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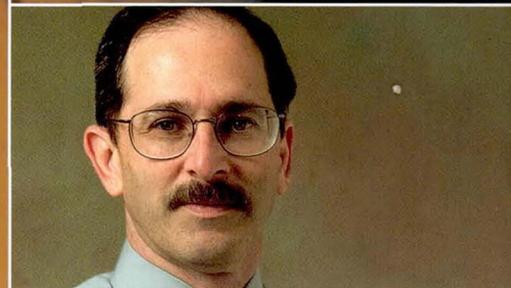
# Academy Sharing Knowledge

The NASA source for project management

# ASK

INTERVIEW

Dr. Michael Hecht



ASK Magazine • Issue Twelve

JUNE 2003

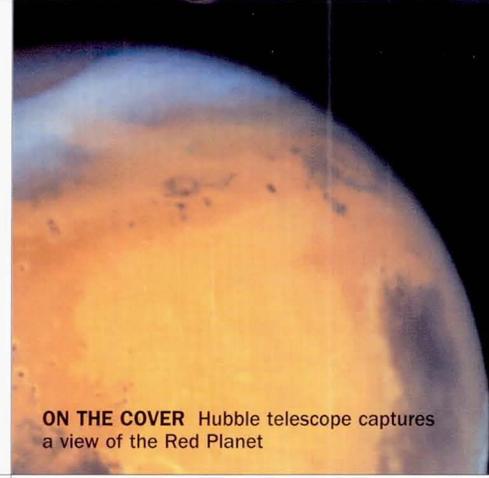


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WELCOME TO THE ACADEMY OF PROGRAM AND PROJECT Leadership (APPL) and *ASK Magazine*. APPL helps NASA managers and project teams accomplish today's missions and meet tomorrow's challenges by providing performance enhancement services and tools, supporting 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*.

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

## What Is This Fourth Dimension?

*Soon after we started publishing ASK, I heard from some of our NASA readers that we needed to feature more stories about managing research projects*

THE RESEARCH COMMUNITY AT NASA, I WAS TOLD, IS TOO often overshadowed by the folks who build hardware. Four of NASA's nine centers, after all, are research centers.

I hope stories in several of our recent issues have satisfied some of those early critics. But to any project manager of a research project who may still feel slighted, well, here is an issue for you.

In working on this issue, what I've learned is that managing research projects demands an understanding of what Dr. Robert J. (Joe) Shaw calls the fourth dimension: politics. His story, "Getting Politically Active," explains how he has evolved from being an observer of organizational politics to actively politicking for his projects. Carol Ginty, who like Joe Shaw is located at NASA's John Glenn Research Center, knows that the technical report doesn't always sell the research. That's why she's always looking for things that will—and finds them wherever they turn up.

Tim Flores returns to *ASK* this issue. I interviewed Tim for Issue 2. At the time, he was on leave from NASA's Ames Research Center, working on a Masters degree at MIT. Finished now, he has a story, "Earthly Considerations on Mars," about the research he did for his thesis. Tim looked at two Mars projects, the successful Pathfinder and the ill-fated Surveyor, attempting to understand the difference between a successful mission and a failed one in terms of the organizational structures of the project teams. Research projects often give us many surprises, and this one is no exception.

Our interview this issue is with Dr. Michael Hecht, a project manager at the Jet Propulsion Laboratory. Among other things, Mike shares what it was like

working as the project manager and co-investigator on an instrument scheduled to fly on an upcoming Mars mission. Did his dual role on the project pose a conflict of interest? Read the interview and see.

In the Special Feature, APPL Knowledge Sharing Manager Denise Lee has a story about how the APPL Transfer Wisdom Workshops have evolved. Denise and her APPL teammates conduct one-day workshops at the NASA Centers, using stories from *ASK* to promote a knowledge sharing culture at each Center. Along with the story by Denise, we've included stories by participants from some of the workshops.

Lastly, we celebrate the life of Frank Hoban, who passed away unexpectedly in December. Frank was the editor of *Issues in Program and Project Management*, published by NASA and dedicated to research done by NASA managers. *Issues* appeared throughout the late 1980s and early 90s. "From The Director's Desk," Dr. Edward Hoffman's column, is a remembrance of Frank, and in the "Loop" we pass along some tributes written by Frank's friends and colleagues.

Hope you enjoy this issue of *ASK*. Remember, this and all issues are for you. •



## Remembering Frank Hoban

*Years ago, I interviewed for a job I wasn't sure I wanted with a man who wasn't confident he wanted me*

THE JOB WAS BEING SECOND-IN-CHARGE OF NASA'S Program Project Management Initiative (precursor to the Academy of Program and Project Leadership), and my interviewer was Frank Hoban.

Shortly after we exchanged typical pleasantries, Frank jumped right into discussing ideas, beliefs and goals. After twenty minutes he asked, "So, when can you start?" I made the second best decision of my life and accepted the job on the spot.

I remember a typical Frank remark when embarking on a new assignment, "Let's get started soon because we can do some really important things, and let's remember to have fun." Few days were as enjoyable as meeting with Frank over lunch and hearing stories of escorting Wernher von Braun to the Dick Cavett show, or working for George Low on the Low Cost Systems Office, or the early days of Space Station.

Frank came from a project world. He much preferred addressing real issues by working with the best people and staying focused on the customer requirements. When I first started with Frank, he informed me that the more time I spent in my Headquarters office the less effective I would be. The customers, experts and practitioners, were in the field—spend time with them.

He made that point personally by the way he used his last few weeks before leaving NASA. He escorted me on a tour of each of the centers. We met with all of the working groups and individuals who were so vital to the

project management community. I still remember him telling everyone what a wonderful leader I would make, and his strong insistence that I receive their support.

Frank had accepted a university teaching position. He felt it was time for a new adventure and assured me he would always be nearby to help—and he was. Over the years we stayed close. One time, several years ago, Frank invited my family to his New Year's Day party. We went for a walk on the grounds of his beautiful home, the two of us, and he asked me how things were going. This was during a period of excessive travel and long hours. I knew he could sense I was burning out. He shared some of his experiences and then talked from the heart about the most important

thing being family. He warned me that it was easy getting caught up in the excitement of work and travel.

The last time I saw Frank was at the Goddard Space Flight Center. We had a few minutes to talk. We discussed possibilities, exchanged ideas, caught up on people and agreed to get together for lunch soon. Leaving, I noted how his eyes sparkled with energy, excitement and adventure. I knew he was planning the next big thing.

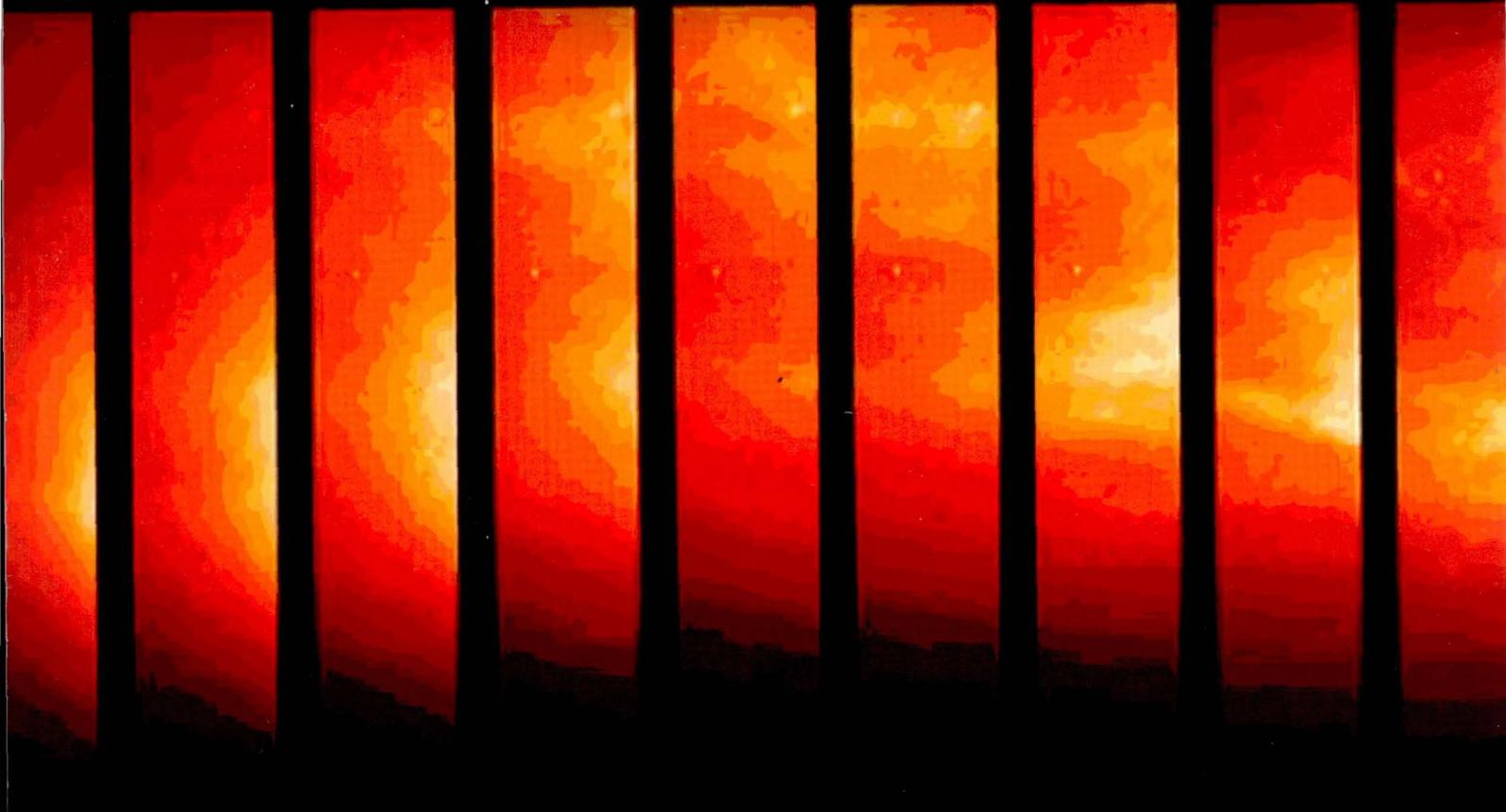
Frank was a big part of what makes NASA special. He was part of a hero generation that faced challenges, dreamt big and remembered to have fun. He embodied a love for family, country and NASA. I have always considered myself an extremely lucky person for having known him. •

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*Leaving, I noted how his eyes sparkled with energy, excitement and adventure. I knew he was planning the next big thing.*

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Martian nightfall: Nine enhanced images capture the twilight of sunset over the Ares Vallis river channel.



# Earthly Considerations on Mars

LIKE THE REST OF THE COUNTRY, I READ THE NEWSPAPER ACCOUNTS of NASA's Mars missions in the late '90s. Headlines touted the success of the 1996 Mars Pathfinder and, later, highlighted two of the 1999 Mars Surveyor program missions as failures. Unlike much of the country, my work at NASA gave me more than a passing interest in the headlines.

by **Tim Flores**

▼ A southwest view from Pathfinder's landing spot reveals the rocky Martian landscape.

When I left my job at Ames Research Center in 1999 to go back to school, both of these projects were fresh in my memory. So, when it came time to choose a research project for my Master's thesis, the Mars missions came to mind. I wanted to work on something of real value to NASA and, by looking at these projects

## One fundamental element distinguished the successful mission from the failed missions: teamwork.

from a new perspective, I hoped I would have something to offer the Agency.

Much had already been written about the Mars missions. At least two books had detailed the success of Pathfinder from start to finish. Committees had studied closely the Mars Climate Orbiter and Polar Lander, two not-so-successful Surveyor projects. Why did I think I had something new to say?

### Asking questions

The Pathfinder, Climate Orbiter and Polar Lander projects all came out of the Jet Propulsion Laboratory

(JPL). They were conducted under the same "faster, better, cheaper" mandate, were all of comparable scope and shared many similar elements and even some of the same team members. But they had very different end results; what accounted for the difference? Aside from the reported technical issues, what could have been the

deciding factors between success and failure? Could the organizational design, politics or culture have been a factor?

With the help of my advisor at MIT, I developed my research project as an organizational study of the Mars projects, and I developed a lengthy set of questions to use when interviewing team members from the three projects. I anticipated that some of the people I spoke with might, quite understandably, be

sensitive about discussing their work on a so-called "failed" mission, and I gave this a lot of thought.

When it came time to contact my research subjects on the Orbiter and Lander projects, I made it clear that I wasn't interested in finger pointing and I wasn't looking to blame anyone for failures. I explained that I was studying the strategic design of each project, i.e., the grouping, linking and alignment of the project. I wanted to look at the political environment to see how the goals and interests of stakeholders affected the outcomes, and I wanted to understand the working culture of each project.



In the end, I was impressed by the generous response of the participants; every one of them expressed a desire to share their knowledge and to help with my research.

### Getting answers

I interviewed, in great depth, eight key figures from the missions (one subject worked on both Pathfinder and Surveyor, and I interviewed him separately about each). I expected to find that the Pathfinder differed from the other projects on a number of levels: resources, constraints, philosophy, and personnel. And this was, to some extent, true. But I was extremely surprised to find one fundamental element that distinguished the successful mission from the failed missions: teamwork.

You can't underestimate the value of effective teamwork. The Pathfinder team developed trusting relations within a culture of openness. They felt free to make the best decisions they could with the resources available to them, and they knew that they weren't going to be crucified for mistakes. That trust never developed in the other programs.

Why did the individuals of one team work so well with another, while the other teams suffered from numerous conflicts and communication gaps? Tied into this are a number of factors. One of the things that



Because dust extends high into the atmosphere, the Martian sky stays bright for up to two hours after sunset.

Pathfinder did was to develop a flat organization, which allowed team members to make decisions across the board. They were not forced to follow the standard hierarchical protocol that usually exists in government programs. Team members were encouraged to speak to one another directly, rather than through managers, and they felt fewer bureaucratic limitations on their work.

Another factor: collocation. The Pathfinder team built their own spacecraft, and they were able to co-locate almost all the team on one floor in one building. Team members had frequent, informal face-to-face interactions on a daily basis. Consequently, they could respond to emerging issues quickly.

Contrast to that the distance between the Orbiter/Lander prime contractor, Lockheed Martin Astronautics, in Colorado and the mission team at JPL in California. Working with dispersed teams made communication failures more likely, and communication failures, in turn, prohibited developing trust.

