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ASK

INTERVIEW

Donald Margolies

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We had the money, and we thought we knew how to do this thing—but our flawed cash flow plan stood between a successful project and us.

—Dr. Kenneth L. Atkins, from his “Mr. Stardust’s Wild Ride” (p. 16)

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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 genuine nuggets of 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*.

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One-of-a-Kind, Two Ways

Though each issue of ASK Magazine *addresses the concerns of project management, this issue, like all previous issues, is a one-of-a-kind product filled with the unique and often innovative insights of individual project practitioners*

In that way, we feel a kinship with Ames Research Center technologist Dan Gundo, who builds one-of-a-kind hardware for NASA projects and has given us a story about one. In "The Clock Is Ticking," Gundo writes about an exercise bed he built for space scientists studying ways to counter the atrophying effects of microgravity on human muscles. The novelty of the exercise bed is only part of what we think you'll find interesting in the story. Best of all is how Gundo learned to work with his customer to define project requirements clearly enough and early enough to allow him to meet a challenging deadline.

Requirements challenges come up in another story, "Enough is Enough," by James Barrowman. On the Rossi X-Ray Timing Explorer mission, Barrowman worked with the science team to put down on paper what constituted "good enough" science before development work on the spacecraft began. This looked prescient when a technical problem emerged, and suddenly the scientists forgot about what was good enough.

This story is not the first to appear by Barrowman in *ASK*. In Issue 3, we featured his story "Pin the Deputy's Badge on Me" about doing double duty as program manager and deputy project manager in the Explorer Program Office at Goddard Space Flight Center. You can read Barrowman's other story by going to the *ASK* archives on our Web site.

Donald Margolies is also making a repeat appearance in the magazine. We featured a story by Margolies in Issue 9 about an episode on the Advanced Composition Explorer (ACE) mission, for which he was project manager. In the interview you'll find in this issue, Margolies invokes examples from ACE to discuss the challenges of scheduling. After reading the interview, you may want to read more about ACE. Again, visit our Web site and you'll find several stories about ACE in Issue 9.

If it sounds as though I'm pushing our Web site, then I guess it's because I am. After several issues not having a Web companion to our print edition, *ASK* is back online at appl.nasa.gov/ask.

We've taken advantage of being part of the expansive NASA portal to introduce many new features. For example, in this print issue we've collected several lessons learned from retired Goddard project manager Jerry Madden. These lessons first appeared in 1995 when Jerry released his underground cult classic, "A Project Manager's Lessons Learned." We've pulled together some of our favorite here from the 128 Madden collected. If you want to read all of the lessons and you don't have a well-connected friend with the original copy of the lessons, you can find them all on the *ASK* Web site. And by the way, you can also read an interview we did with Madden that appeared in Issue 4.

What else this issue? In early 2004, a NASA spacecraft will intersect a comet and return home in 2006 with some microscopic particles of stardust, another one-of-a-kind mission. This is the subject of Jet Propulsion Laboratory project manager Ken Atkins' story "Mr. Stardust's Wild Ride." The spacecraft is presently on its way to rendezvous with Comet Wild II, but Atkins will tell you how precipitously close the project came to an early demise. This story will be a jolt to anyone who thinks the only money issue that matters on a project is how much you get. Atkins shows that *when* the money arrives can be just as important.

There is plenty more good stuff in Issue 14, so go ahead and dive in. •

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.

HECTOR DELGADO is Division Chief of Process Tools and Techniques in the Safety, Health and Independent Assessment Directorate at the Kennedy Space Center. In 1995, he served as Senior Technical Staff to the NASA Chief Engineer at NASA Headquarters in Washington, D.C. He has received many honors and awards including the Exceptional Service Medal, Silver Snoopy Award, and various achievement awards.

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 of the Goddard Space Flight Center 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 of Aerospace 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.

Surf's Up

Saturday morning and I could be at the gym, doing something healthy. Instead, I'm sweating away as I perform surgery on my Dell computer

EARLIER THIS MORNING, I WAS UTTERLY DISCOMBOBULATED when I turned on my computer. For some inexplicable reason, I couldn't get onto the Internet. Understand, Web surfing isn't a hobby for me. My time on the Internet is an addiction.

I call my service provider and the help person tells me that the problem is my card—a 10/100 or 100/10 something. I have to switch my card to an open slot. Huh? I don't know how to open the computer shell.

My helper assures me he'll be here (invisible but connected) to help me get through it. If his grandmother could be instructed to fix her computer over the phone, surely I can be, too. (His naiveté is scary, but forget about that—I'm in good hands.)

My fingers start to quiver. Suddenly, a thought comes screaming from my brain: Why am I here?

I get the Dell open. I even find the card. But all my slots are filled. He tells me to switch the cards to see if the problem is the card or the slot in which it's seated. My fingers start to quiver. Suddenly, a thought comes screaming from my brain: Why am I here?

The answer, I'm afraid, is a sign of the times. I desperately want my high-speed internet service. Crazy, I know, but I have become a Web junkie. I need (the key work here is "need") to read New York newspapers to hear about my favorite hometown teams. I need ESPN to tell me what's happened in the sports I follow and what's going to happen next. Of course, I need to check out *NASA Watch* to feel in the know. Then I need to check flights, since my wife Dianne and daughter Amanda are on a short vacation. I also need to check my e-mail for presentations I'll be working with colleagues. If this isn't enough, on Saturday my son Daniel and I need to play an on-line game with my brother and his friends in Phoenix.

"Place firm pressure on the cards—"

It's okay. My helper is right here.

"—but don't force them."

NYPost.com, ESPN, Dianne and Amanda… I'm on my way. I fumble to put the second card in it's slot.

It's in place! Eureka!

I turn on the computer and.... Yes, it all works. Touchdown. Grand slam. Happy feet!

"Thanks, kid," I say and then I hang up and begin to surf.

The Web has become a source for everything: work, play, collaboration, networking, information, research, stories, news, music, communication, decision making, pictures, surveys, assessments, and everything else. When the system goes down, I start to react like a man with a crack habit.

By no small coincidence, this story coincides with the fact that on July 31, the APPL Web portal debuted. New and improved, as they say. Working with Jeanne Holm's JPL team, the NASA Chief Information Office, and a group of brilliant Web fanatics, we've built an amazing virtual APPL. First up, *ASK Magazine* is again available online—when, where, and how you want it. The Web will also allow us to expand some of our *ASK* features, so keep an eye on us and enjoy.

Be careful, however. You might just find appl.nasa.gov is addictive. •

Enough Is Enough

by James Barrowman

"It's the wrong thing to be doing," I told the director of engineering, trying to head off a last minute change in our X-ray Timing Explorer (XTE) project

THE SPACECRAFT WAS NEARLY INTEGRATED AND HAD passed some of its early mechanical and electrical testing. One of its instruments, the Proportional Counter Array (PCA), had a gas leak in one of the five proportional counter modules that made up the array. The science division where the instrument was being developed wanted a gas replenishment system added to assure the PCA would last for the entire mission.

Adding a gas replenishment system would mean interrupting spacecraft integration and testing; developing a new subsystem and integrating it onto the spacecraft; modifying all the PCA modules; including a complex integration of the instrument onto the spacecraft; and implementing a more complex performance and environmental test process. It was the wrong answer because it made a simple design more complex and added little value to the mission at a major cost in time and dollars. Our mission couldn't afford the additional budget and schedule risks.

XTE was the latest of a long line of projects being managed by my Explorer Program Office, but it was unique in being the first project we had agreed to do for a fixed price. NASA HQ agreed, in return, to provide us with the funding profile we needed to make it happen. We were both trying to break the unhealthy spiral in the Explorer program that saw current missions overrunning and pushing subsequent missions downstream to the point where their science was becoming marginal. The science community was upset and wanted better performance from NASA.

I summarized my arguments to the director. The Engineering Directorate had taken responsibility for the spacecraft development when we established XTE as an in-house project at Goddard Space Flight Center, and also was supporting the PCA development.

"It adds complexity," I reiterated. "It's a significant cost impact for only a marginal reliability increase."

His response was music to my ears, "Jim, I won't stand in your way, but you'll have to convince the scientists and engineers."

Left: *Liftoff on December 30, 1995.* ***Middle:*** *The XTE project team stands in front of the launch vehicle at Cape Canaveral.* ***Right:*** *The Proportional Counter Array (PCA) instrument has five xenon gas detectors used to study x-ray emitting objects in the Milky Way and beyond.*



Now comes the real work

My next stop was the science division where the instrument in question was being developed. I was anticipating a fight because I knew that the scientists and instrument engineers thought they needed the system in order to assure a longer life for the PCA. There was real disagreement on the benefits of the change and the impacts. Four of the PCA modules were sealed well and leak tests had confirmed they would last beyond two years. Only one module had a problem. None of this was outside the parameters of the project's basic requirements, and I knew that I was going to need to rely on those requirements if I was going to win this argument.

I entered the fray, so to speak, because the XTE project manager had asked me to get involved. I was the Explorers program manager, but I worked with my project managers in a way that encouraged them to consider me their deputy. They gave me jobs to do that helped them out. In the process, I created a stronger bond so that they didn't simply view me as a boss, but as somebody who supported them. The project manager and the spacecraft manager wanted to stay focused on the mission development while I fought the political and technical battles necessary to prevent disrupting progress.

As part of our plan to pull XTE off for a fixed price, we worked closely with the science team to document the mission requirements. We struggled together to make the requirements specific, clear, and to the greatest extent possible quantitative. As a result, the XTE project plan identified performance requirements on all the major mission elements. Two of the requirements bore directly on this situation: The mission had to last two years, and four of the five PCA modules had to be operative for that time period. Of course, the scientists' goal was for XTE to last much longer than two years and to have all five PCA modules operating as long as possible.

It's important to note here that we didn't negotiate our requirements in isolation at the beginning of the project. Our requirements were well thought out and realistic because they were established after we had taken implementation approaches into consideration during initial formulation. First, the scientists laid out broad goals. Eventually, we gained an understanding of the architecture, implementation, and programmatic issues, and we were able to sign off on realistic requirements.

We were both trying to break the unhealthy spiral in the Explorer program that saw current missions overrunning and pushing subsequent missions downstream to the point where their science was becoming marginal.

Sealing the deal

When it was time to remind people about these requirements, I met with the instrument team and laid out the total situation, both technical and programmatic. All the key scientists and managers had signed the XTE project plan, and we supposedly had a firm and broad agreement on our direction and plan. "These are your requirements, guys," I said. "You signed up for them, and you agreed to them."

I didn't have to say it explicitly because it was clear what I was getting at: Where's your integrity? If you didn't mean this, why did you sign up for it?

They weren't happy, but they agreed not to pursue the gas replenishment system. Our mission requirements were being met. The scientists stood by their requirements and confirmed their understanding that we

had taken on this mission for a fixed price in response to concerns from the broader science community.

Once that decision was made, my engineers refocused on the question of the leak. The instrument development team redoubled their efforts to seal the fifth PCA module. Eventually, they found a tolerance build-up and fixed it in time to get the module delivered on schedule.

The XTE mission was ready on time and well within budget. It is now on orbit as the Rossi X-ray Timing Explorer (RXTE) mission in honor of astronomer Bruno Rossi. RXTE has dramatically improved the understanding of the high-energy phenomena in the universe, discovered black holes at the center of galaxies, and correlated the size of black holes to the size of the galaxies.

Not only did the mission meet its requirements, RXTE is still scientifically productive after seven years in orbit, and there has been no degradation of the PCA performance. The time we spent working with the scientists to get the right requirements clearly understood and mutually accepted has reaped a far greater return on investment than we dared to imagine. •

The project manager and the spacecraft manager wanted to stay focused on the mission development while I fought the political and technical battles necessary to prevent disrupting progress.

