"Courage is resistance to fear, mastery of fear—
not absence of fear."

Mark Twain

We at ASK Magazine offer our condolences to all those who have suffered directly or indirectly because of the horrible events on September 11. Please remember we are stronger together than any of us alone. Keep this with you and gather courage from it.

Dr. Edward Hoffman
APPL Director

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How Big Is Your Project World?
by Todd Post

How big is your project world? Is it big enough to contain other cultures, head-quarters, hierarchies, and weird harpoon-like guns? Sure it is. The great American poet Walt Whitman said it best, "I am large/ I contain multitudes." And so must you, Mr. and Ms. Project Manager.

In this issue of ASK, we look outside the project box. See how several talented project managers have expanded their definition of project scope to include managing environments outside the systems and subsystems under their care.

Here's a sampling of what we've put together for you this issue:

In "Three Screws Missing," Mike Skidmore tells about his adventures at the Plesetek Cosmodrome in northern Russia. Mike was Project Manager of the NASA contingent on this joint sponsored research mission with the Russian Space Agency. A winter launch made working under stressful conditions unavoidable. Read how a good project manager who wants to get the job done no matter what has no choice but to adapt.

Ray Morgan in his story, "Our Man in Kauai," suggests we take a broader view of what's meant by "the team." On Ray's project, the Pathfinder solar-powered airplane, his definition of the team was not satisfactory if all this meant was the folks on salary. Read how Ray and his NASA sponsors worked with the native peoples in Kauai to achieve a high altitude world record flight, and why it might never have occurred without everyone working together.

Jenny Baer-Riedhart, the NASA program manager on the same Pathfinder solar-powered airplane, schools us in how to sell a program to Headquarters in "Know Thyself—But Don't Forget to Learn About the Customer Too." Prior to its amazing trajectory into the stratosphere, Pathfinder might never have gotten off the ground had Jenny been working less diligently to gain the support of Headquarters.

Scott Cameron of Proctor and Gamble, one of our two regular Feature writers, talks about sharpening your hierarchical IQ in "The Project Manager and the Hour Glass." See how you measure up when it comes to working with your hierarchy. Learn from Scott's 30 years of project management experience on getting along better with hierarchy and thus increasing the odds of your project's success.

Mike Jansen in "The Lawn Dart" describes how he and the "voodoo crew" on the Space Shuttle Advanced Solid Rocket Motor program borrowed a harpoon-like gun from the Coast Guard to catch particles inside of a plume. Why? Because they thought it would work. Find out if it did. How big is your project world? In this case, apparently, as large as your imagination will allow.

These are just some of the stories you'll find in ASK this issue. We hope they

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(CONTINUED)   ## How Big Is Your Project World?

cause you to stop and reflect on your own project's relationship to the world outside. We are also launching a new section this issue, There are No Mistakes, Only Lessons. No stranger to ASK readers, Terry Little inaugurates this new section with his article "The Don Quixote Complex."

Hope you find plenty of learning opportunities this issue. Let us know what you think.

Todd Post

My Future Revisited

by Dr. Edward Hoffman

"And exactly what do you do for me?" asked then NASA Deputy Administrator, Hans Mark.

As was his custom, Dr. Mark was hosting a winter holiday social for Cooperative Education Students from NASA Headquarters. Standing in a corner of the room trying to appear inconspicuous, I was feeling privileged to be one of the lucky CO-OP students at the home of the Deputy Administrator.

But I nearly choked when I realized Dr. Mark was talking to me. Before I could say anything, he put the question in context for everyone there whose ears were now raised. "I know why the other students are here," he said. "They're all engineering students. I know what they can do for NASA, but why do I need a psychologist on staff?"

Understand now this was almost twenty years ago. The other thirty or so people attending the party probably forgot the question shortly after it was asked. But for me it serves as a small moment of truth and remains vividly etched in my awareness all these years later.

First, it indicates the degree to which a professional working in a behavioral field focusing on individual and team development was at one time virtually invisible at NASA. More important, it underscores what a dramatically different place NASA has become.

In the early 1980's, professional development at NASA more or less followed the traditional apprenticeship model. Valued professionals, mostly engineers and scientists, spent many years fine-tuning their skills within their selective disciplines. When an opportunity to manage a project came up, it normally was under the direction of an experienced tutor, often more than one.

Professional development was once a slow process, believe it or not, nourished by an organization of seasoned veterans. Experience was acquired over a lengthy duration in which the individual could experience all phases of a project. The need for professional development was muted and at best supplementary.