Never underestimate the power of positive thinking. Even though the budget for Pathfinder was an order of magnitude smaller than previous Mars missions, team members turned that into a "can-do"



motivational factor. Management took the first step in creating a trusting environment that set the tone for positive results. The atmosphere brought out a strong performance ethic and the relentless desire to accomplish the mission. In contrast, the challenges for the Surveyor program were presented with a negative connotation of “two for the price of one” and “it couldn’t be done.”

Not surprisingly, my research uncovered many of the same factors identified by earlier studies as critical elements to the relative success or failure of the Pathfinder, Orbiter and Lander missions. The striking difference between the projects, however, became clear during my research: the cooperative relationships between team members across the boundaries on the Pathfinder mission did not exist on the other missions.

Without a doubt, sound science and technical proficiency are crucial to a project. But an examination of the Mars missions tells us that we can’t afford to overlook the relationships between the people doing the work.

In many ways, my research continues. I’m trying to apply the lessons I learned to my current work situation. I’ve pushed for more face-to-face communication and I’m trying to help build a relationship of trust between members of the various teams working on my project.

If there’s one thing my research taught me, it’s that every project, no matter what its technical specifics, comes down to being a human capital effort. •

## We can’t afford to overlook the relationships between the people who work on a project.

### LESSONS

- You can enable success but cannot create it. Project managers must find the right balance between giving people the right independence (trust) to accomplish great things and providing the guidance to help them do it.
- Project management is a people industry. Gaining the trust of your followers will grant you more influence than any formal authority.

### QUESTION

*In research, we expect to be surprised because that’s how we learn. On a project, we often greet surprises with some trepidation, understandably. How might you rethink “surprises” on a project as learning opportunities?*



In 2001, **TIM FLORES** earned his Masters of Science and Engineering Management from the Massachusetts Institute of Technology (MIT). Flores attended MIT as part of NASA’s Accelerating Leadership Option (ALO), which allows some of NASA’s most promising mid-career project managers to develop skills needed to lead the Agency in the 21st century. The program combines business management and systems engineering studies at MIT with a one-year developmental assignment.

Managers from all nine NASA Centers have participated in the three-year-old program. In their developmental assignments, graduates have worked at IBM, Raytheon Corporation, MC Corporation, National Reconnaissance Office, NASA Headquarters offices and other industry and Agency settings. Tim Flores’s post-grad assignment with L3 Communications has been extended and he continues to work on the Stratospheric Observatory for Infrared Astronomy (SOFIA), a joint project between NASA and the German space program.

You can find Tim Flores’s thesis about the Mars projects, “Organizational Team Characteristics That Enable Successful Projects at NASA: A Framework for the Future,” on the NASA APPL Web site at <http://appl.nasa.gov/resources/flores.htm>

the people assigned to UEET worked in the HSR program and the Advanced Subsonic Technology (AST) program, which was cancelled at the same time. Though these NASA employees and industrial partners suffered collateral damage when the old programs were terminated, I needed to get them to buy in to the new program.

I spent a lot of time explaining my vision for the new program—and listening to their complaints. That was okay; people need to vent, and you've got to understand that. I believe that by communicating with all the people associated with this program and by developing a relationship with them, we developed a high degree of support for the program—to the point that some of our contractors have taken the initiative to spread the message that the UEET Program deserves continued funding.

I want to make very clear, though, that I have never encouraged any industrial partner to go out and lobby Congress; that's not an appropriate activity for NASA personnel. I think we have a strong, clear vision in UEET and we deliver timely, high-quality technical products. This vision and our success in realizing the vision inspire people to take appropriate action.

I have also spent a good deal of my time with our stakeholders at NASA Headquarters. Over the years, the leadership in the Office of Space Technology has included people of very different backgrounds, experiences, and approaches to program planning. Each and every one of these individuals has been a good person, but they come from different perspectives. My advice to anyone heading up a research program at NASA: Understand your stakeholders' perspectives, or run the risk of seeing your program being killed off in an instant.

And that is also my advice to all program and project managers. You must engage yourself in understanding the environment in which your program or project operates. To put it simply: You can run, but you cannot hide from politics. Either you will influence the politics that surround your program, or politics alone could determine the fate of your program. I learned the hard way that a manager can't afford to be detached. •

## Understand your stakeholders' perspectives, or run the risk of seeing your program being killed off in an instant.

### LESSONS

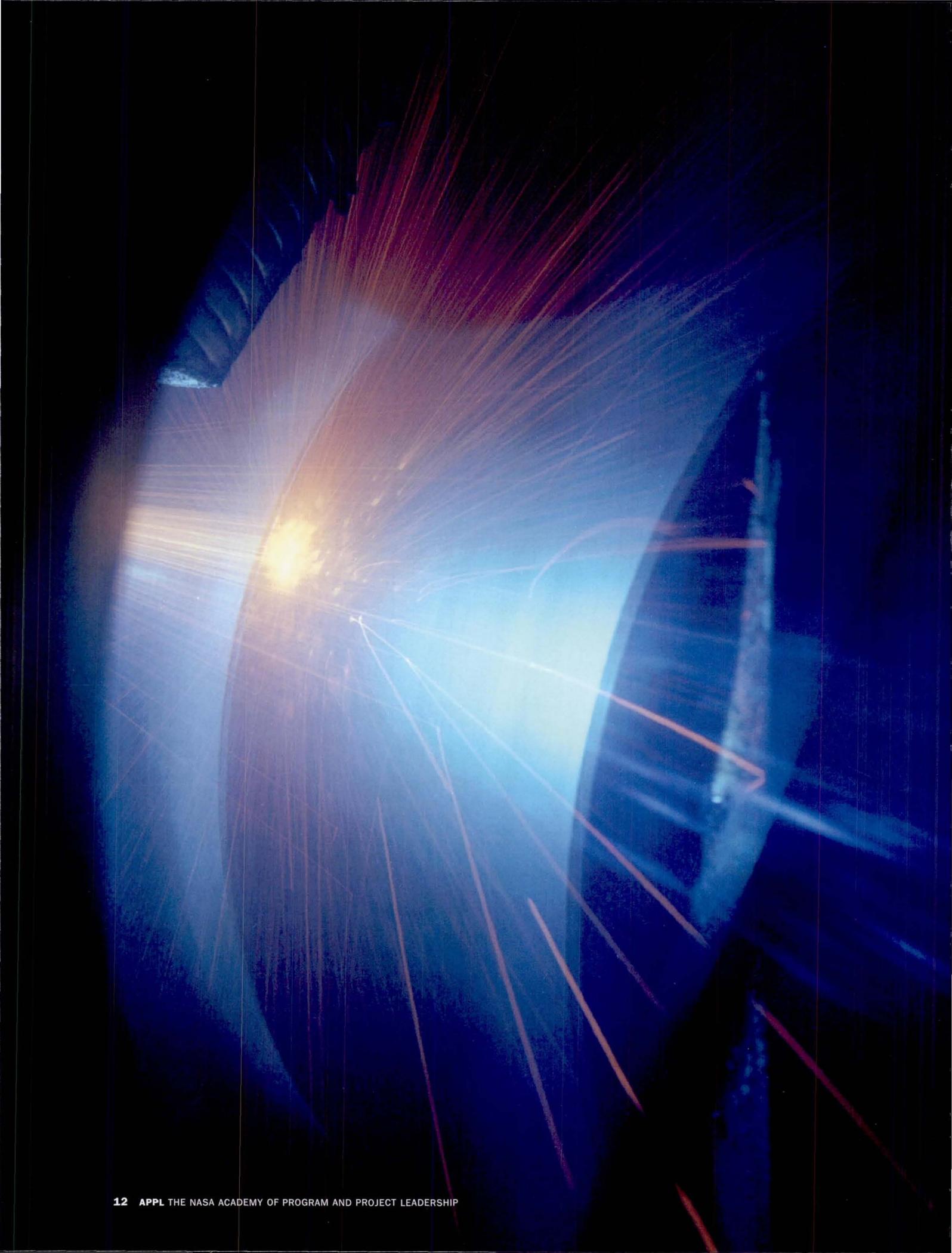
- Projects can, and do, succeed because of politics. And they can fail due to politics, as well. Politics does not have to be a dirty word, if it means working closely and openly with customers and stakeholders; it is an essential approach that requires continuous dedication of time and attention.
- Project management is a people industry. Gaining the trust of your followers will grant you more influence than any formal authority.

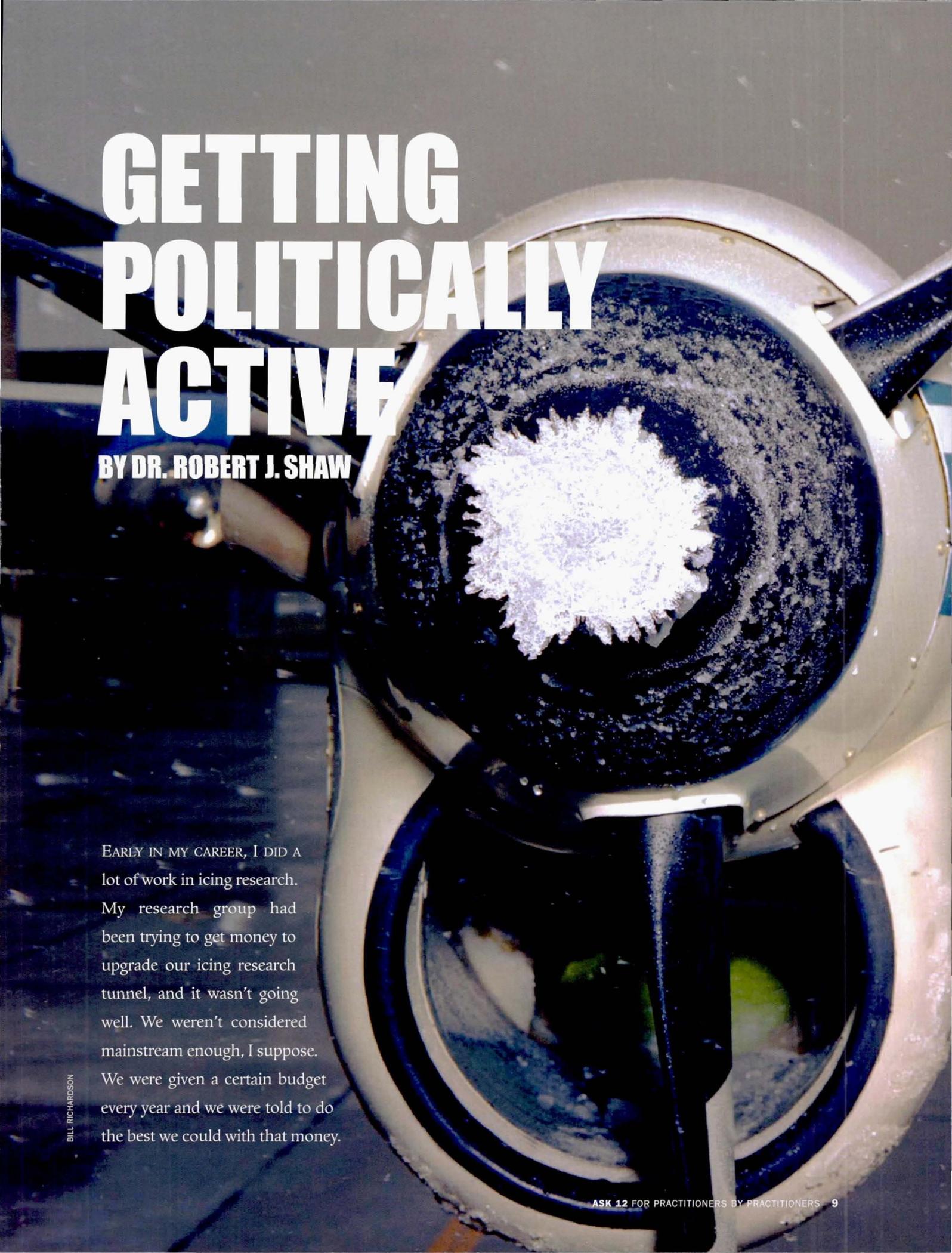
### QUESTION

*How do you get buy-in from the stakeholders on your projects?*



"I suppose we all come to project management through unconventional paths," says **DR. ROBERT J. (JOE) SHAW**. While working on his PhD at Ohio State University, Shaw didn't expect to become a project manager, or to spend his career at NASA. Explains Shaw: "My advisor at Ohio State told me that NASA is a great place to go for five years, learn, gain experience, then get out and get on to the real thing. For me, the real thing was to become a university professor. But as that great philosopher of our time, Yogi Berra, said, 'When you come to a fork in the road, you take it.'" After starting out as a Division Manager in the Icing Program at Lewis, now the John Glenn Research Center, Shaw gravitated to a formal project management role leading the High Speed Research Project. Most recently, he has managed the Ultra Efficient Engine Technology Program Office and started up the Vehicle Systems Program.





# GETTING POLITICALLY ACTIVE

BY DR. ROBERT J. SHAW

EARLY IN MY CAREER, I DID A lot of work in icing research. My research group had been trying to get money to upgrade our icing research tunnel, and it wasn't going well. We weren't considered mainstream enough, I suppose. We were given a certain budget every year and we were told to do the best we could with that money.

BILL RICHARDSON

Out of nowhere came a front-page news story about a horrible plane crash that was due to icing. It wasn't the icing that we were studying but, nevertheless, icing research had new currency (yes, pun intended). Suddenly, the money we were asking for—and more—was made available to us.

I wasn't directly involved in bringing that money to the program. I stood by on the sidelines and said, "Well, I don't understand how the politics of this works exactly, but it seems to be benefiting me and so that's nice." Detachment served me fine in that case. Many years later, however, I was involved in another political football match and, this time, the ball didn't bounce my way.

### **On My Own**

In 1999, the program I was working on, High Speed Research (HSR), was terminated. I could spend pages talking about why it was terminated, but at the risk of sounding like sour grapes, let me just say this: Over a few weeks (literally, a few), we lost our national agenda and priority. We went from the top program to the one that you didn't want to talk about anymore.

It was a very upsetting experience. Many of the people who worked for us wanted to know what they did

wrong. The answer was, "You didn't do a damn thing wrong." There were forces at work beyond our immediate control.