Lessons

• Clear, documented requirements help you control the scope of your project and resist unnecessary changes. Have all key parties sign off on the requirements to assure that they understand and are committed to them.

• Get your project requirements right as soon as possible, but not prematurely. To assure they are realistic, requirements should not be finalized until after implementation approaches have been considered.

Question

How do you know you are done defining requirements?

Deputized

As head of the Explorers Program, **JAMES BARROWMAN** oversaw the successful launch of eight Explorer missions in three years. In his story, "Pin the Deputy's Badge on Me" (*ASK* 3), Barrowman explained that the program's tight resources inspired him to serve as deputy to the project managers working under him. "In addition to reducing overhead while maintaining technical positions," Barrowman wrote, "I felt this would change my relationship with the project managers from boss to supporter." But did it work?

Despite competing time demands, initially "nervous and disoriented" staff, and occasional differences of opinion, the novel arrangement translated into a successfully run program. Barrowman summed up the experience this way: "In the end, the project managers and their staffs were satisfied, I was satisfied, and we were all able to operate an effective and efficient program."

Over the course of a 22-year career as a project and program manager at Goddard Space Flight Center, Barrowman received the NASA Outstanding Leadership Medal, the GSFC Award of Merit, and two NASA Exceptional Service medals. He has been a longtime supporter of APPL programs, and can be reached at jbarrowman@comcast.net

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the clock is ticking

by Dan Gundo

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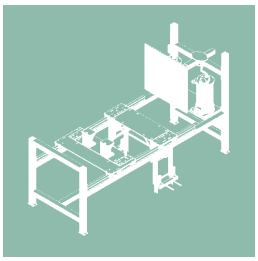

Recently, I worked on creating a one-of-a-kind device for a Space Station group studying exercise physiology at another NASA Center. They approached my department at Ames Research Center to design and build an exercise bed that allowed users to perform the motions that they needed for ground-based research. The real challenge was that they needed the device designed, built, and delivered in just one month.

I drew up rough sketches of a design following the initial plan described to me. The bed was intended to simulate doing squats while in a horizontal position as if on a moving sled. They wanted to incorporate a resistant device called an Interim Resistive Exercise Device (IRED), an adjustable cable tied into a reel to provide a measured amount of resistance. This device was used on the Station for exercising in space; we were taking the same resistant reel and incorporating it in this bed.

In the early stages of a design project, I communicate with a customer as much as I can and as often as they will tolerate. There's a lot of learning that needs to go on, and I prefer to spend a little bit of extra time here because that can save a lot of time later. In the beginning, you need to volley the information back-and-forth, so that you understand the customer's requirements and they know what you're capable of doing.

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SYNCHRONIZING OUR WATCHES

They liked my initial sketches, so I started adding more detail. I also started to identify the shopping list of materials. I explained why I recommended certain materials over others, and how I would go about building the bed based on the resources that I had available to me. We also were narrowing down the cost of it. All of these issues have to be considered from the perspective of producing a design as quickly as possible. This whole process I've described happens in a matter of days, sometimes even hours.

I can make the most wonderfully innovative device that has ever been seen on earth, but if I don't get it done in time for the customer to use it, then it's all been a waste.

When I'm designing something from scratch, there are a lot of uncertainties. In my design for the exercise, I implemented adjustability into the device—more than they had asked for initially—because I knew that people of different heights might need to use the bed. I put more travel in the foot rest when I realized that it didn't have enough range.

It's okay to be flexible and change something many times while it's still a design, because it's a heck of a lot easier to change your design on paper than it is to change things once you have metal cut, welded, and machined. Sometimes researchers will come up with another idea and another idea and another. These can have major ripple effects on all of the parts, pieces, and components of how the device is sized, shaped, and built. So, there comes a point when I want the customer to say, "Okay, I'm settled on this design. This is it. We're going to move forward with it and we're not going to change anything."

From my perspective, the priority on any project is to deliver it on the due date. I can make the most wonderfully innovative device that has ever been seen on earth, but if I don't get it done in time for the customer to use it, then it's all been a waste.

ELEVENTH HOUR

You can probably guess where this story is going. At the point at which I thought we were ready to start buying the materials and cutting metal, my customers introduced a significant change to the requirements. Somebody within their group decided that a counterweight to neutralize the weight and introduce vertical motion of the hips was crucial to the performance of the exercise. It changed the complexity of the project substantially—just a couple of weeks before the due date.

When my customer came back to me asking for this last-minute change, I knew that the responsibility was on my shoulders to make it happen. I wanted to build a product that met their needs, but I didn't quite understand the details.

I had to know for certain, without a doubt, what they wanted—and there was no time in our schedule or travel money in the budget to arrange a face-to-face meeting. To try and get that over the phone, or in a faxed sketch wouldn't eliminate my doubt. So, in order to hold their feet to the fire on specifics, I said, "I need you guys to create detailed drawings and then send them to me as soon as possible."

Now, I don't normally ask a customer to do the design work on a project, but this was a customer who had worked with hardware exercise devices before and who had added a last-minute function to the design. I wanted them to realize the ramifications of a change like this—hopefully, preempting any additional changes. I like to retain as much flexibility as I can during a project, but the customer has to understand that the manufacturing process doesn't allow for ambiguity. I had to shift responsibility for finalizing the design to my customer at this point.

To their credit, they stepped up and delivered the drawings right away. There were a few mistakes but we were able to make the fixes and corrections, and still keep moving forward. We had the idea in mind.

THEN WE START ROCKING

When you're doing design and fabrication on a unique product and you're being asked to deliver on a tight deadline, the project is laced with unknowns. The path of these projects can change at any time—but there is still a method to the madness. One thing I do is keep close track of everything that needs to be accomplished during the development process—from clarifying objectives, to sketching and sizing, to assembly.

Throughout the years, I have developed a file where I keep track of sources for unique parts, tools, and

I wanted them to realize the ramifications of a change like this—hopefully, preempting any additional changes.

instruments—things like special bearings that I don't keep stocked because they're not needed often. I have contact information for these sorts of materials and for all my available vendors, so that I don't waste time trying to track down a part or a tool required by an eleventh-hour development.

I'm also prepared to suggest trade offs when they're necessary to finish on schedule. For example, we planned to paint the frame of the bed, but we ran so short on time that we didn't paint it. It wasn't going to affect the function of the device. That was an easy compromise; others are more difficult.

Initially, they wanted the frame made out of steel. Cutting, machining, shaping, and welding steel requires more time than alternative materials. Aluminum is easier and quicker to cut and machine. Plus, it's much lighter and easier to handle. It cost a little bit more money, but I was able to save time by building the frame out of aluminum.

When you're short on time, man-hours are something that you can't make up. When we encountered some warping in the welded frame, I went to the researchers and told them, "We can still get this done if you'll increase the service request to support more people." They agreed to it, and I brought in additional shop technicians to help solve the problem. They were also critical in addressing a last-minute problem with linear bearings.

All projects like this one involve some degree of trial and error, building and rebuilding, reaching compromises, and learning from mistakes. In the end, our customers had to compromise slightly on cost, but we completed the project on time.

In my world of designing and creating new products, the one constant is speed—not to mention the byproduct of speed: pressure. Some projects may not involve the same level of pressure, but when you complete a quick-turnaround project on time and you've met all of the challenges that at first seemed overwhelming, the reward also seems to be that much greater. •

Lessons

- When creating a unique project, customers don't always know the details of what they need at the start of a project. Close communication between the project team and the customer facilitates a continuous learning process.
- Knowing when to be flexible and when to be firm is a hallmark of successful project management.

Question

How important is face-to-face communication when working with a client?

THE UNBEARABLE LIGHTNESS OF MICROGRAVITY

Ever since space missions began, NASA has worked to address problems caused by the deterioration of bone and muscle tissue due to weightlessness. One method for evaluating prevention and recovery treatments for this problem is to expose normally healthy individuals to periods of bed-rest that duplicate many of the space-weightlessness symptoms. Bed-rest participants remain in a prone position for up to thirty days without sitting up or standing.

The exercise bed described here by Ames Research Center prototyping specialist **DAN GUNDO** is typical of the kinds of projects he works on. Gundo uses a process he describes as "prototype-as-design" to create unique, one-of-a-kind research hardware for small, high-risk projects. Prototype-as-design is a highly interactive, integrated process that allows multiple iterations of complex aspects of a desired R&D product to be quickly evaluated and adapted into a properly functioning whole.

This is Dan Gundo's first appearance in *ASK Magazine*. You can contact him at Daniel.P.Gundo@nasa.gov.

LISTENING TO THAT VOICE INSIDE

THIEN-KIM PHAM

BY DAVE STICKEL

A few years ago, I was managing a project whose scope included the addition of several new unit operations to existing production lines. Part of my project involved adding a fabricated module similar to one another project had recently purchased on a T&M (Time & Material) basis from Company A. This company had done a good job, so prevailing wisdom dictated all we had to do for this part of the job was to adapt the design to our production lines, and go.

ALONG WITH OUR PROCUREMENT MANAGER AND THE project manager of the recently completed project, I traveled to the vendor's shop where these modules were fabricated. On the earlier project, after the bugs were worked out of the design, our company purchased more than twenty of these units. The first unit cost about $180,000, but as the design was tested and reworked, the T&M price came down to about $120,000 per unit for the remainder of the order.

As soon as I walked into Company A's shop, I started getting a sales pitch. The shop supervisor, who I knew from a previous project, said, "Well, Dave, I'd like to introduce you to Sam, who's going to be your fabrication and assembly manager. Any time you want anything, day or night, just call Sam." He went on to tell me, "Here are the machines that are ready to chunk out all your parts the minute you tell us to start cutting steel."

I liked what I saw in the shop, even without the sales pitch.

And then, on top of that, our procurement manager and the project manager from our first project took me off to the side to give me their own version of the sales pitch. They told me that sticking with Company A's current design and fabrication would make my life easier and would allow me to focus on other parts of my project. It was very tempting to think about putting this part of the project behind me.

At the end of the day, we regrouped with Company A's personnel in a conference room. The vendor's representatives said that if I would give them the green light, they would deliver the 50+ machines I

needed at about $118,000/unit. My procurement manager and fellow project manager thought this was what I should do, but I was uneasy. It just didn't make sense to me.

This particular unit operation is similar to a number of other unit operations throughout the manufacturing process, and the design for this one wasn't all that dissimilar from them. I knew we had paid a lot less for those other unit operations.

So I said, "I've just got to think about this." I didn't know exactly what I wanted to think about, but I knew I didn't want to make a decision right on the spot. I had a lot of experience making quick decisions, but something told me to follow my instinct that this decision required more consideration. In the cab to the airport and on the plane on the way home, I kept hearing from my two compatriots that I was making a big mistake by not accepting this offer.

When I got home, I checked my phone messages. Company A's shop superintendent had left me a message. He said, "After you left today, we got together and we sharpened our pencils, and we decided that we can do your project at about $108,000 a machine." It wasn't hard to figure out the math; we would save $10,000 on each of the 50 or so machines. And I said, "Wow! All I did was say I wanted to think about it, and I saved a half a million dollars." My delay of six hours was paying dividends.

But I still wasn't satisfied. This unit operation wasn't on the critical path of my project, so there was no reason I had to make the decision immediately. I had time in my schedule, and I decided to go out for competitive bidding. We bid Company A along with a number of other shops I was familiar with. A few weeks later, I received a bid from Company A for $93,000 per unit. But they still didn't get the job. We awarded the contract at $67,000 per unit to Company B, where I also knew the people.