Since then much has changed at NASA. We've gone from large projects that generally take many years to complete to smaller ones that happen, as we all know, Faster, Better, and Cheaper. In keeping with this new paradigm, the apprenticeship approach is gone, replaced by accelerated learning programs. Myriad tools exist to prepare the modern project manager - web-tools, career development models, intact team support, benchmarking, coaching, simulation training, knowledge sharing, university programs, formal mentoring, e-learning, lunch symposiums, etc., etc. All of these came into existence to quickly prepare managers to survive in an environment of speed, change, and the rapid transitions that occur around the borders of chaos. Is

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(CONTINUED)   My Future Revisited

it better this way? That question is for another article. For now, let's just say it is how it is.

There's little doubt when Dr. Mark asked what exactly do you do for me, he had no idea how NASA was going to change in the next two decades. The truth is I had no idea myself how different a place NASA would become in twenty years. But had I, and had I told all, you could bet no one in the room would have dared believe it could all come true.

From PowerPoint Slides to Powerful Stories

by Dr. Alexander Laufer

An experienced NASA project manager was invited to talk at a Knowledge Sharing (KS) meeting sponsored by the Academy of Program and Project Leadership (APPL). Not used to speaking about his work in front of his peers, i.e., other NASA project managers, our project manager did not sleep well all week prior to the meeting. His wife, who had always been a balm to him in times of stress, tried to comfort him by pointing out how well he'd done in his presentations in front of the directors at his center. This was true, he was known at the center to be a terrific front man for any project he worked on, but in this case it was little comfort.

Again, his wife tried to help by assisting him with his presentation. If not an IT expert, she was certainly better than he was with PowerPoint, and thanks to her his slides looked great. "Give me a grocery list," she liked to say, "and I can make a presentation of it."

The trouble was, and he could see it was difficult for her to understand, the best looking presentation in the world would not have made a difference in alleviating his concern about speaking in front of this group. At the meeting he would be speaking to other project managers, 15 in all, "the best of the best," as the meeting organizers like to say of the project managers they invite.

"It's not just the audience," he tried to explain. "There's a difference in the kind of energy in the room when someone tells a story instead of using a slide presentation."

She looked puzzled. "But we've got PowerPoint! It's the new beta version."

He had spent what he realized was an "unhealthy" amount of time on the presentation, preparing the slides, editing them until he could not stand looking at them any longer, practicing his delivery in front of his whole family, including his young children and even his poor dog. It's funny because our project manager had such a good time participating in other KS meetings. He enjoyed listening to other project managers tell stories about their projects, and he never lacked for his own examples to bring up in his remarks to them either in the large or small group discussions.

During the first part of the meeting, our project manager found it difficult to concentrate on the other presentations. Looking around the room, he recognized the nametags around the horseshoe-shaped table as some of the best project managers in NASA. Some of them in fact were veritable superstars.

When he took his seat at the horseshoe in the conference room, he was wishing he had not been so quick to accept the offer to present. When asked to talk about his recent project, he got excited and said yes right away. All sorts of ideas sprung to mind to talk about, but as he began thinking about them as a coherent narrative he

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(CONTINUED)   From PowerPoint Slides to Powerful Stories

saw his experience as something very different from what occurs on most projects, hardly something common enough to spark a meaningful group discussion. To make matters worse, the presentation was going to concern some of the difficulties involved during a project, and though he had heard others talk about difficulties on their projects, he didn't want people to think these difficulties were all that the project was about.

As he listened to his peers from other NASA centers share their experiences, the project manager looked across the room at another project manger from his center. They flew in together to the meeting and on the plane he was surprised to hear his colleague sound so pessimistic about the meeting, although it was clear soon enough that this was the colleague's first time attending a KS meeting.

"What can anybody really get out of listening to a bunch of people tell stories!" his colleague grouched. "All I'm interested in is the lessons and tools. I hear they have a website where they publish all the stories. For my money, it would be a better use of everyone's time if we all just read the material on the web and sent emails to each other." Then he snorted. "I mean like who really wants to talk about a story."

After grouching some more about how he wished the meeting were being held somewhere else, preferably where he could pack in a half a day of good skiing, the colleague asked him what his presentation was going to be about. When our project manager named the project, the colleague remarked, "Oh yeah, I heard all about that and the stuff you and your team had to go through to complete it on schedule. Amazing you ever pulled it off."

> 'Give me a grocery list,' she liked to say, 'and I can make a presentation of it.'

What should have sounded like a vote of confidence, our project manager heard as a challenge. During those awful nights, those sleepless nights just before leaving for the meeting, he thought about any possible way to make the presentation more interesting, and as he ransacked his memory for details, little bits of humor and specific detail about the project, he wasn't sure if anyone would be able to generalize from his unique experience.

