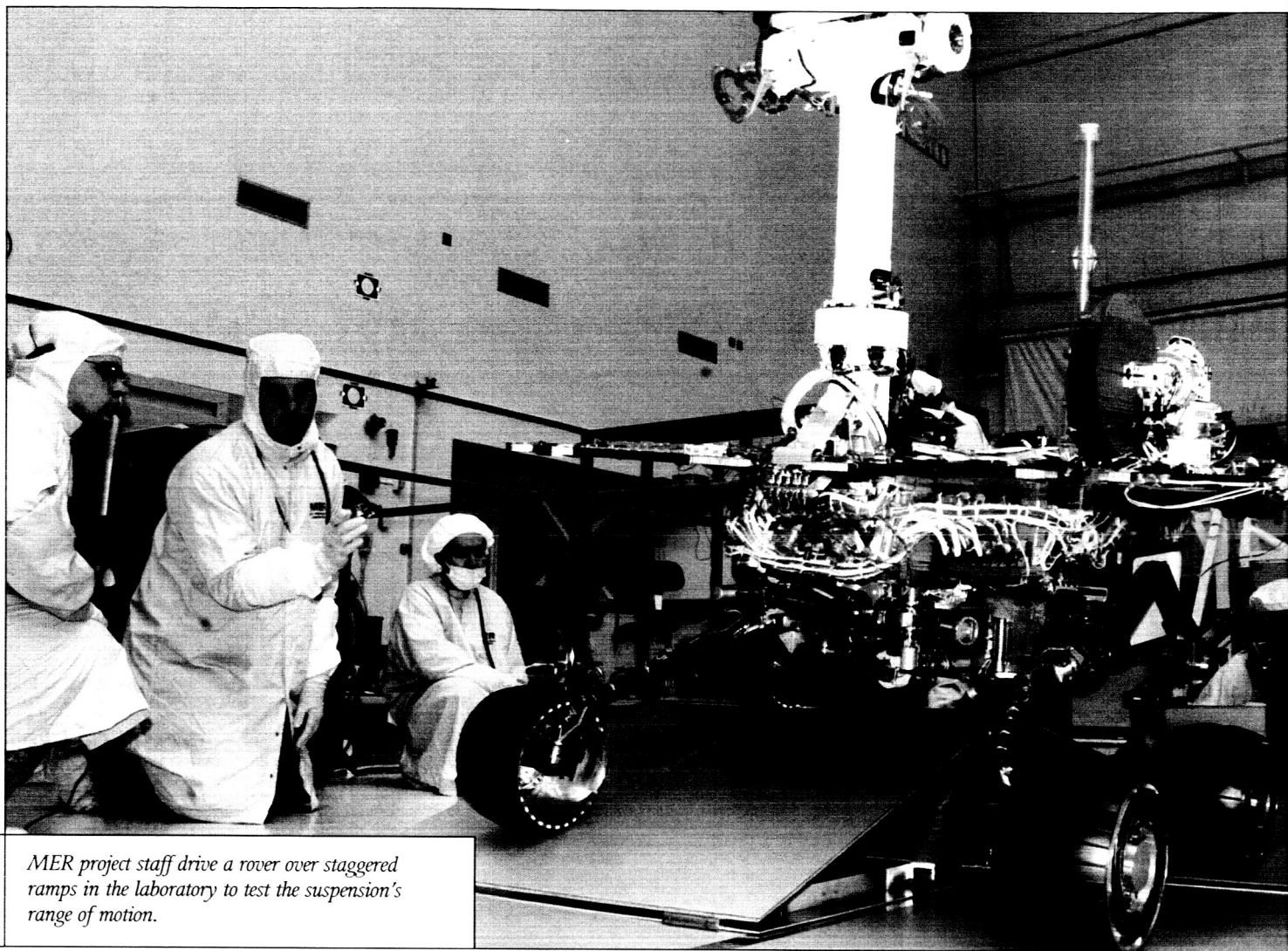
MER project staff drive a rover over staggered ramps in the laboratory to test the suspension's range of motion.



Grissom Hill
215° Azimuth
7.5 Kilometers
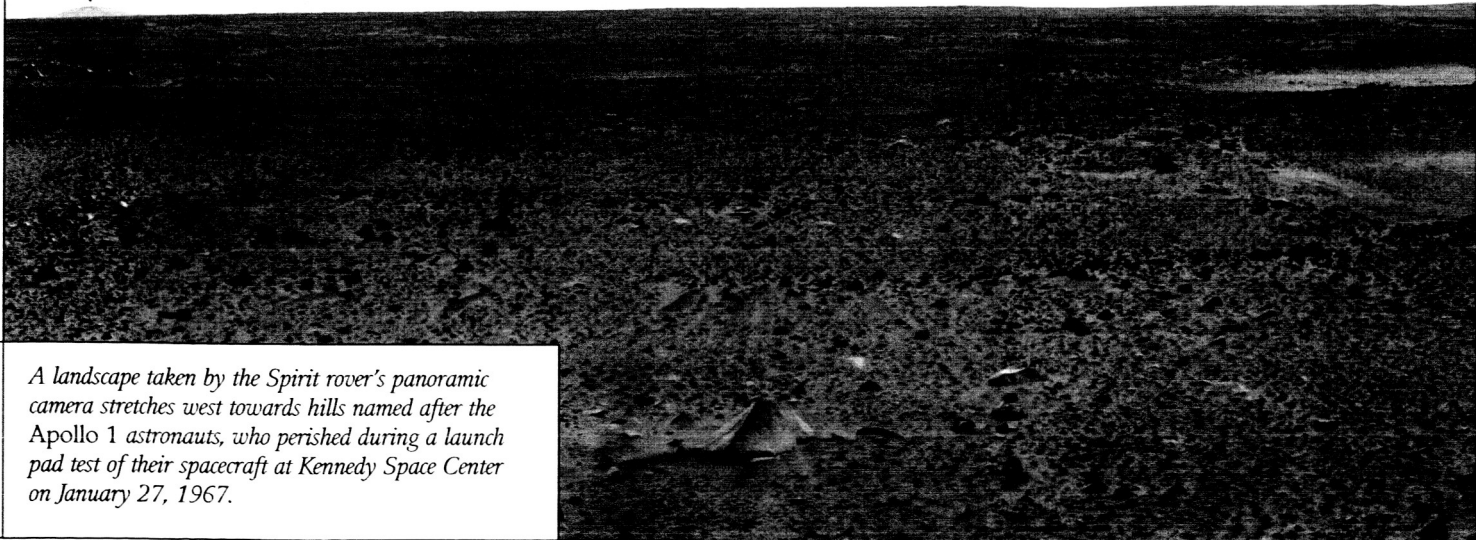
A landscape taken by the Spirit rover's panoramic camera stretches west towards hills named after the Apollo 1 astronauts, who perished during a launch pad test of their spacecraft at Kennedy Space Center on January 27, 1967.

*Spirit's panoramic camera captures an image of the rover's landing site, the Columbia Memorial Station at Gusev Crater.*



*A rover sits at rest in the lab. The MER mission's "eyes," panoramic (Pancam) and navigational (Navcam) cameras, sit atop the rover's white mast.*

What we said at our meetings was more along the lines of "We have a problem here, and we need to find a way to succeed."

Not only did I meet with the project team and management, but every day I would walk around to where members of the team were working and ask, "How's it going now? Did you get that answer yet?"
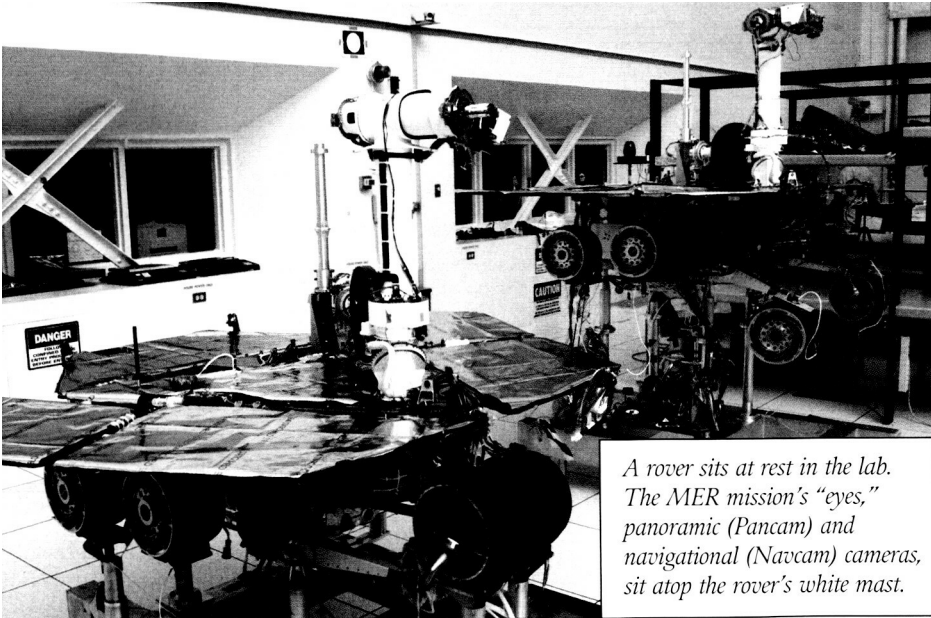
Because of that level of involvement, I knew what the challenges were so that I could forecast where the project might run into trouble. I am sure that I made a few lives miserable during this time. There was a little bit of, "Well, we really don't have a problem. We're going to be able to fix this ourselves."