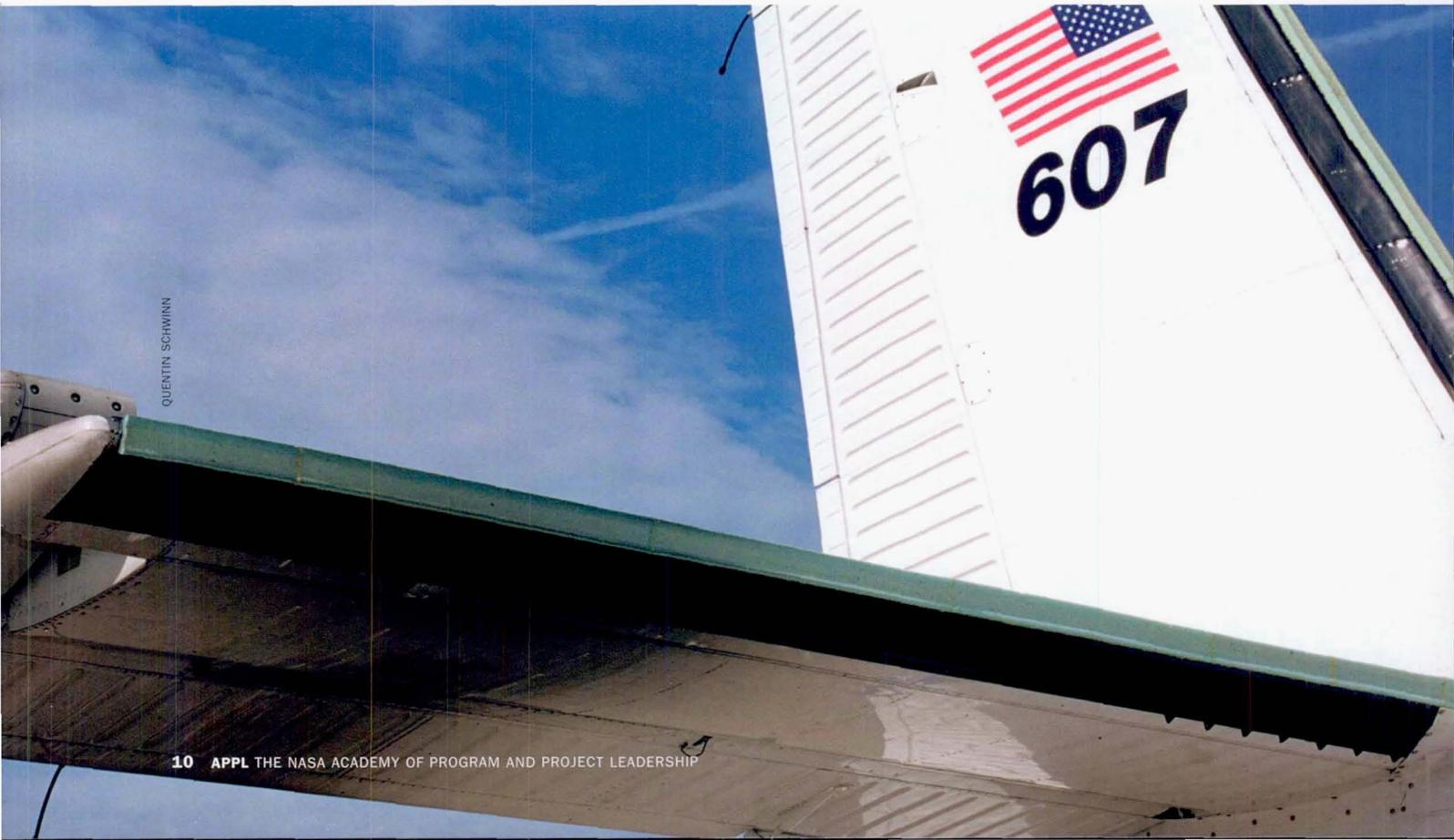
The program was terminated around Thanksgiving. While I was at home for the Christmas holidays that year, I put up shelves in our basement. I worked out some of my frustration with work on my home project. I still have a lot of drill holes in the wall, and there are names associated with each one of those holes.

Shortly after the HSR program was cancelled, Dan Goldin, the NASA Administrator at the time, told my boss that he wanted to start a new program—somewhat similar to the program that had been terminated but different enough to be considered revolutionary. My boss told me that he wanted me to do this job.

I wasn't terribly excited about jumping right back into the political fray. I told him point blank, "I don't want it." He said, "Oh, yes, you do." So, that was the end of that discussion.

### **Politics, Redux**

The Ultra Efficient Engine Technology Program (UEET) is a collection of technologies aimed at impacting future gas turbine engine designs. Some of



QUENTIN SCHWINN

# STUMPING

## FOR THE PROJECT

by Carol Ginty

ADVOCATING RESEARCH IS A LITTLE TRICKIER THAN SELLING OTHER PROJECTS AT NASA. YOU CAN POINT TO A SATELLITE. YOU CAN POINT TO A ROCKET. YOU CAN SEE THE SHUTTLE AND THE INTERNATIONAL SPACE STATION. BUT IT'S DIFFERENT ON THE RESEARCH SIDE. HOW DO YOU DISPLAY COMPUTATIONAL FLUID DYNAMICS? HOW DO YOU GET SOMEONE TO UNDERSTAND THE VALUE OF COMPOSITE MATERIALS OR NANO-TUBES THAT THEY CAN'T EVEN SEE WITHOUT A MICROSCOPE?

WHERE I WORK AT NASA'S JOHN GLENN RESEARCH Center, we joke about how we all went to engineering school, but what we really needed were classes in political science and marketing. These days, it seems that technical decisions aren't made strictly based on the merits of the technology. At their root, decisions about research projects are largely political.

It all comes down to this: How do you convince people that low-visibility projects have the potential to change the way they live, and that they share a vested interest in the outcome of this work? And it's not just the American public or Congress that I need to convince. I've found that I have to do a lot of "stumping" within the Agency about why this technology is so important.

As a project manager, I have to be aware of what's going on at my research institution relative to other

Turn up the heat: Material processing facilities at the John Glenn Research Center host high-temperature research. DONALD HUEBLER

programs and projects—and I have to be on the lookout for any threats that might be coming my project's way. When my program manager, Gary Seng, gets mandated budget cuts, he has to take the money out somewhere. An important part of my job is convincing him that my

wasting money. Instead, I point out that a think tank at Stanford University recently did a study and concluded that raising the engine temperature 50 degrees Fahrenheit across the entire fleet of commercial airlines would save \$1 billion annually in fuel consumption.

That gets people's attention. And that's what I mean by selling the project.

I have learned that the technical paper doesn't sell a project. Frequently at reviews, you watch people nod off in the middle of all the technical data. While it's exciting to the researcher,

it's often boring to the decision makers. If you want their vote, you need to get their attention and you need to show them value. •

## How do you get someone to understand the value of composite materials or nano-tubes that they can't even see without a microscope?

project shouldn't be the one that gets cut.

It helps that I'm genuinely passionate about what we're doing. So, whenever I have the opportunity to present our technology to upper management, I don't simply report the status of our milestones. I try to make every presentation exciting. I show the potential of what we're working on and I talk about benefits down the road. I spin the project however and to whomever I think it needs to be spun.

Currently, I'm managing advanced high temperature materials research. Almost every system study has identified materials as the key to future technological developments. So, I'm always out there looking for any nugget of information that I can pull from one of the studies. I'm looking for that sound bite capable of influencing someone in about 30 seconds—something that will leave him or her thinking, "Oh, we really do need this materials research."

The technology being developed in my project will enable a commercial subsonic engine to perform at higher temperatures. When you raise the temperature in an engine, the engine runs more efficiently. You reduce emissions and save money because the engine burns less fuel. Most current materials have reached their inherent thermal capabilities. So, we are developing both new material systems and coatings for existing materials to achieve this goal.

If I simply told you that millions of dollars have gone into this research and that the operating temperature of an engine has been increased by 100 degrees Fahrenheit, you might jump to the conclusion that we haven't accomplished much, and that we've been

### LESSONS

- There are times when the role of the project leader is simply to sell the project. On a research project it is often more crucial and more difficult, and requires focus, effort, and creativity.

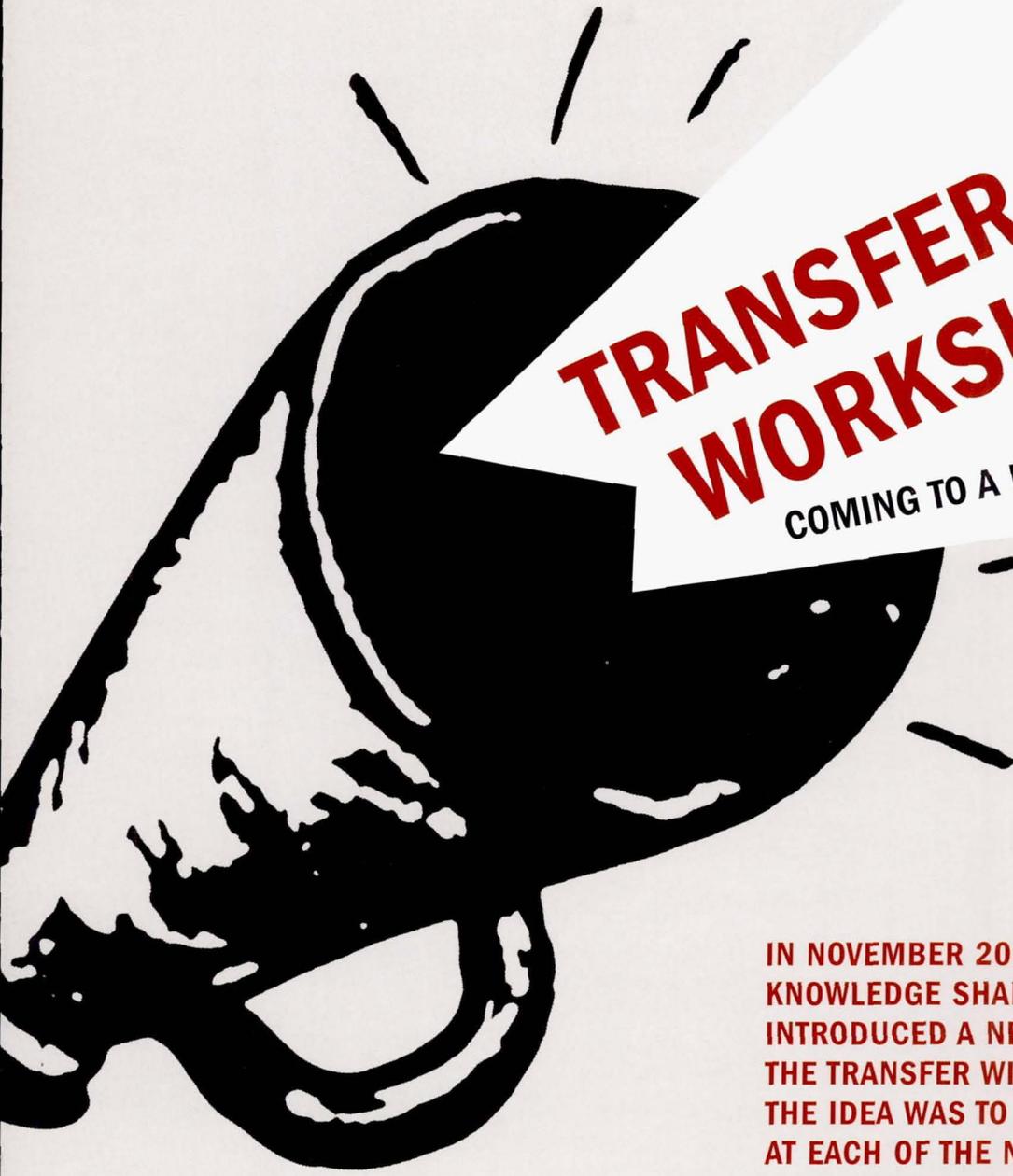
### QUESTION

*Is there a point at which "selling" a project can become "selling out" a project?*

## I have learned that the technical paper doesn't sell a project.



**CAROL GINTY** has held several positions at the John Glenn Research Center over the last 20 years, all involved with the research and development of advanced propulsion materials for aeronautics applications. In 1989, she became a subproject manager for Analytical Methods in the High Temperature Materials (HITEMP) Program where first-life prediction methods were formulated for high temperature composites. In 1991, she became the Deputy Program Manager for HITEMP and assumed the role of Manager in 1998. She was responsible for the successful completion of the program, which had an unprecedented, 12-year uninterrupted life cycle. In 2000, she formulated a follow-on project, Higher Operating Temperature Propulsion Components (HOTPC), and is currently managing that effort.



# TRANSFER WISDOM WORKSHOPS

COMING TO A NASA CENTER NEAR YOU

By Denise Lee

**IN NOVEMBER 2001, THE APPL KNOWLEDGE SHARING INITIATIVE INTRODUCED A NEW PRODUCT, THE TRANSFER WISDOM WORKSHOP. THE IDEA WAS TO GIVE PRACTITIONERS AT EACH OF THE NASA CENTERS THE OPPORTUNITY TO ENGAGE IN A KNOWLEDGE SHARING ACTIVITY.**

YOU KNOW THE FEELING: YOU THROW A PARTY, INVITE A LOT of people and you pray they show up. When we planned one of our first Transfer Wisdom Workshops (TWWs) at Goddard Space Flight Center, we expected to run a workshop with 25–30 people. Instead, only five people from Goddard had entered the room by the time we were supposed to start.

It's hard to "share" knowledge when you don't have people there to do the sharing, but you can only clear

your throat so many times and say, "Maybe we should wait another ten minutes and see if a few more people get here." Eventually, we got things underway.

TWWs focus on practitioners' stories about their work experiences. We craft the stories we discuss and the questions we ask to bring out concrete examples of best practices and lessons learned. Our aim is to help the men and women who work on NASA projects step away from their work for a moment in order to better understand it,



## WE SIMPLY HAD TO DO A BETTER JOB OF GETTING OUR MESSAGE OUT THERE.

learn from it and then share what they have learned with others. By the end of a workshop, we have participants familiar enough with the concept of sharing knowledge through narratives that they write their own stories. (You can see a few of these stories on pages 18–19.)

Though we had only a handful of participants at that first Goddard workshop, we engaged them in lively discussions and, by all accounts, they left feeling that they had spent their time productively and had learned a great deal from one another. We had done a solid job running the workshop—but it was apparent that we had done a poor job recruiting participants.