At the pre-award meeting at Company B, I said, "You know, I've got to be honest with you. You're the lowest bid. Are you confident that you understand this bid?" Long ago, I learned that it isn't good business to take advantage of an underbid—because if you put someone out of business and they don't deliver, your own program suffers, too.

They told me they were confident. And it turned out well. They had done their homework, and we had done ours in working with them and making sure they understood what they were getting into.

In the end, I saved more than $2.5 million by following my gut instinct, which said, "I've got time to think about this." I took advantage of the opportunity to step back even when everybody else was telling me, "You ought to do this right now." Because of that project, I've been willing to trust my instincts more. •

Lessons

- Many leaders who commonly use intuition are reluctant to talk about it, considering it too soft and "mystical" a process to openly acknowledge. But the more we share and discuss stories of decisions based on intuition, the more we learn about when and how to employ it.
- Trusting one's intuition doesn't necessarily mean one has to abandon well accepted processes.

Question

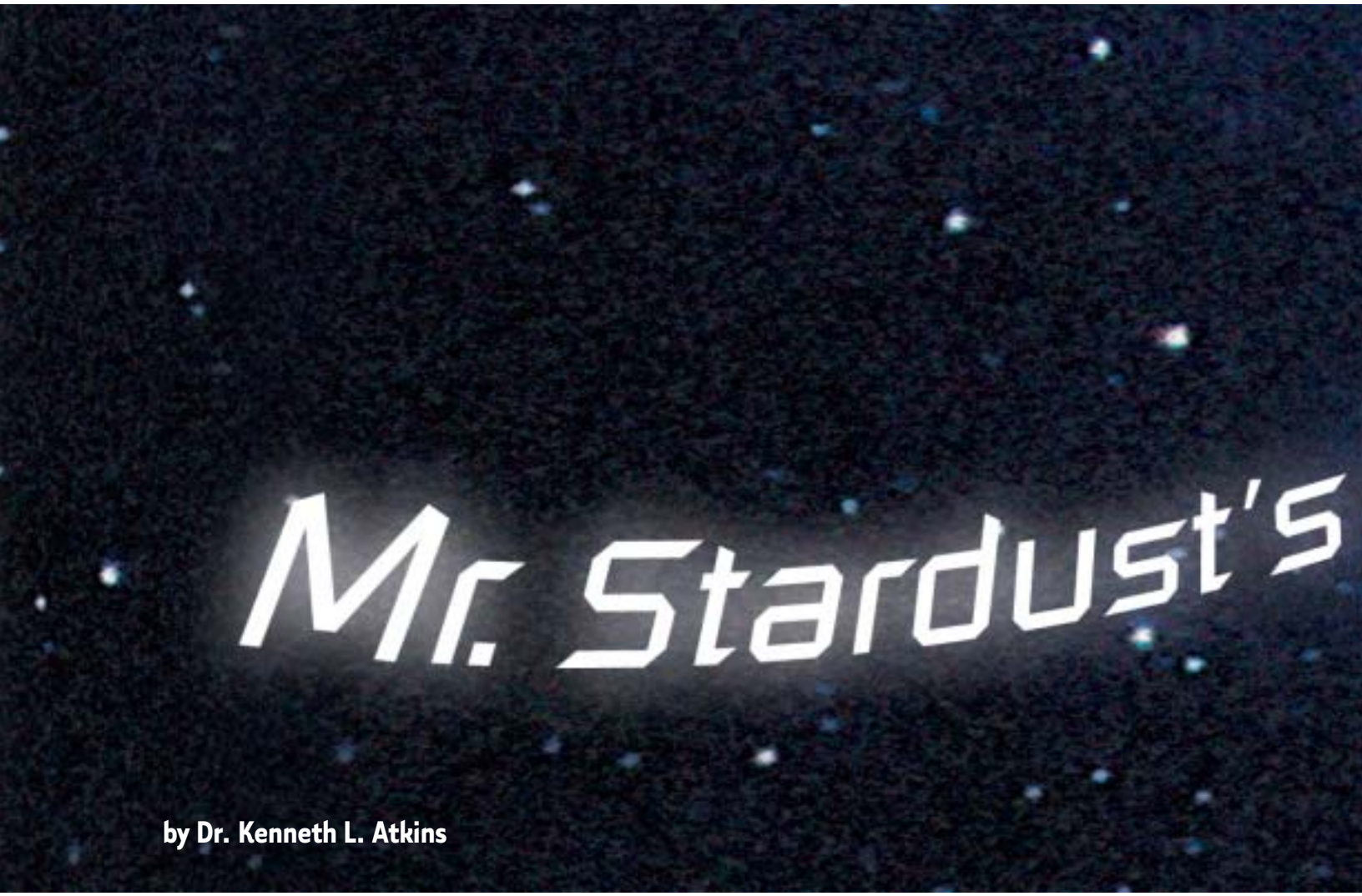
Some people say: "Don't listen to your intuition. Intuition is nothing more than justification of luck." Do you agree?

GOT MILK?

In his 26 years with Procter & Gamble, **DAVE STICKEL** has been involved in capital projects as project manager, cost engineer, and start-up leader. Currently, he serves as the Global Process Owner for Capital Project Management Technology, part of the Corporate Engineering organization at P&G.

"My favorite story about Dave," says *ASK* feature writer W. Scott Cameron, also of Procter & Gamble, "is the time when he asked me to review a hierarchical presentation he was going to give." Cameron didn't think Stickel directly stated what he wanted from his audience. "My feedback," says Cameron, "was that he'd done an excellent job of describing a cow, but he should tell his audience it was a cow and not make them guess he had described a cow." Stickel took the feedback positively, and Cameron assumed that was the end of the story.

A few months later when he visited Stickel's office, Cameron saw a picture of a cow tacked on a bulletin board with the phrase "It's a cow" under the picture. "I guess Dave took my input to heart," says Cameron.



Mr. Stardust's

by Dr. Kenneth L. Atkins

I served nine years in the Air Force, and I had the good fortune to become a pilot during that time. I can still remember the day I got my wings. One day, I was one of the most senior student pilots in the Air Force and, the next day, the greenest fighter pilot that they ever saw.

My experience as a first-time project manager on the *Stardust* mission brought those days back for me. The point is that one can work hard and succeed in an activity only to find the success is just an "entry ticket" to a larger, more daunting set of challenges. Confidence and the thrill of victory suddenly give way to anxiety regarding a new potential for failure. One then must revisit and develop a new determination to succeed at the next level. I've learned that you go through several steps in an adventure—the first being euphoria, second being anxiety, and then, finally, resolve.

As a pre-project manager, I found myself part of a team—comprised of the Jet Propulsion Laboratory (JPL), Lockheed Martin Astronautics (LMA), and our Principal Investigator from the University of Washington—competing against 27 other proposal teams to "win" selection under NASA's 1994 Announcement of Opportunity for the fourth in its Discovery program series of low-cost, highly focused projects. Our entry was *Stardust*, a mission to fly through the dust cloud surrounding the nucleus of a comet called Wild 2, catch some of the cometary particles and bring them back to Earth. As a tantalizing bonus, our proposal included a secondary objective to capture some particles of an even more elusive nature. *Galileo* and some of our earlier spacecraft had discovered a particle stream going across the solar system, and we wanted to try to catch some of that stardust. We proposed to trap these smaller, speedier

particles on our way to the comet. Hence, the name *Stardust* for the proposed project.

Our proposal package was the subject of thorough discussions and reviews during an intense, competitive approval process. After we submitted the proposal, there was the usual lag time between submission, review, and then notification. I went back to my day job, which was in line management.

Then one day I got a call from the Principal Investigator (PI), Dr. Don Brownlee, who said, "Hey, we won! We actually won this thing!" He was incredulous. I was stunned. I was going to manage my first project!

Stardust had been selected from a field of 28 mission proposals to be part of the "Faster, Better, Cheaper" Discovery program series. Approval meant that we were locked into a $200 million contract. Not only was our total budget set, the funding would be delivered to the project based on the dollar amounts we had allocated for each phase of the project.

And I thought, "Gee, this is really great! We did it! We succeeded!" Then, I had another thought, "But there's no team." Like me, they had all gone back to their day jobs. So, I had to go round all these people back up again—and, once I had, we were all in a wonderful state of euphoria. Suddenly we were walking around the laboratory and people were saying, "Oh, there they go. Those guys won. They're the next big deal here."

The euphoria fades

After we pulled the team together, we went to work on the project. We were all excited, saying things like, "We're going to bring back a thousand ten-micron size particles; we're going to get pictures; we're going to catch some stardust." Then we took a closer look at our budget as we put our work structure and our organization together.

I looked at the $9.6 million budgeted for startup, and could see that it wouldn't be enough to get the

It's one thing to put the money together. It's another thing to put it into all the right buckets.

project going. Eventually we would have all the money we needed—but when I looked at the schedule and what had to happen with our initial funds, anxiety set in.

My team came to me and confirmed my anxiety with specifics on our initial dilemma. "The telecom radios are 'long-lead' items. To make our schedule we need to get on contract right away. How are we going to get those contracts funded now? We don't have the money budgeted in our Phase B pot to get started on time." And I realized that we had made a big mistake.

A technician completes work on the collector used to capture cometary particles and interstellar dust.

That's when I learned that it's one thing to put the money together. It's another thing to put it into all the right buckets, and it's an even more crucial thing to get it out in a timely fashion. As we worked through the problem with LMA, our contractor, it was clear we had been overly optimistic in how much time their subcontractor, Motorola, would need to prepare a new contract for the transponders. We also discovered that another LMA project already had a contract in place for the same transponders we needed to buy. If we could act quickly we could simply "add" our units to that contract, but we needed about $11 to $13 million immediately.

I met with the PI and told him, "We've got to be allowed to spend our transponder money earlier than we planned. In fact, we need to commit it now."

And he said, "Well, golly, you know our budget profile says NASA doesn't provide that money now; they might not even have the cash available. Our deal was based on not starting the transponder contract till Phase C. If we ask for it now, we're going to look…"

"You don't need to tell me how we'll look," I cut him off. "We may have the money budgeted for later, but if we can't get it on this existing contract in Phase B instead of C, we're dead!"

So much for the euphoria of winning the proposal, and thinking we had everything locked up when our project plan was signed. We had the money, and we thought we knew how to do this thing—but our flawed cash flow plan stood between a successful project and us.

Before this realization ever occurred, I had put together a small advisory group of Tom Gavin, flight systems manager on the *Cassini* mission; Tony Spear, the project manager on the Mars *Pathfinder*; Mike Sander, past project manager on SIR-C who was currently director of JPL's Technology and Applications Program; and Joe Savino, a long-time "guru" of the electronics division. As I struggled to find a way out of the problem, I definitely needed some advice, and I went to them. I laid out my dilemma, and said, "Look, if I can't get Headquarters to revise my cash flow and give me a better funding profile than I've got, we won't be able to do it."

And they said, "You know what, you're absolutely right."

"I didn't want to hear that, guys," I told them. "I came here looking for a miracle."

Time for resolve

I had competed with other project teams to win approval for my project, but it turned out that I had promised something that I couldn't deliver. That old cliché, "the Devil is in the details," took on new clarity. If my project stumbled so quickly, I would essentially be putting the credibility of NASA's selection process in doubt.

I decided that the best thing to do was to be upfront about my mistake. I accepted the fact that sometimes the only way out…is through! I was going to have to go to the NASA Discovery program manager and say, "I'm not going to spend any of your money unless I can guarantee we can launch this project successfully." I wasn't going to ask for any more money for the overall project than originally budgeted, but I needed to have the cash flow changed.

So, I mustered as much of my courage as I could (with my tail between my legs) and set up a conference call with Mark Saunders, who was the Discovery program manager at that time.