But once they figured out they couldn't get rid of me, they became forthcoming about the problems. If I saw someone in the hall and asked, "Hey how's it going? Are you there?" I began hearing, "Oh yeah, we're there," or "Oh no, we didn't quite make it and this is what we're doing."

After several months, I was able to ease up, but I kept holding weekly meetings so that the team, down to

## For the morale of the team, I decided not to replace him—but I knew that he needed a little more horsepower behind him.

the floor-level technician, knew that I remained engaged in the project. As a matter of fact, I remember that at one of these meetings, one of the technicians looked at me and asked, "Why are you pushing us so hard?"

I explained our position clearly to everyone at the meeting: We were the "eyes" for the entire mission; it would not and could not fly without our cameras. If we fell too far behind on our schedule, we would drag the entire project down with us. That technician didn't complain again.

Some people might think it courageous that he questioned me that way, but one of the things that I've always tried to do in my division is have an open door policy. Everyone knows they can come and talk to me about anything. They call me on the phone, and they know I answer my own phone. If they send an email, they know I'll respond. They know that if they have to see me and I'm not around, that my assistant will work to find them time on my schedule.

### We are tested

One of the things that I pushed the instrument manager on was asking if the team had enough people to complete the testing. We needed to do 24-hour qualification soaks on the cameras in a vacuum prior to science calibration. When we worked the schedule out and worked out the staffing that was required and looked at the two other projects that we had in thermal vacuum at the time, we realized that there weren't enough people. Fortunately, we figured this out two weeks ahead, and not when there was no one to take a 4 p.m. second shift.

We could have had the project team work 12-hour shifts in order to cover the testing schedule. But I noticed that we were starting to see them dragging, and they were already under so much pressure that I was concerned about them making mistakes. I decided to take some of the shifts myself and I enlisted other managers who were capable of doing this work—so that we could give the team some relief during a time when the testing was not critical. Everyone I recruited had some past integration test experience.

My time slot was 4 p.m. to midnight on Saturday and Sunday nights a couple of weekends in a row. You have to rearrange your life to do this, but it's absolutely the right thing to do. We didn't need to use the subject matter experts.

It wasn't technically challenging work, and much of it was boring. You just sit there and take a measurement once an hour. We simply needed someone who could look at the scope and say, "It's in-spec," or "It's out-of-spec." If it was out-of-spec, you made a phone call and found out what to do next. I made a couple of phone calls on my shift when the temperature got a bit too high or too low, and was talked through the process so that I could adjust the temperature.

By offering relief to the troops at this point, they were fresh for the part of the testing program where their expertise was absolutely critical. That's something a project manager learns to do over time, and something that a project sponsor should always watch for. To ask, "Are we pushing our people too hard? Can we come up with an alternative solution that will keep us on schedule? Can we add outside people during non-critical times? Can we tell people who need a break to go home for the weekend?"

## And in the end...

As we closed in on delivery, there came a point that my interactions with the instrument manager were more along the lines of, "Hi. How's it going? We're doing such-and-such test? Oh, okay. How do the scientists like it? Great." Everything was just going fine.

While we never caught up to the original schedule, the cameras were completed in time to be integrated onto the spacecraft and rovers. The instrument team delivered superb cameras that satisfied their customers, the scientists.

After delivery, we had a party. We rented a bowling alley, all of the lanes. Some of us threw strikes and some of us gutter balls, but we bowled together all afternoon

and had a wonderful time. We had much to celebrate, after all; the instrument manager and his team could feel proud of what they'd accomplished.

We had the opportunity to celebrate those accomplishments, once again, after the successful Mars landings—with all the world looking at pictures our cameras had delivered.

LESSONS
• Project sponsors must be prepared to move from monitoring to intervening when a project runs into trouble. Timing is everything; a project sponsor must recognize both when intervention is necessary and when it is no longer needed.
• Effective managers demonstrate leadership by supporting their teams—including managing-by-walking-around and serving as a "soldier" when needed.                •

QUESTION
*How do you draw the line between destructive micro-management and constructive, intensive help?*

**LOOKING BACK**
Though she has years of experience behind her, **MARY BOTHWELL** of the Jet Propulsion Laboratory (JPL) hasn't forgotten what it was like to be a young manager on a troubled project. "I got an assignment to fly an instrument on the second flight of the *Columbia*," she remembers. "Right when everyone thought that we were ready to go, we failed the pre-ship review. It was probably one of the most miserable periods of my life."

The "misery" didn't last, thankfully. When Bothwell's instrument went back in the thermal vacuum for testing, the team was able to "prove the problem wasn't a problem." The instrument was shipped, and it flew—ultimately proving the validity of a new infrared measurement technique. "It started a whole new way of investigating mineralogy on the surfaces of planets," Bothwell explains.

Today, Bothwell serves as manager of the Observational Systems Division at JPL, where she oversees the work of more than 600 managers, engineers, and technicians working on as many as a dozen projects at any one time.

# Sounds Clear
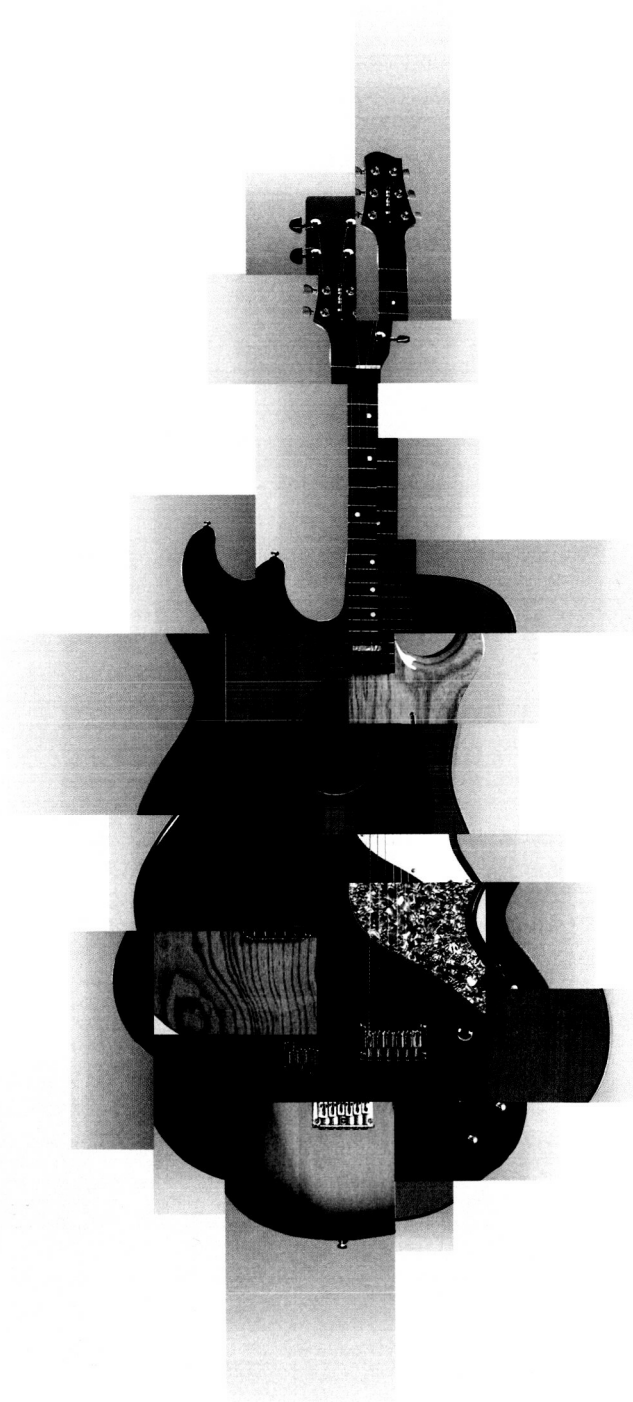
I'm a vice president at Line6, where we produce electronics for musical instruments. My company recently developed a guitar that can be programmed to sound like twenty-five different classic guitars—everything from a 1928 National "Tricone" to a 1970 Martin. It is quite an amazing piece of technology.

**By Alan Zak**

# Enough

THE GUITAR STARTED AS A RESEARCH PROJECT BECAUSE WE needed to know if the technology was going to be viable and if the guitar design was going to be practical. I've been in this business for about twenty years now, and I still enjoy starting up projects whenever the opportunity presents itself. During the research phase, I headed up the project myself.

Once we completed our preliminary research and made the decision to move into development, that's when I handed the project off—and that's where this story really begins.

## Orchestrating a hand-off

We had an engineer, Dave, who had project management experience on comparatively smaller derivative projects, some of our more- or less-matured signal-processing gear. In that role he was performing well, and he had been brought in to help the researcher developing the concept for the new guitar. When we made the decision to develop the guitar, Dave asked me if he could take over the project.

When I kick off new initiatives like this one, I never take them to the finish line. I hand them off to a project manager already in the ranks, or I try to mentor someone who's just starting out in project management. The guitar project was going to run nine to twelve months, which is a relatively short span for our projects, and would only require a small team. It didn't seem too big a project to consider a new manager.

I have to admit, though, that I had my concerns about handing off the project to Dave. He wanted to keep his hands in the firmware development, and become the project manager on top of that. There were many, many challenges in the project. Could we give the instruments an authentic sound? We had never done this. That was the first challenge. The second was that we weren't simply dealing with electronics. As an instrument, the guitar required attention to aesthetics as well as its tactile qualities. It needed to be desirable for the customer from a "playability" standpoint. We might get our arms around it from an engineering vantage point, but we also needed to work with an outside manufacturer for the body.