At a coffee shop not far from Goddard, the Knowledge Sharing (KS) team gathered for a debriefing. I got into a discussion with Dr. Alexander Laufer (Editor-in-Chief of *ASK* and creator of the TWW concept) about our planning strategy. Alex's idea had been to go to each of the Centers and spend face-to-face time recruiting KS affiliates who would, in turn, sell the workshop for us. I pointed out that the plan sounded great in theory, but our affiliates were all busy people, top-notch project managers themselves, and they had precious little time to tout our initiative and make sure chairs were filled at our workshops.

I suggested that rather than relying on affiliates, I should “work” each Center to guarantee we had an adequate turnout. Alex argued that I wouldn't know how to identify the right people. I countered that if we found ourselves on the morning of a workshop not knowing how many people were going to walk through the door, then we weren't doing a good job marketing our program.

I believed that if I had more influence over signing up workshop participants, then I could make the process work. In fact, I promised that I would. I didn't have anything to back me up other than my confidence in the philosophies we were teaching and my belief in the value of the TWWs. We simply had to do a better job of getting our message out there.

To my surprise, Alex came to me the next day and told me that he thought my approach to the problem—recognizing the need for hands-on marketing—was creative and might just work. He had to be willing to accept a risk, but project managers have to do that all the time. He gave me the go ahead.

### NEXT STOP, FLORIDA

Our next workshop was at Kennedy Space Center in Florida. Two months before the workshop, I went with Michelle Collins (then NASA's KS project manager and someone who had spent most of her NASA career at Kennedy), and we walked the halls of the Center, talking with experienced project managers we knew from previous KS activities as well as managers who had been recommended to us. We met with 30 people in 2 days.

We introduced ourselves, gave an overview of the initiative and asked the managers for the names of people we should invite to the workshop. Then we asked them to encourage people on their projects to attend. We only requested 15-minute meetings, because we knew that the only way to get on a busy manager's calendar was to ask for a brief meeting and to honor that timeframe.

This idea of asking experienced project managers to recommend younger project managers for the Workshop goes along with our vision of knowledge sharing as a grassroots initiative. If young project managers get a form letter from NASA Headquarters suggesting they consider attending a new program, how likely are they to take time away from a heavy workload? If a project manager they know and respect tells them that it's a good thing to do, they're a lot more likely to go.

The people we're trying to get to come to the workshop aren't necessarily project managers or even people on a project management career track. We're targeting the team of people who work on a project, trying to get them to embrace the philosophy of knowledge sharing and put to use some of its practices and lessons. The idea is that projects have many components—for instance, procurement, systems



“What we’re trying to do in this initiative is promote learning,” says **DENISE LEE**, who manages Transfer Wisdom Workshops and Masters Forums for the APPL Knowledge Sharing Initiative. Lee didn’t just come off the street to start doing this; her Masters degree in Organizational Learning focused on Knowledge Management. Says Lee of her current work, “My role is to create the space where people can come together to learn from one other.”

In a project like the Transfer of Wisdom Workshops, Lee works to change workplace mindsets and behaviors, and to help instill a culture of knowledge sharing at NASA. Her strategy? “Perseverance,” says Lee, “is necessary in any change project. But even more important is a willingness to learn and adapt as you go.”

engineering and human resources. All the different disciplines contribute to a project.

On the same visit that we spoke with project managers, we identified a champion in Training and Development at Kennedy, Tim Gormley. The idea was to cultivate a local champion because we were only going to be on site for two days. We sold Tim on the concept and he stayed with us every step of the way.

RSVPs for the workshop started coming in almost immediately. I didn’t just let an RSVP drop into my email box. I called each person back and said, “I received your RSVP. Thank you so much. We are

looking forward to meeting you and introducing you to the Knowledge Sharing Initiative.”

How many workshops do you sign up for where someone calls you? Where you talk to the person who’s actually going to run the workshop and they say, “I’m really looking forward to meeting you”? I tried to establish a relationship from the moment someone first heard from me. And from that moment on, I understood that my credibility was on the line.

#### SHOW TIME

The day of the Kennedy workshop, I had a knot in my stomach before people arrived. But as they trickled in, first alone and then in groups of two and three, I knew it was going to be a good day. And it was. By the time we got underway, we had 26 participants in the room.

TWWs use the stories in *ASK Magazine* as a starting point. At the Kennedy workshop, people began reading the story we had given them and silence fell over the room. Slowly, as people finished reading, we heard the murmuring of conversations starting up in the small groups we had set up.

People read at different speeds, and the sound of their voices grew as time passed, until the entire room was discussing the stories and leveraging the knowledge in the stories to talk about their own work. Lessons were continuously being generated and shared, generated and shared.

As I watched people talking at that first Kennedy TWW, I realized that the workshops themselves are the fun part of my job. The material we present speaks for itself once we get participants through the door. Our challenge is speaking for the material in advance, so that people have the opportunity to experience it. •



**THE MATERIAL WE PRESENT  
SPEAKS FOR ITSELF  
ONCE WE GET PARTICIPANTS  
THROUGH THE DOOR.**



## LISTEN UP

Carlos Torrez, Ames Research Center  
*Transfer Wisdom Workshop November 7, 2001*

**O**ur division was under a hiring freeze and our workload was increasing. We had one person on staff who was rarely assigned work on high-profile projects because he was thought to be non-productive. I decided that it was time to bring this person out of mediocrity and into productive mode.

I believe that all people want to do well and want to succeed. I approached my manager with my thoughts about this. He laughed and said, "He doesn't have what it takes and won't change." I pointed out that if we did nothing, the workload would continue to rest on a few people and our best workers were likely to experience some form of burnout. I proposed that I become a mentor to this person.

I began by explaining that I wanted him to succeed. I spent a lot of time listening. Soon his work output and confidence began to improve. He came by and asked frequent questions and proposed possible solutions. This "problem employee" often solved his own problems as he spoke. By giving him the encouragement to extend himself and trust his judgment he seemed to blossom. He even went to my supervisor and asked for more challenging work!

My supervisor came by, excited, and said he had noticed changes and wanted to thank me for doing such

**I TOLD HIM, "ALL I DID WAS PUT HIM IN TOUCH WITH HIS OWN POTENTIAL. HE DID ALL THE REST."**

a fine job being a mentor. I told him, "All I did was put him in touch with his own potential. He did all the rest."

I learned much from this experience: Do not judge. Take time to know people and their dreams and goals. Listening is often more important than talking. •

## TRUSTING THE ENEMY

Terri Rodgers, John Glenn Research Center  
*Transfer Wisdom Workshop May 2, 2002*

**T**he opportunity to manage a flight project came up and I was eager to see what that world was like—to actually see hardware fly. The only catch was that the opening occurred because the current project manager wanted out. It was too much work on top of his other workload, and the project scientist was driving him crazy.

Sure enough, as soon as I took the job, the project scientist started complaining all the way up to his management chain. We would be in a meeting and have to step outside to argue over some disagreement. Finally I decided, "If you can't beat 'em, join 'em." I started to listen closely to his concerns and realized that some were valid. I also started to recognize his strengths, and I capitalized on them. He was quite articulate and he was willing to share his ideas with an audience. I asked him to present a few charts at our monthly presentation to management. I also included him on the telecoms with our payload support managers at Marshall Space Flight Center and Johnson Space Center. These simple things gave him more insight into what was going on with the project, and they cost me nothing.

The project moved along and before too long our hardware was tested and ready to fly. It was time to present our work to management during a two-day review. The project scientist faded into the background because he trusted me to do my job. The first part went fine. I went home Friday evening, thinking about what I would say on Monday. But things didn't work out the way I planned. I was eight months pregnant, and I went into premature labor. I called work to say that I wouldn't be in on Monday.

When Monday came, the project scientist did a wonderful job presenting my charts—but not before praising me for the job I had done. This from a person, who looked more like an enemy than a friend when I first met him. You can go far when you reach out to "enemies" and listen. •



## GET IN BED

Jon Bauschlicher, Kennedy Space Center  
*Transfer Wisdom Workshop January 23, 2003*

**D**uring a long and checkered professional career, I was taught to “never get in bed with the customer.” While working for the government (NASA and US Air Force), “getting in bed” with the customer/supplier would, at worst, compromise your objectivity and result in a conflict of interest, and, at best, give the appearance of impropriety.

While working in private industry, we were told that “getting in bed” with the customer/supplier would reveal minor flaws in your product or process that the customer didn’t really need to know about. We were told that the customer would nitpick you to death with questions and concerns that weren’t important, and that decision-making would be delayed by bringing someone else into the decision making process. We were told that proprietary products or design processes would be revealed to someone without a “need-to-know.”

One project changed my feelings about all that. Project KAFFU (Kiwi Air Force Fighter Upgrade) was a fighter retrofit program for the Royal New Zealand Air Force; we were trying to give F-16 capabilities to old A-4 fighter aircraft. When the contractor I was working for won the competition, the contract included sharing office space with the Royal New Zealand Air Force engineers, pilots, and maintainers throughout the entire development, prototype, and flight test effort—cradle-to-grave, as far as the engineering effort was concerned.

We sat side-by-side with these guys. They participated in every facet of the engineering development program. They helped write requirements, software, drawings, specifications, test plans, test procedures and test reports. They worked in the lab integrating and testing hardware and software. They knew how things worked, and they saw things fail. They saw smart and dumb engineers and managers. They worked and played with all of us. Aside from a few classified areas, they had full access to our entire facility—our engineering labs, work areas and our cafeteria.

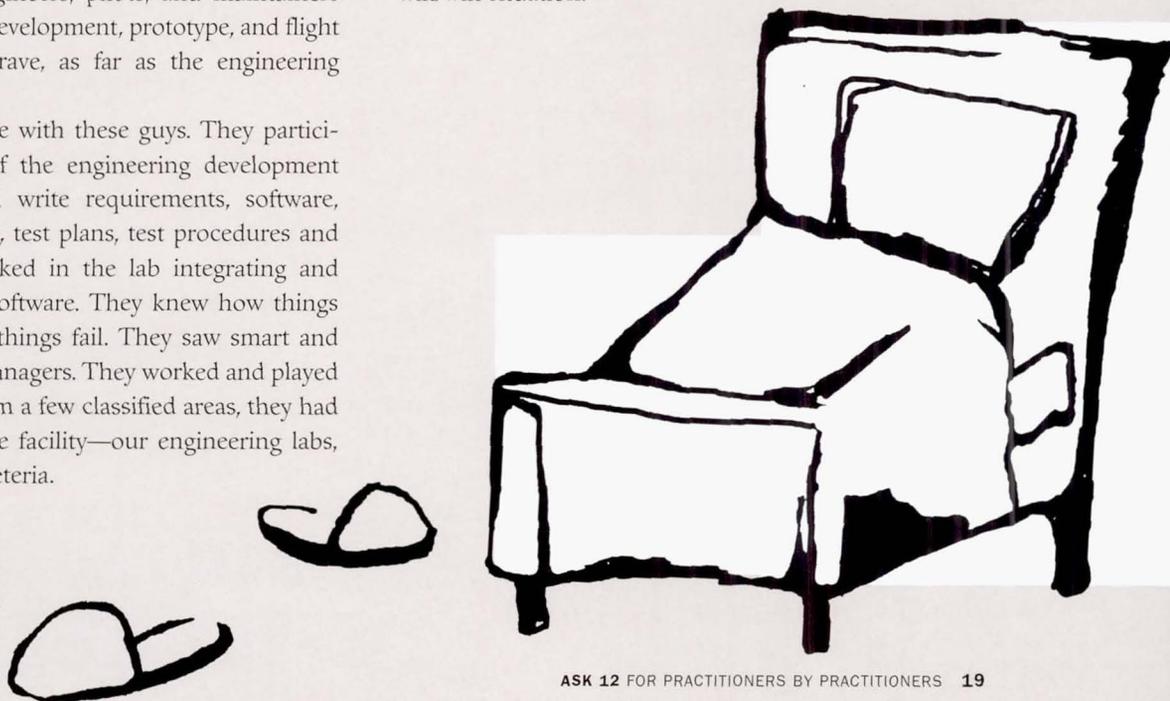
They were truly, fully, integrated into our engineering team. And the results?

We had product advocates (the Royal New Zealand Air Force engineers) who were trusted by both the customer (the Royal New Zealand Air Force) and the supplier (us). With less engineering work for us, we produced a product that more fully addressed our

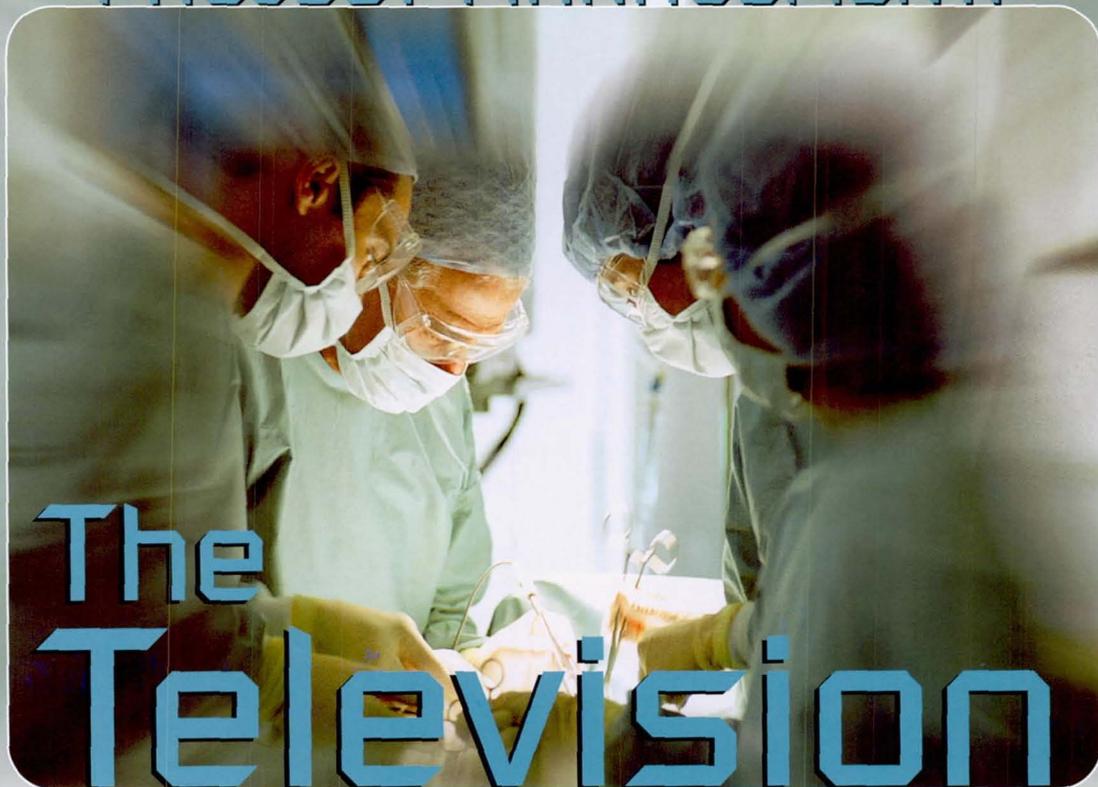
## THEY WERE TRULY, FULLY INTEGRATED INTO OUR ENGINEERING TEAM.

customer’s needs and requirements. It was a better product—more capable and user-oriented—than we would have produced without the active participation of the customer’s engineers, operators, and maintainers. And, in the end, we had a well-informed, well-educated customer expert in our system’s uses and capabilities.