Suddenly it was time for our project manager to get up and speak. He was introduced as one of the most dynamic project managers at his center. He felt a little embarrassed being introduced this way but the faces in the crowd looked expectant, not incredulous, and this steadied him as he walked to the front of the room.

The first part of the presentation went exactly as planned, but it felt all wrong. His delivery seemed wooden, it sounded too scripted, and so he decided to abandon the slides altogether and tell stories he had not rehearsed nor planned on sharing. As he told these stories, he grew more relaxed, the words came out so much easier, and

From PowerPoint Slides to Powerful Stories (C O N T I N U E D)

soon he was enjoying himself. Was it his imagination or did people look more interested in what he was saying?

Someone laughed at a little story he told about a unique aspect of the project, something he originally thought best to leave out because he didn't think anybody would be able to relate to it. Heads all around the room were nodding. A question was asked, answered. Someone told a story about something similar that happened on one of her projects. Now that one person other than the presenter told a story, others came forward with their own stories. Before long it seemed like everyone was involved in the dialogue. More questions were asked,answered,asked,answered...; no longer was it one individual presenting to a room full of listeners, but an entire group of people sharing their own unique stories about their projects. The magical thing about this was that many of the lessons were similar.

Here is an excerpt of what transpired:

"We realized on this project the best way to save time and money was by holding weekly face-to-face meetings with our main contractor, and at times even more often."

"I've got some difficulties with this. It costs a lot of time to travel back and forth. I tend to believe you can accomplish an awful lot by just being smarter in how you use email and phone conferencing."

"Hold on now. I've got to say something about this. I've also found on my projects it was the face-to-face time that made the biggest difference. This is especially crucial at the beginning of the project, and also any time a major contractor joined the team. What I've found in cases like these is that face-to-face interaction prevented misunderstanding from occurring and helped build trust. Sure it costs some time and money on my part, but without it I don't know how we would have stayed on schedule."

"And I've found no matter how much time you spend composing them, emails always just make you aware of the tip of the iceberg. Projects don't sink because of the dangers you see ahead of you. It's the stuff below the surface that does the most damage, and by actually going out and talking to people you learn how big and dangerous those issues really are."

Our project manager standing at the front of the room felt more like a facilitator than a presenter, but that was okay with him. What he was hearing sounded good, it sounded right, and for the first time in a week he recognized this as the feeling he had brought home from these meetings in the past.

"This presentation and our dialogue illustrate an important lesson for us all," said

[He] wasn't sure if anyone would be able to generalize from his unique experience.

(CONTINUED) **From PowerPoint Slides to Powerful Stories**

one of the project managers at the table, and lo and behold, to our project manager's amazement, it was the colleague whom he flew in to the meeting with from his center. "For me it's an especially important lesson. Why? Because I didn't have much faith that I could learn anything at this meeting. I don't know every detail about people's projects, but the thing that strikes me is that these stories have gotten me to think about my own project in a way I hadn't been able to before. Thinking, pondering, reflecting, this is all great. To be perfectly honest, I don't think I've thought this much about my own decisions and actions since I asked my wife to marry me 20 years ago."

The room got very quiet. No one quite knew what to say, until the same project manager who made the observation stood up and rallied everyone, "Come on, let's get on with things. Doesn't anybody have a story to tell?"

When our project manager who had given the presentation returned to his seat, the first thing he wanted to do was write down everything said during the dialogue. He had learned so much. But before he could do that, and no sooner had he reached his chair, the editor of ASK was already on top of him, imploring him to submit his presentation as a story for publication in ASK. Publish it in ASK--what a fabulous idea! ASK is sent to all the project managers in NASA. Instead of sharing his story with just 15 project managers, he could make it available to the entire Agency, and, for that matter, the entire world, ASK being on the web.

Never before had the project manager fancied himself a writer, but the material was apparently good, all those people were nodding, the ASK editor was practically begging him; the stories about the project just seemed to come out of him so easily, why not write it down then?

Four months later, he was in the office one afternoon and got a phone call. It was his wife and she said she had to talk with him right away to tell him that she'd read his story in ASK and was moved by it. "I have a much better appreciation now of what you were going through to finish that project on time."

"There's something about a story that just appeals to the heart," he said.

"I'll say," she added. "What you wrote certainly isn't like that grocery list I helped you prepare. I mean you took a grocery list and turned it into a real meal."

Well, what was there to say after that? No matter whose praise came later, hearing this from his wife was like adding to the meal a bottle of fine wine.

> The magical thing about this was that many of the lessons were similar.

From PowerPoint Slides to Powerful Stories (CONTINUED)

Lessons

• We need both face-to-face communication and virtual communication. Ambiguity is best dealt with by using face-to-face communication. This is true in project life and in knowledge sharing.