Dave is certainly a competent engineer—but one of the problems we sometimes have with engineers is that their people skills aren't strong enough to be effective project managers. Now, I knew that Dave had a hard-core engineering background, but I also knew that he had worked well with his team when managing derivative programs. Plus, he was a guitarist himself. So, he had the enthusiasm I look for. The other thing that I suppose sold me is that he told me that he had been doing some soul-searching and looking at his career track and so forth, and he really wanted to develop his skills as a project manager.

We talked about all of this a lot before I agreed to let him lead the project. I said, "You know, this can be difficult. If you want to do it, more power to you. We will try to help in any way we can, but if the situation does get to be more than you can handle, we need to know."

I gave Dave the project because he had a good track record. But I knew that I was introducing an element of risk to the project, because the scope was larger than what he had handled before. This was something we would need to watch carefully.

## Project discord

Fast forward a few months: Dave did get himself into trouble. The main problem was that he wouldn't relinquish his technical responsibilities. In essence, he was saying, "While I'm doing the engineering myself, I'm also going to be managing the project."

And he did deal well with the engineers and technicians on the program. But we also needed for him to be dealing with the manufacturing interests, supporting the subcontractors, looking ahead to the marketing aspects, keeping control of the financial planning, and

staying on schedule. There's a reason that project management is a full-time job.

Dealing with the body manufacturers in Korea and China, and integrating that with our own electronics manufacturing here in Los Angeles, came close to being a full-time job in itself. The electronics work was also experiencing some minor setbacks. As a result, the project was falling farther and farther behind schedule. I had to have some very frank discussions with Dave. "In my view," I told him, "you're spreading yourself too thin."

Invariably, a young project manager will respond, "I'm not spreading myself too thin. I can keep this thing going, and it's going to get better. Just because I was here until midnight, you know, it doesn't really matter. Give me a week, you know, we're going to turn this thing around."

## I think the nail was put in the coffin when the production units arrived, and they were badly flawed.

In this case that went on for more than a month. From my perspective, it got worse and worse as we went. At last, I said, "Dave, if we get to this next milestone and it's still apparent that you can't function at the higher level of visibility that we need, we're going to have to bring in some help."

I think the nail was put in the coffin when the production units arrived, and they were badly flawed. They were 50 to 60 percent unusable. At that point, I knew I had to bring in a new manager.

### Dealing with the dissonance

It never is pleasant to replace a project manager, especially a young one, because you always, to a certain degree, hurt their feelings, their pride. I brought in a manager, Kevin, with a proven track record who was winding down work on a couple of other programs. He was the best project manager we had on staff.

Earlier, when I had handed off the project to Dave, it was a natural progression. Kevin and I both understood that this second hand-off was very different; it was a sensitive matter. Kevin didn't want to come in and usurp the good things that had been going on, including the camaraderie that had developed among the team members at that point.

By telling their leader to step down, we might inadvertently be letting the team down, and the project could have unraveled quickly. Once things do start to unravel, I know from experience that sometimes you can't put these things back together. My prime concern during the transition was to keep the team enthusiastic and highly motivated.

The way I dealt with that was by staying involved after Kevin took over. I had as much open dialogue with the team as possible—with the schedule as a backdrop. In other words, when Kevin and I put together a new schedule, we didn't foist it upon the team saying, "Look, you've got nine months. You had better make it happen." No, it was a collaborative process. The team not only signed up for the new schedule, they authored it. Once we all had agreed on a schedule, I held regular weekly meetings with the team and the new project manager where we looked at the milestones against our schedule.

And what of Dave? Yes, I replaced him as project manager, but I wasn't saying, "You know, we're just going to cast you aside and move on." I believed that he still had much to offer the project, and that he was committed to see it through to the end. Dave remained on the project, but strictly in a firmware capacity.

His first reaction was typical of what I usually see in cases like this. The project manger that's being replaced says, "Well, okay, I understand. We've got to do what's best for the program." He understands that was a logically sound decision to make; but then the emotions kick in. In general, the people who work for us put their heart and soul into these projects. When they've been disappointed like Dave was, often they'll start acting out. Sometimes it's as benign as being a little less responsive. In extreme cases, they find ways to demoralize the rest of the team.

This was not an extreme case. Dave's bitterness, or resentment, simply had to be managed. I would say that his cooperation ebbed and flowed. In order to let the new project manager focus on more important issues, I took on the job of monitoring Dave's attitude. I made an effort to

work alongside him on occasion, so that I knew when I needed to take him out to lunch and have a talk with him, or when I needed to let things go to give him some space.

## The next movement

In hindsight I can see that I made a mistake in picking Dave to be the original project manager. He had a good track record with smaller scope projects, but I misjudged the level of risk that I introduced to the project by selecting a manager whose experience had not prepared him for the magnitude of this particular project with its many interfaces—including manufacturing teams, offshore contracting, and FCC oversight interfaces.

I also had to relearn another lesson: Project management is a full-time job. If a project manager also wants to take on a technical role on the project, it must be a small, limited role—and not something in the critical path. If you have anyone trying to take on a managerial role, but they're also implicated in the critical path, really in all cases that's a recipe for difficulty if not disaster.

Dave is still with our company, and still working productively. For now, I have made the decision that his future lies on the architecture side of our work. He might have thought that he wanted to be a project manager, but it became clear that his heart was still in the engineering. More than anything else, he wants to be working with the latest, greatest digital signal processing. So, he's very happy in that role. For now, anyway.

And what of the guitar? Even after the new manager came on board, we couldn't get the project back on schedule. Early missteps are difficult to make up, and it was clear that in several respects we did not meet our objectives. One example: We didn't deliver in time to make our original marketing window.

Still, I didn't let the project slip too far before interceding. Ultimately, the project was saved. The guitar was delivered three months later than we had hoped, but it's doing extremely well on the market. In fact, it was our most popular product in the industry last year.          •

### Lessons
- Project management requires skills and experience, but first of all it requires dedicating sufficient quality time to the project. A novice project manager must understand that his or her new role will demand significant energy and time.
- When a project manager is replaced, even if the transition is handled in a timely fashion and with sufficient sensitivity, the project may still require a great deal of oversight on the part of project sponsors. Substituting one project manager for another should not be seen as a "quick-fix."

### Question
*Under what circumstances should a project sponsor remain closely involved in a project after a hand-off?*

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### JAMMING WITH ZAK

"By using digital processing modeling techniques, we can make guitar amplifiers sound like any kind of vintage amplifier you could want," explains **ALAN ZAK**, Vice President at Line6. Zak heads up electronics projects for musical instruments that "give musicians a larger sound palate to work with." The guitar project he describes in his story, "Sounds Clear Enough," is the Variax™: "Vari" as in various stringed instruments it can sound like; "ax" as in the term that guitarists use for their instrument.

Guitar projects are a harmonious fit for Alan Zak. A musician himself, he has played and performed as a guitarist for much of his life. "When I was in high school, I played in several bands. I wasn't a world-class player, but eventually I managed to get gigs opening for people like Ricky Nelson and George Jones."

In his early 20s, Zak decided it was time to go back to school. After two years of engineering courses, he went to work for a startup music company and was involved in the invention of digital recording technologies and sound processing gear, obtaining three patents. "I was also doing a lot of project management. That's when I decided to go back to school to get a Bachelors degree in business." (For the record, he also has two Masters—one in comparative philosophy, the other a MBA degree.)

These days, Zak plays classical guitar—ironically eschewing the technologies he's helped develop. "Technology is wonderful," explains Zak. "I think it's great for recording and for sound reinforcement, but I'm still captivated by the simple musicality of playing."

# BRINGING UP

IN 1977, I had just finished eight years on the VIKING program, which was just a marvelously rich, fascinating experience, using the most up-to-date, sophisticated management techniques, under an outstanding leader named JIM MARTIN. After that, you could say the opportunities available to me within NASA in some ways were limitless.

I REMEMBER QUITE VIVIDLY WHEN I GOT THE PHONE CALL FROM ED CORTRIGHT, who was the Langley Center Director at the time, with news about my next assignment. He asked me to come to the aid of a project that was in trouble, the Rotor Systems Research Aircraft (RSRA).

"Are you sure you got the right guy?" I asked. "You've got so many aeronautical researchers at this center and you pick on me. I don't know anything about this technology."

"This is not a mistake," he assured me. "You're the person I want to do this."

Cortright recognized that bringing this project to its end point would require someone with my skills—not necessarily me, but somebody like me who could drive the objectives of the program towards the plan already laid out. On *Viking*, we said we were going to land a spacecraft on Mars and do science there. Every decision we made was focused on that, so we learned to pay attention to our objectives.

Cortright's concern was that unless someone with a real project background came in to deal with the contractor who was building the aircraft, it could become a continuous sandbox research program. They were trying to make the technology the best they could get it, and this was costing a lot of money and a lot of time. It's like you're trying to get to 99-percent pure. Well, you have to learn sometimes that 95-percent will work, and that requires you to force people to make decisions to get it done.

