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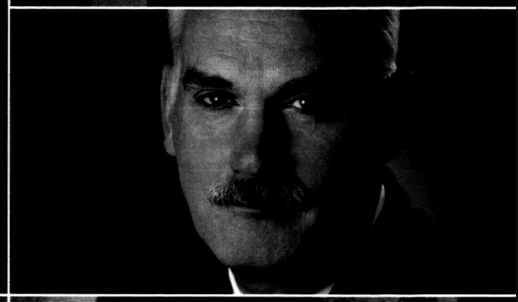
ASK

INTERVIEW

William Readdy



ASK Magazine • Issue Sixteen

FEBRUARY 2004

Inside

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Project management is so much more than handling the technical issues, and getting folks to do what you want them to do. It's giving them what they need, even when you have to dig down deep within yourself to do it.

—Rudy Aquilina, from his "The Journey Back" (p. 6)

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ON THE COVER Space Shuttle *Columbia* lifts off on January 16, 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 knowledge and wisdom that are transferable across projects. Who better than a project manager to help another project manager address a critical issue on a project? Big projects, small projects—they're all here in *ASK*.

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

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Leadership Counts

How many times have I heard project managers tell of learning by way of examples from history and literature?

JUST RECENTLY, FOR EXAMPLE, I INTERVIEWED A PROJECT manager who began to answer one of my questions by paraphrasing the opening lines of Tolstoy's *Anna Karenina*—and, yes, he was aware of the reference. "All successful projects succeed in much the same way," he wanted me to understand. "But each unsuccessful project tends to have its own interesting and original history."

Here is another example. This issue our Interview is with Associate Administrator for Space Flight William Readdy. At one point while meeting with Readdy at his NASA Headquarters office, he directed us (*ASK* colleague Jody Brady and myself) to look across the room towards a bookcase, where he pointed out shelves of histories and biographies. Readdy considers these his reference guides in leadership, books about some of history's greatest statesmen: Abraham Lincoln, Ben Franklin, Theodore Roosevelt, and others.

The stories about leadership we're featuring in this issue of *ASK* may not have the same cachet as those told by Lincoln, Roosevelt and the like, but we think they will still give you inspiring material to reflect on. Frankly, we think our contributors in this issue stack up right alongside the historical giants. Honesty and courage is what matters, and in this issue we're in no short supply of either.

Readdy, for example, who is also an astronaut and former Shuttle commander, generously agreed to talk with us about lessons learned from the *Columbia* tragedy. A year has passed already since the *Columbia* tragedy, and we felt this issue would be incomplete had we failed to observe that.

One of the reasons we read stories is to gain perspective from people whose personal experience on events may help to broaden our own understanding and caution us from rushing to judgment. Certainly there are people who have rushed to judgment about NASA since February 1, 2003. We are most grateful to Readdy for giving us his perspective and allowing us to share it with *ASK* readers.

The story by Rudy Aquilina, a project manager from Ames Research Center, is powerful in what it can teach us about recovery and how not to become paralyzed by grief. Aquilina was project manager on a set of science experiments that flew on STS-107. His story this issue, "The Journey Back," looks at how he and a group of people on the project brought themselves out of despair by memorializing the work they'd accomplished before the premature, tragic end of the mission.

There is much more to this issue than these *Columbia* experiences. In addition, we've reached back to one of NASA's greatest successes, the *Viking* program, in a story by John Newcomb, "End to End Commitment." Newcomb remembers that against the judgment of one of his most trusted deputies, *Viking* project manager Jim Martin stuck to his guns about a critical decision at a critical time in the project. In the same vein, Rick Obenschain tells us about his response to inheriting a project in bad need of leadership.

Leadership manifests throughout this issue, as it does throughout NASA, and we're honored to bring these stories to you to prove that point. •

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

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

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

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

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

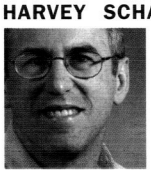
JODY ZALL KUSEK is a Senior Evaluation Officer at the World Bank. She is currently involved in supporting the efforts of seven governments to move to a focus of performance-based management. She has spent many years in the area of public sector reform, serving the Vice President of the United States,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

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

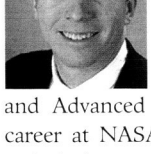
DR. GERALD MULENBURG is the Manager of the Aeronautics and Spaceflight Hardware Development Division at the NASA Ames Research Center. He has project management experience in airborne, spaceflight, and ground research projects with the Air Force, industry, and NASA. He also served as Executive Director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

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

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



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



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

Columbia, Loss, and the Search for Eldorado

I have attempted to share reflections that come from the heart, and hope they do justice and honor for our colleagues and their families.

ELDORADO

Gaily bedight
A gallant knight,
In sunshine and in shadow,
Had journeyed long,
Singing a song,
In search of Eldorado.

But he grew old—
This knight so bold—
And o'er his heart a shadow
Fell as he found
No spot of ground
That looked like Eldorado.

And, as his strength
Failed him at length,
He met a pilgrim shadow—
'Shadow' said he,
'Where can it be—
This land of Eldorado?'

'Over the mountains
Of the Moon,
Down the Valley of the Shadow,
Ride, boldly ride,'
The shade replied,—
'If you seek for Eldorado!'

—Edgar Allan Poe
Originally published in *The Flag of Our Union*, 1849

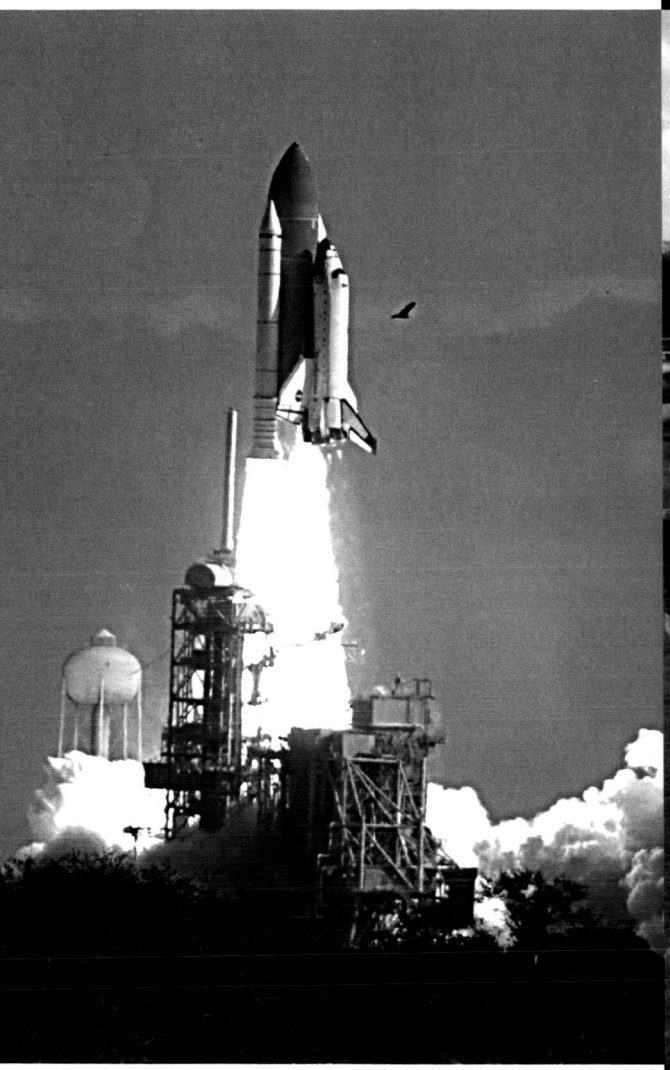
I FIRST HEARD THIS POEM RECITED BY WILEY BUNN MANY years ago at a project management course. (Wiley Bunn was an esteemed NASA leader of the Marshall Space Flight Center across several decades.) Wiley concluded each of his presentations at NASA with the poem. He felt it best captured the adventure, passion, persistence, and boldness associated with NASA and in particular Human Space Exploration.

The words have always had a powerful ring for me. They strike a chord that seems so much a connection to my experience as part of NASA. For me, within the words is an eternal story of exploration, search for meaning, and remembrance.

Part of an explorer's spirit is a commitment and sacrifice to seek the unknown, to expand the boundaries, and to open up a frontier so that others can follow. There must also be an awareness that the search can never be completely fulfilled. One accomplishment leads to another, and one attained voyage beckons another. The ultimate joy for such individuals must come from a life well led and full.

Remembrance is also an essential quality for people that we value and cherish. I recall words that I first heard as a teenager upon the sudden death of my father, "May his memory be a blessing for all your years." I am not certain who uttered the words, but their simplicity weaves a powerful truth that holds. It is a binding agreement with those who came before that what they started we will continue. An acknowledgment that we will be better and do better, because we knew them.

When I think of *Columbia* STS-107—Rick Husband, Willie McCool, Michael Anderson, David Brown, Kalpana Chawla, Laurel Clark, and Ilan Ramon—it makes me think of NASA, exploration, sacrifice, remembrance, a search for meaning, commitment, poetry, and family. •



THE JOURNEY BACK

We had stepped outside the hangar at Kennedy Space Center to prepare for the return of *Columbia*, which was carrying our flight experiments. It was a minute late and still no sound. We would hear it before we saw it, and we expected to hear the big booms at any second. As the clocked ticked by, we knew something was wrong. Then somebody monitoring communications gave us the news. For the last 15 minutes, *Columbia* hadn't been where it was supposed to be.

BY RUDY AQUILINA

Experiment racks surround astronaut David Brown, STS-107 mission specialist, aboard the Space Shuttle Columbia.

SOON, WE HAD OFFICIAL word: the Shuttle was lost. I was emotionally unprepared at that moment to deal with what was happening, and yet I knew that my team would be looking to me for direction. The project team was supporting four experiments from Ames Research Center in California. As I struggled to assimilate the loss, I had no idea what I was going to do next. So many things ran through my head, and it was impossible to wrap my mind around it all.

MOVING INTO ACTION

But I had to do something. I was the project manager, and the team members, about a dozen of them, were waiting for direction. I asked them to gather in a room. We didn't talk much about the loss; people weren't ready to talk about it at that point. I made certain that they all knew there were phone numbers that they could call, and that there were people back at Ames who could talk to them about the accident, if they felt they needed to.

Initially, I encouraged people to go home, but most of my team made it very clear that they wanted to stay at Cape Canaveral. They'd been there for days or weeks or months, and they weren't able to just walk away. I tried to give some structure to the project at that point, so that the team members felt productive. We set up daily morning meetings to update what was known, and to lay out the day's activities. It was mostly busy work for everybody those first few days; just doing something helped us get through the day.

The hard part was figuring out what they needed from me, without my invading their space. We began plotting out what we would need to do over the coming days to wrap up our operations. The first practical thing would be preparing to pack up all the ground equipment once it was released. It took about seven or eight days, but we were able to get the bulk of the lab equipment, our supplies, and the backup flight hardware packed up and put away. Then, one by one, we headed home.

GONE, BUT NOT FORGOTTEN

This was my first Shuttle payload as project manager. We all know that projects often don't go as planned, but the idea that something could go wrong on this scale had been beyond my thinking. Truth is, I don't know that you can ever really be prepared for something like this.

When we think of tragedy striking, it is usually something personal and private. You get some respite by losing yourself in your work. But in this case, this very public tragedy happened in our workplace. Every time I saw or read something about it, I felt drained. Even worse were the times I got a call to identify a piece of hardware. I would look at the photo and it was like I was right there in the middle of the trauma, all over again.

Several weeks after we had returned to Ames, a group of people from the project suggested that we do something to memoralize the *Columbia.* As the project manager, I was the person they turned to for guidance, but I have to admit it wasn't easy. Emotionally I wasn't yet ready myself to be thinking of a memorial, but when the team suggested a memorial, I didn't feel that I could say, "Yeah sure, good idea—now go ahead and plan it on your own." So I arranged a meeting with a facilitator. I thought we would need someone who was removed enough to be able to keep all of us on task.

What project team whose work came to a premature end wouldn't feel something missing, some need to get past the loss?

And, as I expected, it wasn't like other meetings we typically have, because there was still a lot of raw emotion in that room. We were a close team to begin with; many of us still saw one another on a regular basis, but I became aware of emotions that I wouldn't have normally been exposed to as their project manager. Even though you try to get to know everyone on a project, this was different because we were discussing feelings that are very personal to people. As people expressed themselves at our meeting, it made me acutely aware of how much more there is to project management than the technical aspect, and of how much you learn about your teammates by just listening to them.

We hoped to honor the memory of the *Columbia* crew, but we also wanted to do something that honored

the work of all the people at the center who were involved with our project. There were probably 200 people at Ames who had been involved in some way, shape, or form. Even though we had no science return from our experiment, we had accomplished quite a bit in the last four years. We wanted to recognize all the work that people had put into the project, and I think that we came up with a good concept, and, more importantly, it allowed team members a chance to take back some measure of control.

Gathering the Troops

All projects closeout with an awards ceremony. For our project, even with its premature ending, anything less would have been unacceptable. After checking in with the team, it was clear what type of event people wanted, and when we finally held the ceremony in June, it was low-key and informal. Normally, we would have had a crew member share his or her personal observations. This ceremony would have to be different.

We opened with a slideshow of images that lasted about ten minutes and included a lot of pre-flight work. We knew there were personal photos out there, so we had asked people to share them with us. We had pictures of people having fun on the project. Then we showed the crew photos and the on-orbit images that we had collected, with a beautiful soundtrack playing in the background. The folks who put this together did a wonderful job. We burned a CD copy of the show for every member of the core project team to take home.

The ceremony itself didn't last as long as a typical end-of-project awards ceremony might have, but with Ames management present, we acknowledged everyone who worked on the project. I was concerned that it would be depressing, but it didn't turn out that way at all. Afterwards, we went to a nearby park and had some beer and chips and talked.

At that point, people were ready to talk about what had happened; you might even say that they had reached a point where they needed to talk about it. Talking together was a positive experience for all of us. It helped provide us with a sense of closure on this project. Our situation, because of *Columbia*, was exceptional, but what project team whose work came to a premature end wouldn't feel something missing, some need to get past the loss?