• A movie is more interesting than a slide show. Likewise, a story is more interesting than a bulleted list.

• Sharing a unique story with a group of peers will trigger other members of the group to share their own unique stories and will generate a productive dialogue.

• What is common to powerful stories is their uniqueness. Among other things, knowledge is about applying general principles to unique situations. Therefore, unique stories are powerful knowledge sharing vehicles.

> " To be perfectly honest, I don't think I've thought this much about my own decisions and actions since I asked my wife to marry me 20 years ago. "

The Don Quixote Complex

by Terry Little

ABOUT THE AUTHOR

Terry Little is in the civil service with the Department of the Air Force, where he has been a program manager for five major defense acquisition efforts. He entered the Air Force in 1967 and served on active duty until 1975.

> All I needed was to get approval, I believed, and there would be this big cash payment for the people who worked for me.

Prelude to a Mistake

I've made plenty of mistakes in my career, but the one that I think of as providing the greatest learning opportunities occurred while I was program manager of a large Department of Defense (DoD) project designated by Congress as an acquisition reform program. I was told I would have my department's support to try almost anything—so long as it wasn't illegal—to improve acquisition in DoD.

One of the things that came to me was to emulate a practice used by many commercial companies, profit sharing. I wanted to establish a way for the people working for me to share in the savings of the program. As I saw it, it was a win-win situation. I was sure the savings were going to be enormous, and I believed it would stimulate my people to be more creative, innovative, and give them a greater sense of ownership over the outcome of the program. I said to myself, "Self, you could look really heroic if you got this approved and your people got a big fat bonus all because of your brilliant idea."

Thus I set off on my Don Quixote quest to get approval.

Despite My Best Efforts

When I went back to tell the people in my department, I found their reaction to be a little too cool for my tastes. Suddenly they were backing off when I started talking about pay-for-performance incentives. But that didn't matter to me. I already had fallen in love with my idea and was determined to get approval at the Pentagon no matter what.

I commenced to making trips from Florida to Washington, DC every week, talking to various people in the Pentagon, explaining what I had in mind and why it was such a wonderful idea. All I needed was to get approval, I believed, and there would be this big cash payment for the people who worked for me.

Over the next two years I spent almost half my time in Washington. I got so carried away that my boss came up to me and told me to stop this. "This is not your job," he said. "You've got to get back to your program."

I told him, albeit in a polite way, "No!"

So carried away did I get with my brilliant idea that I decided to try and see the Secretary of Defense himself. The Secretary of Defense, no matter who he is, is a serious man. Fortunately, he was also patient with me. I managed to get an appointment on his calendar for a 15-minute meeting. I explained my proposal. He listened, and then he said, "Well, I need to talk with my staff about this."

The Don Quixote Complex (CONTINUED)

My stomach dropped when he said that. Finally, there was this horrible realization for me. All along I thought I just had to get to the right person. Here I thought I had him. When he said this to me, unenthusiastic as everyone else I talked with, I knew that I was finished. I knew this because the people he was going to talk with were the same people I had talked with before I got to see him.

What I Learned as a Result

To push the system is the right thing to do, but whenever you make a decision you always have to weigh the cost. I had in my mind that I was doing this for all the right reasons, that I was doing it because I was standing up for the people who were working for me, the people who worked 10 to 12 hours a day, the people who came in on weekends. Because they respected me and I was leading them, I felt motivated to keep pressing forward. But once it became about me, about my success, I lost sight of the fact that I was responsible for them back home in Florida,where the real work of the project was being done. The cost of pushing on the system,in this case, far outweighed the benefits.

What I learned derives from three big mistakes I made.

Mistake one: I lost focus. I forgot what my job was and why I was there. The whole time that I was devoted to my campaign to bring profit sharing to everyone on my team the real work of the program unfortunately suffered, so much so that when we moved into the next phase it was almost terminated because of things that weren't done in the previous phase. The major reason for this neglect was because I was spending so much of my time at the Pentagon.

Mistake two: I didn't realize it at the time, but I persisted at this for so long not because I was impassioned about trying to help my people. Instead, it became about keeping my ego from being bruised. I persisted because I couldn't admit that I had failed. I couldn't admit that this hill was too tough to climb. I closed my eyes to everything except my own focus and my own desire to be recognized for achieving this thing that nobody else had ever done. That was clearly wrong.

Mistake three: After this was all over and I looked back and saw that it was my fault that the program experienced so many difficulties, I felt disgusted with myself. I thought constantly about what I had done, how I could be so stupid, and it took nearly a year for me to come to some kind of peace with myself. For a year it made me draw in and not want to push anymore, it made me timid and risk-averse, and that is a crippling state of mind to be in for a project manager.