I said, "Mark, I've got good news and bad news. The good news is the project looks OK for the amount of money we signed up for. But the bad news is that unless we get some money earlier than we're scheduled for, I'll have to put my badge on the table and walk away. We just won't be able to make the critical path." Along with our PI, Don Brownlee, and LMA program manager, Joe Vellinga,

I explained the dilemma and the potential to utilize the existing contract to make schedule if we could fund it now.

That's when the miracle happened. He said, "How much do you need?" Just those words implied hope. I expected something more like what a rebellious son might hear in a woodshed. "Are you guys nuts? You made this deal, now live up to it." Or worse.

Before he had time to reconsider, I said, as casually as possible, "Oh, I need about eleven to thirteen million." (Inside I was anything but "casual," because that was a lot of money to have incorrectly planned in a budget profile. I considered it to be a big mistake, but I was desperately trying to keep my cool.) And he said, "Well, you're in luck. Our Near Earth Asteroid Rendezvous project is currently under-running, so my funding flexibility happens to be good right now. I can 'prefer' [send early] the money."

It goes without saying that salvation does wonders for depression. After some appropriate-level gratitude statements and a little groveling-recovery, we ended the telecom with a new level of appreciation for careful cash flow planning and a resolve to not be in this situation again.

Certainly, our admiration for the Discovery program manager, Mark, who had been so tough during the competitive phase of the proposal, skyrocketed. What wisdom. What mercy. He could rightly have sliced and diced us before giving us the money, but he chose to listen. He chose to understand. And with his own flexibility, he had achieved a higher level of motivation and resolve in the project leadership team by working with us, not on us. It was a good day.

Stardust was successfully launched on February 7, 1999. It has been flying extremely well, and has spent quite a bit of time with its collector exposed to the stardust mentioned early on in this story. It's on its way, hopefully, to a successful fly-through with the comet in January 2004—and a return to earth in 2006 with both comet particles and stardust. I was even able to give money back at the end of the development and launch phase of the project, almost a million dollars.

This thing about cash flow is something that I'm now preaching to all the proposal teams in my current role as a review board member. At the beginning of a project, cash flow is king. The reason I had this screw-up was because I had looked at my overall budget and said, "We can do this." I was inexperienced, and I didn't see cash flow as an issue.

I started this story by talking about my days of excitement in the Air Force. I'll finish by talking about times of leisure now in my semi-retirement. I've played a lot of golf during my life, but I never took any lessons. So, frustration with my game and results has a long history.

Just recently, I faced the fact that I had no clue as to what I was doing wrong. I went out and hired a pro to help me. At the first lesson, he said, "Here's how your grip needs to be." And he went through a lot of other things, but the bottom line was, "If you don't set up correctly, you can't hit the shot." You can imagine how that line struck home!

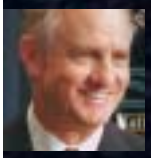
And this is what's key to the story I just told about *Stardust*. If you don't have that cash flow set up correctly along with the budget and the schedule, you can't "hit the shot" and you're going to be in trouble. •

Lessons

- Effective budget planning considers not only how much money a project requires, but also when the money is needed.
- Many times, project success isn't the result of not making mistakes; it's the result of having the courage to face mistakes head on and take action.

Question

Does your work environment engender courage?

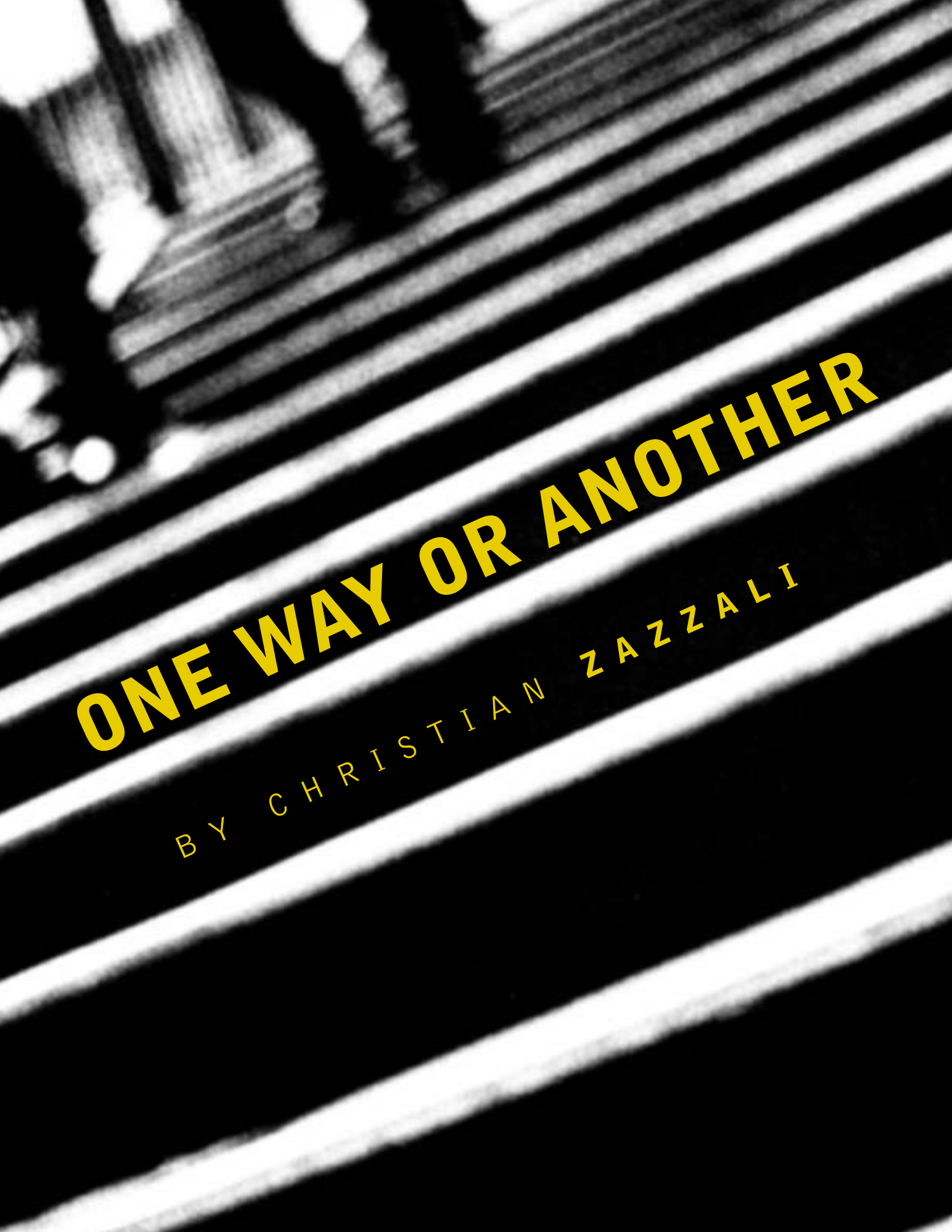


OUTREACH

If all goes as planned, the *Stardust* spacecraft that **DR. KENNETH ATKINS** and his team launched in 1999 will travel 242 million miles from Earth to encounter Comet Wild 2 in January 2004. En route to the comet, the spacecraft will collect interstellar dust particles believed to consist of ancient pre-solar grains and nebular. Stardust will capture and store these particles by extending a tennis racket-sized collector filled with a product called aerogel (a glass foam, which is the lightest solid known to man).

Also on board: two copies each of a pair of microchips, engraved with over a million names—including names submitted by the public during a 1997–1998 outreach program, and all the names of soldiers memorialized on the Vietnam Memorial in Washington, D.C. One set of chips will remain on the spacecraft as it goes on to orbit the sun. The second set will return to earth along with the aerogel collector in January 2006, aboard a 125-pound reentry capsule.

The story by Atkins was based on his presentation at the February '03 APPL Masters Forum. Atkins can be contacted at Kenneth.L.Atkins@jpl.nasa.gov. Visit the *Stardust* Web site at http://stardust.jpl.nasa.gov


ONE WAY OR ANOTHER
BY CHRISTIAN ZAZZALI

I BUILD A PROJECT A HUNDRED TIMES IN MY head before we start work on it. I put formal plans into writing, but I also try to work through every scenario I can think of in advance to have everything lined up like dominoes, with all the details in place.

But things still go wrong—like the time we had twelve weeks to demolish one floor of a building, then build it back. After reviewing the client's drawings, I told them that the twelve-week schedule wasn't going to work the way they had things sketched out.

"You have us finishing the frames after the drywall's in," I pointed out to them. "But the door frames are clear oak, and there's not enough time." I outlined the man-hours and the timing required to do the job the way they had stipulated, and explained why it couldn't be completed on schedule. Then I offered an alternative solution.

Instead of waiting to build the frames on site, I suggested having them built in advance at a Canadian millwork factory. We could have them shipped down the week before the job was finished, and then install them. Great idea, everyone agreed. It would require a little more money for shipping, but that was acceptable.

With a week to go, I believed that the job was going well—until I got a phone call from the superintendent.

"The doors are here, the frames are here, all 25 of them, and they look great," he told me. But then he added the line made famous in the Apollo 13 movie: "Houston, we've got a problem."

"What's the problem?" I asked.

"The frames don't fit in the freight elevator."

"Then carry them up," I told him. "You know, get some guys and haul them up the stairs."

"We've already tried that. They won't make the first turn because of the jog and the—"

"I'll be right there," I told him.

It was at that point that I got that feeling in the pit of my stomach that every manager gets when a problem crops up with about a week to go on a project.

I got that feeling in the pit of my stomach that every manager gets when a problem crops up with about a week to go on a project.

AS FAR AS THE CLIENT WAS CONCERNED, THE JOB WAS COMPLETED ON SCHEDULE. BUT WE KNEW THAT DISASTER HAD BEEN NARROWLY AVERTED.

It's about the time you start thinking, "Maybe I should just keep driving."

How was I going to get these oversized frames up to the 12th story of a building and installed in a week for one of our best clients? This was a client worth millions to my company. I couldn't ask them for more time; they had already scheduled the movers and the utility installations. Everything had to happen that weekend. I still needed to file inspections before the client could move in, and I couldn't schedule the inspections until we had the doors on and working properly.

As I was driving to the site, I started thinking of new approaches to the problem. The superintendent had told me that the frames couldn't make the first turn. But could they make the second? I called back and asked.

"What difference does it make if they fit through the second turn?" he asked me. "We can't get them past the first turn." But I was already thinking: Let's figure out a way to get rid of the first turn.

In the meanwhile, I arrived at the site. As I parked, I looked at what was next to me: another one of my company's projects. We were constructing a building right next door, and we had a tower crane sitting on the site. So I asked the superintendent, "How about if we carry the frames down to the 12th floor from the roof?" And he answered, "We didn't think about that. But the frames aren't on the roof; we have them on the loading dock."

I went over and spoke to the superintendent on the other job. In a matter of minutes we had the frames lifted to the roof with the crane. Then all we had to do was to carry them down two flights, instead of up twelve.

It all worked out, and our customer never knew there was a problem. As far as the client was concerned, the job was completed on schedule and the doors looked great. But we knew that disaster had been narrowly averted. Back when we were planning the job, all I had needed to say was, "How are we going to deliver these pre-built frames to their locations? Let's check the freight elevator." Just one more detail, and we would have had everything running smoothly.

I've learned that whenever I come up with a unique solution to a problem, I need to be prepared to consider the implications of applying that solution. What elements of my plan are affected by the solution? What elements of the project need to be adjusted based on these changes?

But if it were only that simple…the truth is that while we can avoid some problems by asking the right questions, there still will be problems to be solved and lessons to be learned on every project. Recognizing this helps me to be mentally prepared to meet the challenges in front of me, armed with two essential tools: experience and flexibility.