Many months later, we're all still dealing with the tragedy, but we're also moving on. We put together a final report that reminded us, once again, of all that we had accomplished. I think finishing the report helped all of us to move on.

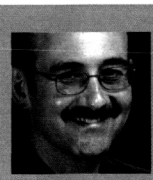
I'm now the project manager for another set of experiments that we hope to fly in 2006. People ask me if I'll do things differently this time, because of my experience on *Columbia*. On a technical level, the answer is, "No, not really." Socially, it's "Yes." Project management is so much more than handling the technical issues and getting folks to do what you want them to do. It's giving them the support they need, even when you have to dig down deep within yourself to do it. •

Lessons

- Managing the cost, schedule, and technical elements of a project is only part of the picture. A project manager must also be capable of assessing and addressing the emotional needs of his or her team.
- Teams deserve to have an opportunity to gain closure on a project that comes to a premature end.

Question

Failures of some scale are commonplace on projects. Most are not cataclysmic. To what extent, can you prepare for failures? Or does anticipating failure become a self-fulfilling prophecy?



"I like being involved in all aspects of a project—the engineering and the operations, as well as the science. It brings the project to life," says **RUDY AQUILINA.** Over the course of a 13-year trajectory at Lockheed Martin, Aquilina worked his way through the ranks from a verification engineer to deputy project manager. He was hired by NASA four years ago.

"I think the life science research NASA is doing is just great research, and I'm happy to support it," explains Aquilina. "My degree is in aerospace engineering, so my work supporting life science gives a new slant to my view of the world."

The project Aquilina managed on STS-107 supported four life science experiments:

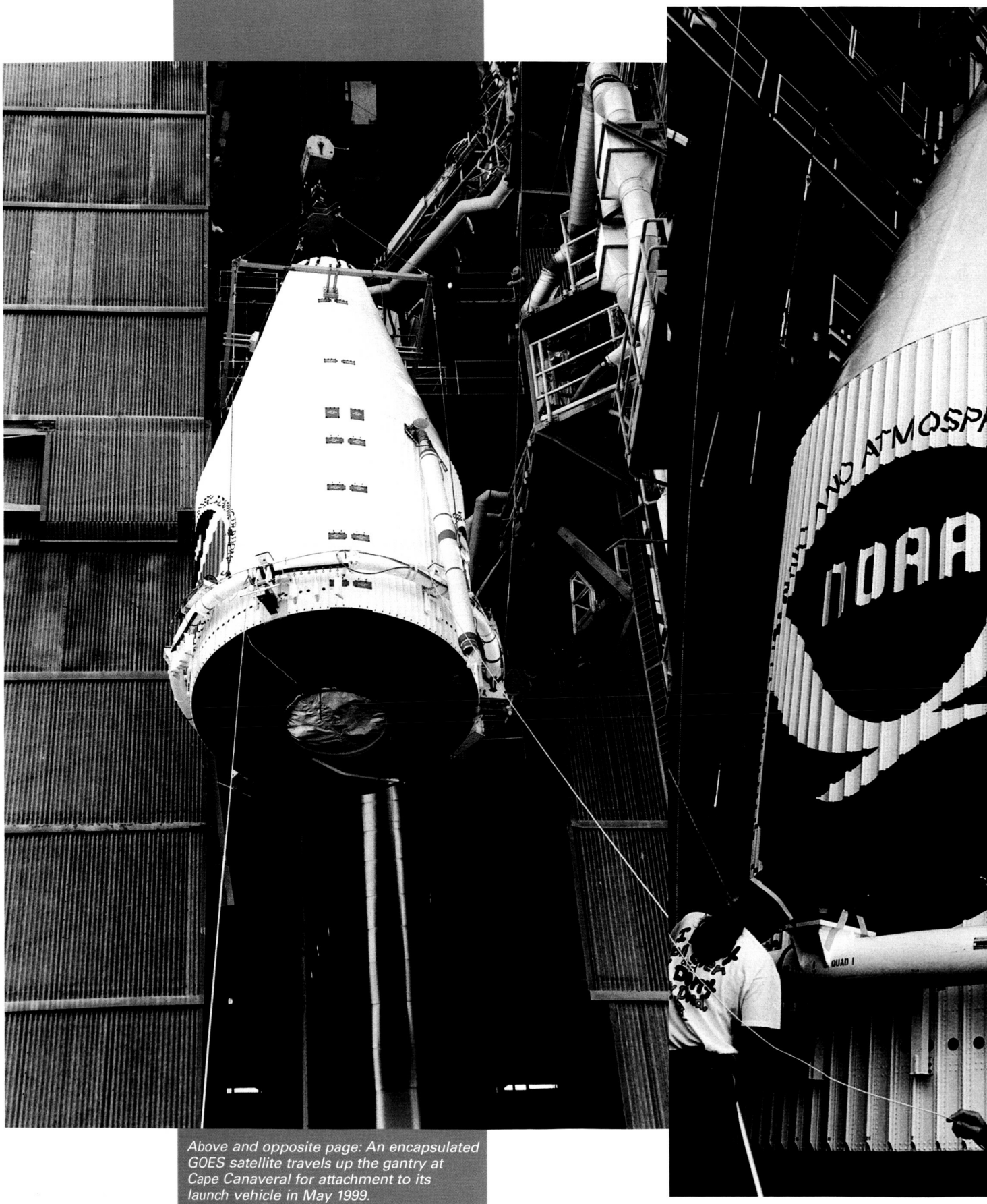
98-E409, Choroidal Regulation Involved in the Cerebral Fluid Response to Altered Gravity

E386, Arterial Remodeling and Functional Adaptations Induced by Microgravity

E127, Anatomical Studies of Central Vestibular Adaptation

BACTER, Bacterial Physiology and Virulaence on Earth and in Microgravity

Find a complete list of STS-107 science activities on the Office of Biological and Physical Research Web site at http://spaceresearch.nasa.gov.



Above and opposite page: An encapsulated GOES satellite travels up the gantry at Cape Canaveral for attachment to its launch vehicle in May 1999.

WHAT GOES AROUND, COMES AROUND

RICK OBENSCHAIN

I was managing the Earth Observing Systems (EOS) platforms project at Goddard Space Flight Center, and I wasn't looking for a new job. But one day, the new Center Director, Dr. John Klineberg, called me into his office and said, "How would you like to be the new GOES project manager?"

I replied, "Well, I don't think so, John. That sounds like a pretty lousy job."

Above: Workers prepare the GOES-K payload for launch in April 1997.

He looked a little startled, and I asked him if he'd seen the front page of the *New York Times* a couple weeks before with the headline, "Hussein Invades Kuwait." The only other article above the fold that same day was about the Geostationary Operational Environmental Satellite (GOES), and it said something to the effect that the project was "continuing its downslide into oblivion."

I wasn't interested in leaving a successful project like EOS—with its six, $1-billion platforms and 17 instruments scheduled to launch on a Titan-4—for a project that had made the front page news for all the wrong reasons. There wasn't anything to consider, or so I thought.

"You didn't think that sounded like a question, did you?" John asked me.

"I thought I heard a little inflection," I told him. "But I guess I understand the situation now."

And so I went to work on GOES.

AN UPHILL BATTLE

The project was in horrible shape—about $500 million over budget and five years behind schedule. NASA and the National Oceanic and Atmospheric Administration (NOAA) needed to launch weather satellites to replace the aged, limping satellites doing the job at the time. They had spent $100 million a year on GOES to build hardware that didn't work so far.

You get in on a program like that and nobody really expects you to succeed. The funny thing is that low expectations can actually give you a little more freedom to work things out. You can do something like I did, for example, by telling the Secretary of Commerce that you need a bit more of your money upfront.

He said to me, "This is the money we have." And I said, "If we can get the money on the schedule we've asked for, we can launch a fully functional satellite in three years. Or with all due respect, Mr. Secretary, you can keep spending $100 million a year, and you'll get your satellite on the 12th of never." He came back and told me that if NASA would commit to that launch date, then he would give us the money—and he did.

While he was thinking about it, I took a look at the number of people working on the project. I said to the government team at the time, "Look, from where I sit, it looks as though the contractors build the instruments, and the contractors build the spacecraft. You need to tell me what you're doing to make progress happen. This has got to be a team effort."

I listened to what they all had to say. I figured out what we needed to do on our side, what we didn't need to do, and what we weren't ready to do yet. I told my leads that we were going to cut our total work force in half—government and contractors—and we went down from around 800 people to 400. That was enough to do the job, and at the same time I essentially created a savings account by doing this. When problems came up, I could stay within my budget because I was only paying for half the people. That's a lot of cost.

TAKING RESPONSIBILITY

Once we had our budget in line, I needed to find a way to get everybody on the same page. One of the things I took a look at was our award-fee contract.

For the last few years, the contractors had typically been awarded 50 to 60 percent of their potential fees. So, I went to my two contractors and said, "Look, you all have been getting mediocre award fees. I have a deal for you. I'm going to let you pick ten milestones for the next six-month period. The only thing I'm going to require is that you have to pick milestones that truly reflect progress. Something that shows we're moving from point A to point B in delivering this hardware."

I went on to tell them that if they achieved all ten of their milestones, they would receive 100 percent of their award fee. But if they missed even one, then they got zero, and I expected to hear no complaints, no arguing, no going to my boss, or anything else.

Sure enough, they agreed. Because they got to pick their own milestones, they were certain they could achieve all of them and finally get good award fees. They seemed to have no doubt about it.

Well, at the end of the six months, they missed eight of the ten. That didn't make any of us too happy. The good thing was, though, they didn't complain to anyone. The other good thing was that they wanted to try again. I said to them, "Look, you help me figure out how to manage this program, and you will be rewarded."

echnician tests deployment
he sounder instrument's
or on the GOES-L satellite.

THE FUNNY THING IS THAT LOW EXPECTATIONS CAN ACTUALLY GIVE YOU A LITTLE MORE FREEDOM TO WORK THINGS OUT.

GETTING THE RIGHT PEOPLE

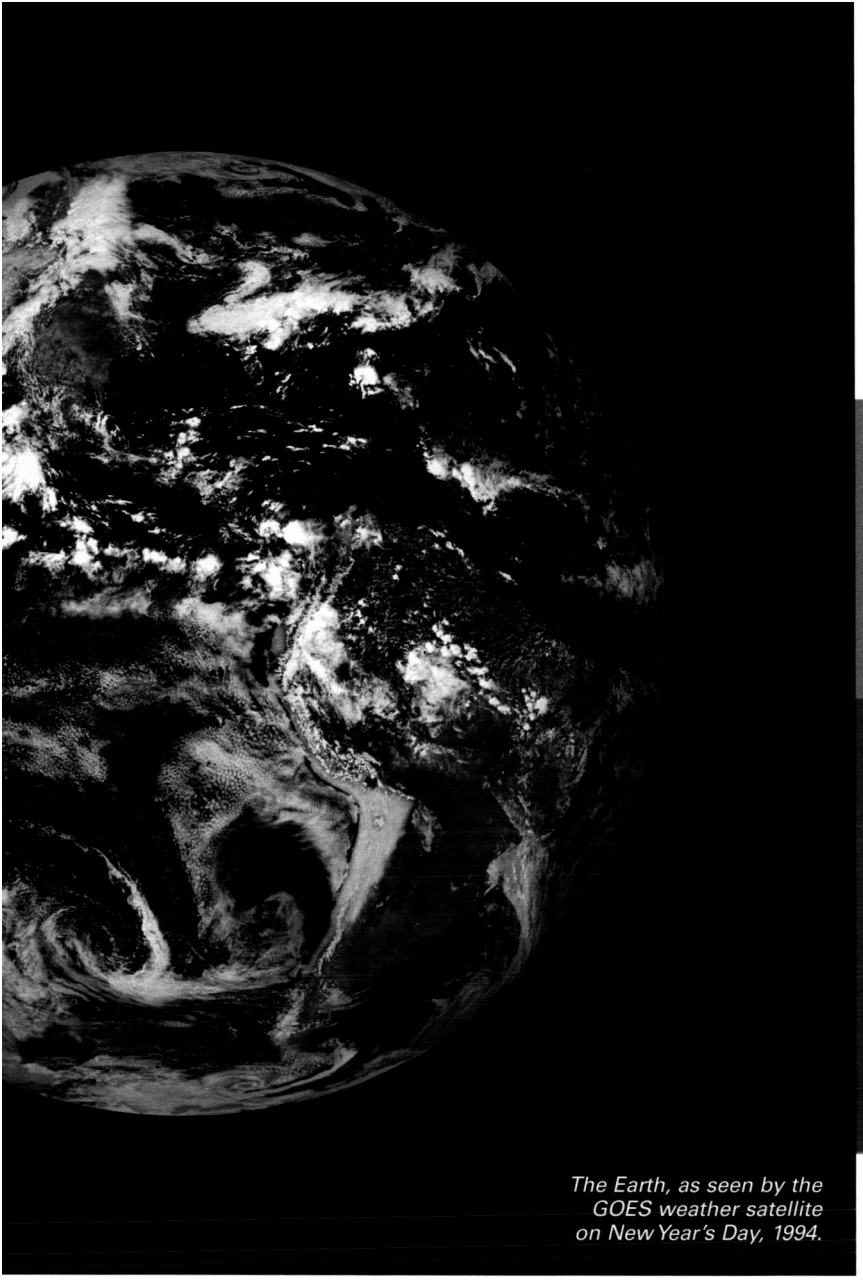
During this time, we were having the most problems with our instruments, which were being built by one of our contractors. I knew that I had to assign someone to take charge of this area, and I knew whom I wanted: Marty Davis. Marty was working on another project, but I had seen him in action on the Gamma Ray Observatory (GRO), and I knew he was the person I needed on my team.

I went to my Center Director and I said, "You know, John, I've just got to have somebody who can go on site and ramrod these instruments because we're not getting anywhere with them."

He nodded, and asked who I wanted. "You can have anybody you want," he said.

"That's good," I said, "because I want Marty Davis."

He said, "We can't move Marty. We just put him on another project ten weeks ago."



The Earth, as seen by the GOES weather satellite on New Year's Day, 1994.