The project manager was also the researcher who had designed this aircraft. The whole project was his idea. He had worked in helicopter research for 28 years. I would say he probably had spent seven or eight years getting the project approved. Then he spent another three years working on it. Altogether a decade of his life was invested in this project. It was going to require a delicate touch for me to step in and help him understand that this was what was best for the project. I realized that this was his baby, there was no doubt about that, and I had to promise him that I was going to take care of his baby.
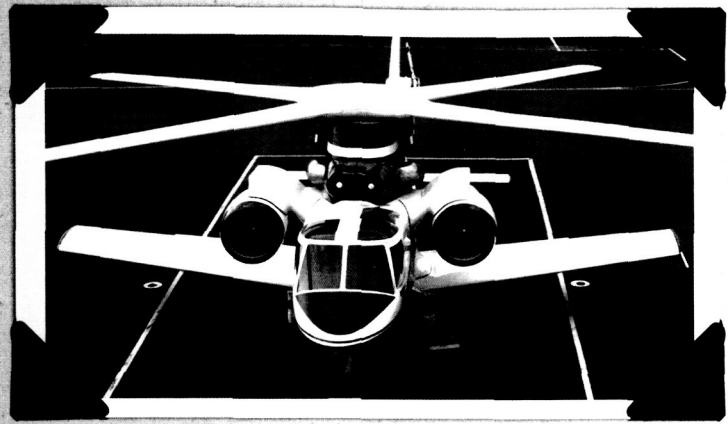
# BABY

**BY ANGELO (GUS) GUASTAFERRO**



Members of the first-generation Rotor Systems Research Aircraft strike a pose. Dressed to the nines in the front row, fourth from the right, is project manager Gus Guastaferro.

A next-generation X-Wing Helicopter awaits takeoff.

One of the things that made this project exciting to me, and why I was keen to accept the challenge, was that in spite of decades of leadership in aeronautics, my center, Langley, had never designed its own fully integrated airplane, except for this one.

I said to Cortright, "Well, before I say yes, let me go talk to the individual." I told him that I wouldn't make a decision until I understood the problems, and I wanted to understand them from the project manager—not from a third party, but from the person running the project.

## A MEETING OF MINDS

I went to see him. Nothing had been announced yet, and I didn't tell him I was considering taking over the project, but he knew something was up. He was not dumb. I was not there because I had nothing to do for lunch. I just said I was asked by the director to get a rundown of what he was doing. To his credit, the manager was forthcoming with details.

So, I went back to Cortright and said, "I'll take the job, if you still want to offer it to me because I understand what the challenges are and what the problems are. I believe I can help, but I want to keep the current manager as the chief engineer."

When Cortright made the call to the project manager to tell him he was going to be replaced, I wanted him to explain it in no uncertain terms,

*They were trying to make the technology the best they could get it, and this was costing a lot of money and a lot of time.*

"Hey, you're going to be replaced, but Gus would like to have you on his team. He needs you."

And it's true, I did. It would have been very hard for me to take over this project without his smarts. I had a pretty good sense of my own weaknesses. I didn't come there as a helicopter research specialist. I was expected to

step out of the space world, because remember *Viking* was an outer space mission, and enter this new world of aeronautics. I could have said I don't need this person and gone out and hired a different chief engineer. My management would have supported it.

But how you handle a transition like this is important. There was no guarantee my method was going to work, but I had previous experience in two situations like this where the manager was forced to leave and I had to take over, and I did not want to repeat what happened to me in either of those cases.

## FLASHBACK

Once, I had to take over management of a critical resource without the help of the previous project manager because he was fired. It was then I learned how difficult it is to pick up where someone else has left off—without that person's knowledge to rely on.

Another time, on *Viking*, I faced a situation similar to what I was facing on RSRA. In 1973, a little more than two years before launch we ran into problems with one of the instruments. Jim Martin said, "You're no longer the management operations director. I'm putting you on this instrument, and you've got to go make it happen."

Again, I offered to make the instrument manager my chief engineer. I could have easily let him go, but I decided that he should still be on the team. I wanted to make him a part of the solution rather than a part of the problem. The worst thing is to say, "Hey, thanks for being around. Good luck. Have a good life," and then walk away. That's a big mistake. You have to be sensitive to that transition. Nobody likes to be replaced.

Hence, I did the same thing that I did on the RSRA, but the difference was that the instrument manager on *Viking* wasn't a researcher, he was a project type, and he never accepted the transition. He never did anything to hurt the project, or me, but he wasn't interested in helping either. I had to decide whether I would bring him along or let him go. Eventually, I found another position for him that allowed him to leave the project with dignity.

I learned an important lesson from this experience. When you see that there is a lack of interest, then you work hard at finding them a new place, another niche. You've got to get that person off your project and get them somewhere else.

## THE COOPERATION FACTOR

There is no question in my mind that my job on RSRA would have been tougher without the cooperation of the project manager I replaced. It was certainly a lot easier with him. He stayed with me for about two months as my chief engineer, and he was just wonderful in terms of the transition. He understood my skills and what needed to be done, and was able to put his own ego on hold while he adapted to this new life.

**The worst thing is to say, "Hey, thanks for being around. Good luck. Have a good life," and then walk away.**

When you get in an environment where somebody has lost their baby like the RSRA researcher, and you do a good job in convincing them that they can still be a part of the solution, then you've done the right thing. The researcher on the RSRA believed in his baby so much that he accepted the fact that this transition was necessary to be successful. He spent a lot of time giving me the technical aspects to do my job as best I could. What I gave him was an understanding of why this decision had to be made.

Now I also had to show the team that I valued this individual. He was obviously well liked and respected as a technologist. I can't speak for the rest of the team, but I think they respected me for the fact that I didn't hurt their former leader.

Right after I joined the project, I held a party. The manager that I replaced came with his wife. You know, I sensed more hurt and sensitivity in his wife than I ever did in him, and so I made sure to take her aside and let her know how important her husband was to the project and that he would certainly be sharing in its success.

Thirteen months later, I'm proud to say that I lived up to my word. The day we had the first flight, he was standing right there with me. It was still his baby, and he had raised it well. He just needed a little help in getting it to college. •

LESSONS
• You don't want to lose key project knowledge. When a person being replaced has key project knowledge, seek ways to make sure that knowledge remains available to you.
• Be sensitive during transitions. You don't know how emotional fallout will affect the project. Allow people to step out of their roles with dignity.
• Don't overlook the teammates of a leader who is replaced. It is not your job to convince them that this is the right decision, but you should respect their feelings toward their colleague.

QUESTION
*How can you detect early on whether attempting to leave the replaced manager on board is going to be successful or not?*

**STAYING IN TOUCH**
Following his work on the research project described in this story, **ANGELO (GUS) GUASTAFERRO** went on to serve as NASA Director for Planetary Programs, Deputy Director of the NASA Ames Research Center, and Vice President of Civil Space at Lockheed Martin. Now retired, Guastaferro's decades of aerospace experience don't go untapped: He continues to consult for NASA on future space systems and serves as Chairman Emeritus of the Hampton Roads Technology Council and Director of the Virginia Technology Alliances.

In addition, Guastaferro's work for APPL includes serving on the Advisory Board of the **Leaders as Teachers & Mentors** (LT&M) program, which leverages NASA's wealth of human and intellectual capital by connecting recognized program and project management experts in NASA and the aerospace industry to practitioners of all levels across the agency. LT&M participants, some active managers and some retired, reach beyond their immediate circle of colleagues to provide guest lecturing, teaching, consulting, and mentoring.

# TRANSITION TIME: ZERO
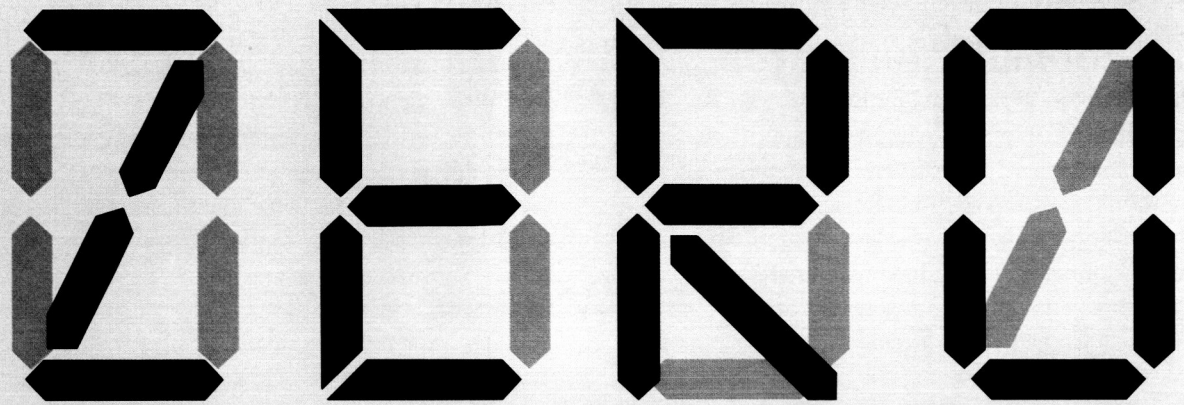
BY W. SCOTT CAMERON

**I had been in a technical/project management assignment about two years, when one day my boss asked me to come to his office to "discuss an opportunity." When I arrived in his office, he indicated that the project manager of one of our biggest ($10M+) and most important projects had requested to be removed from the job immediately, and the organization was going to grant the request. He felt I was the most experienced person he had and thought I would be a perfect fit for this job.**

THIS JOB WOULD, NO DOUBT, POSE CHALLENGES. Engineering was near completion and most of the equipment was on site—but only 20% of construction had been completed. I would have just six weeks to complete construction, start up the facility, and begin production. I was flattered to be considered, but realistically knew I had only done one similar, but smaller, project in my career.

I had managed that project from the start to the end—so I had no experience with assuming another manager's project. This assignment would be a three-to six-month job at a remote location. I would need to

be on site in just two days, in order to have transition time with the old project manager. I worried this wouldn't be enough time to learn everything that I would need to know.

After thinking it over for a night, I accepted the assignment, packed my bags, and arrived on site ready to debrief with the project manager—only to discover the project manager had decided not to return to the site. Thus, my transition time was zero. I focused, instead, on meeting the rest of the team and learned another key piece of the puzzle: There were serious interpersonal and functional issues within the team.