> *To push the system is the right thing to do, but whenever you make a decision you always have to weigh the cost.*

(CONTINUED)   **The Don Quixote Complex**

I learned three major things from this experience. One was how important it is to maintain your focus no matter how attractive it might seem to go after something that's not quite within the focal plane. Two, how important it is to separate your ego, that is, your self-worth, from your job. Three, how critical it is when you do make a mistake--and when you are trying to do anything at all you are going to make mistakes--to forgive yourself immediately and move forward. Yes, you need to forgive yourself immediately, not six months later, not a year: immediately. By not forgiving myself I was only compounding the other two mistakes.

The irony of it all is that I did get approval to start a profit sharing program, but only for civilian employees. Uniform military were prohibited. Because not everyone could participate, we decided not to implement it.

> **"** I persisted because I couldn't admit that I had failed. **"**

The Trouble with Success

by John Brunson

In preparation for the February 1996 reflight of the Tethered Satellite System (TSS) payload, the Marshall integration and test team traveled to Kennedy Space Center to support the Interface Verification Test (IVT) between the satellite and tether connector. The test, which was run in the summer of 1995, proved to be hotter than the Florida sun and caused the team to sweat just as much.

We were feeling the heat because TSS hardware was failing to pass the IVT. A great deal of our frustration was caused by the fact that this system had flown before and had successfully passed the same test. The Marshall and Kennedy test team, many of whom had been involved during the first mission, pulled together to try and understand the cause of this failure.

On the surface there was no reason for this simple but critical test to be failing. Every precaution had been taken between missions to safely stow the hardware. Inspections were made prior to connecting the two halves. The same procedure successfully used during the first mission had been followed, and we had made no modifications to the hardware.

As the integration and test team lead, I had to make the call back to Marshall and alert the Program Manager as to our status. We were eight months away from launch and a solution was needed quickly to keep us on schedule. All eyes, including Headquarters, were focused on us identifying and correcting the problem.

Start With the Obvious

We were fortunate to have good people from Marshall, Kennedy, and the contractor community as members of the team. We also pulled in expert help from outside as needed. You've got to remember that success occurs due to the "people" on the team and their commitment to solving "the team's" problem. Everyone on the team understood the urgency of the problem.

It's hard to describe exactly the energy that comes from working on a crack team in a pressure situation like this. Say nothing of the fact that all the while everyone knew our actions were being watched throughout the Agency. We all were doing the best job we could anyway, but with this "little" bit of added pressure, it was an awesome motivating force. Situations like this are when the true character of the individuals and their contributions to the team surface. When you actually experience something like this at a crux moment in a project, it's almost like you are operating in a totally new space, and you yourself are transformed, knowing that the energy you are getting from your teammates is bringing out the absolute best in you.

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≫ John Brunson is currently assigned to the Systems Management Office with the Marshall Space Flight Center. His career in the space industry began in 1980 as a technician working on the first Space Shuttle. Mr. Brunson is also a distinguished member of the ASK Review Board.
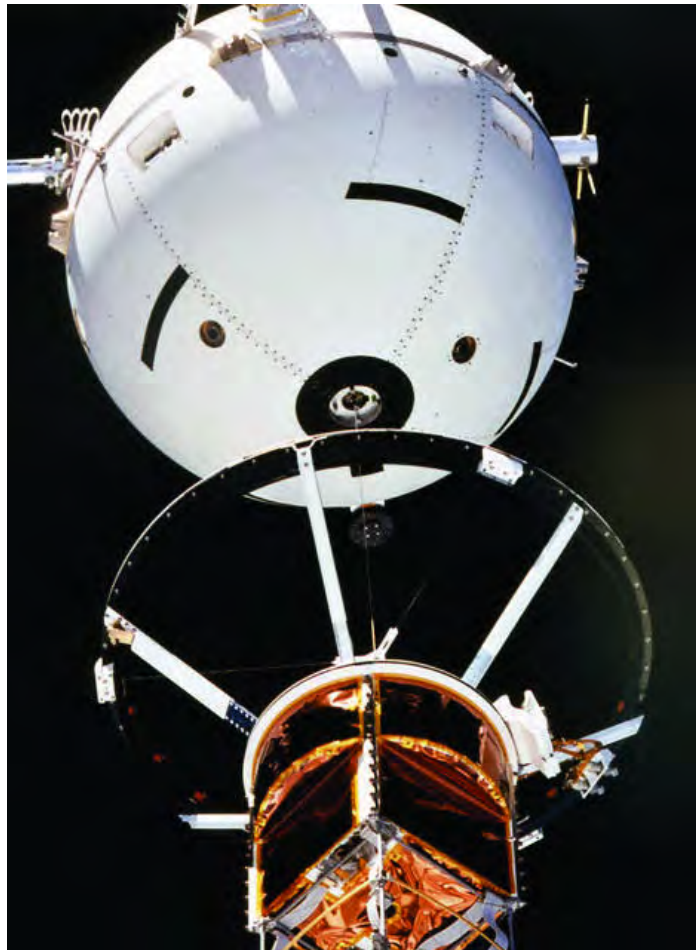
" All eyes, including Headquarters, were focused on us identifying and correcting the problem. "