I NEEDED TO UNDERSTAND WHAT WAS REALLY NEEDED BY THE PEOPLE WHO WOULD BE USING THE INSTRUMENT.

I told him why I needed Marty, and why no one else would do. When Marty heard about it, he almost killed me when I wouldn't budge from that position, and our friendship of 20 years almost disintegrated. But, in the end, the director put Marty on the project.

Marty spent a couple of years, almost resident, with the contractor. In the process, we made instrument development and integration a team effort between the contractors and Goddard. In fact, Marty did such a great leadership job that after we launched the first satellite in the series, and built most of the second, he threw me off the project. Marty continues as the GOES project manager today.

TALK TO ME

The instrument that gave us the most trouble was the sounder. Marty told me that despite doing the best they could, trying to meet the specifications for the sounder would delay launch. I needed to understand what was really needed by the people who would be using the instrument. Our customer was NOAA. Unfortunately, we had about three levels between the actual user, the National Weather Service, and the people who worked with us at NOAA.

One day I called up Joe Friday at the National Weather Service. I said, "Joe, what time in the morning do you get in?"

He said, "I get in at 6:30 a.m."

I asked him, "If I'm standing downstairs at the elevator at 6:30 tomorrow morning, can I have the first half-hour of your day?"

He agreed. I got up early and went over to his office building. When he came in and saw me waiting by the elevator, he said, "Things aren't going too well, are they, Rick?"

I said, "Joe, they're not. But I'm going to make a deal with you. If you will tell me right now what's the minimum you can accept on the first spacecraft, we'll get it off the ground. Eventually, we're going to build you five spacecrafts, and I promise that every one will be better than the last from the instrument standpoint. But I can't build the sounder the way you want right now. We're going crazy. I can't get agreement on the real requirements from NOAA. So, what can you accept?"

We sat down there and negotiated in thirty minutes what the sounder was going to be like on the first GOES. I left the building before the other NOAA people came in, because I couldn't be seen there talking to the National Weather Service.

I came back and said, "Okay. We've got a plan now. We know how to do this." I told the people at NOAA what we were doing, and they said, "Well, wait a minute. You're not meeting the spec."

I said, "I'm meeting your requirements."

"No, we want you to meet the spec."

I said, "We're not going to meet the spec. We're going to meet the requirement. Where did that requirement come from? Do me a favor, and go back and talk to the people who are going to use this instrument and make sure that isn't what they're willing to work with."

And guess what the National Weather Service told them? They said, "Yeah, Rick's right. It's not the specification, but it's what we need."

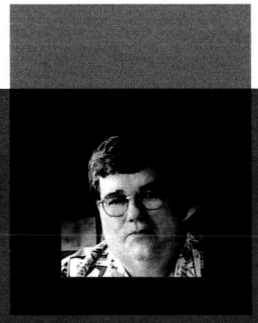
So, with NOAA's concurrence, we built our sounder and launched their satellite. We were still the same $500 million over budget that we had been when I joined the program 3½ years before, but the important thing was that, against all odds, we delivered what was needed. •

LESSONS

- Don't be afraid to take dramatic action to get your project back on course, including fighting to get the right person for each key position on your team.
- Let your contractors participate in selecting their metrics and incentives.
- Seek out the "real" users of your end product and make certain that you understand their needs.

QUESTION

How open are the communication lines between your project team and your end users? What can a project manager do to facilitate candid communication throughout the project lifecycle?

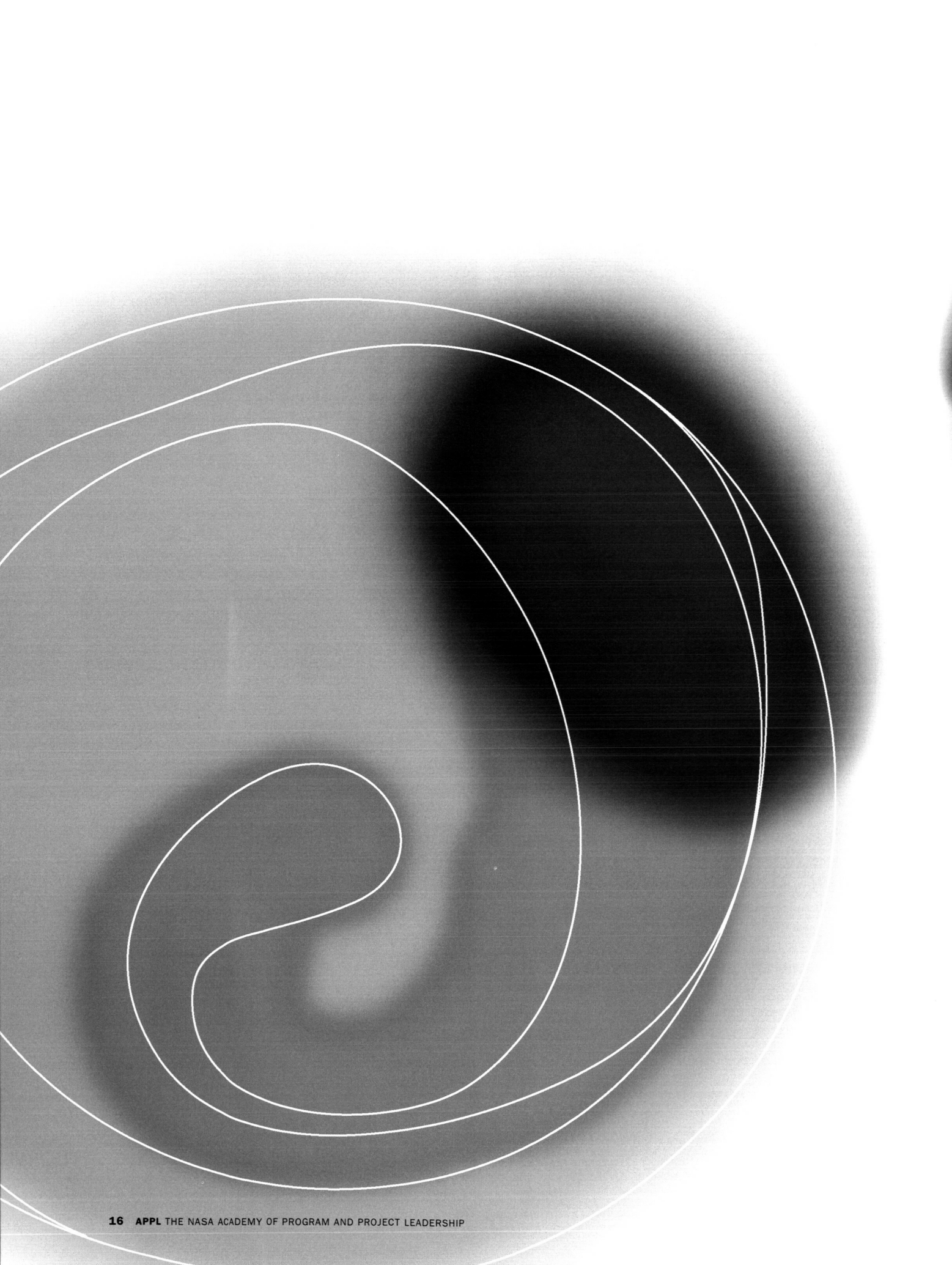


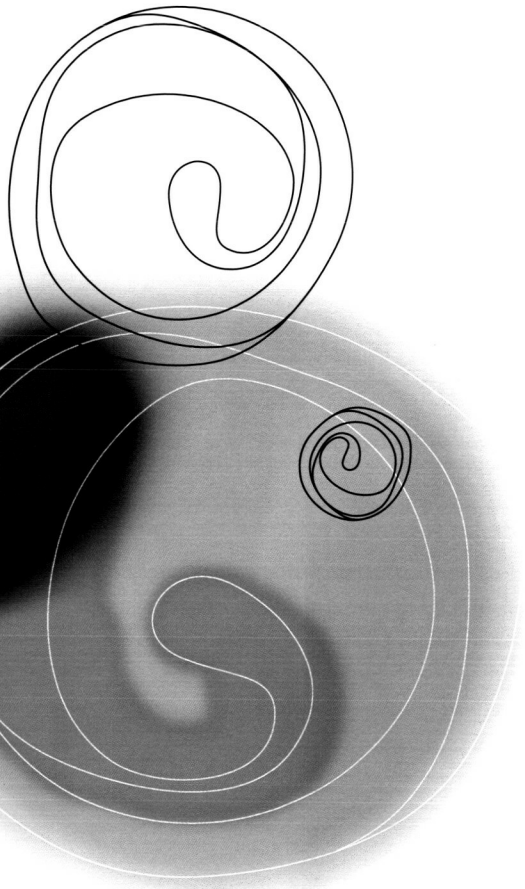
TEAM PLAYER

"The real benefit of having strong government and contract teams is that both feel confident in their abilities; therefore, you can negotiate very nicely. Rick had that honed to a T," says John Hraster, who met **RICK OBENSCHAIN** when the two worked on the Gamma Ray Observatory (GRO) project at the Goddard Space Flight Center.

Hraster cites Obenschain's ability to recognize and take full advantage of team members' strengths—on both the government and contract sides. "Rick did that to perfection, and that strong relation really paid off, because a couple of strong teams together have a synergy that goes beyond the project work itself," explains Hraster.

Obenschain began his NASA career in June 1962 as a college intern in the Goddard Advanced Systems Implementation Branch. He was selected as the Director of the Applied Engineering and Technology Directorate at Goddard in June 2000. He has received the NASA Distinguished Service Medal, Outstanding Leadership Medal, Exceptional Service Medal, and Equal Employment Opportunity Medal, in addition to Goddard's Award of Merit and a Von Braun Medal for Excellence in Space Program Management from the American Institute of Aeronautics and Astronautics (AIAA). Obenschain spoke at the APPL Masters Forum in July 2003. He can be contacted at Arthur.F.Obenschain@nasa.gov.





Marbles for the Imagination

by Jack Shue

To fill the need for engineers and scientists of the future, we at NASA need to start attracting youths to these fields now. With this goal in mind, Goddard Space Flight Center encourages its employees to find ways to capture the imaginations of our next-generation workforce. A second grader has a different outlook on what is exciting, versus that of a tenth grader, but to capture the imagination of either is important.

I enjoy talking to kids about engineering, particularly applied engineering, and so the question is always on my mind: What makes a person want to be an engineer or scientist? Or, more specifically, what makes someone want to go into engineering or science? Is it a single event?

Several years ago I got an idea, and, as with most ideas, it was not accompanied by a blinding flash of light. The idea came to me at the National Marbles Tournament. To watch a good game of marbles is to watch physics at work. The dedication and effort these players put into their game can be the mark of a good engineer or scientist.

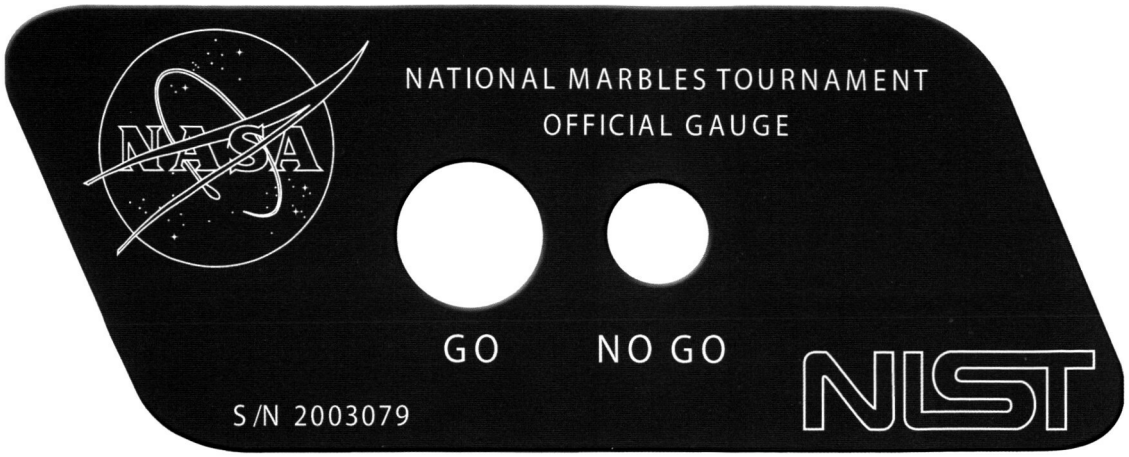
My son had been playing the game of Ringer (a U.S. Marbles Game) for several years, and now he was coaching. In the rulebook for Ringer, one rule states, "The shooter shall be not more than ¾ inch in diameter and not less than ½ inch in diameter. All contestants' shooters should be checked for size prior to the beginning of the game."

Several people at this tournament had been using drafting templates as gauges, but the organizers discovered that the templates were too large. Here was an engineering problem, I said to myself—and it was then that the thought crossed my mind: Wouldn't it be a good way to get the kids' attention by making some NASA-sponsored gauges and handing them out? Even better would be to fly one of them in space.

Now, where do you start once you have an idea? In this case, I started by talking with my colleague Mike Ryschkewitsch from Applied Engineering and Technology at Goddard while we were in the gym one morning. As fate would have it, the conversation took place while my son was at the 79th annual tournament. I suggested that it would be fun to make a gauge and get it flown in celebration of the 80th anniversary of the tournament. Mike seemed to enjoy the idea and suggested I write up a brief proposal so that he could give it to the Public Affairs Office for review.

Needless to say, there were the usual jokes about losing one's marbles, but the idea was well received; and to prove that I knew where my marbles were, I produced out of my pocket some marbles and gave one to each person who attended the kickoff meeting to produce gauges for the tournament.

With permission given to run the project, Mike came up with the money needed to fabricate the gauges, and in addition came up with the idea to have the gauges



calibrated by the National Institute of Standards and Technology (NIST). The Goddard mechanical branch was given the task of designing and manufacturing a gauge large enough to include two holes and the NASA and NIST logos. By using a computer-driven mill they were able to scribe in the logos, as well as the name of the tournament and the words "GO" and "NO GO" under the two holes.

I had originally asked for one gauge, but once word of this project got out, the presentation list was up to 43 gauges for the tournament participants. The Public Affairs Office suggested manufacturing another 20 to 30 gauges.