I try to remember what I learn on projects and carry those lessons forward. Now, for example, I give every contractor on every job the dimension of the freight elevator with the pricing proposal. With that, I no longer own the problem. It's the contractor's responsibility to build something we can fit in the elevator.

Just as importantly, when problems do pop up, I try to stay open-minded about potential solutions, and put creative thinking to use. I try to remember that what doesn't go up, might just come down. •

Lessons

• Even experienced project managers can't anticipate every potential problem. Part of planning ahead should include allowing oneself the flexibility to rethink the plan and improvise if necessary.

• Unique solutions to problems sometimes create a set of new problems unique in nature as well. In dealing with sudden changes in planning, try to consider what other elements of the project will be affected, but don't second guess yourself into a state of inaction because you can't anticipate every contingency.

Question

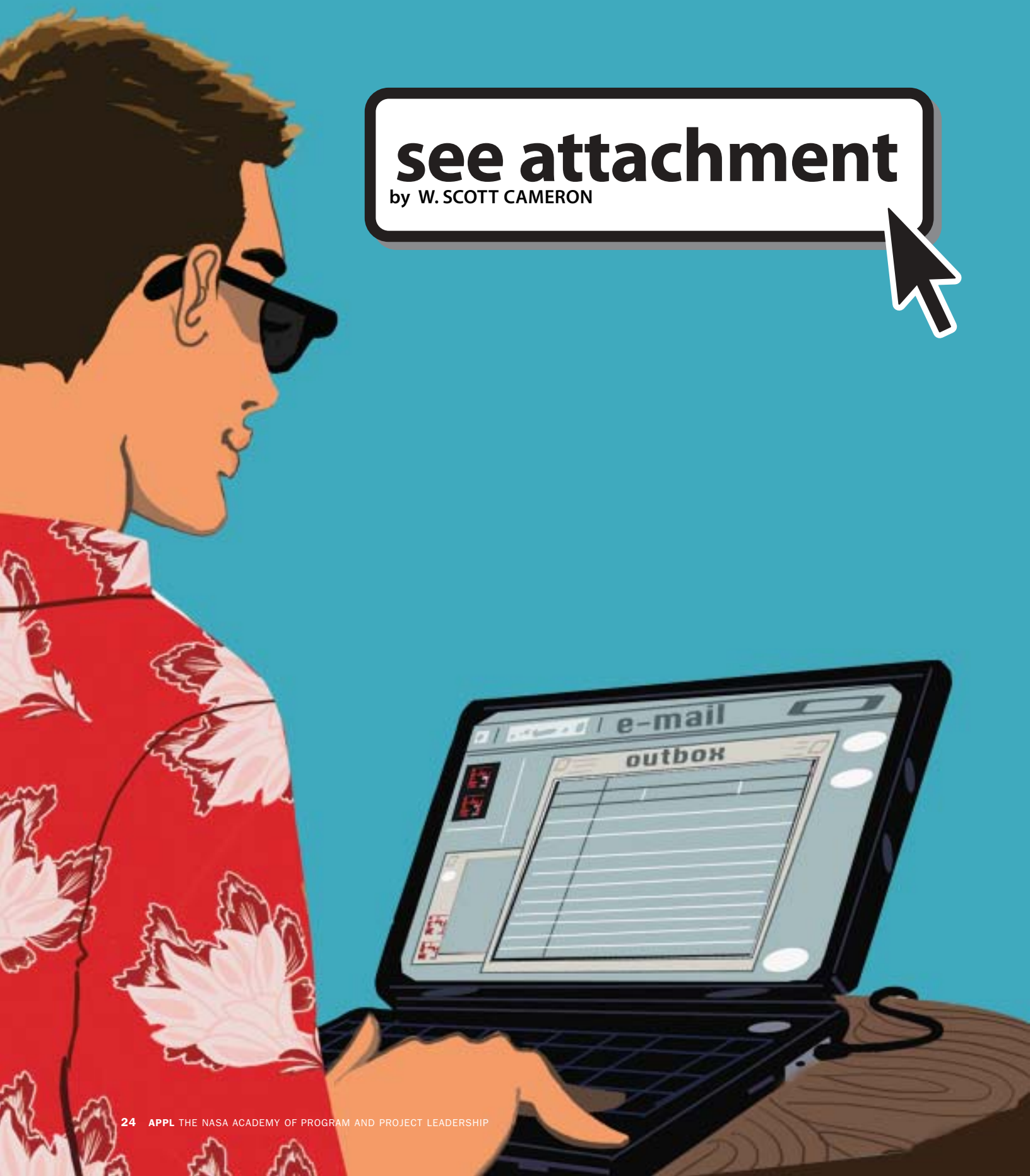
How do you create a culture that fosters both detailed planning and flexibility?

On almost every day of the year, HITT Corporate Interiors begins work on about twenty commercial construction projects and completes another twenty. As a senior project manager for HITT, **CHRISTIAN ZAZZALI** has multiple project managers reporting to him at any given time. His job: to keep all the plates spinning.

Zazzali has been with HITT since 1999. He has received the Associated Builders & Contractors' Excellence in Construction Award. Zazzali's story "Thanksgiving Hocus Pocus" appeared in *ASK* 10. He can be reached at czazzali@hitt-gc.com.

see attachment

by W. SCOTT CAMERON



"SEDUCTIVE" IS A WORD RARELY ASSOCIATED WITH PROJECT MANAGEMENT. AN EXPRESSION LIKE "24/7," ON THE OTHER HAND, IS ALL TOO FAMILIAR. MARRY THESE TWO, AND ANOTHER WORD IS BORN: "E-MAIL."

SINCE E-MAIL GENERATES ITSELF ON A ROUND-THE-CLOCK, daily basis, it's not unusual for me to receive an average of fifty e-mails a day, or more than 300 a week. That's a lot of e-mail.

I have spoken with many of my fellow project managers about my relationship with e-mail. In my case, reading and responding to it is a temptation almost too hard to resist. When I receive an e-mail I tend to want to stop everything I'm doing, and open and answer it. Indeed, in my life you could say e-mail is a force to be reckoned with.

Interestingly, my fascination with mail began a long time ago. I trace it back to my days as a young boy when I started receiving my first letters from friends and family. Walking home from school, I was often filled with curiosity, wondering if I had received any mail that day. In college, I knew the exact time the mail was delivered, and I headed for my mailbox as close to that hour as I could. After that, I served in an Army Reserve Post Office Unit, where I came to realize how important a postal unit was to the military. There were many others like myself, far from home, who relied on the written word to stay connected to the people in their lives.

Over the years I have changed in many ways, and so has the mail. But the same sense of connection, and the same urge to respond to someone who has written me, remains. The 24/7 nature of e-mail has compounded the situation. It is relentless in its pursuit of my time and attention—and, as such, e-mail has become something I have had to manage in a variety of situations.

I've learned that being seduced by e-mail is far from uncommon experience. I was talking with another manager and he told me he was having problems with some of his younger engineers, as they were spending more time on their computers answering e-mails than on the shop floor managing their projects. He wanted the engineers to interact more with the people on the shop floor, and he felt this problem was having a negative impact on their performance and how their co-workers perceived them. When he confronted one of the engineers, the response he received was that it was the engineer's job to answer e-mails—not necessarily to be on the shop floor all the time. They both had a point.

Project managers must lead by example. As we continue to increase the amount of time we spend on tasks like e-mail, so must we continue to improve our time management skills. We need to make conscious decisions about the minutes and hours we will spend staring at the screen and emptying the inbox, and how we will utilize this tool to our advantage.

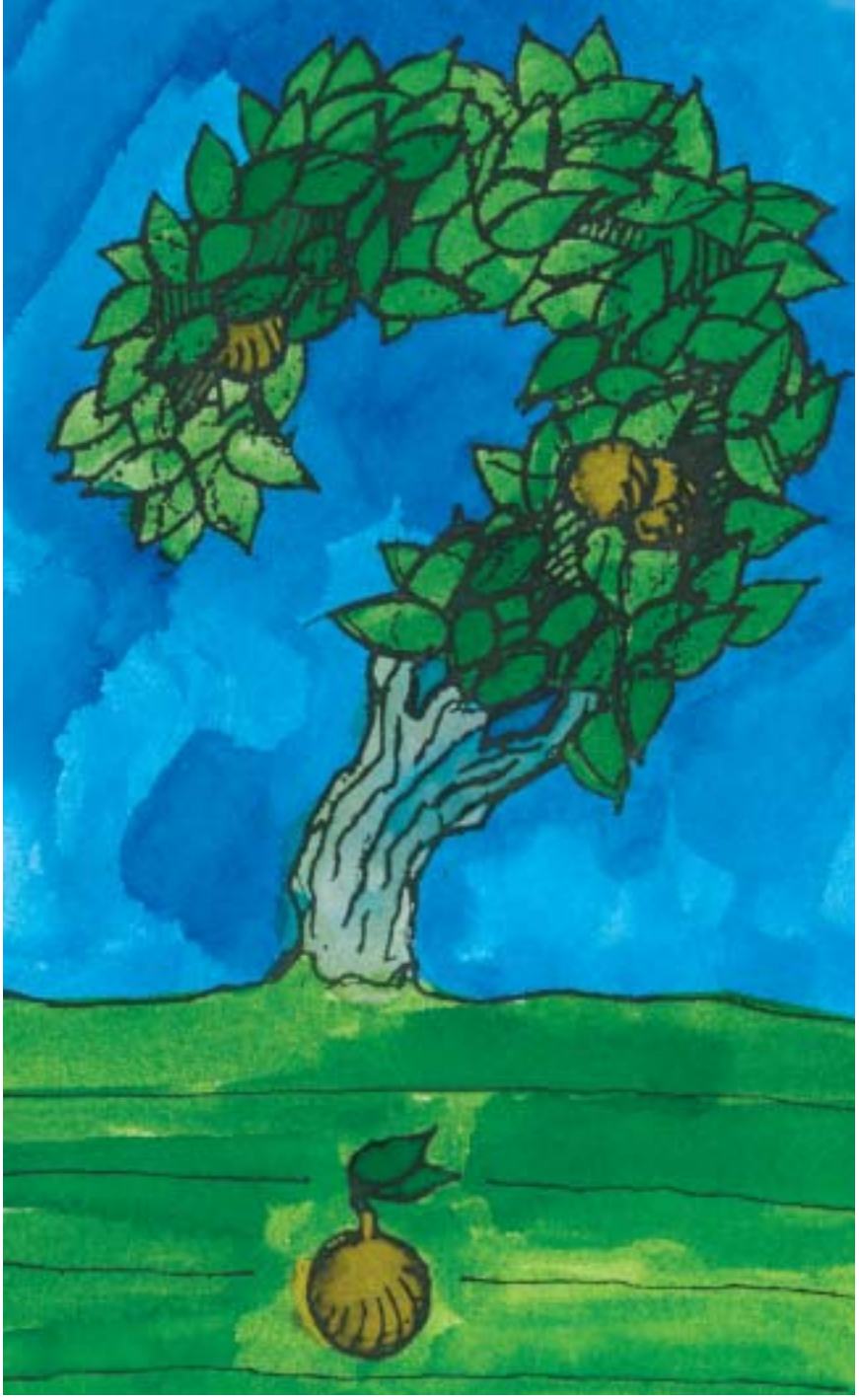
What worked for snail mail, works for e-mail: Back when snail mail was the only mail I had to contend with, a performance coach taught me a few tips that I continue to use today.

- Touch each piece of mail only once.
- Either pitch the mail or respond immediately. (As a last resort, defer action until another day.)
- Keep a minimal number of files so you're not tempted to warehouse a large amount of mail.