(CONTINUED)   The Trouble with Success

Onboard Space Shuttle Atlantis a crewmember used a 70mm handheld camera to capture this medium closeup view of early operations with the Tethered Satellite System (TSS).

> " You've got to remember that success occurs due to the "people" on the team and their commitment to solving "the team's" problem. "

Hours were spent reviewing procedures and drawings. We considered all the contingencies that might be contributing to the problem. Additional testing and analysis was conducted and evaluated. We spent hours gathered around the conference table, throwing ideas out and putting them up on a white board. The pros and cons of each one were explored, and the proponents of their theories argued vigorously why one was superior to another.

The Trouble with Success

Finally, we selected an option to implement, what came to be known as the "360 Degrees Test," and were hopeful it would support our assumptions, verify the problem and, if successful, lead us to correcting the problem, re-running the IVT, and verifying our fix.

You look for the obvious and try to work your way back. We believed the connector on the tether side was manufactured improperly and was actually cocked off its normal perpendicular path and recessed by several thousandths of an inch back into the connector body. The 360 Degrees Test allowed the team to connect, disconnect, rotate, and reconnect the bottom half in 15 degree increments. This test was designed to find the region around the connector that got connectivity.

It was obvious to us when we got the data back that there was a manufacturing problem within the Tether Connector. The vendor acknowledged that it was a manufacturer's defect. There was a great sigh of relief all around because we knew the problem could be fixed quite easily. X-rays and other data helped to verify this. Once we were satisfied with all the test results, we set off to replace the connector and ultimately passed the IVT.

You May Never Know How Close You Come

The moral of this story is, "The trouble with success is you may never know how close to failure you came." As I said at the start, this mission was a reflight. There was actually no change between the first time we did the integration and the second. The procedures we used were exactly the same. Probably the first test team got lucky and nailed the connection just right.

We have known risks in every program, and we have unknown risks because it's the nature of the beast. The problem is our past successes drive the schedule that we create for reflight missions. We try to plan for the best we can, but until the vehicle is up in the air in an environment it was built for, doing what it is supposed to do, you have a lot of restless nights. Plan and hope for success, pray for luck, but be ready to address failure.

Lessons

• If results do not meet expectations, for better or worse, we have little choice but to see this as an opportunity for learning.

• Teamwork is of the utmost importance during crisis situations.

? Question

To what extent does luck play a role in project success?

Three Screws Missing

by Michael Skidmore

ABOUT THE AUTHOR

Michael Skidmore is the Manager of the Sensors 2000! (S2K!) Program and is the Technology Development Manager for the Life Sciences Division at NASA's Ames Research Center. S2K! generates development opportunities by integrating available technologies and technological needs from disparate science, engineering, and operational organizations within NASA, in other government agencies, and in academia.

To say that the Russian Space Program's (RSA) approach to space flight is different than NASA's is at best an understatement. I had the opportunity to experience some of this difference firsthand in late December 1996 while working with our Russian counterparts to prepare for the launch of Bion 11. This was the ninth mission in the COSMOS/Bion series and the first conducted under a bilateral NASA/RSA contract.

This mission was different from earlier ones in that it was our first joint mission, whereas on prior missions we flew as invited guests. This time we had control of 50 percent of the science payload. Earlier missions had covered a range of experimental models: everything from simple cell cultures to non-human primates. The purpose of this current mission was to study the physiological effects of flight on two 4-5 kg. male rhesus monkeys.

NASA's role, in addition to specific scientific research goals, was to develop the bioinstrumentation and to work with our Russian counterparts to ensure that it was fully functional when integrated into the spacecraft. A striking indication that this was a different world from anything I'd experienced at NASA occurred when we got to the Plesetsk Cosmodrome in northern Russia where the launch took place.