A second grader has a different outlook on what is exciting, versus that of a tenth grader, but to capture the imagination of either is important.

The gauges were taken to NIST for calibration, and for a finishing touch they brought out a ¾-inch gauge marble that had its dimension known to 3 millionths of an inch. Much to the shop's chagrin, the gauge marble did not pass through six of the gauges. This was a lesson to us on how to specify the tolerance for a gauge. The dimensioning should have been ¾ (0.750) inch +0.005 / -0.000 instead of the ±0.005 used. NIST was kind enough to have a technician ream open the holes that did not pass the standard.

The 80th anniversary tournament took place at the beginning of June 2003. We had hoped our gauge would catch a ride on the Shuttle, but we had to settle on a balloon flight. The first thing the engineers wanted to know was, what was a marble gauge, how big were they, and how much did they weigh?

These were easy questions to answer, and the response came back that it would not be difficult at all to fly them on one balloon; in fact, they normally fly more duct tape than that! I kept one gauge as a spare "just in case," as I had heard the story of the balloon gondola that found the only deep lake within 200 miles of the drop zone.

Balloon season starts in May and I needed the gauges back two weeks before the tournament. It is not uncommon for the engineers to wait weeks for the right conditions. The launch took place on May 24 in New Mexico, and it was almost a week before the gauges were returned. They were delivered to me the day before I was to leave for the tournament.

At the start of the project, I had not given much thought as to who would be coming to the tournament. Mark wanted to be there to do his job as Public Affairs Officer, and he asked if I would mind if he invited the Center Director to come. To my amazement the Goddard Center Director, Al Diaz, was enthusiastic about going. At the briefing I gave him, Al got a gauge and some marbles. He requested another gauge so that he could give it to NASA Administrator Sean O'Keefe.

Mark suggested that we should try to get an astronaut to do the honors of presenting the gauges to the tournament finalists, and he put in a request for one. With just a few days to go it was confirmed that we would get an astronaut, Tony Antonelli, and that he would spend the entire day at the tournament.

I like to imagine that some day I'll hear an astronaut, engineer, or Nobel laureate telling an audience that it all started for them back at a marbles tournament.

When we arrived, the tournament had already been under way for three wet days. The day of the finals it rained again, but marbles takes place rain or shine. Tony was there in his blue flight suit, and the rest of us in some form of NASA clothing. Al and Tony were both very good sports about the whole thing, including the rain, and the enthusiasm of the marbles group towards NASA was touching.

Tony gave his speech and did a question-and-answer session with the players, and while they were the questions only kids could ask, it showed that the public does follow what we are doing. After one of the questions, Tony revealed why he had gotten into the astronaut corps. It turns out, he had been fascinated as a kid by watching the *Skylab* astronauts run in space. I like to imagine that some day I'll hear an astronaut, engineer, or Nobel laureate telling an audience that it all started for them back at a marbles tournament.

A largely volunteer effort that had required little investment on the Agency's part had indeed captured the imagination of youth. And there was another, unforeseen payoff, as well—the project had sparked the enthusiasm of a good number of people at NASA and NIST along the way. Watching the presentation of the gauges was the closing of a satisfying, yearlong endeavor for me. •

Lessons

- For NASA to play a leading role in inspiring tomorrow's scientists and engineers, individuals within the Agency need to recognize outreach as an important activity.
- Good ideas can die on the vine without persistence. Persistence marries intelligence with leadership.

Question

At what point does individual initiative need to be organized and creativity managed?

"Marbles for the Imagination" typifies JACK SHUE'S view of how to get young people excited about science: seize every opportunity. Shue, an electrical engineer at the Goddard Space Flight Center, finds talking with students to be some of the most rewarding work he's done since joining NASA sixteen years ago. "I estimate that I talk to close to 1000 students each year," he says. "This year, I'm mentoring a group of high school students. I also try to do one or more science fairs each year, and last year I helped review grant proposals for the State of Maryland." Shue participates each year in National Engineers Week, which includes visiting schools to coach teachers on getting students interested in NASA science and engineering projects.

As for his interest in marbles, Shue credits his son, who began playing marbles nine years ago through a county recreation program. "Some of the group traveled to tournaments preparing for Nationals, and I started to do some of the refereeing. I learned from some of the coaches what was needed to be a good player." The proud father adds, "The last year of eligibility (at age 14), my son made it to fourth place at the Nationals." Tournament competition can be fierce, Shue says. He won't speak for anyone else, but insists he himself has never lost a single marble at one of these tournaments.

Jack Shue can be reached at John.L.Shue@nasa.gov.

A scale model demonstrates the *Viking* lander's deployed legs and radar in their post-touchdown configurations.

END TO END COMMITMENT

BY JOHN NEWCOMB

PROBABLY ONE OF THE TOUGHEST, MOST GUT-WRENCHING decisions I have ever witnessed on a project was the one involving the end-to-end test for the *Viking* lander. At this point on the project, I was trajectory analysis and design manager on *Viking*, so mine was not a small stake in the decision.

The traditional approach is to test an integrated system such as the lander or a spacecraft once it's been assembled. It is a complete system test, and in general it's the way to go. But "in general" doesn't apply to every project. In almost every case, and certainly in our case, there are limits on your ability to simulate the total set of conditions such that the test will be 100% valid. Plus, when we got down to that point, we were running tight on time and money—and end-to-end systems tests are always expensive.

As a project progresses, an effective project team will develop and maintain a list of possible cost offsets that can reduce scope. The *Viking* project had developed and maintained such a list, which included some fifty items of cost or schedule offsets, along with an assessment of their associated risks. We knew it was time to turn to the list again when the NASA administrator sent word to us in 1974 (one year prior to launch) that *Viking* had to solve all future problems without requesting additional funding.

To test or not to test

As the time for the end-to-end test came near, Jim Martin, the *Viking* project manager, called us all into a meeting. Jim listened to all the arguments, pro and con, about the value of the test. The project team presented data on the smaller tests already being conducted, which had verified the performance of various subsystems and interfaces. Then we discussed the known deficiencies of the end-to-end test, as well as the risks associated with canceling it.

After Jim assured himself that every subsystem and component involved had been adequately tested, he announced his decision to cancel the end-to-end test. It wasn't an easy decision; some of the people Jim trusted most didn't agree with him. One of them was Israel Taback, (affectionately known by all of us as Is) chief engineer for *Viking* and just the best systems engineer I have ever known in my life. That was the only time during the course of the *Viking* mission that I ever saw Is Taback put his body across the track—and Jim Martin ran over it.

Taback stood up and argued that we couldn't afford not to run the test. Jim Martin relied heavily on Taback

and had the utmost respect for him. But Martin also was a guy who had the guts to stand alone and make a decision.

Testing my own commitment

The day that Jim decided to cancel the test, I made the mistake of walking out of the meeting beside Taback. He turned to me and said, "Well, you know we've cancelled the test."

I nodded—and that's when he picked me up, figuratively, by the scuff of my shirt. "As of now," he told me, "I hold you personally responsible that there won't be a sign reversal in the control logic for the lander."

Taback had reason to be worried, because we had crashed—not us, but NASA—a spacecraft before due to control logic sign reversal. This was part of my responsibility on the project, and so in other words he was saying my career was on the line.

I had a fellow emulating the control logic. The end-to-end test would have verified that there was no sign reversal. Now, we wouldn't have that assurance; so, you can bet that my first stop after the meeting was in the office of the lead for the guidance, control, and sequencing computer.

Taback's response—something that has been born out over the years—was that one test was worth a thousand opinions. He was a strong believer of "test as you fly, and fly as you test." We (NASA) had screwed up several spacecraft because we didn't obey that very simple rule. His position was that there is no reason compelling enough to delete an overall systems test. "I don't care what you guys tell me," I remember him saying. "There is no justification."

But Jim did justify it.

An engineer examines the aeroshell that protected the *Viking* lander during entry into the Martian atmosphere.

The art of persuasion

With all this at stake, it would be easy to second-guess Jim's decision, but there was more to the story, of course. At best, we had hoped to run an overall systems test on the lander that would be ninety-something percent valid. To do that, we'd have to fudge a few things. So, it wouldn't have been a perfect test, number one. Number two, we were able to do a tremendous amount of testing on the various subsystem levels such that we had a lot of confidence that the system, as a whole, would work.

In most of our projects we have to make very difficult decisions with limited knowledge. I like the way one of our *Viking* team members, Tom Young, put it. Tom's take on a tough decision was to say: "If we make this decision, are we prepared to defend it in Congressional testimony?" If the answer is yes, then you probably made the right decision. On *Viking*, we very nearly got the chance to find out.

After Jim cancelled the test, we received a scathing report from the Inspector General's (IG) office that said *Viking* had been placed in severe jeopardy because the end-to-end systems test had been called off, and they felt it was a totally inappropriate thing for management to do. When the IG does something like that, they give you a draft report, and they give you a chance to respond to it before it becomes official.

Jim took a look at the report and didn't agree with the conclusions. There were no new findings about the risk of canceling the test; it came down to a difference in judgment.

Jim knew that a negative report would distract our team from the work we needed to do. To address the report, he called in his deputy project manager, Gus Guastaferro, and asked him, "Gus, will you handle this?" You should understand that Gus was known for his creative negotiation techniques.

On the day of the meeting with the IG group, Gus went into the room, and shook hands with everyone.

"IN GENERAL" DOESN'T APPLY TO EVERY PROJECT.

They were all young, all about 25 to 30 years old. Gus smiled, and started talking.

He said, "Oh, that's a very interesting report you've got here. We have been very interested reading it. But let me ask, just to help me here, what are your backgrounds?"

He looked at the first guy, who told Gus he was a business major in college. He went to the next guy. He had an engineering background, but little practical experience. And so on.

When they'd gone around the room, Gus said, "Okay, you gentlemen have written this report and stated your opinion. You certainly have a right to do that; but you've just got to realize that your opinion, which is based on a total of about thirty years of minimal technical experience, has to be judged against the opinion of about 800 years of engineering experience of more than fifty senior engineers."

He went on to say, "If you do pursue this, of course, we will request a Congressional review, and I hope you realize that you will be asking your bosses to defend your thirty years of judgment against our 800 years. Some people, I dare say, might question that kind of disparity."

WHAT'S IN A TEST?

The end-to-end test would verify the complex sequence of events from lander separation to landing. Due to the large distances involved and the significant delay time in sending a command and receiving verification, the lander needed to operate autonomously after it separated from the orbiter. It had to sense conditions, make decisions, and act accordingly. We were flying into a relatively unknown set of conditions—a Martian atmosphere of unknown pressure, density, and consistency to land on a surface of unknown altitude, and one which had an unknown bearing strength.

In order to touch down safely on Mars the lander had to orient itself for descent and entry, modulate itself to maintain proper lift, pop a parachute, jettison its aeroshell, deploy landing legs and radar, ignite a terminal descent engine, and fly a given trajectory to the surface. Once on the surface, it would determine its orientation, raise the high-gain antenna, perform a sweep to locate Earth, and begin transmitting information. It was this complicated, autonomous sequence that the end-to-end test was to simulate.

Then he left the room. (We later learned that the IG had decided not to publish the report.) That was typical Gus. Don't get mad; just get what you need. And typical Jim, too. Know the strengths of the people working for you. Let them do the jobs they do best—like handing over the report to Gus. But also be willing to overrule them, when the overall good of the project demands it.

Jim also believed in making decisions in a completely open fashion, with everyone who wanted a say involved. And that included his critics—although he was not about to let his critics go unanswered. Jim didn't ignore criticism; he evaluated it.

IN OTHER WORDS, HE WAS SAYING MY CAREER WAS ON THE LINE.

Moreover, he expected nothing less than absolute truth from his people. The one unforgivable sin was to put a spin on something or to hold back needed information. I saw people attempt to do this in a staff meeting and that was their last meeting. They were off the project that day.

All discussions of major decisions were held in open forum. The decisions were completely open and the reasons and results were made known to the entire project and to NASA management. Jim's requirement for open communication within and outside of the project permeated the *Viking* project community. In that vein, the decision and the reasons for the end-to-end test cancellation were immediately made known to the Center Director, the Associate Administrator, and the NASA Administrator. They also knew that it would save $1.1 million of additional funds, and they knew the risks associated with it.

And in the end...

After that famous decision, we used to say that we were still going to perform the lander end-to-end test—it would just happen on Mars. When this "test" finally took place on July 20, 1976, and the first pictures started coming back, I don't believe there was a dry eye in that whole Space Flight Operations Facility. •

LESSONS

- Truly good decisions can only be made when there is free and open communication and information exchange throughout the project.
- Team members are more likely to accept decisions, even if they do not agree with them, when they understand why and how decisions are made.
- After discussing controversial issues with team members, project managers must have the courage to make unpopular decisions, if necessary—and to take responsibility for those decisions.

QUESTION

Why is it more difficult today to rely on expertise and knowledge when exercising judgment that challenges accepted norms?