Overall, the results from “getting in bed” with the customer were nothing like I had been taught they would be. Nothing but good came from the effort, and both customer and supplier benefited—the ultimate win/win situation.



## PROJECT MANAGEMENT:



# The Television

# SHOW *by* Terry Little

Contrary to what my wife would say, I don't watch much television. I do, however, regularly watch one show on the Learning Channel—the reality series called *Trauma: Life in the E.R.*

WHILE WATCHING THE LAST EPISODE, I RECOGNIZED parallels between what was going on in the emergency room, with its host of accident and gunshot wound victims, and what goes on in successful project management.

### Inside a Metaphor

First, there was a sense of urgency, but not haste. As an ambulance or helicopter brought in patients, the physicians, nurses and technicians did some quick planning, anticipating the likely condition and needs of the patient. They moved to get the necessary tools and equipment in place before the patient arrived.

Once the victim appeared, there was no wasted motion. With time as the chief resource, no one did anything that didn't directly address the ultimate objective—saving the victim. The medical team shared a clear set of priorities: deal with life threatening issues first, possible long-term consequences second and ignore everything else.

Each person in the room had an active role. No one was in the emergency room as an observer or overseer. Someone was clearly in charge, but typically no one waited to be told what to do. Interestingly enough, no one ever seemed paralyzed by fear of doing the wrong

thing. Through training and experience, the entire team operated in harmony. When there wasn't enough information to make a decision about a course of treatment, the staff moved quickly to get more information using x-rays, magnetic resonance imaging and similar diagnostics. People spent little time debating or pondering what to do next. They decided on what to do and got on with it.

Sometimes the unexpected happened and a situation that seemed to be in control suddenly went out-of-control. In those cases, there was no hand wringing or fault finding—just a measured, adapted response to the new situation. Sometimes there were mistakes; mostly they were acts of omission rather than commission. There was concern and open discussion about the mistakes, but learning was the chief consequence.

I also noted that there was a general acceptance that not everything affecting the patient was totally within the control of those in the emergency room. The staff spent their time dealing with what was in their control and not complaining about what wasn't.

## Rerun

I know some of you are thinking that I have carried this metaphor too far. Perhaps so—perhaps not.

Consider planning and preparing for the project. It's important to do it, but a team shouldn't spend too much time trying to achieve perfection. The plan will never perfectly reflect reality. And what about priorities? Certainly a project's priorities are likely to be less clear-cut than those in an emergency room, but having them and working to them is no less important.

Think about economy of resources. It's important to have the right number of people working the project, but each must have an active role. Like the emergency room, a project has no place for bystanders.

Expending effort on the niceties when the fundamental objective is in question doesn't work. From what I know of project management, the expression "Nero is fiddling while Rome burns" is alive and well. Recall from your own experience what happens when a project begins to go awry. Lots of meetings, lots of

analyses and lots of discussion—all aimed at deciding on the "right" thing to do. We accept that as a matter of course, but should we?

What's wrong with making a rapid decision based upon the data at hand, intuition and experience; and then, having made the decision, focusing our energy on execution? Let's face it, a perfect answer for any project emergency doesn't exist. Yes, there are some fundamentals to consider, but never a back-of-the-book answer that prescribes the solution.

And finally, how do we deal with mistakes in project management? They are inevitable, you know. Any project manager who claims to have never made a mistake is either a neophyte or a liar. Sometimes our mistakes result from things we do or don't do when we should have known better. Other times our mistakes are only retrospective mistakes—mistakes because of factors we could not have known or anticipated.

In either event, we should deal with our mistakes and those the folks working for us make in the same way as the emergency room does. Admit the mistake. Distill all the learning from it we can. Move on. Like the emergency room staff, the alternative of avoiding mistakes by doing nothing simply isn't in our playbook. •



"In order to provoke unconventional thinking, you need to create a situation where the status quo won't get you there," says **TERRY LITTLE** of his management style. "Until you're able to turn that light on in people's heads that just doing things the same old way isn't going to get you to where you need to be, you're not going to stimulate innovative, creative thinking."

Little is currently the Director of the Kinetic Energy Boost Office of the Missile Defense Agency. Before that, he was the head of the Air Force's Center for Acquisition Excellence. He is one of the Air Force's most seasoned program managers, and was promoted to Senior Executive Service in 1997.

# LESSONS LEARNED

## AGAIN AND AGAIN AND AGAIN

RECENTLY I HAVE SAT THROUGH A VARIETY OF PROJECT CRITIQUES AND HAVE ASKED THE TEAMS INVOLVED TO ARTICULATE THEIR LESSONS LEARNED ON THEIR PROJECTS. DURING THESE REVIEWS, MY ANXIETY LEVEL AND BLOOD PRESSURE INVARIABLY INCREASE BECAUSE I HEAR THE SAME LESSONS LEARNED, REPEATED AGAIN AND AGAIN FROM EACH TEAM.

I WANT TO SCREAM, "I LEARNED THESE LESSONS 30 YEARS ago. Why do we continue to learn these same lessons over and over again?" I don't scream, though; I remind myself the individuals are probably experiencing these lessons for the first time. I've come to realize, too, just about all the repeated lessons reduce down to just one primary lesson: Project scope drives project cost and schedule.

Said another way, if you properly define and gain alignment to your project scope early in the life of your project, the cost and schedule will follow.

### **I love the scope but hate the cost!!!**

I was the project manager on a project and was called into a Friday afternoon meeting to review the project's cost, scope, and schedule. I used my traditional agenda of scope review, cost review and schedule review. During the scope review, I discussed the base scope (i.e. scope required to meet the business requirement) and the value-added scope (i.e. savings-justified scope, which is discretionary but improves the economics of the overall project). The scope review went extremely well.

Next we talked the cost of this scope. The reaction was, "I love the scope but hate the cost." My response was if you like the scope, then this is the cost. We went back and forth on this point for the next twenty minutes and at the conclusion of a robust discussion, we agreed to the proposed scope but disagreed on the cost to be presented to top management the following Monday. We did agree to mull over the scope and cost data and reconvene on Monday morning to review our positions again. We met at 7 AM on Monday and agreed to use my cost figure in the subsequent meetings with hierarchy. The figure was used, the scope was installed, and the job came in slightly below the stated costs.

This experience reaffirmed my belief that if you get the scope correct, the costs will be correct. As I sit through other project critiques or learn a project's costs are trending high or low, the root cause I ask the team to address is how their original scope basis has changed. Without exception, changes in scope by the team and/or their hierarchy directly relate to changes in cost and schedule.

**by W. Scott Cameron**

### **I want this cost but need that scope**

We started to design and construct a “grass-roots” manufacturing facility and planned to complete the multi-million dollar project several years later. Unfortunately, just how many millions of dollars the plant was going to cost became extremely troublesome.

Early in the life of this project, management believed the project should cost \$X, a figure based on their collective experience and not on the project’s scope. Agreement to proceed with the project and its staffing was based on their \$X cost figure. A subsequent conceptual study, however, indicated that the project’s cost could be as high as \$X + 40% based on the defined scope.

Management declared this estimate unacceptable. They questioned the cost engineer’s credibility, even though he was quite experienced and had used proven methods to develop the estimate. Accusations

flew that the scope and estimate were “gold-plated.” After agreeing to reduce the project scope to appease management (for example, reducing the building size), a compromise estimate of \$X + 20% was reached by agreeing to eliminate or change specific scope items.

After receiving project funding, however, the eliminated/modified scope was restored because the reduction decisions had been based on cost criteria alone, with no real consideration of the actual needs of the project. For example, by reducing the building

size, a key piece of process machinery could no longer fit, so the building had to be returned to its original dimensions. Despite valid scope additions, management refused to approve project change authorizations. They said, “You already have 20% more funding than you need. We’re not going to give you more fat!”

Once management ignored valid cost estimating and trending data, the project team didn’t bother much with cost control. The situation soon got out of hand. The project team knew they were exceeding their funding commitment, but since management refused to listen to the team’s concerns and data,

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### **SINCE MANAGEMENT REFUSED TO LISTEN TO THE TEAM’S CONCERNS AND DATA, COST CONTROL WAS INEFFECTIVE.**

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cost control was ineffective.

So the required scope grew while the cost predictions stayed the same. When the project team completed definition and design, a second estimate was published at \$X + 25%. During construction, the estimated cost of the plant increased to \$X + 40% (note the amount the conceptual study estimated at the outset of the project).

At project close, the project team had done an excellent job of designing and building the plant. The start-up was on time and one of the best in company history. Cost was the only criterion the project failed to meet. Once again, the same lesson learned: Project scope drives project cost and schedule.

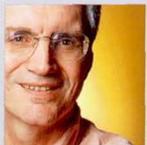
We continue to learn this lesson over and over again. One day I may just scream! •

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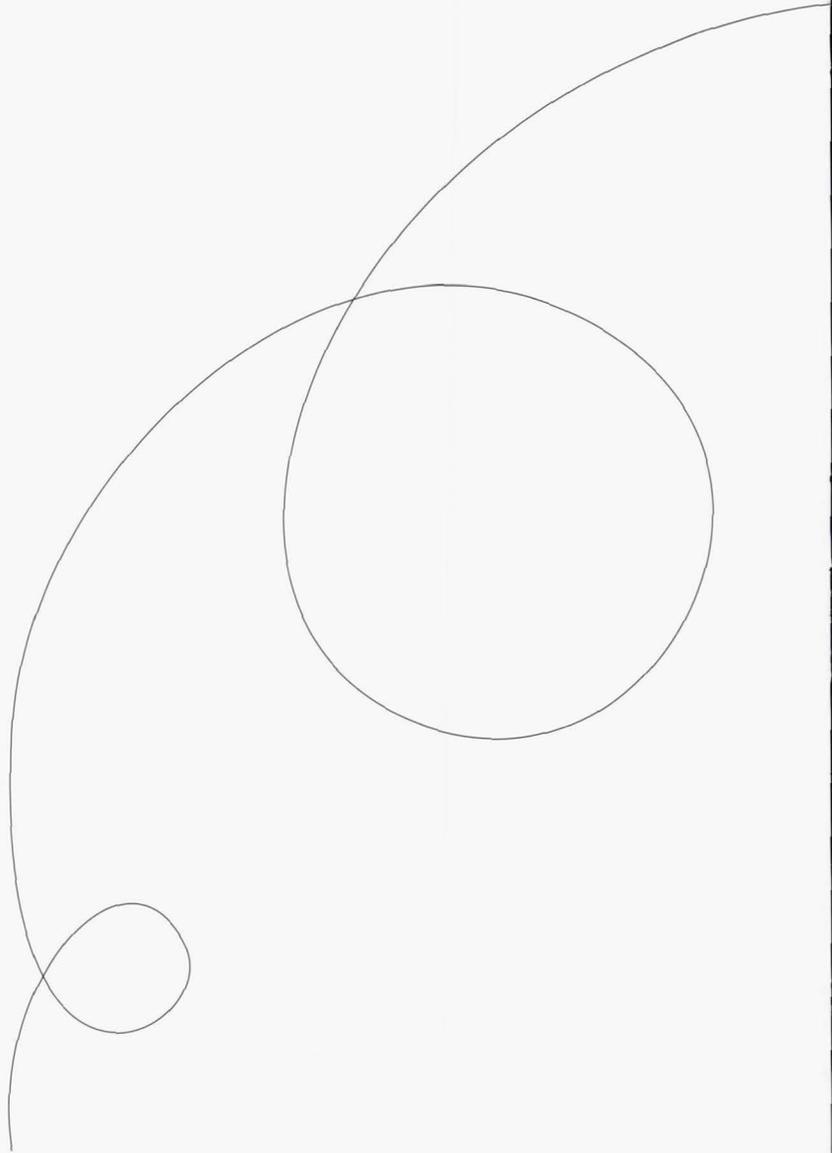
### **WITHOUT EXCEPTION, CHANGES IN SCOPE BY THE TEAM AND/OR THEIR HIERARCHY DIRECTLY RELATE TO CHANGES IN COST AND SCHEDULE.**

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**SCOTT CAMERON** is the Global Capital Systems Manager for the Food & Beverage Global Business Unit of Procter and Gamble Company in Cincinnati, Ohio. For the past 20 years, he has managed capital projects and developed other capital management practitioners for Procter & Gamble within its Beauty Care, Health Care, Food & Beverage and Fabric & Home Care Businesses.



In an interview last year (ASK 7), Cameron reflected on his tenure as a project manager: “When I think about how I have grown throughout my career, I can talk about the projects that I’ve worked on. But when I get down to the root cause of my growth and development, the most important factor has been the people who managed, coached and challenged me. Individual managers have had a profound impact on me. As I look back, I can see how this boss taught me how to write proposals. This mentor taught me financial aspects and cash flow of the company. This peer focused me on schedules. This one focused me on team dynamics. This one taught me how to listen and not immediately react. A collection of people helped me become the manager I am today, and now I feel that it’s part of my job to share my experience with younger managers the same way that others invested in me.”





# Grins & Giggles

## The Launch Pad to High Performance

By Maj. Norman H. Patnode

Long ago I observed that people get more things done when they're having fun. At the time, I had no idea why. Now I think I have an answer. When children play, look at the energy that's put into it, that's shared with everyone else. This sort of energy brings people together, unleashes their creativity and indeed inspires them to do amazing things. To steal a phrase from Dr. Owen Gadenken's article in ASK 7, it's their "activation energy." Amazing stuff! Dr. Gadenken highlighted the need for activation energy to propel a team to high performance. I'd like to focus your thoughts on creating this energy.