Team members were candid with me—many told me that they didn't like other people on the team, or they wanted to be working outside their current functional areas. The R&D, engineering, construction, and manufacturing personnel had formed a variety of alliances amongst themselves, and none of these alliances were focused on getting the job completed on time to meet the business need.

By noon on the first day, I knew this was going to be an interesting challenge, to say the least. The good news was that the project files were organized and in good shape and the team members appeared competent. With the clock ticking, I also realized I didn't have time to train new people. I decided to trust the remaining team members and focus on their strengths while trying to use each hour of every day wisely to build team unity.

I used the first two days to join up with each team member on a one-to-one basis to understand what he or she felt they needed to be successful. I used the information to define an execution strategy to meet the schedule, and then I began trying to break down the interpersonal and functional barriers I had inherited. These join-up meetings were a critical component for me to revise the existing execution strategy. During these meetings I discovered if an individual's success criteria were different than the team's success criteria. Even though a person has agreed to the team's criteria, they may actually be

**THERE WERE SERIOUS INTERPERSONAL AND FUNCTIONAL ISSUES WITHIN THE TEAM.**

motivated by other criteria, which could negatively impact the project. A one-to-one, face-to-face, join-up meeting was the only way I knew to build solid trust between the project manager and the team members.

I also decided to not look back or focus on what caused the team to become segregated, but to focus on moving forward. Thus, I decided never to utter the words I have heard spoken often by project managers assuming an existing project: "You wouldn't believe how screwed up this job was when I took over."

**A ONE-TO-ONE, FACE-TO-FACE, JOIN-UP MEETING WAS THE ONLY WAY I KNEW TO BUILD SOLID TRUST BETWEEN THE PROJECT MANAGER AND THE TEAM MEMBERS.**

After the first two days it was time to tackle the files to determine the technical scope and see what omissions and cost issues, if any, we were facing. This strategy worked well and by the end of the week the team began to focus on what was needed to meet our timeline. We began a 24/7-work schedule with the project team and construction crew working extended hours. As the days passed, the team began to function better and began to pull together. We even made time for team-building activities, which were viewed positively and continued to sharpen our focus as a working unit.

To make a long story short, we performed a miraculous turnaround, but missed the start-up date by a week. Instead of berating us for not meeting the original schedule, management was elated we came that close—considering where we were six weeks earlier. The team continued to work better and better with one another and, by the time the team disbanded twelve weeks after start-up, it was a very cohesive unit.

This experience taught me something that has been born out over time: A successful transition doesn't necessarily lie in time spent with the exiting project manager. Don't get me wrong—that can be a big help. But the success of a transition actually lies in getting to know the people you will be working with, understanding their perceptions of what is and isn't working, and taking the time to read and analyze existing files to get a flavor of the project as well as the cost, schedule, and technical commitments that have been agreed to or modified over the course of the project.          •

**W. SCOTT CAMERON** is the Capital Systems Manager for the Food & Beverage Global Business Unit of Procter & Gamble. He is also a regular contributor to *ASK Magazine*.

# PASSING THE BATON
## LESSONS IN REGRET

### By Terry Little

I HAVE LED SIX MAJOR DEFENSE ACQUISITION PROGRAMS during my civil service career. For most of those, I was the first leader the program had and did not have to adjust to someone else's legacy. This was both good and bad.

The obvious good was that I was able, for the most part, to fashion things as I wanted them. These included patterns of interaction inside and outside the project office. I chose who would be in leadership positions. I developed the managerial philosophy and leadership vision. I decided my role vis-à-vis others in the office. I created the expectations and goals. The bad part was that all the while I was doing this I never considered what I might be leaving my successor to deal with. My reasoning was simple: I never intended to leave. I should have known better.

Every time I left a program, it invariably went into a nosedive that lasted anywhere from a few months to, in one instance, more than two years. I could blame my successors for failing to pick up where I left off, but that would ignore the obvious. I was the common element in every case. I had failed miserably in preparing the way for my inevitable successor—failed five times! What had I done or not done?

For one thing, I had adopted many non-standard practices which suited me, but would likely be unsuitable for my successor. Consider earned value and metrics as an example. Because I did not agree with earned value and metrics, I simply did away with them. I worked on a face-to-face basis getting my information first hand and verbally. My way involved an amount of travel that any reasonable successor would simply not tolerate. Additionally, the DoD's "best program management practices" places a lot of emphasis on using earned value and metrics as tools. Anyone replacing me would probably be adhering to these.

The second thing I did was to make many manager-to-manager agreements that we never formalized in writing. They were just good faith understandings between two people. What happened when my successor arrived? There were no more understandings. My successors honored the written agreements, but had no allegiance to the unwritten ones I had made. The result was sometimes major turmoil.

Third, I unconsciously fostered a tailored mentality among both the people who worked for me and the contractors' project personnel. For instance, everyone knew that I was impatient with detail and wanted to get quickly to a bottom line that I could measure against my intuition for making decisions. Good for me, but bad for my successor—likely to be a more typical program manager who would expect detailed analysis.

I also developed a somewhat deserved reputation as a bridge-burner. If one of my peers from outside the project office didn't agree with what I was doing, I simply went around or ignored him or her. It worked for me, but my successors had to rebuild lots of bridges, which took time, energy, and focus away from executing the project.
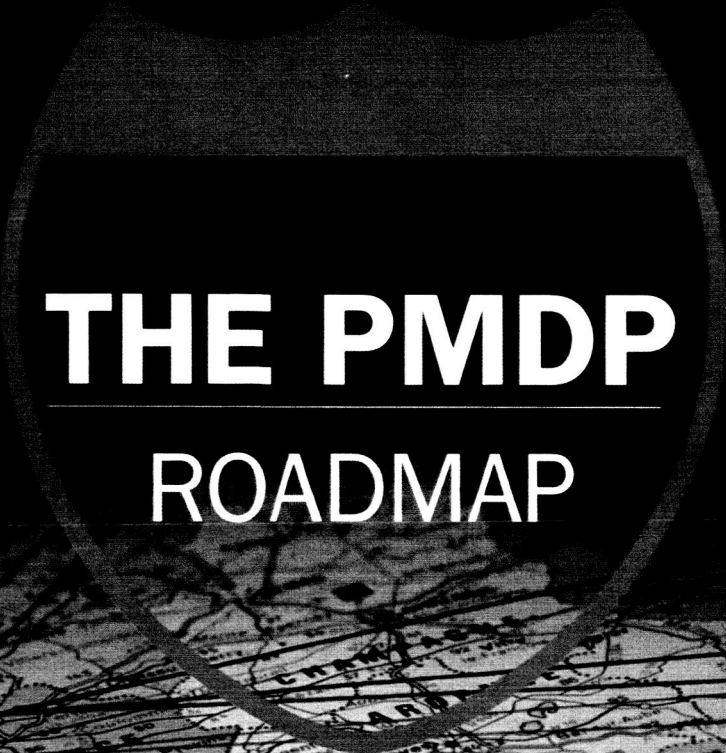
I cared more for people's passion, loyalty, and their ability to get results than I did for how they did things. In that way, I put some real "odd-balls" in responsible positions. I was more than willing to sweep up any broken glass—a willingness that my successors did not share.

Perhaps my worst fault was that I never groomed anyone to be my successor. I could have done that easily, but since I didn't intend to leave, it never occurred to me that I should do that. Some people take longer to learn from their mistakes. It has taken me failing to do this five times before I finally learned to begin a succession planning process in earnest starting from Day 1.

In a perfect world, a program or project would have one manager from birth to death. But we don't live in a perfect world. What should you take from all this? You decide. My conviction is that leading a project in a way that best allows a seamless transition to another leader at some uncertain time in the future is fundamental to project success. •

**TERRY LITTLE** is the Director of the Kinetic Energy Boost Office at the Missile Defense Agency. One of the most seasoned program managers in DoD, he is also a regular contributor to *ASK Magazine*.

# THE PMDP
## ROADMAP

The Project Management Development Process has been a great boost for my professional development. Having gone through the program—and having received recognition for advancing through all four levels of it—I've had opportunities that wouldn't have been available to me otherwise.

—Rex Geveden, Deputy Director, *Marshall Space Flight Center*

NASA's COMPLEX AND HIGHLY TECHNICAL MISSIONS rely on effective project teams and managers. Since 1993, through its Project Management Development Process (PMDP), the Academy of Program and Project Leadership (APPL) has offered direction to the Agency's project practitioners as they advance in their careers.

PMDP helps identify and sequence professional experiences, courses, and other project-based learning experiences that support individual career goals and center activities by outlining competencies at four levels of development. The result is that PMDP provides NASA project practitioners with a road map to the knowledge and competencies appropriate for their job—and the jobs to which they aspire.

Plus, new this year, APPL has rolled out its electronic Project Management Development Process (ePMDP) tool, a learning management system that includes a dynamic presentation of the PMDP levels, competency areas, competency organizational structures, Individual Development Plans (IDP), and online PMDP enrollment.

*APPL's website, www.appl.nasa.gov, provides access to ePMDP, as well as other online resources for NASA practitioners enrolled in the Project Management Development Process.*

### ● PMDP LEVEL I: TEAM MEMBER

At Level I, the project team member demonstrates an awareness and understanding of NASA's project management (PM) tools, techniques, and lexicon. A Level I project practitioner is an active, contributing member of a team—often a functional expert, business manager, systems engineer, scientist, or project control agent. Level I portfolios are validated by a practitioner's immediate supervisor.