Another situation I've had to deal with is whether to take my computer on vacation or leave it at the office. After much thought and negotiation with my family, I decided to take my computer on vacation. I have received many comments about this decision (i.e. are you a workaholic, are you crazy, a vacation is for rest not answering e-mail). I really can't argue with these comments, but I have imposed some restrictions on myself so my vacation isn't just an alternative work location: I don't read my e-mail every day of vacation, I don't let what I read in an e-mail change the timing of any of our vacation plans, and I only access my e-mail during "dead time" when my family is doing other things.

I've reasoned taking my computer on vacation is healthy for me. It reduces my stress level upon return to work. While it's still easy for me to get excited about a letter waiting in my mailbox, coming home to 350 or more e-mails is hardly what I would call "seductive." •

W. SCOTT CAMERON is the Capital Systems Manager for the Food & Beverage Global Business Unit of Proctor & Gamble. He is also a regular contributor to *ASK Magazine*. He can be reached at cameron.ws@pg.com.



REQUIREMENTS

THE MORE THE BETTER?

BY TERRY LITTLE

For as long as I can remember, we in the Department of Defense have based our development programs on user requirements. The process is more or less sequential. The user develops the requirements, supposedly driven by the threat, and the developer structures a program to satisfy them.

Great process, right? Nope. It's a bankrupt process that has failed time after time.

In truth, most of the so-called "requirements" are really "desirements." They have little or nothing to do with the threat or real need, but everything to do with what the user or sponsor thinks may be possible. And what's the worst part? Much of what ends up in the requirements stem from what overly optimistic, fiscally naive program people—government or contractor—eager to "sell" the program have told the user or sponsor they can do.

Being overly constrained by too many requirements with too little wiggle-room will invariably create problems.

When the chickens come home to roost, as they always do, one can invariably trace many a program problem to having written unrealistic expectations into the requirements. It's a self-fulfilling prophecy.

How does one deal with this? Simple. Nothing ever, ever, becomes a requirement until two things happen: (1) there is a solid understanding and acceptance of the requirement's cost and schedule implications; and (2) knowledgeable technical people are so confident that the program can meet the requirement within the cost and schedule that they are willing to bet their jobs on it.

Yikes!! Does this mean that we never undertake high-risk projects? No. What it does mean is that when you undertake high-risk activities, you agree on an expectation or requirement that includes failure, or falling short, as a real possibility, and your cost and schedule reflect the risk. The other thing that it means is that you may have to start a project with some requirements open until after the work progresses to a point where the requirement meets the two criteria above.

The process is also flawed because there are usually too many requirements. Something about the engineering or designer mentality seems to demand hosts of requirements as an input to the technical process. Granted, it's more comforting to have someone else issue the requirements than it is to have to derive them. But, being overly constrained by too many requirements with too little wiggle-room will invariably create problems. In a perfect world, a sponsor's requirement would only be to obtain a certain capability with the detailed technical requirements derived from what's truly possible.

Linked to this issue of over-specification is the problem of prioritization of requirements. If everything is equally important, then nothing is important. In my estimation, a program or project should start with only a few key requirements. "Few" means not more than four or five, and "key" means that, if the program doesn't meet these requirements, it should be terminated.

Finally, within DoD cost is almost never a requirement, much less a key requirement, but it should be—always. Cost is a technical issue. We can only buy as much technical requirement as we can afford. It's true when we buy a car, and it's also true when we initiate a project.

My practice has been to put cost—which may be development, production, or both, depending on the program—into the technical performance specification. Why do this? I do it to make clear that everyone on the project, most especially the technical people, must own cost just as they do performance. Cost can't be just the concern of the project manager or the budget analyst. Everyone has to own it.

So what does all this mean? Simple. One sows the seeds of a project's success or failure during the requirements stage. With bad seeds the fruit will be bitter indeed. •

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*.

Tipping

JOAN BAEZ

the Balance

by Claire Smith

I come from a small coal mining town in Pennsylvania—from a culture and a community where in order to get your needs met, you had to be an activist. You could not afford to sit around and wait for the world to give things to you. You had to stand up for yourself.

As an activist for the project community at NASA's Ames Research Center, I see my role as finding out what resources project managers need to help them run successful projects. I need to go out and advocate for those resources, if necessary, and I need to be supportive—not just for the projects, but also for the project managers and their teams. It's not something I can do sitting at my desk waiting for the phone to ring.

To me, that's what an activist does. It's public service. In this case, my public is the project-practitioner community.

From the streets of Palo Alto to the stars

When I first came to California in 1972, I went to work at a drug abuse treatment center, right in the middle of a Palo Alto business community—a community who, incidentally, circulated petitions in an attempt to prevent us from moving in. They didn't want drug addicts living in the neighborhood or hanging around their businesses. At the time, the only place people detoxified was in the street or in jail. Or they died.

Within two years, the very same business people who got the petitions signed to have us barred were getting petitions signed for the city to continue our funding in the same location.

How was that?

It was about building relationships. For example, the leader of the we-don't-want-those-folks-in-here movement was a barber whose shop was right next door to our drug treatment center. A few of us from the center would talk with him over a game of chess because we

learned he liked to play. He got to know us. Then we started going out to lunch with him. Eventually, we brought clients to his shop for haircuts. Little by little, he became a part of the community that we were serving, and an advocate. And this all happened before the night his son overdosed. That night, we were the people he came to, the people who saved his son's life.

We were building a community—just like we're doing now at Ames, and with the Academy of Program and Project Leadership (APPL). This time around, we're trying to build a community of practice. We're trying to spread the message that knowledge sharing isn't something that you do *to* people. It is something you do *with* people.

APPL West

When I came to Ames in August of 1998 in the Training and Development Group, I was the fifth person in that job in two years. People were skeptical that I would be any more successful than my predecessors, but a part of my approach is that I don't carry around other people's legacies. After all, if I didn't believe in people's capacity to do wonderful things, I never would have been a drug treatment counselor. I would have been a drug dealer.

One of the items on my to-do list was to learn if anybody was interested in project management training. I didn't come in with an agenda. My approach was: What do you want? What do you need? How can I help you?

I didn't know anybody. The fact that I was in a position of having to ask questions helped me connect with people at Ames. For example, as I talked to people, I found out that the number one reason why people weren't going to training was the lack of travel dollars. There were other issues, of course, but that was one I thought I could handle. I said, "Well, if we can't go to Wallops Island, Virginia [where APPL conducted all of its project management training courses], then we will bring APPL to Ames."

The very first time I met with Ed Hoffman, the APPL Director, I said, "Ed, what do you think if we turned Ames into APPL West and brought APPL resources to the West Coast?"

He said, "Oh, oh, okay, sure." Later, as Ed tells it, he turned to Tony Maturo, APPL Deputy Director, and said, "Who is this nut case from California?"

The only catch was that I had to make it happen. But it was even more complicated than that. As I quickly discovered, a constellation of forces needed to be brought together to say, "We are going to make this happen." For example, my organization managed the training conference center building. Lodging, however, was managed by another organization. Then there were the procurement people, whose buy-in was needed in order to release Ames training dollars to do these residential courses. So I had to convince a lot of different people that this was good for the project management community and good for Ames, in terms of bringing courses here that people wanted.

Ames Research Center wind tunnel facilities at Moffett Field, California.

It's not something I can do sitting at my desk waiting for the phone to ring.

The first thing I did was to take a community-organizing approach. Rather than simply throw it together and say, "This is a Claire thing," I wanted it to be something that was independent of me, something that would continue because it existed as part of the culture, rather than because one person wanted it to happen. I invited other people to join me in planning our first steps.

We started off with one class. We made up flyers. We had leaflets. I passed them around like I did in the

old days. I put them on people's windshields. I handed them out as people walked in the cafeteria. I did a mailing. The class filled.

Ed Hoffman came out for the class—probably to see if the "nut case" could pull it off. While he was here, I decided to have a community meeting to introduce APPL. I hoped to pose a question to my fledgling community, "What can we do here at Ames to really look at and pay attention to project managers, and project management development and training?" That would be the first time we asked this question in a public forum, but not the last. In fact, it is a question we ask continuously. Asking it is part of how we are building a community of practice here at Ames.

During the planning meeting for the APPL community meeting, I was told that no one would come. "It will never happen," people told me. That gets back to the message I received when I first arrived at Ames: Nobody cares. Nobody is interested. Nobody will come. It will never work.

But I decided, as always, that I would try it anyway. And, you know what—people came. There was clearly an appetite, and it was obvious from the energy on display at that meeting that people wanted the opportunity to come together as a community.

That APPL West community meeting was just the beginning of a project that continues on today. I still see myself as an activist. I still think there's so much more we could be doing. But here's the happy ending to my story: I'm not alone. •

We're trying to spread the message that knowledge sharing isn't something that you do to people. It is something you do with people.

At The Tipping Point

"A lot of folks don't even know the project leaders who work in the same building, let alone in the same code, let alone in the same center, let alone in the same agency," says **CLAIRE SMITH,** commenting on the conditions that led to the burgeoning Knowledge Sharing Initiative (KSI) she has organized at the NASA Ames Research Center. Since coming to Ames five years ago, Smith has worked to nurture a community of practice among the Center's project managers.

Today, her KSI mailing list goes out to almost 1,500 practitioners. In addition to distributing *ASK Magazine* and hosting guest speakers (including Stanford professor Robert Sutton, author of *Weird Ideas That Work*), Smith has planned and promoted scores of events designed to bring the project management community together. "We've had pizza parties. We've gotten together for dinner," says Smith. "Anything that brings people together to tell stories that share experiences and ideas has the effect of building a community."

Cartoon drawing provided by Claire Smith's old friend Joan Baez.

For more information about knowledge sharing at Ames, contact Claire Smith at csmith@mail.arc.nasa.gov

FIFTEEN OF MADDEN'S LESSONS THAT DEAL WITH PROJECT CHALLENGES.

LESSONS FROM THE DARK SIDE FROM JERRY MADDEN'S "100 LESSONS LEARNED FOR PROJECT MANAGERS"

"NOT ALL SUCCESSFUL MANAGERS ARE COMPETENT AND NOT ALL FAILED MANAGERS ARE INCOMPETENT," READS JERRY MADDEN'S LESSON #21. "LUCK STILL PLAYS A PART IN SUCCESS OR FAILURE, BUT LUCK FAVORS THE COMPETENT, HARD-WORKING MANAGER."

During his distinguished 37-year career at NASA, Madden synthesized in-the-trenches experience into his "100 Lessons Learned for Project Managers." Eventually, the list grew to include 128 lessons, but the name never changed, and the collection of mostly serious, sometimes funny observations about project management remains widely recognized—and often quoted—inside and outside the Agency.

Among the wisdom captured in Madden's lessons, were words of warning. Madden identified both the common pitfalls of project life and the best ways to avoid taking the plunge. Never one to shy away from difficult subjects, Madden's lessons talk frankly about project management's "f" word: failure. Here we excerpt fifteen of Madden's lessons that deal with project challenges.

WORDS TO THE WISE

[#90] The seeds of problems are laid down early.... Review of most failed projects or of project problems indicates that the disasters were well planned to happen from the start.

[#122] Too much cost data on a proposal can blind you to the real risks or forgotten items.

[#126] Make sure everyone knows what the requirements are and understands them. Much easier to say than do....You have to have the right people look at requirements. A bunch of managers and salesmen nodding agreement to requirements should not make you feel safe.

USE PAGE FROM ADVERTISING SPREAD

[#3] The source of most problems is people but damned if they will admit it. Know the people working on your project, so you know what the real weak spots are.

[#20] Managers who rely on the paperwork to do the reporting of activities are known failures.

[#91] A comfortable project manager is one waiting for his next assignment or one on the verge of failure. Security is not normal to project management.