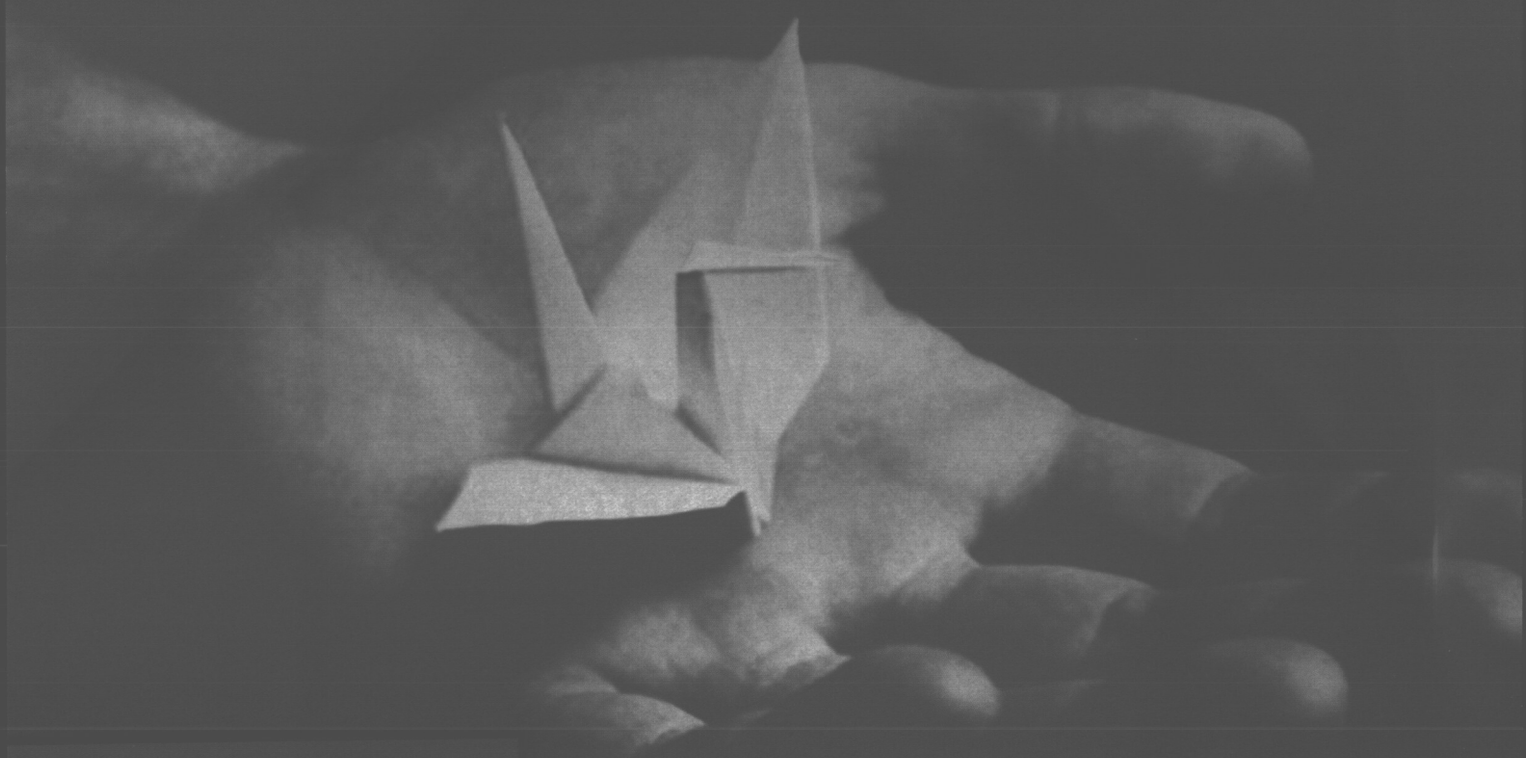
REMEMBERING JIM MARTIN

JOHN NEWCOMB held several positions on *Viking* from 1968 to 1977. In addition to being trajectory analysis and design manager during the phase covered in "End-to-End Commitment," he also served as the *Viking* operations analysis manager and *Viking* support office manager, and was deputy to Jim Martin for extended mission planning.

"Jim moved his people around," remembers Newcomb. "His project organization was a very fluid one." If one area of the project needed attention, Martin re-organized his leadership team, and put team members in the positions where he felt they were needed the most. "When things stabilized," Newcomb explains,"he would often move people again. I went from highly technical assignments such as being responsible for the design of the orbiter and lander trajectories, to one in which I had to coordinate the entire *Viking* team to develop the flight operations protocol, to one where I was involved in negotiating contracts for the extended mission worth a total of $40 million. In that way, Viking was a very broadening experience for me."

As *Viking* project manager, Jim Martin led a 750-person team of NASA, industry and university engineers, scientists, and technicians. *Viking 1* and *Viking 2*, twin robot landers, launched in 1975 and touched down on Mars a year later, NASA's first successful missions to the Red Planet. In Issue 15 of *ASK*, Tom Young's story "Class Act" also paid tribute to Martin's leadership style. Jim Martin died in 2002.

Fly Away



By Scott Tibbitts

AT 1 A.M. THE PHONE RANG, WAKING MY WIFE AND ME. KARLA, WHOSE HUSBAND KURT WORKED FOR OUR COMPANY, EXPLAINED THAT KURT HAD NOT COME HOME FROM WORK THAT NIGHT. SHE WAS WORRIED, AND WANTED TO KNOW IF I HAD ANY IDEA WHERE HE MIGHT BE.

KURT WAS ONE OF THE LEAD ENGINEER/PROJECT MANAGERS at our company, Starsys, in Boulder, Colorado. I had hired Kurt six years ago and found him to be a man of few words but huge actions. Kurt had single-handedly created two new business areas in the company and made a significant contribution to the upcoming Mars Exploration Rover mission. Conscientious, inventive, quiet, caring, he was well liked by every person that he came in contact with. Kurt and Karla had two children, ages four and nine, and he was one of those fathers who had figured out that the important things in life center on family.

I told Karla I would call her back, and then called several other folks in the company. No one had seen Kurt since lunch, and he had missed some important afternoon meetings. The operations manager drove back to work and checked Kurt's e-mails and the sign-out sheet. It looked as if Kurt had left for lunch, but then did not return.

Gary's words were emphatic "You put a message on there and make it as big as you can!"

It was now 2 a.m. There wasn't much more I could do before morning, but I decided that doing anything was better than just waiting. I hopped in my car and joined Karla driving around the area looking for Kurt's car. We checked in with each other every five minutes or so by cell phone. Neither of us could come up with a scenario that wasn't bad news. We nervously joked that maybe he had run off to Mexico, but knew that we were grasping at straws.

First thing the next morning our company had an all-hands meeting. I explained that Kurt was missing and that it did not look good. The company settled into the day, everyone quietly hoping and praying that this would turn out all right. Karla dropped off her four-year-old at Starsys before the police arrived at her house to get involved with the search.

The call came in at nine that morning that they had found the car at a trail head. I vividly remember what happened next. With the leadership team around the conference table, another call came from Karla with the words, "Kurt's gone. What am I going to do?"

While running in the mountains, Kurt had a fatal heart attack. An avid backcountry skier and climber, he was 45 years old and appeared in great health. I looked at the people in the room with me, and the tears came. While Jenny, our HR director, took Kurt's son home, I announced another all-hands meeting.

I stood in front of the room not knowing what I was going to say. I had always known that at some point I would have to deal with a death in our company. Since many of the folks are involved in risky activities such as climbing or motorcycle riding, I expected this would be the cause—not a heart attack. But here it was, and what was I supposed to say and do?

I spoke honestly from my heart, and from my own experience as a father. It was a struggle to get the words out through the tears. Starsys is a closely knit team of 100 people. I asked that the family be in our prayers, and that people do what they felt they needed to do during the day—whether that was going home, or working, or just talking. Everyone headed back to their offices and the company settled into mourning for Kurt.

That day people started to ask what they could do to help the family. One of the engineers offered his home, and about twenty people got together that night to talk. Over the next couple days we set up a fund where people could contribute dollars or vacation time or comp time, and Starsys would translate that into equivalent dollars and provide a matching contribution. The contributions were astonishing. Several people offered up a week of upcoming vacation. Spontaneous and generous contributions also came in from the companies Kurt had worked with.

Other forms of support came in, as well—such as the letter that Michael Hecht from JPL wrote to Kurt's

children describing all the special things that their father had done for the Mars Program. With the letter, he sent a package with Mars memorabilia.

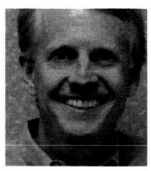
The company continued to grieve throughout the month. We left Kurt's desk space untouched for a while. When the time was right, Karla came in with the children after hours, packed up Kurt's belongings, and took them home. As it turned out Kurt was quiet about his accomplishments at work, and the family had little knowledge of the details. We wrote the children a letter that described all that he had done, and the things that he contributed to the space program.

Two weeks later we had an idea; the last program he was working on was Radarsat II. The Electronics Control Unit (ECU) had some space on it where a message could possibly be etched. We asked Karla if the children would like to put a message on the cover that would be going up to the heavens to circle the earth. When Karla said yes, we called Gary Heinemann, the Project Manager on Radarsat II, and asked if we could put a small message on the box. The call came back the next day. They had checked with MacDonald Dettwiler. Gary's words were emphatic, "You put a message on there and make it as big as you can!" Karla and the kids each wrote a personal message, which was then etched onto the cover of the ECU, visible on the spacecraft for all to see.

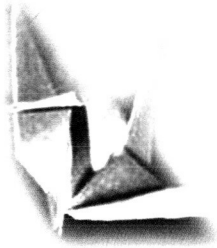
A month afterwards, Karla asked if the family could come to Starsys to say thank you. With the company in the meeting room, Karla talked about how hard the month had been and how thankful she was for the people of Starsys and what they had done. Then she explained that the children had a gift for us. Over the next 10 minutes they quietly walked up to each of us, said thank you, and handed us an origami crane that they had made. It was an emotional closure to a very rough month. Just about every office in the company still has one of the cranes in some special place as a reminder of Kurt.

So life continues. Karla and the kids remain connected to Starsys and come to the company parties and events. Since the loss, quite a few people have made a point of stopping me and expressing a different version of the same message: "I never understood what people meant when they said Starsys was a 'family.' Now I know." •

"I never understood what people meant when they said Starsys was a 'family.' Now I know."



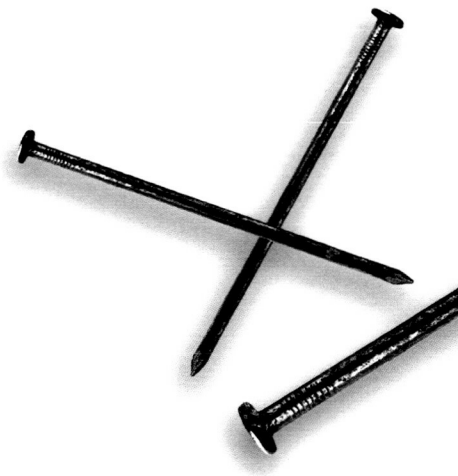
SCOTT TIBBITTS IS THE PRESIDENT OF STARSYS RESEARCH IN BOULDER, COLORADO. HIS STORY, "AS SMALL AS POSSIBLE," APPEARED IN *ASK 13*. ALONG WITH RAY MORGAN, TIBBITTS JOINS W. SCOTT CAMERON AND TERRY LITTLE AS FEATURE WRITERS FOR *ASK*, WHO WILL NOW APPEAR IN ALTERNATE ISSUES.




Coming
of Age

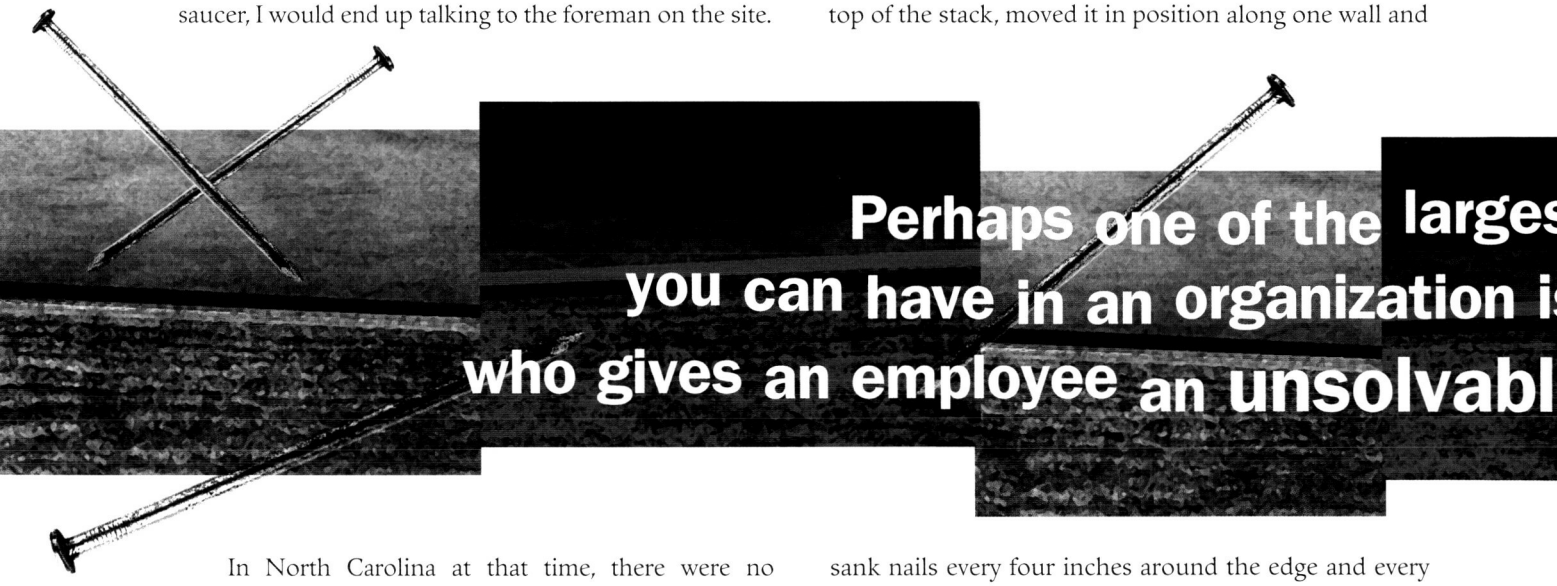
One of the great perks I looked forward to when I turned sixteen was being able to give up my paper route and get a regular job. Paper routes are okay, but for a young, timid kid who was afraid to ask for money, it often proved to be a non-profit operation. At age sixteen, I could get a social security number, which meant that I could go get myself a real job.

BY RAY MORGAN



THE FIRST DAY OF SUMMER VACATION THAT YEAR, I RETIRED from the paper route that had been in my family for nearly a decade (passed down brother to brother) and I became a free agent. I had always wanted to be a carpenter. I don't know if it was because I just liked the idea of working with wood, or if the ability to use noisy, masculine tools like a hammer and a power saw just made me feel more like a man, but, at sixteen, I saw carpentry as the ultimate job.