AFTER YEARS OF EXPERIENCE WITH TEAMS, I'VE COME TO recognize the absolute necessity of grins and giggles—of having fun. This is hands-down the best way to create the activation energy needed to move a team forward. I'm so convinced of this that when I join a team, if it's not safe to have fun, I work to change that. In whatever way possible, no matter how stilted or silly, it's essential to

## As a team moves towards higher performance, its members begin to see the differences between themselves not as obstacles, but as opportunities.

inject humor into a team's work, and the earlier the better.

Once when I joined a small team of engineers who were responsible for managing tests of reentry vehicles, I found myself surrounded by people who were not having fun. They would frequently, after getting off the phone with a customer, begin to rant and rave about how stupid the customer was and how much trouble the customer was causing them because of some new funding or schedule change.

My solution? I brought a toy plastic dart gun to work. Whenever one of my teammates began to rant and rave, I grabbed my gun and shot him, over and over until he shut up. At that point the whole team was gathered around, and after we all quit laughing at the ridiculousness of the spectacle, we began to talk about the problem and what we could do about it. In a matter of weeks, the attitude of the team had shifted. We began to work together and to focus on how we could make our jobs easier by making our customers' jobs easier.

And the dart gun? Believe it or not, within a couple of weeks everyone had one, and we continued to use them as a fun way to blast the negative energy out of our team.

Fun doesn't have to be this dramatic. The key is to bring people together—so that they can share, explore and have fun. This can be done with something as simple as a lunchtime card game.

I still remember one of my earliest team experiences. Fourteen of us were doing stability and control work for high-speed military aircraft programs. Most of us were young, right out of college, which meant we were strapped for cash. We ate our sack lunches each day as we sat at our desks and reviewed reports or read technical

journals. All that changed the day that Paul, a senior engineer in our group, brought in a couple decks of cards and herded us into the new central conference space. "Bring your lunch," he said, "we're gonna have some fun." We were a little apprehensive—was this allowed?

After assuring us that we weren't breaking any rules, he said we were going to play Hearts, and he started explaining the rules. We ate, played and kept score. More importantly, we started talking to each other. Just in that first day I learned that Bill raced his car on Saturdays at the local drag strip, José had a girlfriend in Toledo and Joe was taking classes at night in hopes of getting into medical school. It was fun, and we agreed to play again the next day.

Pretty soon we were competing for bragging rights. Then one day, after Bob had won several days in a row, it happened—we ganged up on him. While it's true we "ganged up" on him, what really happened was we started working as a team. Looking back on it, I realize that as we got to know each other, it became much easier to ask those "dumb questions," and to ask the team for help when we needed it. We also got a lot better at working together, solving problems, and getting things done—all because of a silly card game.

If it hadn't been for those card games, I'm sure none of us would have made that three-hour drive to Toledo seven months later to see José and Lori get married.

Fun comes in many shapes and sizes, but one of the best ways to bring on those grins and giggles is to tell a

## In whatever way possible, no matter how stilted or silly, it's essential to inject humor into a team's work, and the earlier the better.

good story. We all recognize how much learning can be found in a good story, but we shouldn't neglect the fun that can be squeezed out of one, as well. On one of my more recent teams, we made a point to share our stories in a fun and humorous way.

Every Friday afternoon we'd meet in the courtyard for refreshments, a much-deserved break, and the

Owen Gadeken and Maj. Norman H. Patnode met in January 2000 when Gadeken was the faculty advisor to Patnode's section in the Defense Acquisition University's (DAU) Advanced Program Management Course. "Although Norman sat in the back corner of the room, he was not shy about commenting on virtually anything that caught his interest during the course," remembers Gadeken, whose article in *ASK 7*, "Activation Energy," brought out the "Grins and Giggles" in Patnode. Says Gadeken: "Whenever I had a

particularly dry or even complex subject to discuss with the class, I could always rely on Norman to come up with some interesting insight on the topic." Gadeken soon discovered that Patnode also had a well-developed sense of humor, probably honed from the experiences he relates in his article. Eventually, with Gadeken's encouragement, Patnode joined the DAU faculty. "I continue to be amazed," says Gadeken, "at the insights Norman can draw from both his and others' seemingly routine project management experiences."



**MAJ. NORMAN H. PATNODE** is a Professor of Program Management & Leadership at the Defense Acquisition University, where he provides

training in strategic leadership, critical thinking, teamwork and teambuilding, the application of Myers-Briggs (MBTI), program risk management, coaching and conflict management. He also teaches a number of the basic program management tools. He can be reached at [norman.patnode@dau.mil](mailto:norman.patnode@dau.mil)

presentation of what we called the "Clue Bird" award. (A "Clue Bird," an expression used by pilots in the military, is a good luck sign because it lands on one's shoulder when one needs it most.) The rules were simple. Anyone could get up and tell a story about someone on the team. Usually the story involved some "noteworthy" activity from the previous week, such as how Dan had become a hero by screwing something up in a way that caused the rest of the team to take note of an impending disaster, and avert it.

This was a big team, responsible for the Herculean task of manufacturing and delivering the Air Force's newest large cargo aircraft, so there was never a shortage of stories each week. The stories were always clean and in good taste, but since it was widely accepted that only 10% truth was required for a good story, they always brought plenty of comic relief.

After everyone had told their stories, we'd all vote by applause and the "Clue Bird" would be passed on to the winner to display proudly at their desk for the week. As we all headed back to our desks, laughing and reflecting on the stories we'd just heard, and what we'd learned from them, you could actually feel the increased energy in the team.

The thread that weaves these three examples of teams sharing grins and giggles is the very fact that they were "sharing." Shared experiences create space where team members can get to know one another, and discover how much they have in common with each other. These commonalities are the building blocks of

trusting relationships. And trust is the foundation required to build a high performance team. With a high performance team, you can accomplish anything.

As a team moves towards higher performance, its members begin to see the differences between themselves not as obstacles, but as opportunities. Exploiting these opportunities leads to more innovative ideas and increased performance. Team members learn to move past superficial differences in how they look and speak, and begin to recognize the differences in how they think, explore and even dream. They find new and creative ways to put those differences to work for the team. As a result, performance soars.

As for the team members, they'll tell you they're having the time of their life. They'll tell you what they're doing is fun, not work. Then they'll make you swear not to tell anyone. So don't. Just keep on grinning. •

#### LESSONS

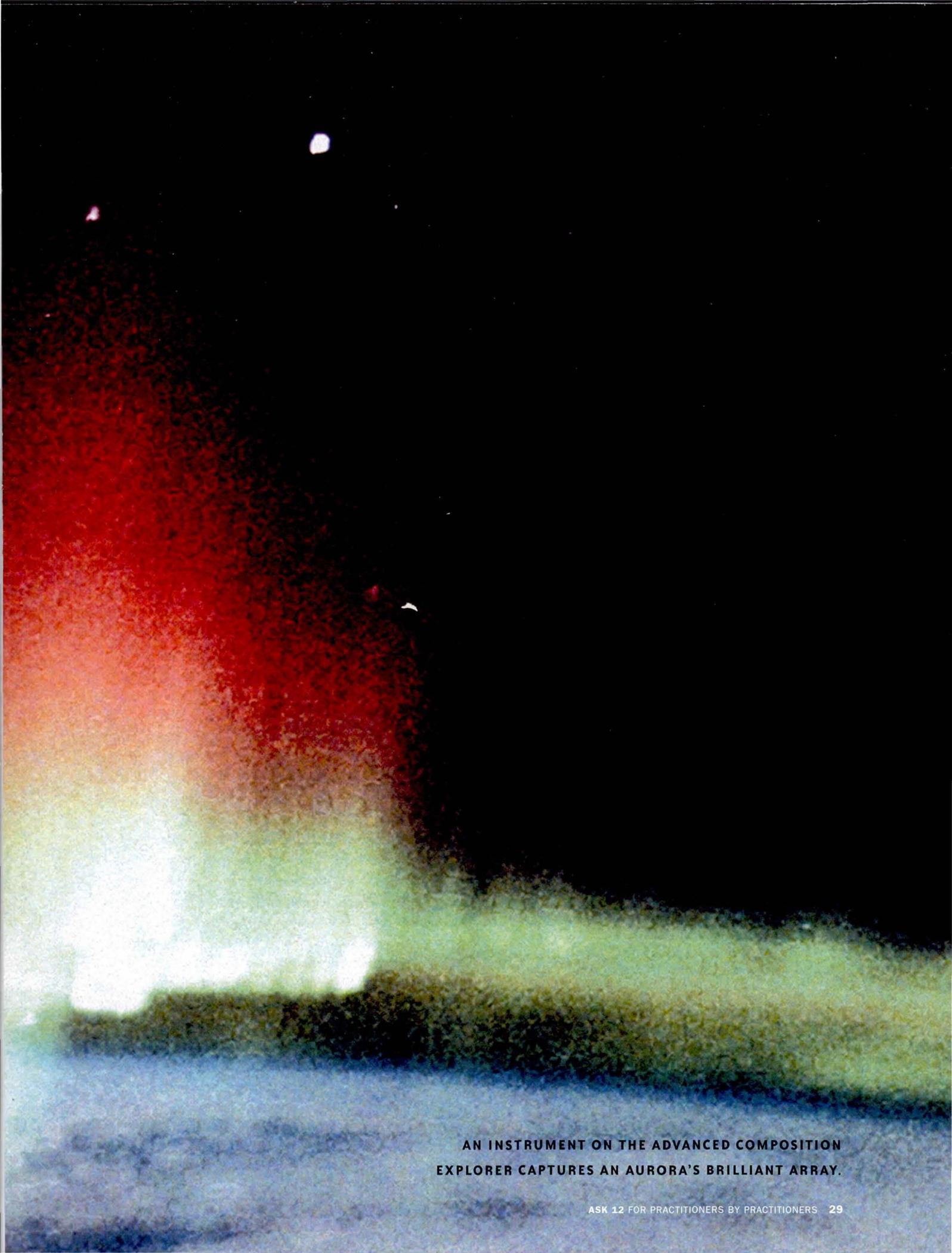
- Work can and should be fun. Think about a child at play—curious, open-minded, learning and discovering. Play can stimulate a cycle of solving problems and uncovering new ones by bringing out the best in each of us.
- Regardless of your position on the team, you can create the fun and energy needed to launch your team on a path to high performance.

#### QUESTION

*If not by play, what ways do you tap the "activation energy" of a project team?*

> > > I M P L E M E N T A T I O N  
R E V I E W S

> > > THE BIGGEST CHALLENGE IN MANAGING SCIENCE  
INSTRUMENT DEVELOPMENT OR ANY NEW TECHNOLOGY  
DEVELOPMENT FOR THAT MATTER IS TRYING TO GET THE  
PROJECT COMPLETED ON SCHEDULE FOR THE MONEY YOU  
HAVE. FEW PROJECT MANAGERS ACCOMPLISH THAT,  
DESPITE WHAT THEY MIGHT TELL YOU.

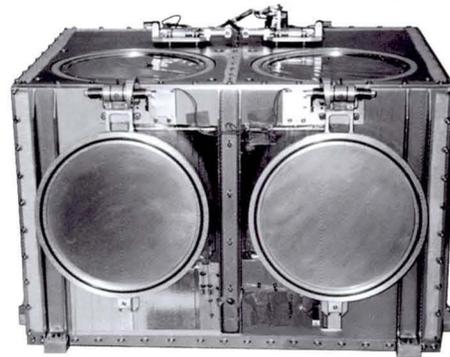


**AN INSTRUMENT ON THE ADVANCED COMPOSITION  
EXPLORER CAPTURES AN AURORA'S BRILLIANT ARRAY.**

IT JUST DOESN'T HAPPEN, AND IT'S EASY TO UNDERSTAND why: technology development doesn't have a predictable path. You haven't built this thing before so how the heck do you know how much it's going to cost, and, besides, you can't foresee all the problems you'll run up against. You know the result you want and you declare success when you are "close enough." In short, the job must be "dynamically" managed.

When I worked on the Advanced Composition Explorer (ACE) project, we needed to produce five instruments that were either entirely new or were considerably modified from earlier models. These were each \$8–10 million instruments. All of them were what I would call technically risky in one way or another—some in several ways.

Some of our problems early in the project derived from not understanding exactly what the instruments were intended to do (what was going to be good enough), and not knowing what we could do to help the university-based teams in building them. We in the payload management office took the approach of asking



Typically, reviews are design-focused. In point of fact, many of a project's problems are not due to design flaws. They are due to implementation flaws—if the implementation doesn't have a good "design," it will not be executed smoothly.

When I use the word "implementation," I mean it in the broadest sense: implementation of the design and manufacture of the instrument. And I don't just mean taking a look at schedules and money; I mean looking to see, as well, if you have the right team, if the team is assembled in such a way that the lines of responsibility make sense, if the interfaces are clear and easily defined.

Do you have margin for error? Where are the technical risk items and what is your plan to deal with them? Who is responsible for what? How many engineers do you have on this job and do they have the right experience? Oh, you have five engineers? Well, I only see three engineers in the room; where are the other two? "Well, they actually work for Joe Blow, a scientist down the hall. Joe has promised me that a year from now, when I need the engineers, I can have them." Yeah, right, but what happens if Joe decides he needs them in a year? They actually work for him, right?

Here's another example: On one project, an instrument team partners with a team from the European Space Agency (ESA). A foreign scientist there tells his American counterpart, "I can give you an electronics board or part of your detector system and it will do all these wonderful things, and you won't have to pay for it out of NASA's budget because ESA will pay for it." The American scientist says: "That's great; that makes my instrument cost a half million dollars less."

>>> **I HAD NEVER BEEN ON A PROJECT BEFORE WHERE THIS WAS DONE, BUT IT TURNED OUT TO BE THE SINGLE MOST VALUABLE REVIEW WE HAD FROM THE POINT OF PROJECT SUCCESS**

each team, "What do you need in order to get your job done, and how can we make that happen?"

As a cure for this problem, one of the things that we decided to do was to have Implementation Reviews. I had never been on a project before where this was done, but it turned out to be the single most valuable review we had from the point of project success.