[#110] Though most of us in our youth have heard the poem that states "for want of a nail the race was lost," few of us realize that most space failures have a similar origin. It is the commonplace items that tend to be overlooked and thus do us in. The tough and difficult tasks are normally done well. The simple and easy tasks seem to be the ones done sloppily.

KEEPING TROUBLE AT BAY

[#44] Mistakes are all right, but failure is not. Failure is just a mistake you can't recover from; therefore, try to create contingency plans and alternate approaches for the items or plans that have high risk.

[#54] All problems are solvable in time, so make sure you have enough schedule contingency—if you don't, the next project manager that takes your place will.

[#31] Redundancy in hardware can be a fiction. We are adept at building things to be identical so that if one fails, the other will also fail. Make sure all hardware is treated in a build as if it were one of a kind and needed for mission success.

[#78] History is prologue. There has not been a project yet that has not had a parts problem despite all the qualification and testing done on parts. Time and being prepared to react are the only safeguards.

IF AT FIRST YOU DON'T SUCCEED

[#32] Don't be afraid to fail or you will not succeed, but always work at your skill to recover. Part of that skill is knowing who can help.

[#97] Talk is not cheap. The best way to understand a personnel or technical problem is to talk to the right people. Lack of talk at the right levels is deadly.

[#22] If you have a problem that requires the addition of people to solve, you should approach recruiting people like a cook who has under-salted, i.e., a little at a time.

[#29] In case of a failure:

a. make a timeline of events and include everything that is known;
b. put down known facts—check every theory against them;
c. don't beat the data until it confesses, i.e., know when to stop trying to force-fit a scenario;
d. do not arrive at a conclusion too rapidly. Make sure any deviation from the norm is explained — remember the wrong conclusion is prologue to the next failure;
e. know when to stop.

LESSONS FROM THE MASTER

Les Meredith, former Director of Space Sciences, had this to say of **JERRY MADDEN** and his project do's-and-don'ts: "God only gave us Ten Commandments. Jerry has listed over a hundred instructions for a Project Manager. It is evident a lot more is expected from a Project Manager."

Madden retired from NASA in 1995 as Associate Director of Flight Projects at Goddard Space Flight Center. Considered by many of his peers to be one of NASA's premiere project managers, Madden's reputation for frank, on-target observations of project management continues to be celebrated today, as his list of lessons is handed down to a new generation of project managers.

Naturally, not all of Madden's wisdom made it into his "100 Lessons." Marty Davis, who worked under Madden at Goddard, recalls one of the unwritten lessons: "Show up early for all meetings; they may be serving doughnuts."

Jerry Madden can be reached at maddenjeremiah @netscape.net.

ASK Talks with

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Donald Margolies

Since 1963, Donald Margolies has served in a number of management positions at the NASA Goddard Space Flight Center, and in 1998 received NASA's Outstanding Leadership Medal

MARGOLIES RECEIVED THE AWARD IN RECOGNITION FOR HIS innovative leadership of the highly successful Advanced Composition Explorer (ACE) mission. ACE launched in August 1997, and has been providing scientists with information about space matter and near-real-time advance warning of geomagnetic storms. ACE is one of several missions run in the NASA Explorer Program, which is characterized by relatively low to moderate cost and small- to medium-sized satellites capable of being built, tested, and launched in a short time.

Most recently, he served as observatory manager on another Explorer Program mission, the Microwave Anisotropy Probe. Prior positions at Goddard include project manager for the Total Ozone Mapping Spectrometer mission, deputy project manager for the Explorers and Attached Payloads Project, observatory manager for the Solar Optical Telescope Project, observatory manager for the Active Magnetospheric Particle Tracer Explorers Project, and spacecraft manager for the Magnetic Field Satellite.

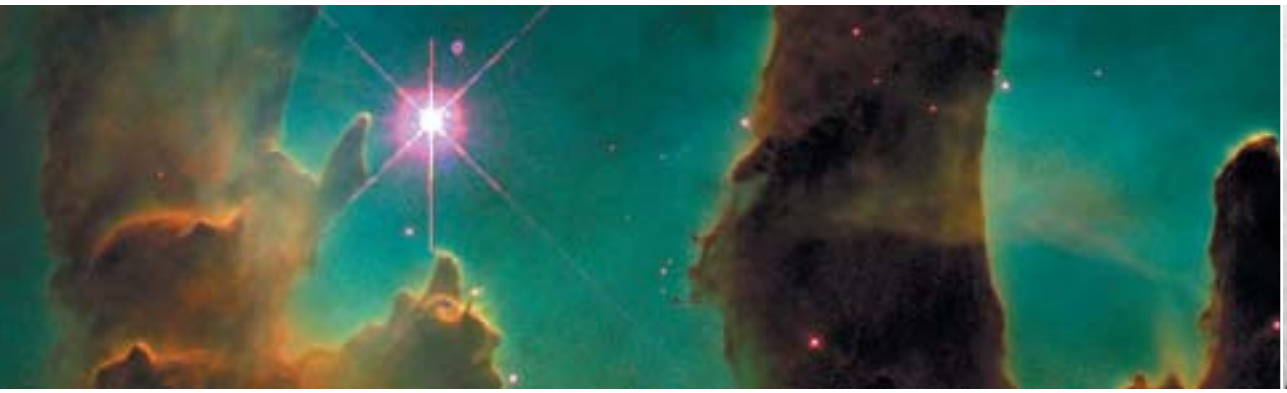
As he approaches retirement, Margolies has been active in the APPL Knowledge Sharing Initiative, including serving as a member of the *ASK* Review Board. His other awards include NASA's Exceptional Service Medal and the Goddard Space Flight Center Outstanding Service Award.

You wrote a story about your work on the Advanced Composition Explorer (ACE) project for* ASK *(Issue 9). I remember that you said that your "primary objective was to launch on schedule." How do you get a project team to make that happen?

I have approached it in a number of ways. For example, on one project I have gone so far as to take my team away from our normal business site for a week. Everybody sat down and developed their schedules, and then using such high tech tools as pencils, paper, and rulers, we put together a networking diagram. People could look at that and say, "No, no, this isn't right, we need to do this first." That was one way I got people together to agree on a schedule.

On some projects, schedule slips have been blamed on tension between the science team and the project management team. Did you do anything specific to try to mitigate that sort of tension on ACE?

I worked closely with both the principal investigator, Dr. Edward Stone, and the payload manager, Allan Frandsen. My relationship with Al took on much greater significance as the project evolved, because fairly early on Dr. Stone also became the director of the Jet Propulsion Laboratory. At any one time, there were always several things competing for his time and attention. Still, we communicated regularly.



Did you two have some kind of system set up for that?

Only in that we made it a practice not to ignore communication. Dr. Stone and I set up a schedule to talk with each other on the phone every week. Even if it was to say that the weather was nice in California and there was nothing much happening here at Goddard, we always kept the appointment.

What are some of the common pitfalls you've seen on projects in terms of how scheduling is treated?

Well, I'll give you an example. On one project, I went to visit my contractor, and I met with their scheduler and project manager. We went into their war room, and there were schedules all over the wall. They were wonderful, as detailed as can be, and so I had to ask: "Who developed the schedule?" The scheduler said, "I did." And so I asked another question, "Did the people doing the work have input?" He said, "No."

The next day I notified the contractor that I wanted the project manager and his scheduler removed from the project, and I told him to start building schedules that were representative of what work really needed to be done. As a project manager, there are certain things you can dictate: the end date, maybe certain review period dates; but in terms of what else has to be done, you've got to ask the people who are doing the job.

So you felt that schedules they had shown you had no basis in reality?

None. Here were these wonderful schedules, detailing every single thing you ever wanted to know about the project—and it was totally irrelevant. Now, understand, I am not against using schedulers. I have worked with several good ones. But you need to talk to the people doing the work. You need to find out what they have to do and how long it's going to take. Even if you do it that way, your schedules can still be fallible, but at least you have something that everybody has bought into because they helped to develop it.

HERE WERE THESE WONDERFUL SCHEDULES, DETAILING EVERY SINGLE THING YOU EVER WANTED TO KNOW ABOUT THE PROJECT— AND IT WAS TOTALLY IRRELEVANT.

Were there any unique scheduling challenges you faced on ACE?

The scheduling challenge on ACE was working with twenty science institutions. It was a big team, spread out

widely across the U.S. and parts of Europe. They were all experts in their own scientific and technical domains, but creating and adhering to schedules wasn't their forte. So the real challenge was making sure all of the schedules converged on the same launch date.

In what way, for example by looking at a decision you made at some stage of the project, were you able to address that challenge?

At the start of the project, I had the choice of spreading the limited amount of money I had among all the players, or looking at and mitigating the greatest risks on the project.

I responded by putting the bulk of the money into trying to identify the key risks in the development of the science instruments and mitigating these to the best extent that we could. I wanted to enter the development phase with the least amount of technical, schedule, and cost risk as possible. To do this, I had to limit spacecraft development funding at the Johns Hopkins Applied Physics Laboratory (APL).

What were the risks involved in doing this?

In holding APL back by three months, or six months, I knew I could be shooting myself in the foot if they were not able to recover. But I believed, even with a slow start, APL would be able to catch up.

Why? This was my third mission with APL, and I thought I understood the culture there. Mary Chiu, the APL Program Manger, was new to me, but I knew many of the other key people on the project. APL had built spacecraft many, many times before. My concerns about APL being able to do the job actually were quite minimal.

On the other hand, no one was certain how effectively we could mitigate the risks with those problem instruments. The greatest uncertainty on a science mission is in the development of the instruments. There were nine on ACE, five of which were new. Because I was limited as to how much money I could get in the early stages of the project, the question was: What was the best way to use it?

How did things turn out?

Once we got more funding, I told APL to start ramping up on the spacecraft development. As it turned out, they were able to catch up.

You're never right a hundred percent of the time. Still, you have to go with your judgment. Experience counts for a lot.

At one of APPL's Masters Forums, you told a story about how you worked with Mary Chiu to address a schedule concern you had about APL. What struck me about that was you said you learned something about people's motivations on projects.

YOU'RE NEVER RIGHT A HUNDRED PERCENT OF THE TIME. STILL, YOU HAVE TO GO WITH YOUR JUDGEMENT. EXPERIENCE COUNTS FOR A LOT.