I didn't have much of a plan, so I simply drove around to different construction sites that I found on the outskirts of Greensboro, North Carolina. I would walk around the site, telling whoever I saw I was looking for a job, and eventually, just like an alien is always directed to the leader of a country after deplaning from his flying saucer, I would end up talking to the foreman on the site.



In North Carolina at that time, there were no construction unions; hence, almost anyone who owned a hammer and a screwdriver could call himself a carpenter and have a fair chance of getting hired. Minimum wage was $1.25 an hour; most "unknown" workers, however, started even lower. One Mr. O.J. Wray decided to take a chance and hired me at $1.10 an hour to work as a finish carpenter's helper. I actually didn't even own a hammer at that point.

When O.J. told me my job title, at first I imagined working alongside a journeyman carpenter as his apprentice, and learning the skills of the ages. (Why, I bet by the end of the summer I would probably know enough to build my own house! My mom would be very proud.) What I found out, though, was that a helper basically was assigned to do hard or dirty jobs others didn't want.

Initially, I cleared out leftovers from inside the house and piled them in scrap heaps, swept dust from the floors, and cleaned out corners where "other carpenters" had taken a pee—with only occasional chances to work with anyone who actually made things from wood.

One morning, I was finally given a chance to advance my skills. O.J. needed someone to put down the plywood under-flooring for linoleum that was to be laid in a kitchen and dining room. O.J. was not given to wasting words or time. He told me to bring my tools (by this time I had acquired a hammer, a nail set, and a screwdriver) and follow him to another house in a nearby development, where O.J. gave me my first taste of on-the-job training.

In the house, we found a stack of A-D grade, ½-inch fir plywood, along with a box of 8-penny, cement-coated nails. O.J. slid a sheet of plywood off the top of the stack, moved it in position along one wall and sank nails every four inches around the edge and every eight inches through the middle, permanently bonding it to the 1-by-4 fir sub-flooring. I was amazed how he rarely took more than two blows of the hammer to drive a nail, one to set and one to sink, with no apparent effort. When he had me do it, I took about ten hits with the hammer for each nail.

After taking a little time out to ridicule my hammer technique, O.J. took a look at the pile of plywood, noticing that the good, or "A," side of the next piece was up and that the "D" side (with all the knotholes) was down. He gave me explicit instructions: "Take that plywood off the stack just as it sits—do NOT turn it over."

O.J. left me there alone to finish laying the kitchen and dining area that morning, before lunch. Although it bothered me when I saw that many of the sheets had knotholes showing on the top, I was desperate to prove I could do a good job, just as I had been told, and I wasn't

about to turn one of the sheets over and get chewed out for it. I assumed that O.J. knew something about the wood that I couldn't comprehend, and that the holes in the top didn't really matter once the matting and linoleum were laid over them.

To avoid the ugly part of this story, just let me say that it took me three days to get up what only took me three hours to put down. I learned a great respect for cement-coated nails. Using a crowbar, each sheet of the fir plywood came up in small pieces, and most of the nails had to be pulled out separately.

What made it worse for me, though, was the shame and unfairness. O.J. had come back late in the day to see what I had done. He assumed that I had ignored his instructions about turning the plywood over, and he never deigned to speak to me directly again. Instead, he

talked about me to the other carpenters, ridiculing my skills and intelligence.

The other carpenters, of course, wouldn't believe my protests about doing just as I had been instructed; they simply smiled and shook their heads when I tried to explain. I ached for the chance to explain myself to O.J., but he never even acknowledged my presence after that event. The humiliation was so bad, the next rainy day I left and went looking for another job.

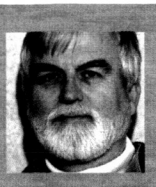
O.J. made several mistakes. Obviously, he failed to explain to me his goal, or aim, of creating a perfectly smooth surface for the linoleum, so that holes and gaps would not show through the flooring later on. Secondly, he wrongly assumed that all the "A" sides of the plywood faced up. Old O.J. jumped to the conclusion that because the first three sheets of the stack had the "A", or smooth side, up, that all the rest of the sheets shared the same orientation. In fact, they did not; most of them had the "D" side up, with lots of voids where knotholes had fallen out.

But an overarching mistake, and one that was a little less visible (but more endemic throughout the business and government world) was that he "over-constrained" the problem. Left to my own intelligence, even without telling me to put the smooth side up, I would have flipped over the plywood that was upside down, just because it looked bad to me. But, because he constrained me with explicit directions not to turn the plywood over, and because I had no direct access to him to challenge this constraint when it became a problem, I was unable to solve the problem using my own brain.

I have seen this situation of over-constraining a problem by absent decision makers, preventing its solution, played out over and over in many organizations. To me, this is a form of delegating responsibility without authority. This paradox is also a predominant source of stress at work, and is perhaps one of the largest morale breakers you can have in an organization: a manager who gives an employee an unsolvable problem.

In my early days of running a division and having my own employees, I'm sad to say that I emulated that behavior more than once. At the time, I rationalized it. Now, I know how wrong I was, and how I may have ruined the morale of employees who only wanted to do good work. I recognize that almost every time I didn't get what I wanted from an employee, it was because they didn't understand what I really expected from them, they didn't understand how to provide it, or there were constraints placed on them that stopped them from doing a good job.

I am sure O.J. is long dead and gone. He wasn't young when I worked for him. I think he would have been amazed to learn what a long-lasting effect his behavior that week in 1963 had on me. •



RAY MORGAN is head of Morgan Aircraft & Consulting and a senior technical advisor to NASA. He has published several articles in *ASK Magazine*. His most previous, "PERT Charts Take Precedence," appeared in Issue 11. Along with Scott Tibbitts, Morgan joins W. Scott Cameron and Terry Little as feature writers for *ASK*, who will now appear in alternate issues.

The Accelerating Leadership Option (ALO) combines business management and systems engineering studies at the Massachusetts Institute of Technology (MIT), culminating in a Master of Science degree, with a one-year developmental assignment. But the real result of ALO is a dynamic group of leaders who will shape the future of NASA and its impact on the world.

The ALO program accelerates the development process of exceptionally promising NASA project leaders to positions of increased responsibility. Participants in the elite program are selected because of their technical expertise and proven leadership abilities. Through ALO, APPL provides an opportunity for these mid-level project managers to learn with the best and from the best.

The first ALO class entered the program in 2000. In addition to earning their MIT degrees, recent participants have completed developmental activities with IBM, Raytheon Corporation, EMC Corporation, Aerospace Corporation, National Reconnaissance Office, NASA Headquarters Office of Earth Science, NASA Headquarters Office of Aerospace Technology, and the International Space Station Program Office. The goal of this phase of the program is to arrange an assignment that is centrally involved with the mission of the participant's home center, and that takes advantage of the graduate's training while providing new challenges.

Following center and agency approval, applicants must be accepted by both the ALO program and MIT's graduate school. APPL provides the funding for participants' academic expenses, and centers support the developmental assignments.

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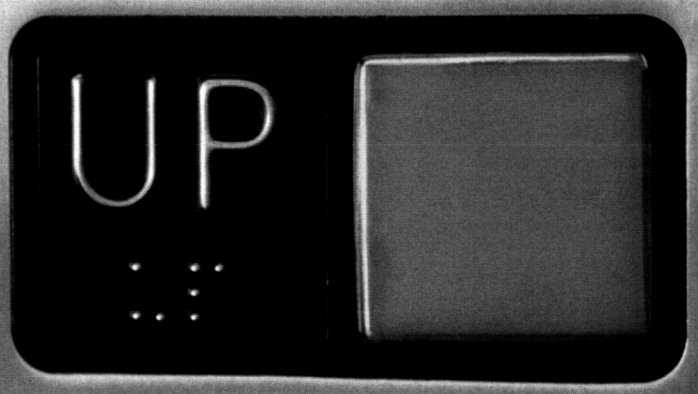


by Freddie Douglas III

AFTER A LONG DAY OF TRAVEL, I FOUND MYSELF IN A HOTEL elevator. I had recently graduated from NASA's Accelerated Learning Option (ALO) at MIT, and I was proudly wearing my new school tee shirt and baseball hat. Another man got on the elevator, turned to me and asked, "When did you get your brass rat?" I understood the reference to the school's mascot, and I told my elevator companion that I had just graduated in 2002. Then the elevator door opened and we parted ways.

Sometimes, we in NASA are so close to the effort that we lose sight of the true value of our work and how important it is for each one of us to be able to explain that value confidently and with conviction.

Two days later, the same gentleman approached me, mentioned MIT and then asked where I worked. I responded proudly, "NASA—Stennis Space Center." After twenty years of NASA service, I was prepared to respond to what usually came next: "Where is Stennis? What do you do? It must be great to work for NASA." That was not the case this time.

The conversation turned immediately into an attack on NASA. "The Agency," the man told me, "is a waste of tax dollars. It should be disbanded and turned over to the private sector." He was very upset that NASA hasn't reduced the cost of getting payloads into orbit in order to make feasible the commercialization of space. He demanded to know why NASA hasn't made space tourism a reality.

I gave my tried-and-true response: "NASA's missions return great value because they help improve life here on earth." But this time, my response fell on deaf ears; the man was clearly angry that NASA hasn't opened space to the public. In the past, I might have continued to try to give an easy answer, blaming Congress or something like that. But since entering the ALO program, I've come to accept that providing easy answers rarely answers the real questions.

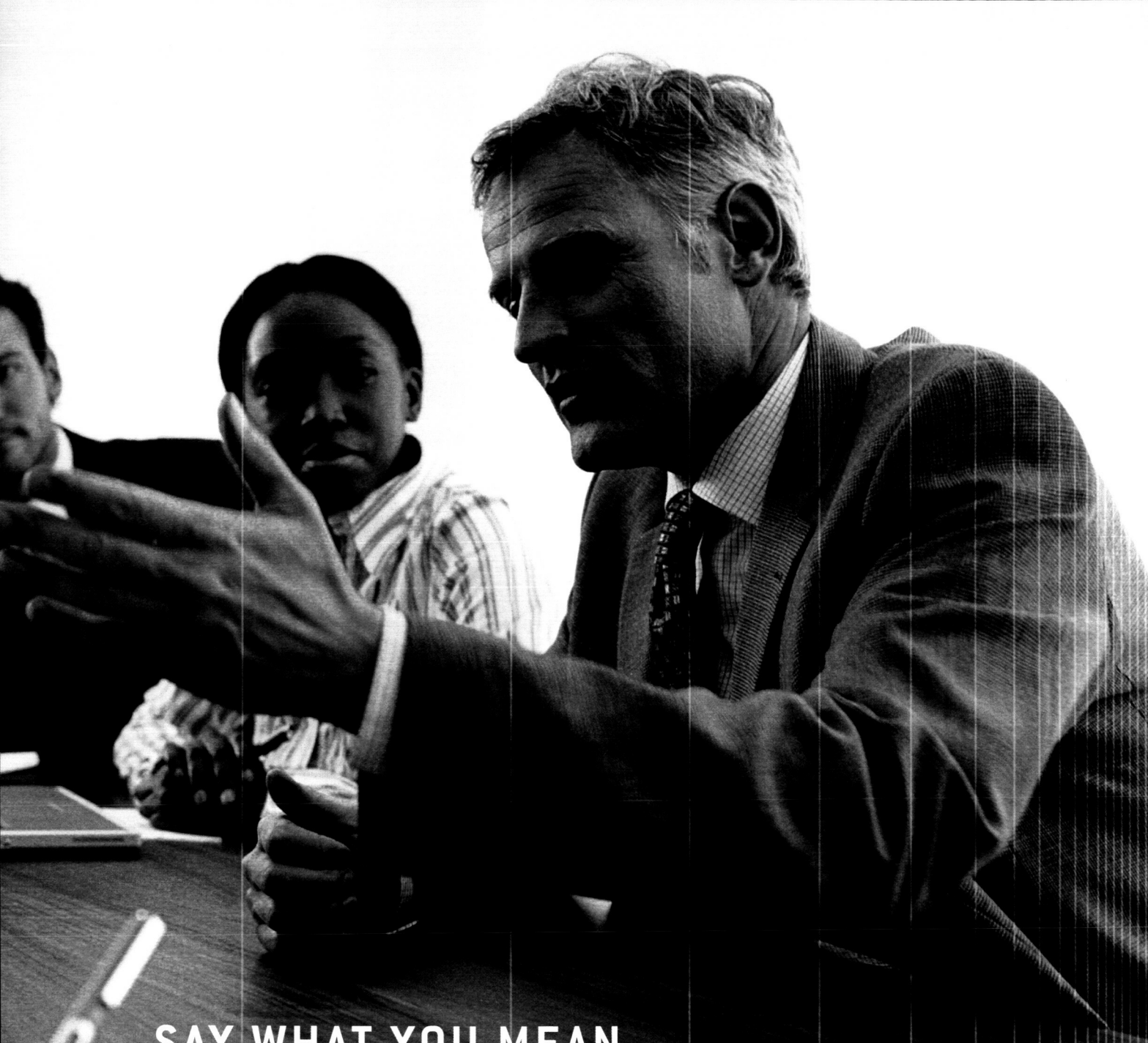
I gave his questions more thought, analyzing them the way I had learned to during my tenure at MIT. I then posed a question to him: "If you expect NASA to commercialize space, have you considered how value is derived from the process?" I explained that the commercialization of space is a function of reducing the cost of getting payloads to orbit via new launch vehicle architectures. Little of this made sense to the businessman with whom I was speaking, until I restated this position in economic terms: markets, profits, value, and customer. I won't go into the details of the discussion that ensued, but I will say that it could never have taken place before I attended ALO.

Sometimes, we in NASA are so close to the effort that we lose sight of the true value of our work and how important it is for each one of us to be able to explain that value confidently and with conviction. Since completing the ALO program, I have given my work more thought, and have realized that it's not enough that we do our best here at NASA to deliver cost-effective, high quality services. We need to focus our cost effectiveness and quality efforts on the things that matter to the customer. Yes, we need to deliver technically accurate services on time and within budget, but we also need to consider the big picture of value delivery, we need to address how specific stakeholders view value, and we need to concentrate our efforts where we add value for our stakeholders.

We need to focus our cost effectiveness and quality efforts on the things that matter to the customer.