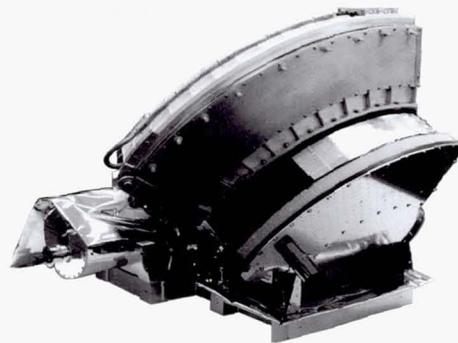


**FROM LEFT TO RIGHT, A TRIO OF ADVANCED COMPOSITION EXPLORER INSTRUMENTS:  
SOLAR WIND IONS MASS, SOLAR ISOTOPE AND SOLAR WIND ION COMPOSITION SPECTROMETERS**

But what happens, a little way down the line, when ESA is a little slow to fund its part of the project, or erratic currency exchange rates cause a financing problem or a new tariff regulation prevents the transfer of technology from one side of the Atlantic Ocean to the other? These are examples of implementation questions. It may still turn out that having ESA supplement the program is the right thing to do, but you have to ask the questions.

The point of the implementation review is to prevent problems from occurring later by trying to get our arms around the planning from the start. Our discussion might go like this: "Well, look, instead of having that scientist across the ocean be solely responsible for delivering this critical element, maybe we can find some other way to get it." Or we might decide to fly there and observe first-hand how well our counterparts are doing, and if there is something we can do to help assure success.

For the ACE project, we traveled around to each partnering institution. The process took several months because we would camp out onsite for three days. We sat



our payload manager, was good at that and we managed to find the expertise that we needed.

The review teams turned out to be between five to eight people, a balance across the different disciplines, and they included the payload group (i.e. Al Frandsen, Howard Eyerly, our Reliability and Quality Assurance Manager and me). Say we knew that a team was having a problem making their detector meet launch load requirements. We would grab somebody from JPL who could solve that in a week instead of letting the instrument team spin their wheels for six months. In addition, we would typically bring someone from Goddard who was good at understanding resources and estimating actual costs.

The implementation review happened only once at each site, but it was a big deal. I would say it was the most important thing we did to enable ACE to deliver on schedule and within budget, because we recognized and dealt with potential problems before they became unmanageable and costly.

Since then I have seen several projects that would have benefited from this review. It is important that it take place at the right time. You have to understand your requirements, your schedule, and your other resource constraints. You also have to understand where you have flexibility. If the review is too early, it is not beneficial; if it is too late, you are buried in trying to solve the problems of the day instead of being ahead of the wave.

Implementation reviews do one other thing. They set the tone for management of the project. They establish a teaming relationship (if they are run properly), and they level the playing field instead of setting up turf wars. •

**>>> THE SIZE AND COMPOSITION OF REVIEW TEAMS  
WERE TAILORED TO THE PLACE WE WENT**

around the table together, listened to presentations and figured out how we were going to get the instrument built and delivered. We found the holes and looked for ways (together) to plug them. We tried not to be optimistic and fool ourselves.

The size and composition of review teams were tailored to the places we went. It was always tricky putting together just the right team, but Al Frandsen,

**GERALD (GERRY) MURPHY** founded Design Net engineering in



1996 as a network of senior consulting engineers serving as "problem solvers" for NASA missions. The network evolved into an aerospace hardware/software development company providing design and fabrication service to businesses, universities, and government agencies. About his world since leaving NASA, he says, "Managing with flexibility is still my paradigm. In fact, it works in small business environments even better than when you are managing the standard NASA project. In either case, the ground under your feet is always in motion, and fog in the road up ahead never quite 'clears.'"

## ASK Talks with

## Dr. Michael Hecht

*Dr. Michael Hecht has been a member of NASA's Jet Propulsion Laboratory (JPL) staff since 1982. He is currently Project Manager and co-investigator for the Mars Environmental Compatibility Assessment (MECA)*

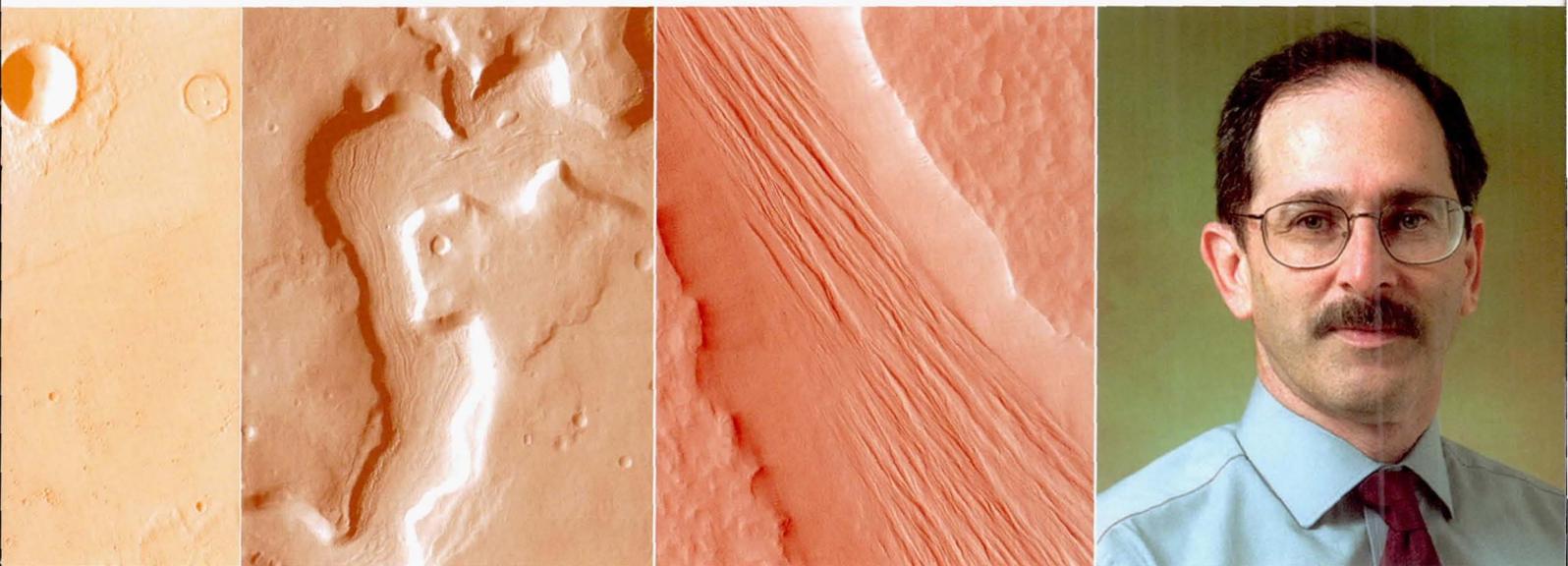
DEVELOPED FOR THE 2001 MARS SURVEYOR LANDER, MECA is a miniature chemistry, microscopy, and electrostatics laboratory. MECA was chosen by NASA from a field of 39 proposals and was developed to perform studies on the potential hazards that the soil and dust on Mars might pose to human explorers. (The MECA project was featured in an earlier article by Dr. Hecht in ASK 7.)

In his previous assignment with NASA's New Millennium Program, Dr. Hecht was instrumental in defining the "microlander" that was adopted as NASA's New Millennium Program Deep Space 2. Beginning in 1991, he led a microtechnology program at JPL's MicroDevices Laboratory.

Dr. Hecht was the first recipient of JPL's Lew Allen Award for Excellence, which was established in 1990 to recognize and encourage significant individual accomplishments or leadership in scientific research or technological innovation by JPL employees during the early years of their professional career. He has published extensively in both the surface science and the planetary science literature. He received his Ph.D. from Stanford University in 1982. He has also been a member of the ASK Review Board since ASK 1.

*A couple of years ago, you gave a conference presentation about a science instrument, MECA, that was going to fly on a Mars mission. You described yourself as both the project manager of the instrument team and the co-investigator. It's unique for a project manager to be involved so directly in the science of a project. Why are these normally kept as separate functions?*

Generally, there is the concern—and it is a legitimate one—that someone who has an investment in the scientific return isn't going to be able to control the resources. At my institution, JPL—and I think at NASA in general—you'll find there's a creative tension between the science team on a mission and the project team. The model is that the science team pushes the capability, while the project manager holds the line and protects the resources. The science team will come and say, "We want more memory so we can do more analysis on the ground and return better data," while the project manager will say, "that will push the budget or schedule." Allowing a scientist to also have a project management role is generally viewed as the equivalent of letting the fox guard the chicken coop.



*But MECA was different. How so?*

MECA was a very unusual project. We were below the radar, if you will, so we could be a little more relaxed.

*What kind of relationship did you have with the Principal Investigator (PI), someone you were working with closely as a scientist and at the same time managing?*

On MECA, the principal investigator was expert in the general scientific issues we were studying, hazards associated with particles. He was a senior guy, very skilled and very knowledgeable, from whom I have learned a tremendous amount. But he knew almost

nothing about Mars science, so that was really my role. I was the one defining the Mars science agenda.

mission. The other job, frankly, is a day-to-day science management job. Most people in this community recognize that once you get past winning the proposal, it's more important to have a science manager than it is to have a statesman.

*How does your background as a scientist, or researcher, help you as a project manager?*

To me, the science is part of the whole system. When you optimize the system, the science is one of the factors that you can weigh. I'll give you a very simple example. This happened with MECA when we had an opportunity

*Allowing a scientist to also have a project management role is generally viewed as the equivalent of letting the fox guard the chicken coop*

nothing about Mars science, so that was really my role. I was the one defining the Mars science agenda.

When we have a discussion about who should be the principal investigator for an instrument or a mission, we recognize that there are two different jobs of the PI, and you seldom find an individual good at both of them. One job is to be the statesman, the spokesman, the senior individual with unimpeachable scientific credentials, who stands up in front of the cameras and speaks for the

to add a component, a stirring device that would accelerate chemical reactions. Now, the reaction of the project manager of the overall mission was, "You're adding capability to the instrument." My reply was, "By doing this we can finish the experiment in one day instead of two days. We won't have to deal with an overnight freeze and thaw cycle, which not only imposes risks, but adds a great number of requirements on testing, specifically environmental testing."



While I'm considering the science and engineering and project management as part of the overall risk picture, I have a different perspective than someone who is only treating the issue as a requirements driver.

*Does this sensibility, being a scientist/project manager, affect how you select your team?*

We all have a model of the kind of person we want working for us, and it often mirrors our own abilities and interests. That "sensibility," as you want to call it, defined my choice of all of our staff. On MECA I put the kind of team together that I could work with. I drew on a group that JPL likes to call "technologists," a group it doesn't normally look to for mission work. By technologists, they mean scientists in disciplines other than space science. That's not pejorative; it's just

train them in my management style. So, I had a team of generalists, and I think that's why it worked. I think that everyone felt like they could do any job on that team. They had an assigned job and they accepted that, but only because that was what had been negotiated. If tomorrow we changed the agreement, they could have stepped into a different role.

*Was it difficult to convince people without flight experience to join the project?*

It varied with each person. Of the hundred or so PhDs in the MicroDevices Laboratory, I have probably approached thirty of them with such an opportunity at one time or another. Of the thirty, perhaps five or six jumped at the opportunity. That's why they came to JPL, they told me. They'd always wanted to do space work,

To me, the science is part of the system. When you optimize the system, the science is one of the factors that you can weigh

terminology, nothing more. You could have a Nobel Prize-winning biochemist and JPL wouldn't put him in a science category.

These were people that I had worked with for years, and years, and years. Many of them were physicists or chemists. I tend to be fond of physicists because I am trained in physics. The organization I came out of is called the MicroDevices Lab. We had people who are electron microscopists or spectroscopists, people who study the arrangements of atoms on surfaces. In fact, that's what I did most of my career. I studied surfaces and interfaces, semiconductor materials.

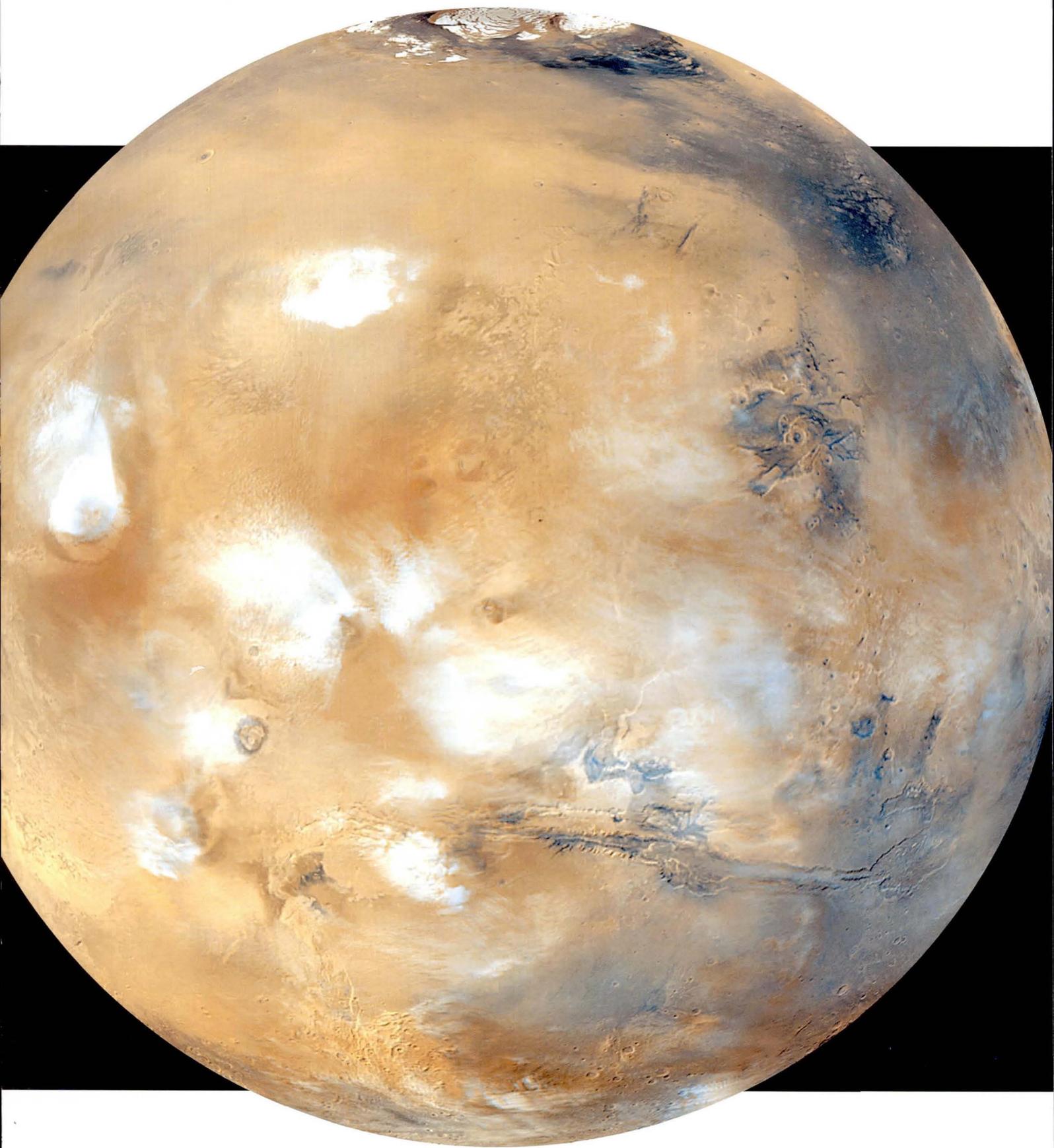
My model for project management was the one I learned from hanging around small businesses. If someone is too busy to finish this job, the person at the next desk will finish it. Laboratory scientists are good at working this way, and have an instinctive grasp of the trades involved in defining the instruments. I thought it was easier to take those very bright, PhD scientists and train them how to do mission work than it was to take the people who typically worked on flight projects to