*Required training: APPL's Foundations of Project Management class (or equivalency). Information about APPL classes, including schedules, is available in the Career Development section of the APPL website, www.appl.nasa.gov.*

### ● PMDP LEVEL II: SUBSYSTEM LEAD

Practitioners at this level have at least two years of project team experience (including two years as a subsystems lead) and must demonstrate the application of PM tools, techniques, and lexicon at the project subsystem level, including utilization of PM best practices. Level II portfolios are validated by the Center Peer Group and PMDP panel.

*Required training: APPL's Project Management and Systems Management classes (or equivalency).*

**Developing NASA leadership**
I'm certified at Level I of PMDP, and I'm in the process of finishing up my certification for Level II. Though my title doesn't read "project manager," I have come to realize that everything I do requires some sort of project management skills.

Over the past couple of years, I have worked with the Integration Engineering Section for the International Space Station. Right now, Space Station is reorganizing,

and I'm going to help out over on the operations side. We have limited resources, but high technical demands. Efficient project management is what ties those two together—and certainly the findings of the *CAIB Report* bear this out. As an Agency, we can't afford to base our decisions on a limited viewpoint (cost and schedule) when there are critical technical requirements that have to be met.

It's important now that we use the *CAIB Report* to try to see what we need to do to become better as an agency—and I think that the PMDP process supports this effort. Effective project management is key to getting us where we need to go.

—**Bili Stinson,** *Kennedy Space Center*

### ● PMDP LEVEL III: PROJECT MANAGER

Level III project mangers must have at least eight years of project team experience and five years of successful project management—in addition to demonstrating the integration of PM tools, techniques, and best practices across subsystems at the project level. Level III portfolios are validated by the Center Peer Group and PMDP panel.

*Required training: APPL's Advanced Project Management class (or equivalency).*

### Expanding horizons

I started out in operations on the Shuttle Program and for more than ten years I was a systems engineer on the floor. I went from a greenhorn apprentice working for a senior systems engineer to be a lead systems engineer with people working for me.

At some point, I set a goal of becoming a project manager—and I knew there was a lot I needed to learn. So, I went and sought opportunities that would expand my exposure to project leadership.

PMDP was part of that process for me. I received my Level III PMDP designation last year. In addition to what I've gained through the curriculum and hands-on experience, I've benefited from all of the people that I've met through the process. Over the years that network has become invaluable to me.

Not everyone wants to become a project manager, but I think that having project management experience is an essential part of doing any agency job. Projects are at the heart of all of NASA's work. I encourage everyone in my division to be at least Level-II certified, because it gives them a formal way of looking at and understanding project work by understanding how to deal with schedules, logistics, people, and all the rest.

—**Hector Delgado,** *Kennedy Space Center*

### ● LEVEL IV: PROGRAM MANAGER

Leaders with responsibility for a large agency-wide program must demonstrate strategic vision of PM principles, tools, techniques, and best practices. Level IV managers must exhibit the ability to manage a complex program or set of intricate projects with multiple associated interfaces, performing appropriate trades across projects and providing reviews and recommendations to projects—including cost, schedule, and technical performance management. Program managers' PMDP portfolios are validated by the Center Peer Group, PMDP Panel and an agency-wide panel.

*Required training: APPL's Program Management and International Project Management classes.*

### The path ahead

I feature my Level IV PMDP certification prominently in my resume and job applications. I think my promotion to my current position and the one before this were directly influenced by my Level-IV PMDP certification. The leadership here certainly mentioned it frequently.

The best part of PMDP is that a career development path is laid out for you. To some people it may look like you're merely "checking off" a list of requirements. In reality, as you go through the process, it turns out to be a strong enhancement to your career development. That's because it is put together by people who understand what it takes to move through the different levels of program and project management. So, if you take the pains to go through it, I really think you emerge from that process being highly suited to provide effective program and project management.

—**Rex Geveden,** *Marshall Space Flight Center*
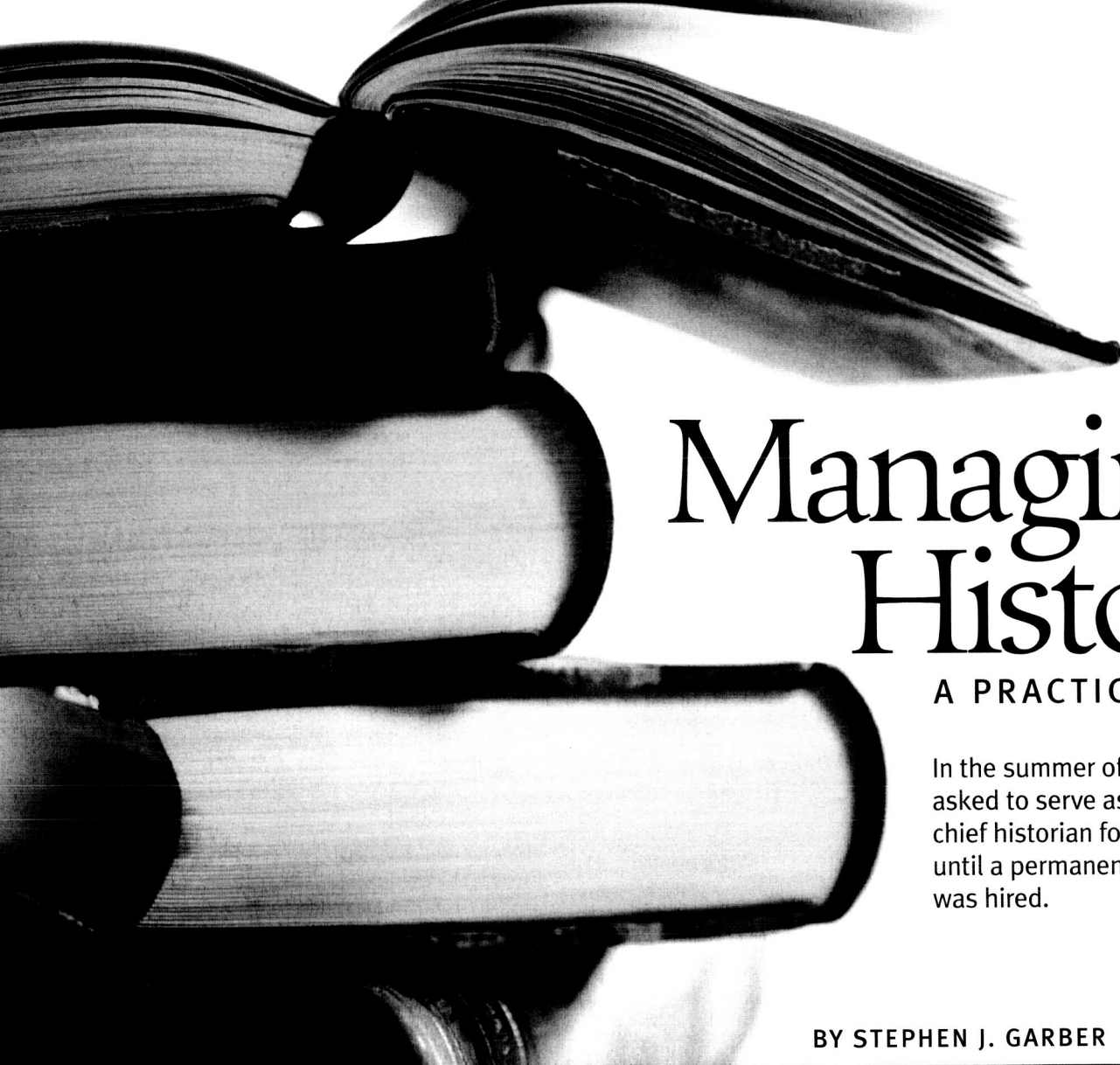
# Managing History:

## A PRACTICUM

In the summer of 2002, I was asked to serve as interim chief historian for NASA until a permanent replacement was hired.

BY STEPHEN J. GARBER

ROGER LAUNIUS, THE PREVIOUS CHIEF HISTORIAN, HAD accepted a job offer from the Smithsonian. I guess you could say I was the logical person to step in while the search began for his replacement. I had been with the NASA History Office since 1995, and had worked closely with Roger. While not officially called his deputy, I suppose you could say I had functioned in large part as one.

I had established and overseen a successful intern program in our office and had also worked with various outside historians as contractors; the work had piqued my interest in project management. Even though I understood my work as chief historian would be temporary, I looked at it as a good career opportunity. I enjoyed doing historical research and working on my own, but I wanted to improve my management skills.

My time as acting chief historian and the experiences that led up to it have underscored a management principal that's worth repeating: Projects are people.

**Practice One:** Leverage your resources to create win-win situations for both you and your team members.

Here is an example of some useful practical knowledge I gained managing a small project that I thought would serve me in good stead in my new assignment. Several years before I became the interim chief historian, I had been given the task of managing the History Office website, including supervising a small volunteer staff. We usually have one or two people who do some volunteer work for our office, and I used them to post new content to the site.

Then there was this other person, Chris Gamble. He wasn't working as an official volunteer for us, but he spent a lot of time volunteering criticism about our website—especially regarding every place he noticed a typographical error. I appreciated his feedback but I needed to find a better way to channel his help.

It occurred to me that I should try to recruit Chris into doing something more proactive, and I asked him if he would be willing to look over some new Web pages before we "went live" with them. That way he could catch errors before they went public on the Web, rather than later. He agreed.

After Chris had worked with us for a while, it wasn't such a big leap to ask him if he would be interested in preparing out-of-print publications for the Web in an electronic format. Since then, he has formatted literally dozens of books for us that are now available online. As a small token of our thanks, I send him free copies of all

# It's not as though I've found a perfect solution, but I have learned to think through different options for communication.

of our new publications—but he continues to work on a volunteer basis. If we were to hire a computer professional to do all this HTML work, it would cost a lot more than we could afford.