That broader view, I would argue, is just the beginning of the return on NASA's investment in me. •

FREDDIE DOUGLAS III completed the APPL Accelerating Leadership Option (ALO) program in 2002, obtaining a Master of Science degree in Engineering and Management at the Massachusetts Institute of Technology. He is currently the head of the Systems Management Office at NASA's John C. Stennis Space Center in Mississippi. He can be contacted at freddie.douglas-1@nasa.gov.



SAY WHAT YOU MEAN

BY LYNDA RUTLEDGE

WHEN I FIRST STARTED WORKING FOR THE AIR FORCE, I HAD A HARD TIME UNDERSTANDING HOW WE MAKE OUR SOURCE SELECTIONS.

WE HAND THE CONTRACTORS A REQUEST FOR PROPOSAL (RFP), AND WE DON'T TALK TO THEM A LOT AFTER THAT. THEY COME BACK AND HAND US THEIR PROPOSAL; WE TAKE IT AND EVALUATE IT. WE WRITE DOWN WHAT WE THINK IS WRONG WITH THE PROPOSAL—AGAIN, WE DON'T TALK TO THEM—AND, AFTER THEY REVIEW OUR COMMENTS, THEY HAND US BACK A WRITTEN RESPONSE.

AFTER ONE OF THESE EXCHANGES, I ASKED A CONTRACTING OFFICER, "WELL, WHY CAN'T WE JUST ASK THEM QUESTIONS?"

HE SAID, "OH NO, YOU CAN'T DO THAT. YOU MIGHT ASK THE WRONG THING."

THINK ABOUT IT. WHEN WE GO OUT TO BUY A CAR, WE would never hand over a sealed bid and pass information back and forth in writing without asking the salesman a few questions about features or the way the car handles. Not asking questions when we're buying something that's never been built before seems even more ludicrous to me. After source selection, we ask questions, and the contractors answer us. We do this on a daily basis—so, why would we do anything differently during source selections when such openness could be of tremendous benefit to the project?

WHEN YOU START SORTING THROUGH ALL THESE LAYERS YOU REALIZE THERE REALLY AREN'T A WHOLE LOT OF RULES THERE. WE'VE PUT THESE CONSTRAINTS ON OURSELVES.

The source selection is intended to be non-confrontational. The way I look at it, confrontation makes sense while you can still do something to prevent a misunderstanding and you can avoid making a costly mistake. I can tell you all about the impact of a misunderstanding during the source selection phase. I've been on a program in which the source selection process was protested, and it was costly and painful.

Some of this don't-talk policy comes down from the Federal Acquisition Regulations, and then flows down through Defense Federal Acquisition Regulations, and then ultimately to the Air Force. When you start sorting through all these layers you realize there really aren't a whole lot of rules there. We've put these constraints on ourselves.

DOING THINGS DIFFERENTLY

When I finally got a program of my own to manage, the Small Diameter Bomb (SDB), I decided I wanted to do things differently. At this point, I had already been on one program that attempted to do source selections differently—including using oral presentations to allow contractors to make their proposals. Unfortunately, we had to make so many concessions to appease the contracting officer, who worried about a protest and the resulting political fallout, that doing things differently added very little value.

I had no stomach for revisiting that argument again, but on SDB I put forward an acquisition strategy that was much more aggressive in schedule than any of our weapons systems that we had fielded from scratch. Integral to my acquisition strategy was to get through source selection very quickly. In order to do that, we had to change the way we did business.

When I started to brief management on my strategy, I decided to be straightforward about my intention to do an open source selection with real time discussions. I had a bullet on one of my slides that said:

- Oral proposals with real-time discussions

I thought, well, if I can sell it to the head of contracting, I'm probably safe. During my brief, I watched his face to see if he cringed. No reaction. I stood there for a few seconds more.

"What I mean by this," I said, "is that we're going to all sit in a room together, and the contractors are going to give their proposals, and we're going to ask them questions."

He said, "I understand you."

I usually don't ask permission, I just ask forgiveness, as the saying goes—but in this case I couldn't believe my ears. I said, "So, you don't think anyone is going to have a problem with this?" He said, "No. Go ahead. Try it. Let us know how it works."

I thought, declare victory, uncork the champagne; but that was somewhat premature.

Next stop was our industry partners. I thought they were going to love this. All I've ever heard from them is, "Government never communicates what it really wants in an RFP."

So, I told them this: "There will be no big written volumes that you have to submit, not even for costs. Everything is going to be done orally, the same way that you do business with us every day after source selection. We're going to sit in a room together and we're going to hash things out until we understand one another. Then we're going to give you your evaluation. We'll tell you everything along the way."

I wasn't ready for their reaction. They started shifting in their seats and looked uncomfortable. I said, "Well, what's wrong? You've always said that we don't communicate well in our RFPs."

A vice president of one of the companies said, "What if one of my guys screws up and says the wrong thing?"

I said, "If he's the one that knows the technical business, if he's the one who is the expert who can answer the questions, then that's who you need to put up there. And you need to trust us."

Again, the fidgeting started.

"You will have the right to strike anything from the record you don't want," I said.

They still didn't know if they liked it. We listened to a lot of "what-ifs." Finally, I said, "I hear your concerns. I understand them. I'll take full responsibility for this if it doesn't work out."

STRAIGHT SPEAK

First, we did a dry run. Each of the three contractors competing for the award had the opportunity to give an eight-hour briefing, just as they would when the stakes were for real. Ultimately, the contract we signed was going to be based on their updated briefing charts.

In the dry run, we gave them candid feedback. We told them what we thought they had done wrong, what they misunderstood in the RFP, and they were then able to say to us, "When you said in your RFP this statement, that's what it meant to us."

We said, "Well then, how can we modify our RFP so you understand what we mean?" And they told us.

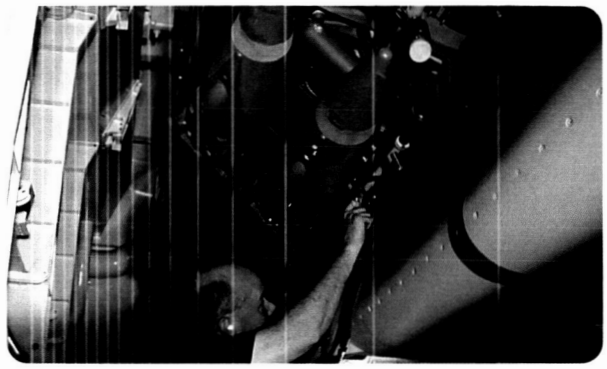
There were two things we got out of that. Number one, the contractors better understood what we were asking for. Number two, we understood better how they were interpreting our RFP, so that we could clarify our document.

We gave them their feedback and said, "Here is where we think you are. Here is what we rank you as of right now." They had the opportunity to say, "We disagree with you." We did change some scores based on information that we got. Sometimes we upgraded them. One time we actually downgraded a contractor.

Some said, "I still think you don't understand; you got it wrong, and I think I should have a better score than you gave me." As part of the dry runs, we allowed them to appeal to the source selection authority and gave them the opportunity to tell their side of the story. The source selection authority was able to ask questions and uncover details about what we had done and why we had done it. Ultimately, as a result of that process, some of the scores did change. It didn't change the overall outcome of the source selection, but the contractors felt that they had been heard.

Doing the dry runs made the contractors feel a lot more comfortable. When it came time to hold the official oral presentations, no one complained that the process was unfair. No one protested.

Afterwards, I called up some of the contractors who weren't selected and asked, "Well, are you going to ask for your day in court with the source selection authority?" They all said no. The process was fair, they agreed.



THE BOEING COMPANY

A technician mounts the Small Diameter Bomb for deployment.

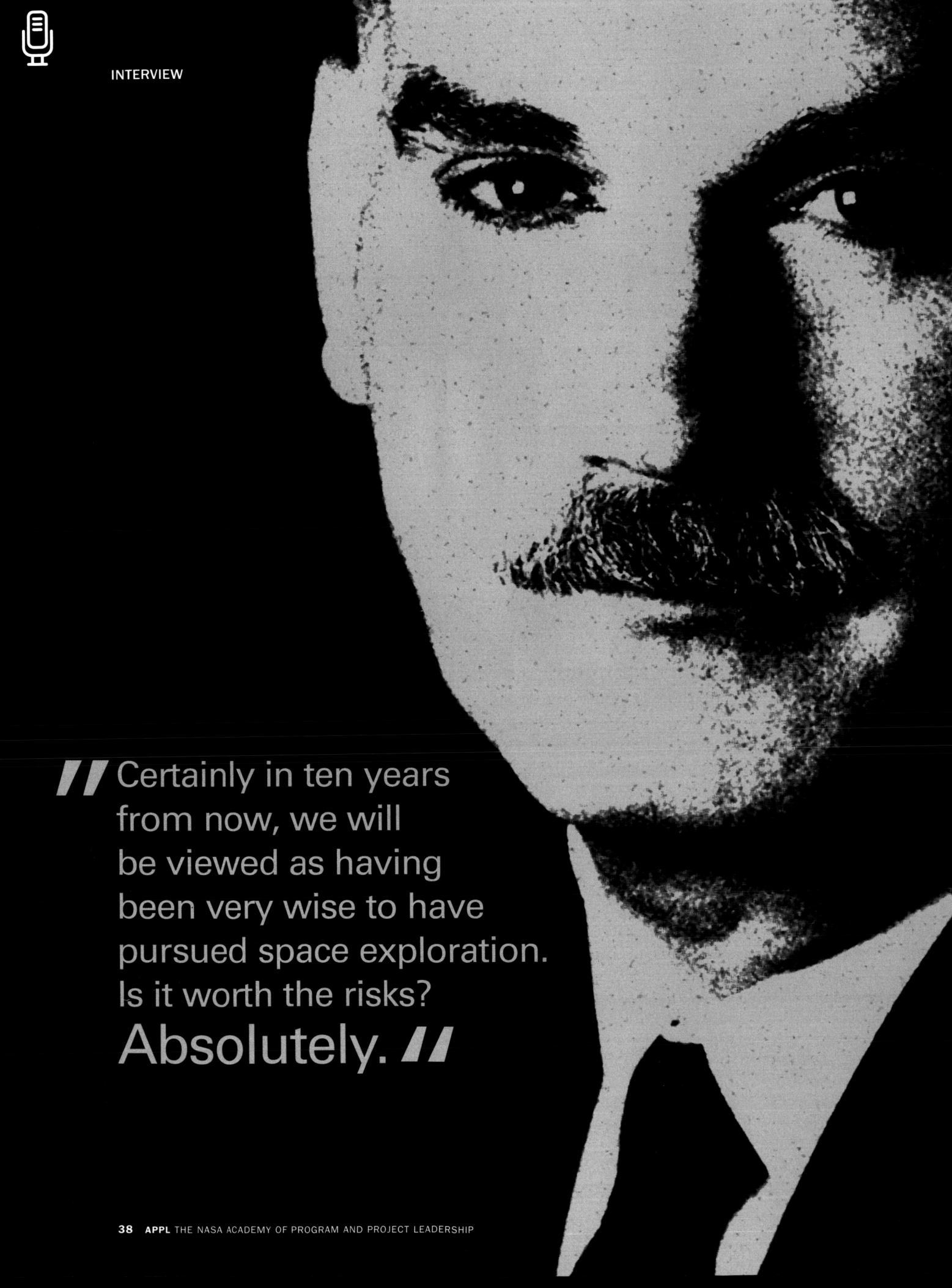
Doing a source selection this way isn't just about saving time and killing fewer trees; I chose to use this approach in part because I like to talk to people and look them in the eye. It goes with my straight-speak approach to project management. I'll tell you exactly what I'm thinking, and I expect you to do the same. It sets the tone for the kind of relationship I want to have with my contractors after the selection, and I think it has an impact on results, too. Communication is the key to success; so why wait to get the talking started? •

NO TRANSLATION NECESSARY

"Besides English, LYNDA RUTLEDGE is fluent in two languages, Spanish and straight-speak," says Terry Little, who has worked with Rutledge on the Joint Air to Surface Standoff Missile (JASSM) program. "Now, there is no country named Straight-speak. In fact, the language of straight-speak has almost gone the way of Latin in our business, at least in the Department of Defense."

Rutledge began her Air Force career in 1989 as a mathematician in the Freeman Mathematical Laboratory. She later transferred to JASSM as a systems engineer, and then managed the concept exploration and planning of what is now the Small Diameter Bomb (SDB) program. She served as the SDB Program Manager at Eglin Air Force Base in Florida until March 2002. She is currently Deputy Director of the Precision Strike System Program Office at Eglin.

"I think one of the most refreshing things about Lynda," adds Little, "is that she says what's on her mind. She says it clearly, and she says it without equivocation. That, it seems to me, is at the root of why she has so much credibility in the Defense acquisition community."



"Certainly in ten years from now, we will be viewed as having been very wise to have pursued space exploration. Is it worth the risks? Absolutely."

ASK talks with

WILLIAM READDY

As Associate Administrator for Space Flight at NASA, William Readdy has spent much of the last year addressing Agency plans for future Shuttle missions in the wake of the *Columbia* accident. But Readdy's connection to the Shuttle dates back much farther. A member of the astronaut corps since 1987, he has logged 672 hours in space on three Shuttle missions (STS-42, STS-51, and STS-79).

READDY GRADUATED FROM THE UNITED STATES NAVAL Academy in 1974. After eleven years service as a naval aviator and test pilot, he joined NASA in 1986 as a research pilot. His technical assignments to date have included Training and Safety Officer, Orbiter project staff; NASA Director of Operations in Star City, Russia; and Space Shuttle Program Development Manager.

Mr. Readdy is the recipient of the Distinguished Flying Cross; Space Flight Safety Award; NASA's Distinguished Service Medal; two NASA Outstanding Leadership medals; two NASA Exceptional Service medals; three NASA Space Flight medals; the Legion of Merit; the Meritorious Service Medal; Navy Commendation, Achievement, and Expeditionary medals; two National Defense Service medals; the Armed Forces Expeditionary and Reserve medals; and various unit and service awards.

On August 6, 2002, NASA Administrator Sean O'Keefe named Readdy the Associate Administrator for Space Flight.