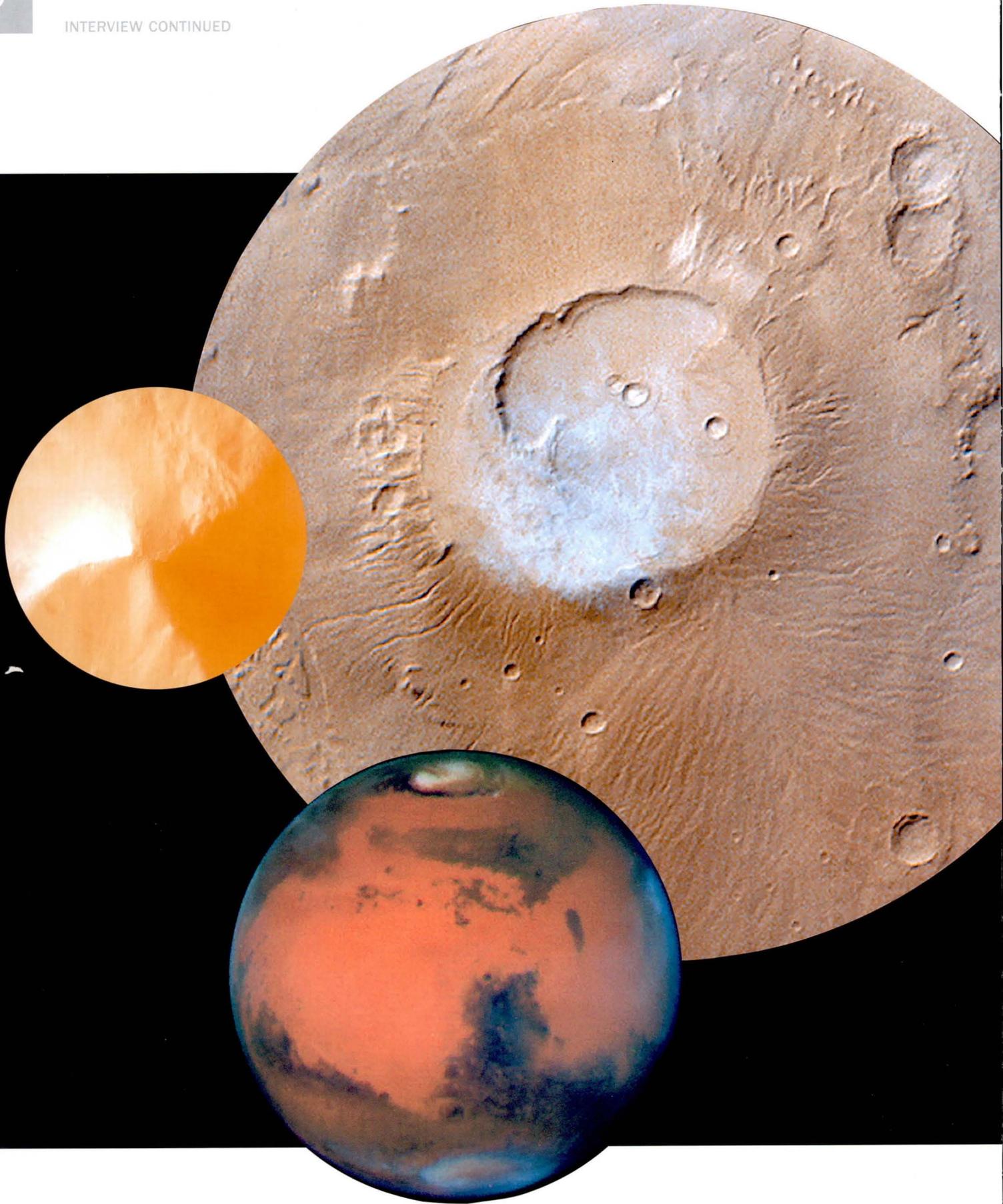
they'd always wanted to build things to fly; they never knew how to go about it, and they were completely isolated from the flight culture at JPL.

*Did anybody think you were managing the project in an unorthodox way by building a team of "generalists"?*

I don't know. But one of the most interesting conversations I had when MECA started was with the fellow who was the section manager of the MicroDevices Laboratory at the time. He was concerned about what I was doing because he worried that once those people went to work on a mission, they would never want to come back into research. "Why is that so terrible?" I asked. I think it's a good thing for a research organization to have turnover—and for us to have alumni in the larger JPL community.

In the end, it turned out every one of them went back to research afterwards, but I think they all felt that they came back to their research with a broadened perspective. The flight world gives you street smarts about how to get things done on schedule and to cost that you never learn in the research lab.





*Back to the conference we mentioned at the start of the interview. I remember you walked into the lobby one night and said that you had gone outside to look at Mars. Is that frontier aspect of it something that means a lot to you?*

Yes, absolutely. I have to admit that is something that's fairly recent. That is something that has developed within the last decade, at most, that kind of passion for Mars.

*And what is the source of it?*

Several things, one of which I suppose is that I'm turning 50 this year. I also think it is far more common at JPL than almost any place at NASA to find that kind of passion. You find people who come to do jobs all over JPL—in contracts, in the machine shop, as scientists, as engineers—and they tell you, "I know I could have made more money in private industry, but I just fell in love with the idea of going out and exploring the solar system." That's very common.

*My model for project management was the one I learned from hanging around small businesses. If someone is too busy to finish this job, the person at the next desk will finish it*

*You began your career as a researcher, and then moved into project management. Was that a way for you to get to Mars?*

Not entirely. I enjoy wearing a lot of different hats. I've slowly come to realize that this is something that drives me. I want to have some experience in every part of this process, basic instrument concepts through instrument development, through the actual building of flight instruments where I have done my project management, and through the study, the science of what I learn, both the data from the instrument and the modeling and theory. I've been driven to be that broad generalist. The only place in that whole chain where there is a conflict, an artificial conflict imposed by the institution, is in the role of science and project management.

*Could you imagine being the project manager of a project that didn't allow you the freedom you had on MECA?*

I don't know. I imagine that if I was on a project where I wasn't able to select the kind of people I wanted to work with, the experience would be much less satisfying to me.

*Is it fair to ask which of these two, science or project management, matters the most to you?*

If I have to choose whether my career is going to be in project management or in science, for me that's a very, very difficult choice.

*Let me ask you one other question. You're on the ASK Review Board, and you participate in the Masters Forums. What's the value of the Knowledge Sharing Initiative for you?*

One of the most important messages you learn here is that as you delve into project management more deeply,

you realize the idea that anyone is doing it to a blueprint is ludicrous. Nobody uses a blueprint.

Certainly every time I come to the Masters Forum, or read *ASK*, I come away with having learned something. I should say not just new tools, but new perspectives. I think learning, and not just learning other ways of doing things, but learning to have realistic expectations is very important. It is just like raising children. My first one was six years old before we had the second one. You somehow expect the second one will be like the first. Of course, they never are. They couldn't be more different human beings. I'm sure if we had a third the same thing would happen.

I'm at that stage in project management where I need desperately to learn that lesson. If I go in expecting the next project to be like the previous one, I will not only be severely disappointed, but I could very well fall flat on my face.



## Tributes to Frank Hoban



*On December 5, 2002, NASA lost one of its stars, Frank Hoban. Recipient of the NASA Exceptional Achievement Medal and the Apollo Achievement Award, Hoban ended his NASA career as director of the Project Management Initiative. In 1997, he published a book about his NASA career, *Where Do You Go After You've Been to the Moon?**

I FIRST MET FRANK THE DAY AFTER I WAS ASSIGNED TO FORM a Space Station task force. Frank stopped by my office to say that he knew we would need someone to look after management, and he was interested in the job. I liked his style, and I gave him the job on the spot—probably the best program decision I ever made.

We discussed the organization we needed for the task force, and realized that we couldn't afford to go through the usual advertising and selection. So, Frank personally persuaded the best and the brightest to join the program. It was a great outfit, and we had a lot of fun—thanks in large part to Frank's efforts. (Everyone remembers the summer parties that we had at his farm in Northern Maryland.)

To the end, Frank excelled at making people want to take part in whatever he was working on. We will miss you, friend.

**John Hodge**

IT WAS OFTEN SAID OF FRANK THAT HE HAD AN "IDEA A minute," and many of them were exceptional. But the most important example Frank set for us was his marriage to his beloved Mary Louise. Although married for decades, they remained as giddily in love with each other as a pair of high school sweethearts. I remember when Frank was still working at NASA headquarters, they would talk often during the day. I never heard Frank end one of their conversations with anything other than, "Love you," or "I love you, too." You only had to be around them for a few minutes before you were not only in awe of their devotion to one another, but also a bit envious as well.

**Tony Schoenfelder**

FRANK WAS QUITE AMAZING IN A NUMBER OF SPECIAL WAYS. I remember his smile that encouraged all to sit and talk, his genuine respect for people's ideas and comments, and his creative imagination never at rest. He was dedicated to developing training programs and tools to enhance the effectiveness of project managers at NASA. Although his formal resources were limited in this endeavor, somehow he attracted talented individuals to join him. Textbooks define this as leadership. Frank was an extraordinary leader and a great friend.

**Dale Crossman**

I FIRST MET FRANK OVER 20 YEARS AGO WHEN I JOINED THE Space Station Task Force. He liked to point out that he was the fourth person hired on the program, while I was somewhat later on the list. My response to him was that at least I was the second Irishman. I dubbed him "Father Mulcahy" after the priest in the television series *M.A.S.H.* because so many people in the office brought their problems to him.

After we both left Space Station, we went to different offices at NASA Headquarters, but stayed in frequent contact. After retiring from NASA, Frank put together a program to tap the talents of other retired NASA managers. The last time I saw him was at a meeting on December 3rd, and he was as upbeat as ever.

As distinguished as his career was, Frank's real strength was his character. He was one of my best friends, and I miss him every day.

**John Sheahan**

## REVIEW BOARD

**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 20 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 20 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 also a member of the Advisory Board of the NASA Academy of Program and Project Leadership and 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 20 years, and was awarded the Sloan Fellowship to attend Stanford Graduate School of Business in the fall of 2002.



**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.





## Perfection Is in the Details—or Is It?

*After I earned my engineering doctorate at the University of Texas, I accepted a teaching position at Texas A&M University. By 1982, I was ready to return to the field and put principles to practice*

I MOVED BACK TO ISRAEL AND GOT A JOB MANAGING A large building project where I was in charge of both the design and construction. The complex I was working on was being built in Jerusalem—but the design took place in Tel Aviv. I spent my days shuttling back and forth between the two sites.

It soon became clear that things weren't going according to the textbook. I had learned to prepare implementation plans as early as possible and as detailed as possible.

My construction superintendent, an experienced engineer twenty years my senior, kept postponing the planning I asked him to do. He insisted we weren't ready to create a complete plan because details of the project kept changing.

Eventually, I came to realize that he was right to delay the detailed planning, because quite often I would explain something I wanted done in the morning; then I would go to Tel Aviv in the afternoon and find out that the design had been altered and the information that I had passed along in the morning was no longer accurate. Still, I didn't know how to explain what I was observing—even to myself.

I left that construction project to teach a summer graduate school class on construction productivity at Texas A&M. As part of the course, I sent five teams of students to construction sites to see how productivity could be improved. The students set out armed with high-tech tools and prepared to conduct sophisticated measurement and analysis. I expected them to come back with recommendations to improve productivity at their sites by changes in project staffing, equipment use and the like.

After weeks of study, they produced, instead, detailed short-term plans for the projects they had observed. As project managers, we were all taught to

prepare comprehensive plans, with full details at the beginning of a project. But that wasn't what my students observed in the field, and it wasn't what I had experienced as a project manager. I began to question the accepted theory of project planning. Something so basic that it was alarming.

Why, I wondered, didn't experienced project managers have these detailed plans in place before construction began? Why did they have to wait for my students?

After the course ended, I spent some time giving presentations at construction companies across the U.S.

I shared my questions about planning with top managers at the best companies. No one threw me out of the room, and that was enough to keep me going. I continued to struggle to understand what I had observed.

Then, a piece of writing came along to reinforce my thinking. In Jay R. Galbraith's 1977 book, *Organization Design*, I found the missing piece of my puzzle: uncertainty as information gap. I came to understand that planning equals uncertainty reduction. In subsequent research, I was able to confirm this. I observed that uncertainty is not an exceptional state in an otherwise predictable process of project work.

With this new insight, it was easy to see why my superintendent kept postponing his planning and why my graduate students didn't find detailed plans at the sites they visited: they needed to collect data onsite, after construction started. Detailed plans aren't possible in the absence of information. I learned that perfection is, indeed, in the details—but not prematurely. A project manager must adjust the degree of details in a project plan to the completeness of available information.

It is so clear to me now, but it took me years to reach these conclusions. Before I could, I had to let go of assumptions that I had been taught. So much of learning, I have come to realize, begins with unlearning. •

*I began to question the accepted theory of project planning*