He's done all this incredible volunteer work for us from his home in Switzerland. I've never met him in person, and I think I've spoken on the phone to him once; we communicate by email and snail mail. A happy ending to the story (although he continues to work with

me) is that I nominated him for a prestigious NASA award, which he received. Afterwards, he wrote me a moving email, telling me how proud he is to be part of the NASA team.

Sometimes when I'm having a bad day, I think about Chris Gamble. I'm just glad to work at an agency that engenders such enthusiasm from the public and in an office at NASA that gives me the flexibility to leverage resources in unusual ways. I don't think too many other people in government have the opportunity to tap such volunteer efforts.

**Practice Two:** Because moving from team member to manager changes responsibilities, you may need to develop different communication strategies for dealing with people you already know.

Personalities rub people different ways, and dealing with all the different personalities around me when I began working in the role of the chief historian was the big challenge I faced. Suddenly, I understood why, for example, Roger had clashed with certain people. Often I clashed with them, too. In the past I tended to vent or openly criticize other people I was unhappy with. I realized quickly that as head of the department I couldn't afford to do that any longer; it would be counter-productive to our work, besides being unprofessional and unkind.

Today, my communication style varies, depending on the person I'm dealing with. I like to use the coaching analogy: You've got to figure out what each player needs to stay motivated and productive; some may need reassurance, some "tough love," and others "just the facts." In practice, though, I know that there's not an easy answer for each personality.

One person I work with, for example, kept calling me and wanted to have long phone conversations to discuss every little detail of the project he was working on. I began scheduling regular tag-up meetings and asked him to save all non-urgent items for our meetings. Then the tag-up meetings began running longer than I wanted. I began scheduling meetings with start and end times. I took a stronger role in leading the meetings and I closed the meetings on time. Our meetings became more efficient, but then I was concerned that we might not get around to covering everything we needed to cover. So, you see, it's not as though I've found a perfect solution, but I have learned to think through different options for communication.

> **Finding mentors like these people has been helpful in grounding me, giving me perspective, and reinforcing my initial learnings.**

I often think back to two professors I knew in grad school. One taught a class on strategic management and pointed out that some people prefer to get their information verbally and some prefer the written form. This seems obvious, but I hadn't thought about it that way before. At the time, I was a grad assistant for another professor who liked to call meetings with me and his other assistant to "chew the fat" for a while. These bull sessions seemed like a waste of time to me and I couldn't figure out why he liked to talk so much. I had wrongly assumed that because he was a researcher and writer, he always liked to get his information in written form. So the obvious moral to the story is that each person has a different communication style.

**Practice Three:** Identify those people whose judgment you trust and be willing to seek out their advice.

To get through this situation and others that have come up, I have relied on people around me for advice—often people I had known, but never turned to in the past. There is one particular person in my office that I've always thought of as a level-headed individual. I hope she doesn't mind that I've begun to use her as a sounding board. Indeed, it seems to have encouraged her to use me as a sounding board, as well, for things that she's wrestling with.

Roger was very good about offering to help after he left. Sometimes I turned to him to ask his advice on situations, even if I already had a good idea of how I would handle them. I didn't call him with every little decision, but I talked to him when I thought a situation warranted extra attention. When he was still my boss, he had often asked me for my input on things. We seemed to be in sync in terms of our judgment in many cases.

I also had lunch with the head of our History Advisory Committee a few times over the year I served as chief historian. I felt that it was a good thing to do when I was feeling a lot of stress or when I didn't know how to handle certain situations. It wasn't as though he could offer any magic advice—but he is older than I, again has good judgment, and in general is a reasonable person with some gravitas. At first it surprised me when he would ask me personal questions like, "How is your wife doing? How is your health?" I wanted to focus our precious lunch hour on a host of work-related questions. But I quickly realized that talking about those personal things helped me to put any problems at work in perspective.

Finding mentors like these people has been helpful in grounding me, giving me perspective, and reinforcing my initial leanings.

### The story ends, or perhaps it's just a chapter

In November of 2003, I finished my temporary assignment as the chief historian and handed off the job to Dr. Steven J. Dick. I've returned to my role as a senior member of the History Office.

Was it a good year? I think so. Taking on a senior management position was a stretch for me, but knowing what I know now, I will be happy to stretch myself again when the right opportunity arises. •

Thomas R. Gavin joined the Jet
Propulsion Laboratory (JPL) in 1962.
Currently the Associate Director of Flight
Projects and Mission Success, he has
garnered a long list of engineering
and management positions, including
serving as mission assurance manager for
both the *Voyager* and *Galileo* projects,
spacecraft system manager for the
*Cassini* mission to Saturn, and deputy
director for JPL's space and earth science
programs. His previous assignment was
director of space science flight projects.

GAVIN WAS HONORED IN 2003 AS A FELLOW OF THE American Astronautical Society at their national convention in Houston, Texas. He has received NASA's Exceptional Service and Outstanding Leadership medals, and *Aviation Week & Space Technology* magazine's Laurels Award for outstanding achievement in the field of space.

***You've been with JPL for 41 years. What were some of the early lessons you learned from the project managers you worked under?***
The technical challenges in those early days were immense. I learned from the early practitioners in the space program, such as John Casani, Bill Shipley, and Casey Mohl. They were all bright, disciplined thinkers who emphasized understanding problems in great technical depth. In fact, we're still following the principles that they laid down 40 years ago.

***What is something that you learned from them that you still use today?***
Casey, for instance, would have coffee every morning in the cafeteria at 7:15 a.m. Everyone was welcome to come, sit down, have coffee, and ask questions. Guess what I do? People know that I come in to the cafeteria around 7:30 a.m., and, if they want to talk, they know where they can find me.

***Do you remember making mistakes or having missteps when you were working for any of those legendary project managers? If so, how did they respond?***
I was the mission assurance manager for the *Voyager* project and John Casani was the project manager. Casani has a very systematic approach in examining issues or problems. When you had to present a problem and the potential solution, Casani would very quickly work the discussion to the boundary of your understanding of the issue. He always worked it with you so that you were discovering the soft spots in your solution. It was always a constructive learning experience with Casani.

***So, the response wasn't to slap you down?***
No. It was very much to help me. I had the opportunity of a terrific on-the-job learning experience.

***So, you got to see the processes modeled?***
Yes. I learned incrementally. I absorbed it all, piece by piece. I didn't really have to think about what I needed to learn; I was lucky enough to see it modeled over time.

We recognize that in today's environment of short development schedules, engineers don't necessarily have the luxury of incremental learning. With new projects frequently on the horizon, we need to supplement their hands-on experience with training.

To that end, we at JPL have compiled many years of experience in our *Flight Project Practices and Design Principles* and we have developed a project's manager class—where the role and responsibilities of project management are explained to newly appointed and prospective project managers. This class is popular and provides a detailed look into the life of a project manager. As a result of this class, we have increased our pool of engineers ready for a project manager assignment, and we have also had engineers recognize that project management may not be for them. This unexpected outcome from this class is beneficial to both the employees and the Laboratory.
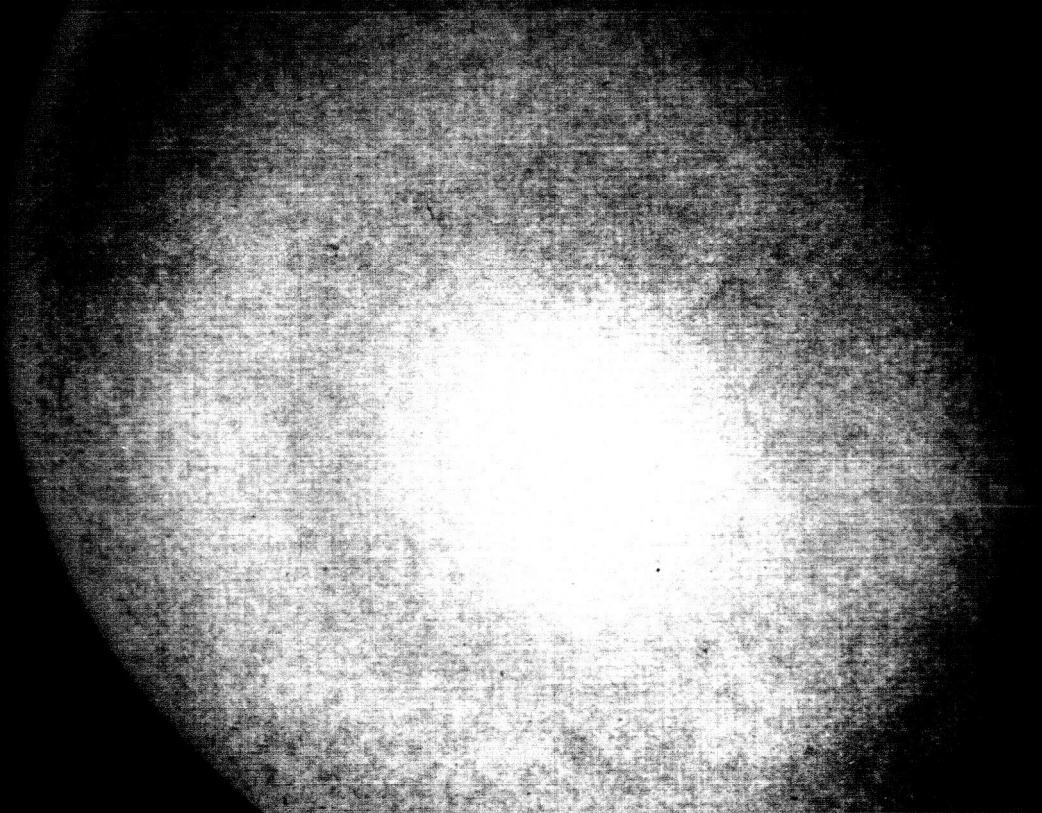


The Voyager 2 *spacecraft captures an image of Saturn's rings.*
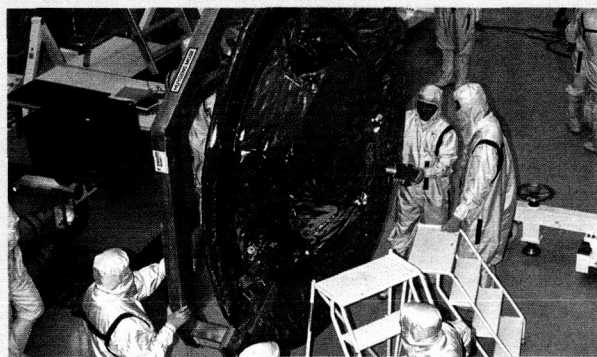


Technicians install the Huygens probe on the Cassini orbiter in the Payload Hazardous Servicing Facility.