Pilot Stephen Oswald, Commander Ronald Grabe, and Mission Specialist William Readdy show school spirit aboard Discovery *on STS-42.*

***In addition to your current work, you remain a member of the astronaut corps. Clearly, the loss of the* Columbia *hit close to home for you. Has it been difficult to listen to the criticism aimed at NASA in the wake of* Columbia?**
Faced with a situation like this, you can either be defensive or you can be receptive. Maybe all of the input that you'll get won't be exactly correct, but if you focus on what's not perfect in what you're hearing, then you don't learn.

We (NASA) need to learn from this experience. Even bad situations like this one can be good learning experiences.

If there's one thing that I've learned from STS-107, it's that when you get too pleased with how you're doing, that's when you really need to start feeling uncomfortable that you're missing something.

When you addressed the Return to Flight team last year, you emphasized the importance of forging new leadership for NASA's space flight missions. How have you set out to accomplish that?
The first thing I tried to do was to articulate those qualities, those attributes that I wanted in our leadership.

One of the things that I realized was that I wanted someone with broad experience to manage the Shuttle program. At the very top of the list of what I was looking for—in addition to the broad background—had to be the leadership, the integrity, and the people skills to be able to manage a program across all of the different populations of projects, programs, Centers, and contractors.

At the end of the day, my selection was Bill Parsons—not your traditional mold of someone who has gone up through the project management ranks, or someone who has been brought up in engineering or in mission operations, but somebody with a very broad background ideally suited to fit this position.

I'm not saying that there was only one single person in the whole Western Hemisphere who could do the job. There were other people with those skills—but many of them absolutely had to stay in their current positions because they were essential to other aspects of Return to Flight. They had such unique skill sets; we couldn't move them without causing other dominos to fall.

How did the project community receive your selection?
I have to tell you that there were a lot of people who were blown away by the selection, because it was so far "outside the box." It wasn't a traditional selection.

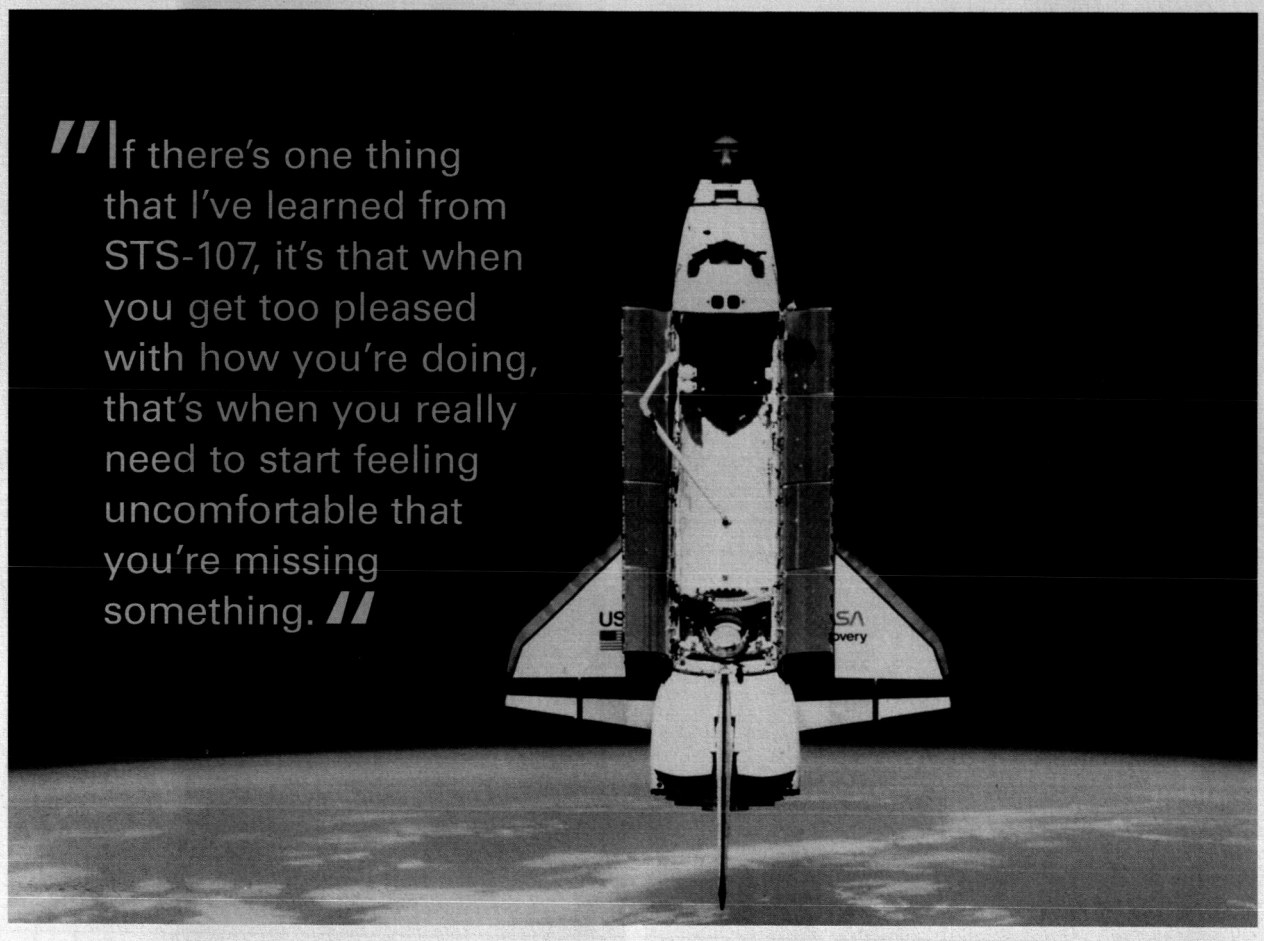
There were a number of different considerations that went into all the selections I have made post-*Columbia*. I think that points to a couple of things. One is that before you get into thinking about who you want to fill a position, you need to be thinking about what skill set, what attributes, what qualities you're looking for.

An experience like this must force you to reflect on your own responsibility as a leader. It's not just a matter of what NASA needs to do, but what does William Readdy need to do?

The thing to do is to use the people around you as sounding boards. When you're grappling with a problem, the first assumption you have to make is that your problem is not completely unique. That people have dealt with similar problems before—maybe not in your organization, but in another organization, in another company, in another place—maybe another time.

Theodore Roosevelt. There is a book, *Lincoln on Leadership;* it's a spectacular book that I've gotten a lot of insight from. We're experiencing some of the same problems that Lincoln had with his leaders. People haven't changed fundamentally, and they've been solving problems since time immemorial.

Again, the first thing to understand is that your problem is probably not totally unique, no matter what the problem. As tragic and horrific on an Agency and personal level as STS-107 was, it was not absolutely unique, in terms of how to deal with it.



Space Shuttle Discovery *opens its cargo bay doors during STS-51. William Readdy piloted the mission in September 1993.*

I don't hesitate to ask for advice. I seek out mentors. Sometimes it's people that have dealt with the same problem. Usually, older, wiser people, but not always. Sometimes it's mentors in the form of books.

If you take a look at my library, you won't find a lot of program management books. An awful lot of the books I read are by people like Ben Franklin and

Did you always want to work for NASA? Is your interest in space exploration something that dates back to when you were a child?

It started in third grade, listening to John Glenn's flight on the public address system in my school. We were all in the cafeteria listening. I wasn't paying attention. My teacher whacked me on the knuckles

and told me to pay attention; she told me that this was really important stuff.

I started paying attention. During the Apollo years, I followed every single one of those missions down in my basement watching on the TV and following the news.

What did you hear in that John Glenn broadcast after you got your knuckles rapped? What captured your imagination?

Actually, I think it was the attention I got from the teacher.

On top of that, I remember even at the time being aware that there was real drama associated with the flight, and not just the excitement of the liftoff, but every part of it. It was just something that made a big impression at the time. Eventually, many years later, I got to meet John Glenn.

So you were hooked on space flight?

After Apollo, there was a hiatus. By that time, I was starting to fly in the Navy, and I guess I lost track of what was happening in space.

I just wasn't paying much attention at all to NASA, except that I remember some of the Shuttle development work—hearing about people flying the approach and landing tests. I remember thinking that was a dream job for a test pilot.

Eventually, I became a Navy test pilot myself. The first thing they did was to take us down to the Johnson Space Center as they were preparing for the STS-1 mission. I knew then that was something that I had to do.

What do you consider your biggest challenge now at this stage of your career as Associate Administrator? What gets you passionate now?

I think it's still our missions. The missions that we do are so special. Take human space flight or Shuttle, for example. There is a tendency, certainly in this town and elsewhere, as well, to view this kind of work as been-there, done-that, got-the-t-shirt work.

I think that most of that evaporated on the morning of February 1, 2003 when people realized this is really tough stuff. There was nothing routine about it, and there won't be in the near future.

If you think about the 8½ minutes of the Shuttle's ascent and about the hour or so of reentry, and then the five minutes as a fly-by-wire, 100-ton glider, we probably have about 120 or so hours, total, of dynamic flight in all of Shuttle history. Compare that to the thousands and thousands of hours that you would have before you would field a new generation fighter or a commercial airplane.

This is the first generation really of space travel. We're still learning a lot.

The Space Shuttle Atlantis *(STS-79) roars into the night on liftoff, September 16, 1996. Leading the crew is Commander William Readdy.*

What is your response to the naysayers who believe it's too risky to put people in space? Why have manned missions?
We, believe me, are very aware of what the risks are, even if everybody else isn't. Certainly our families are. We think it's worth it. We continue to learn more and more things. We continue to make that foundation that will allow us to push back the boundaries of the unknown. Ultimately, though, it's not about us. It's about the future—the future we'll leave behind for our kids.

Do you worry that the public has become less enamored of space exploration?
No, I don't. But I also know that we have a continuing obligation to communicate and educate the public. There is no doubt about that.

Every time I go out and talk to people, I ask them how much they think our country spends on space. I start out by saying, "Okay, here is your Federal tax dollar. How much of this goes to space? Thirty cents on the dollar? Twenty cents on the dollar?" Typically all the hands in the room are up by the time I get to ten cents on the dollar.

Then I tell them it's less than a penny for all of NASA, before we start getting even lower than that to what actually goes to human space flight. They're always astounded the number is so low.

When I think of the benefits that we've already derived from space exploration over the last few decades, and the investment that we've made in our future, it astounds me, as well. And there is so much more to come.

I believe that an International Space Station will be blindingly successful, far beyond Hubble Space Telescope's success even, in terms of relevance to people all over the world. We can't afford to turn our backs on the program.

I think we'll hear a resounding "yes" at the end of the day. Certainly in ten years from now, we will be viewed as having been very wise to have pursued space exploration. Is it worth the risks? Absolutely.

How do we get from where we are today, to where you see us going?
We need to be determined to meet our Return to Flight objectives. This will be a process that we will need to recalibrate and recertify each and every day. We will have to earn back trust one day at a time, one launch at a time, one mission at a time, and one landing at a time. This is exactly what I've told my Return to Flight team.

But, of course, you can talk all you want, and if that's not how you comport yourself, if that's not how you actually live, then it won't have any lasting credibility. As individuals and as an Agency, we must be anxious to learn from our mistakes, and we must be persistent in the face of adversity. Few will remember what we said, but it is my fondest hope that years from now, all will marvel at what we, together, have done. •

The Eye Cannot See Itself

For learning to take place, we must recognize the gap between our espoused theories and our actual behavior

A CLOSE COLLEAGUE OF MINE HAS TAUGHT AND WRITTEN extensively about strategic planning and project planning. In fact, he is regarded as an expert on these subjects. Observe his actual behavior, however, and it is clear that he is a very poor planner indeed. Rarely does he take time to plan anything systematically. What's more, my friend was completely unaware of this wide gap between his espoused theory and his "theory-in-use," until I felt obliged to point this out to him.

Unfortunately, unawareness seems to be the norm rather than the exception. Let me offer another example, this one about myself. In 1991, following seven years of extensive research on project planning in a dynamic environment, I was ready to test my research results. Procter & Gamble (P&G) met my requirements for a successful organization operating in a dynamic environment. My key message to P&G was this: "Project success depends primarily on planning and control, which accommodate uncertainty." I stressed the need for successive refinements of plans, for experimenting, for prototyping, and for managing by moving about.

As I started interacting with individuals and teams, I found that the most experienced and successful project managers had already applied many of my concepts, though not always in the most systematic and formal manner. That was expected and fell in line with my charter. I was supposed to try and introduce these concepts in a formal way throughout the company.

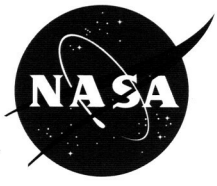
What I didn't anticipate is that these experienced and successful project managers applied a major concept that was not part of my arsenal. They practiced teamwork. I observed through my own eyes how they all behaved on the job. They spent a great deal of effort to develop teamwork based on trust and mutual interdependence. They practiced it religiously, and it was central to the way they managed their projects.

I received the message directly from so many different individuals and always in an unambiguous way. It was almost impossible to ignore the importance of teamwork. It was clear that I would have to change my message. More importantly, I had to change my mindset, quickly and fundamentally. And I did. The only difficult thing to understand was why I hadn't already recognized the value of teamwork to project success.

They all spent a great deal of effort to develop teamwork based on trust and mutual interdependence.

During the 1970s, prior to joining university life, I worked for about eight years as a practitioner, first as a project engineer and later as a project manager. Looking back, I saw that my implicit "theory in use" as a practitioner was trust-based teamwork. But when I started my career as a researcher I somehow—without any noticeable difficulty—assumed the prevailing academic mindset in construction management circles, which at the time completely ignored teamwork.

But how had I lived for more than ten years without recognizing the gap between my own theory-in-use and my espoused theory? Peter Senge, from MIT, asserts that this gap is quite common, and explains that it is difficult to notice your own theory-in-use because "the eye cannot see itself." Senge suggests that you may want to ask the help of a good friend, a "ruthlessly compassionate" friend, to help you recognize your theory-in-use. I could have used such a friend ten years earlier. As did my friend, whom I started this story by telling you about. •



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