It was December and the conditions in northern Russia during winter are obviously quite cold. Even so, this was an exceptional time. All of northern Europe was in the grip of a fierce winter storm, so the temperatures outside were especially harsh and the snow quite deep. On one occasion, while returning to the base late in the evening, the snow was falling so heavily we couldn't see more than a few feet in front of the bus, and snowdrifts on the road were piled up as high as the hood. That the driver could see the road, could keep the bus on the road, and got us safely back to our quarters struck me as a small miracle.

What was also remarkable about this episode was that none of our Russian counterparts seemed to regard the bus ride as anything out of the ordinary. Understand correctly, in no way am I trying to suggest their attitudes were cavalier. What is "remarkable," I think, is how their composure reflected the "get-the-job-done" culture of the Russian Space Program. Blizzards, sub-zero temperatures, hazardous road conditions, these were certainly obstacles to overcome, but did they ever weaken anyone's resolve? You never heard so much as a complaint.

We saw this kind of stoic resolve throughout the project. One of the most impressive examples was when they had to deal with assembly and integration procedures to mount a top cover to one of their enclosures. The Russians found out they were short three screws so someone on their team found a box of parts, dumped them out,

Three Screws Missing

fished through them until they found three screws that fit, and we were back in business. At NASA you can visualize a more "resource intensive" environment where the screws would arrive in certified containers with a specific screw for each position and mounds of paperwork verifying each part's heritage back to the quarry.

The setting of the Bion 11 Project.

> **What is "remarkable," I think, is how their composure reflected the "get-the-job-done" culture of the Russian Space Program.**

Despite our cultural and work-related differences, we worked effectively with our Russian counterparts. Why? I would say the main reason was that together we approached the project as a unified team in the strongest sense of the word, meaning we shared the same goal of bringing off a successful mission. The two sub-teams were able to function as one united and effective team, overcoming the natural obstacles of an advanced technological endeavor. The key to this was collocation.

The bond and trust we established by working together, as well as suffering together, cannot be overstated. It was a tremendous improvement to be able to talk directly with them as a problem arose. For instance, on the night of the launch there appeared to be a technical glitch and we were called down to the launch facility from the hotel where we were staying. At first the Russians suspected it was an issue with our hardware. We could look at the equipment, discuss it with them, and we were able to establish categorically that it was not our hardware to everyone's satisfaction.

> **The bond and trust we established by working together, as well as suffering together, cannot be overstated…**

(CONTINUED)   **Three Screws Missing**

Could we have achieved this as quickly and pleasantly as we did via distance? I will venture an opinion that our collocation under these austere conditions went a long way to warm their ears to what we said.

While we had some differences of opinion along the way, in part because there were fundamental differences in our approaches, overall the mission was a success. It was quite an education for me, working within the Russian system and seeing how differently they address and resolve problems. The take-away lesson for me was the realization that you can arrive at success in many different ways. The Russian procedures, while much less paper intensive and seemingly more accepting of risk than the US methods, have been quite successful. The modified Soyuz rocket and Cosmos/Bion spacecraft have a success ratio in the range of 98%. While I wouldn't go so far as to embrace their methods, there is certainly something we can learn from their experience and attitude that limited resources are a challenge, not a showstopper.

Lessons

• There is always more than one way to complete a project on time and on cost.

• Collocation helps to overcome cultural differences between individual members and provides the entire team with a unified sense of purpose.

Know Thyself-- But Don't Forget to Learn About the Customer Too by Jenny Baer-Riedhart

Crash and Learn

I made several appearances at NASA Headquarters (HQ) to brief higher-ups on the status of my program when I was the program manager of a Joint Sponsored Research Alliance (JSRA). Early on in this endeavor, I learned a key lesson in working with multiple customers. Always know the folks you're meeting with, and always tailor what you're going to say based on who you know will be there.

I learned this the hard way, I'm afraid to say, after getting thrown out of people's offices. What can I say, I'm a slow learner. I wasn't quite as attuned to the personalities in the room as I should have been, what their requirements were, what their problems might be with what I was saying; I failed to realize that I was basically perceived as a threat, a bringer of very bad tidings.

"Hey we've got this great program back in California," I said, and from the word go they were hammering me. They didn't want to hear anything about a program aimed at developing Unmanned Aerial Vehicle (UAV) technology.

"This is not going to work! This is not the kind of airplane we want! Why are you telling us about this!"

From their standpoint, I was the enemy, someone who would suck up resources they needed in other areas.

I should have seen it ahead of time. The thing is I did see it, but I thought all I had to do was show up and explain how successful the program was and voila, they were in my pocket. Yes, I knew how they were fighting for their other platforms, how they had their own constraints and clients whom they had to please, but I believed in my heart that this program was important for NASA and that I could convince them of it.