> "Someone said to me once, 'Why would you want to run scared?' I said, 'Because it makes me think of all the things that could go wrong, so I can deal with them before they do.'"

*Uranus as seen from the* Voyager 2 *spacecraft.*

*As someone whose responsibility it is to groom project managers, what do you look for? What do you expect in people who want to be project managers?*

First of all, they must have the necessary technical and leadership skills and personal integrity.

You also must be able to inspire the confidence of the project team who is going to work for you. Take Pete Theisinger, the project manager of the Mars Exploration Rover, for example. He took on the job of launching two spacecraft from a dead start in 37 months. His team members had to have faith that he was going to lead them and look after them. Those are the qualities that I look for.

*How do you spot the real leaders?*

You have to watch their careers. What challenges have they faced? What commitments have they made and have they met those commitments? What have they delivered? In many ways, this is a natural selection process. Around here, if you say you want to be a project manager, the first question is always going to be: What experience do you have? What have you delivered?

The fact that you want to be a project manager doesn't mean you are going to get the job. Part of the experience set for a project manager has to be delivery responsibility—what have you delivered successfully? Did you do it on time? Did you do it on money, be it hardware or software?

In addition to delivery experience, we are looking for the total package. How were your communications skills? How did you deal with problems? How did you deal with stress? It's those kinds of things.

*As you were going through that process yourself, was there a point where you said, "This is going to make or break me"?*

Sure—again, for me it was *Voyager*. I was named mission assurance manager when I was 30 years old, and I was on the mission until it launched in 1977. Because of my work in the first couple years of the project, I was given responsibility for the radiation hardening of the spacecraft from all of the mission's electronics. They said, "Okay, you go do this job." I had that development responsibility from 1974 until launch.

*Voyager* leveraged everything in the rest of my life at JPL. On the other hand, if *Voyager* had not gone well, they might very well have said, "Well, we saw what he did."

*At the time, did you think you were in a little over your head?*
I thought I was in way over my head. I was thinking, "You want me to do what?" *Voyager* was a real stretch for me.

*Don't you think there's irony here? One of the things you're talking about is making certain that people are prepared to advance to the next level. On the other hand, you're talking about stretching, about making a leap.*
That's right. You've got to make people stretch a little. I decided early on that I love to run scared. Someone said to me once, "Why would you want to run scared?" I said, "Because it makes me think of all the things that could go wrong, so I can deal with them before they do."

*Voyager* was my biggest stretch. With the *Cassini* project, on the other hand, there was no reason that I couldn't do well with that. I was the spacecraft manager for *Cassini*, and by that time I was well prepared for it.

*I'm sure you still found a way to scare yourself.*
I did. Before *Cassini*, I had always worked on the technical side of the house, where the emphasis was on meeting the engineering requirements first and foremost. Cost was secondary. Now I had a different role. That was the first time on a project that I had to manage the money, and it was definitely a stretch in that sense. So, I poured a lot of effort into learning about cost estimating and cost performance. I stumbled for a while but ultimately succeeded.

*But in the end you returned money on* Cassini. *How did you manage that?*
Some people will argue that we just had a lot of money to work with. I would say we were disciplined. From the start on *Cassini*, I knew what reserves we had for the spacecraft. The budget was $611 million, and $71 million of that was reserve. We made a series of decisions about how we would implement the project, and what type of management systems we would put in place to make certain we understood where the money was.

We did a lot of fixed-price contracting, for example. So, we said, "Let's make sure we get the requirements right the first time, because if we fix-price this and then we go back and change requirements, we're going to hemorrhage money." Some of the contractors bet that we couldn't discipline ourselves, but we did. We spent the first two years of the project making certain we understood the requirements and had the right design.

*So, you delivered the goods. Then you had to leave the project when it was time for operations. How does it feel to hand off a project to someone else?*
You just walk away from it. You get the new management ready, and then you walk away.

It was interesting with *Cassini* because as we were approaching the launch, I would warn the younger staff, "You're about to experience a feeling of separation." There were as many as 700 of them on the project team at one point. I would say to them, "You've been working now for five or six years with all of these people. You're a part of this great *Cassini* team here at JPL. We're going to launch it, and then all of this is going to go away. You're going to have a sense of loss. You need to be prepared for that."

*How was it for you, personally?*
Actually, when we came back from *Cassini*, it was kind of funny. Just imagine it: You're the leader of the band. You've got everybody watching you. You're down at the Cape. You've got the headphones on and you're launching the spacecraft. Everybody is cheering and high-fiving, right?

Then I get back to JPL and walk into my office. Do you know what I saw in the office? Boxes and boxes and boxes. The guy who was the manager for operations came by and said, "Hi, welcome back. When can you be out of here?"

When I came back from *Voyager*, it was the same thing. I had been down at the Cape for four months. I showed back up at JPL, walked up to the *Voyager* Missions Support area and my badge wouldn't work. I rang the bell. The girl said to me, "Can I help you? Who are you and why are you here?"

*So, I guess the only way to get through that is to find the next project?*
That's right. Projects end. That's our reality.

But I love it. Listen, we are privileged. Everybody who works for this agency is privileged. We're privileged to serve the American people the way we do. It sounds corny, but look at what the American people have allowed us to do. We need to do our very, very best. We should kick our personal interests aside. We're doing these things in the name of science and for the American people. I never forget that. •

**"A**s we were approaching the launch, I would warn the younger staff, 'You're about to experience a feeling of separation.' **//**

Voyager 1 *launches aboard a Titan III/Centaur rocket on September 5, 1977.*

# Checkmate to Uncertainty

*Coping with project uncertainty requires, at times, surprising solutions.*
*I recall a story related to me by a project manager that illustrates just such a solution*

THE PROJECT MANAGER WAS OVERSEEING THE CONSTRUCTION of a new complex of swimming pools for a university, when the school's athletic director asked him to also remodel the basketball arena. He'd never done a remodeling project before, and this particular project was extensive. The entire arena needed an overhaul. He'd established a good relationship with the athletic director, and since his project was winding down, he agreed to tackle the remodeling job.

One consideration in his planning was that the basketball stadium was used by many of the school's sports groups, so there was only a small window of opportunity to complete the job—the last three weeks of summer vacation. This timeline was nonnegotiable.

His first draft of the project schedule required a one-month timeline to complete the remodel as proposed. Working with the athletic director, he reduced the scope of the project and drafted a schedule with several contractors working in parallel where possible. The three-week timeline could be met.

He presented the initial plan to the school's administration for approval. The plan had the last day free for any emergency that might arise (Figure 1). The administrators, based on their experience with previous remodeling jobs, asked for a revised plan with two days at the end for emergencies. What he gave them instead was a plan with no free days at the end.

Why? After meeting with potential contractors, he found that it was impossible to accurately estimate the time needed for some of the remodeling tasks until the work had actually started. If one contractor exceeded the estimated time, for example, that would delay the start of the next contractor's work. The contractor who followed the first would not sit idle; instead he would move to another job, further delaying his start time and rendering the entire schedule useless.

Prior to developing a schedule, he established two criteria to reduce uncertainty. First, he reached an agreement with the athletic director that there would be no changes to the project. Second, he would select his contractors on the basis of proven reliability, not just cost.

The schedule had to absorb changes as work progressed without collapsing. He did this by inserting time buffers—a half- or full-day between tasks—to follow tasks that were on or close to the critical path and had a high probability of time overrun. These would allow him to absorb schedule changes without stressing the overall timeline. A bar chart depicting the project schedule would look like a checkerboard, with black squares representing planned tasks and white squares representing the time buffers (Figure 2).

The result was excellent. While he did use some of the time buffers, he never had to change the scheduled start time of any of the contractors. This convinced the administration to adopt a "checkerboard" system for all future remodeling projects.

The story I heard from this project manager demonstrates what I have seen time and again: Successful project managers create project schedules that can easily checkmate uncertainty by loosening the connections between uncertain tasks. •
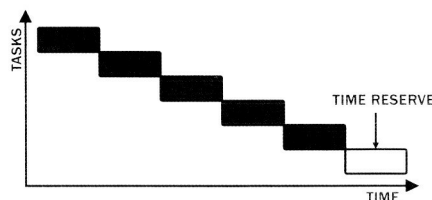


Figure 1: Proposed Initial Schedule



Figure 2: The Checkerboard Schedule