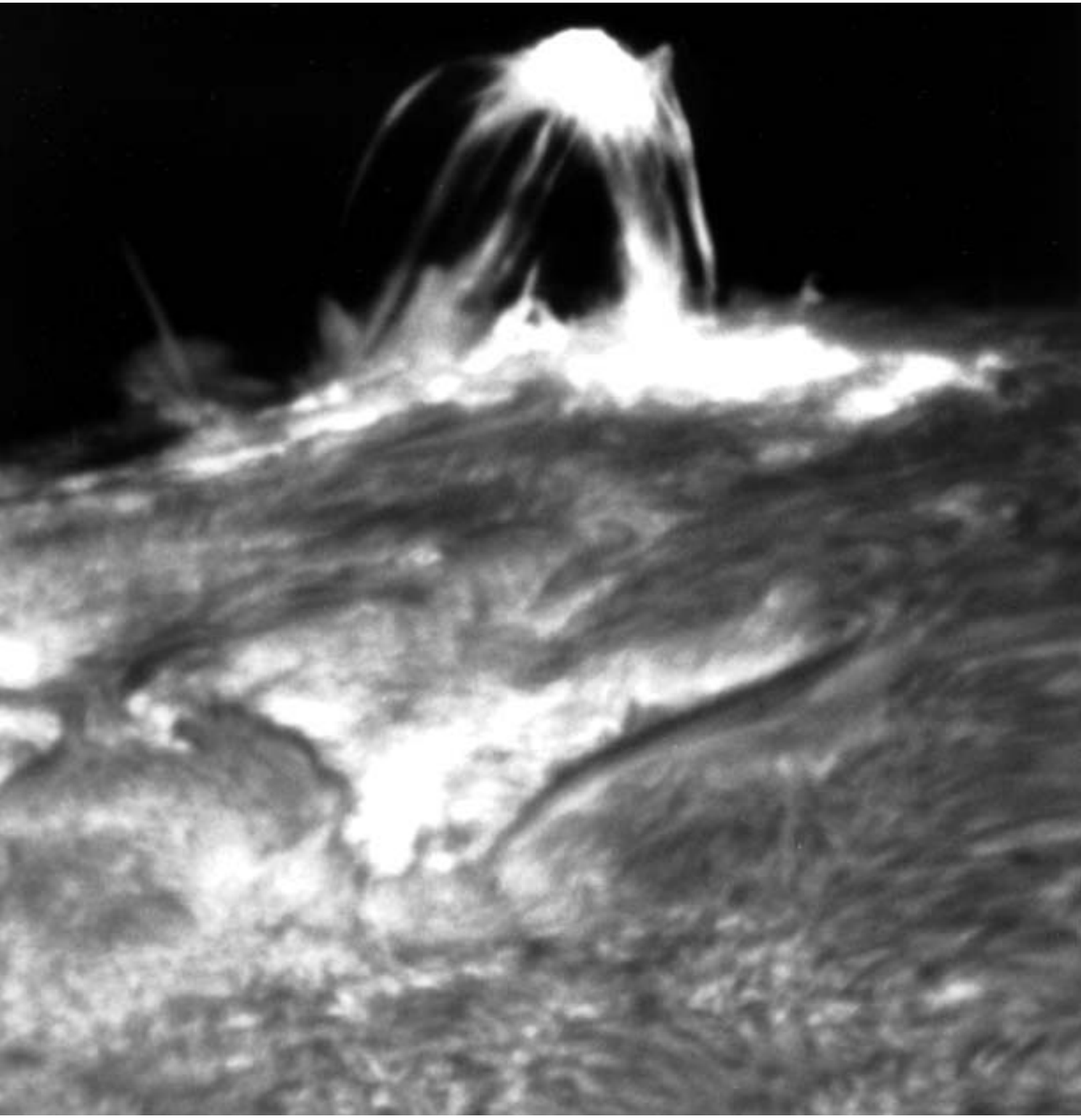
Yes, I remember. The story was that APL had fallen behind schedule as we were approaching our integration and test phase. We not only had to integrate the spacecraft and test it, we had the nine instruments coming in. It looked to me like there was only one of two ways to make up the difference: either put some people on double shifts, or work on the weekends. Neither was an attractive alternative, but we had a lot to do and the work had to get done.

I asked Mary to go ahead and tell her people to do one or the other. She told me that she couldn't do that. Her people were salaried and she couldn't direct them to put in overtime, where they wouldn't be paid for their work. I have to admit that took me aback. For one thing, I wasn't asking for a lot of time—perhaps seven days at most.

But I have to give Mary credit. She pointed out something that was a no-brainer, really. Technically, she couldn't require her people to work the extra hours, but she also knew that she didn't have to tell them to do anything. Professionals don't have to be reminded that they have a job to do. It was so obvious that I was astonished and embarrassed that I hadn't realized it myself.

Sensors on the Advanced Composition Explorer satellite measure solar phenomena like the flares seen in this x-ray image.

A closer view of the Sun's surface during a solar flare.



These were people at APL that you'd worked with before?
Yes, that's true. I knew a number of people on the APL team because I'd worked with them before, and I recognized that what she was saying was true. These people would come in and work the extra hours; they would work Saturdays, Sundays, nighttime, whatever it took to do the job. All we had to do was put it out there that we were behind schedule, and they would rise to the challenge on their own. And they did. Ultimately they recovered all of the time.

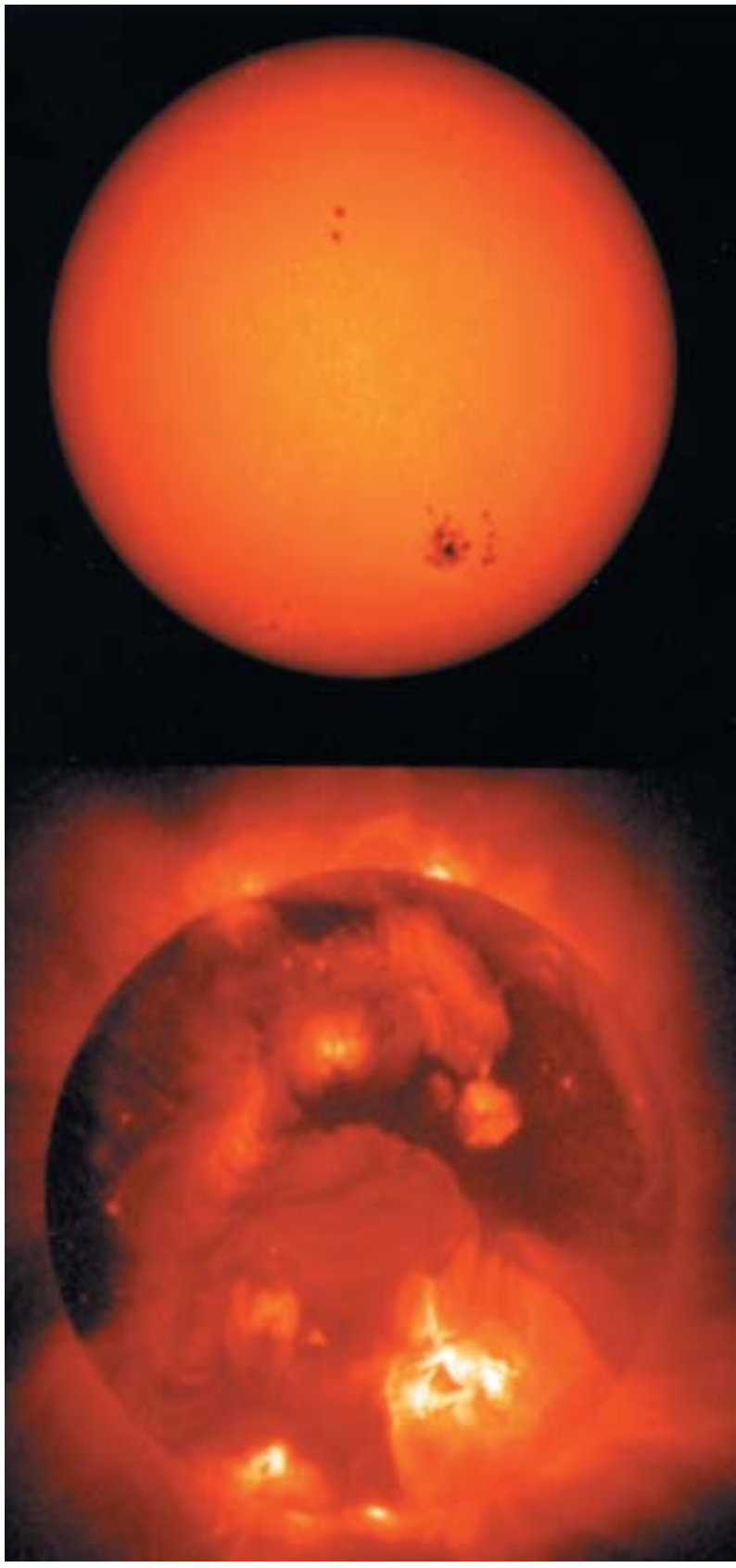
So what was the important piece of learning about people's motivations on projects?
Well, it is much better to let people come up with a solution and implement it than for you to force it down their throats. Isn't that preferable to mandating that they do the work? Think about it from APL's standpoint, if they heard NASA telling them to work harder than they already were—with NASA knowing full well these people weren't going to get paid for this—it would be like NASA was trying to get something out of them for nothing.

The mission launched, and it has been very successful in terms of the science collected. But are you satisfied in how you met the challenges you identified?
Let me put it this way, we picked a target launch date three and a half years in advance of launch, and if there had not been a launch vehicle problem on a different mission we would have launched on that day. As it was, we launched four days late.

That's incredible when you think about how common launch slips are. Six months, or a year is hardly unprecedented. So are there any rules of thumb that you would encourage project managers to follow when building schedules?
Just this. There is this tendency to think there's only one way to get from A to B. It turns out there are an infinite number of ways to get from point A to point B. What may work on one project may not work very well on another project for a variety of reasons.

The lesson I've learned is that while it's good to have a road map, you have to realize the map is good for today, but it may change tomorrow, and it may change again the next day. Use the schedule as a tool and be flexible, if you can. Cultivate a great team, take advantage of their experience, and pray for good luck. •

Solar activity reflects changes below the Sun's surface.



Management as Improvisation

Things are supposed to work a certain way—and then there's what really happens

DESPITE THE BEST PLANNING, GAPS EMERGE BETWEEN THE model and the reality of most projects. Often, when unexpected problems arise during project implementation, quick thinking and a pragmatic approach are the tools managers need to bridge the gap.

I was reminded of this when I spoke with a project manager in charge of modernizing old buildings for the Federal Government. Though he had straightforward goals (removing asbestos, updating wiring, etc.), achieving these goals proved anything but straightforward. The real challenge, the manager discovered, was completing his work without disturbing the tenants still occupying a building.

QUIET ZONE At one of his sites, a Federal courthouse, workers had continually violated noise restrictions imposed during the hours that court was in session. Typically, when noise complaints came in, someone from the project office found the source of the problem and reminded workers of the restrictions. When confronted, workers explained that they either hadn't known about the restrictions or had forgotten them.

The solution? Directly addressing those who could control the noise—the workers—and making it clear that they would be held responsible for their actions. The project manager posted the noise restrictions at every construction entrance—along with a warning that violation of noise controls could "result in immediate and permanent removal from the job site." A simple sign was all it took to address a significant threat to project success.

LIVE WIRES On another project, demolition work on one floor of a building disrupted the telecommunication service to occupied offices. It turned out that years of office space reconfigurations had resulted in tangled wiring that wound its way between floors and through offices. For example, stripping a telephone closet on the 12th floor cut service to offices on the 14th floor.

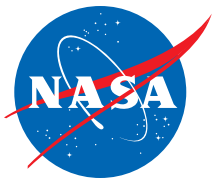
The obvious solution was to hire a technician to systematically trace all the wires and eliminate the problem upfront—but the project couldn't afford this. Instead, the manager found a retired technician willing to work "on call" to identify live communication lines before renovation began in an area, using a listening device. This low-cost solution provided a satisfactory solution.

A NOSE FOR TROUBLE When the roof of a fully occupied office building needed to be re-tarred, occupants complained that the noxious fumes were reaching their offices. The project manager learned that fresh-air intakes on the roof were sucking in the fumes whenever the wind blew in their direction. The air intakes couldn't be turned off completely, if the building was to remain occupied.

The building manager threatened to evacuate all 5,000 occupants, which would bring the project to a standstill. When experts couldn't come up with a technical solution, the project manager came up with an innovative fix: He invented a new occupation. He hired a "sniffer" to sit beside the intakes and sniff the air for tar fumes. When the wind blew fumes towards the intakes, the sniffer turned them off temporarily—never for more than a couple hours, and well within acceptable limits.

KEEP IT SIMPLE As this manager learned, the unknowns of project work often require immediate response. Thankfully, high-performance results don't necessarily require high-tech solutions. Quick, simple, and inexpensive fixes are sometimes the answer to keeping a project on schedule and within budget. •

ASK



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