What I failed to recognize was that people are not convinced just because the seller believes she has a wonderful product. *The seller needs to understand what the buyer wants from a product.*

Staying Alive

You cultivate supporters at HQ by putting yourself in other people's shoes and learning what do they want to get out of this. In my case, I imagined that I was on the other side of the table and I've got a tight budget and I'm looking at having to cut programs. "Tell me why should we keep you alive?" they're going to ask. I think, 'What would I want to hear if I was in that position?' I would want to make sure I

ABOUT THE AUTHOR

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> I failed to realize that I was basically perceived as a threat, a bringer of very bad tidings.

(CONTINUED) Know Thyself--
But Don't Forget to Learn About the Customer Too

had a viable program, a program that I could get recognition for, one I could get congressional backing for; it should be successful, and it might as well be unique too. Even better, it should NOT have to cost a lot of money.

And that, basically, was how I packaged it.

Pathfinder in flight over lakebed.

> " You cultivate supporters at HQ by putting yourself in other people's shoes and learning what do they want to get out of this. "

But before I went anywhere near HQ again, I did some serious training. I got in shape. You might even say I went to boot camp.

Mainly I found people who appeared regularly at HQ to talk about their programs and used them as a sounding board. We set up role-playing sessions, or what we endearingly referred to as our "murder boards." Folks from my Center and other partners in the JSRA pretended to be my audience back at HQ. We didn't just pick people arbitrarily, we looked for ones with areas of expertise similar to those we knew I would interface with at HQ. I briefed them with the charts I was going to take, they told me what I'd be killed on, and I changed what I had to in order to stay alive. When I went back to HQ, it still didn't feel like I was among friends, but at least nobody kicked me out of his office.

"Here's my understanding of where you guys need to be, the missions you need

Know Thyself--
But Don't Forget to Learn About the Customer Too

to be looking at, the platforms you want to support."

Basically, I just figured out what mattered most to them. The information I gathered straight out of their reports. I said to them this is what you guys want, and this is how I can deliver.

"This airplane is going to provide you with sensors that are better than any of the ones you've currently got. These sensors you'll be able to use on the platforms you're already flying and at a much lower cost."

I brought charts that were worth more to my program than an original Picasso. Talk about visual aids, I had one with 40 pictures showing all the things we were doing and how they were interrelated. It was eye watering. They were blown away.

The rest of course, is history. Years after the events described here, the program's legacy demonstrates our work to sell UAVs at HQ was well worth the effort. Helios soared this summer to world altitude records, and reached the thinnest edges of Earth's atmosphere. There is even talk now that someday a craft based on this design is going to be used to study the atmosphere on Mars. By then, I expect, no one will ever recall our early battles to prove we had a winning project from the start.

Lessons

• There are times when the role of the project leader is simply to sell the project.

• Projects can, and do, succeed because of politics. And they fail because of politics as well. Politics does not have to be a dirty word. If it means working closely and openly with customers and stakeholders, it is an essential approach that requires continuous dedication of time and attention.

• The most compelling sales pitch you can make is not that you have something wonderful to sell. It is 'I understand what you need.'

? Question

How do you work to discover what your customer wants and needs?

Our Man in Kauai

by Ray Morgan

ABOUT THE AUTHOR

Ray Morgan has recently retired as Vice President of AeroVironment, Inc., where he established the Design Development Center in 1980, the division of AeroVironment that develops and produces its aircraft, serving as Director until April 2000. Mr. Morgan has overseen more than 75 projects and the development of over 50 unique vehicles, including over 35 Unmanned Aerial Vehicle's (UAV's) in his tenure at AeroVironment Inc. AeroVironment has been globally recognized as a pioneer in solar powered and electric aircraft, and has placed 5 of its vehicles in the Smithsonian Museums.

Before we went to Hawaii to begin flight tests on the Pathfinder solar-powered airplane, we knew we needed the support of the local community there. Otherwise it was going to be a struggle to achieve any of our goals.

We'd chosen the island of Kauai because of the favorable conditions there for high altitude flight tests and also for the opportunity to perform demonstration science missions over areas that were uniquely undisturbed by humans. But to take advantage of these conditions, we had to overcome obstacles that were far more down to earth.

For one thing, no one had ever gotten permission to fly an Unmanned Aerial Vehicle (UAV) in FAA airspace there beyond the site of the operator. While we could conduct our high altitude test flights without leaving the airspace controlled by the Navy, to perform the science missions planned over the island we needed to operate in FAA controlled airspace.

In a place like Kauai, where the locals are faced with a combination of a high cost of living and few jobs at the professional level, coupled with a highly desirable environment that prompts many to want to find a way to live and work there, there is a natural apprehension about outsiders. In spite of a natural desire to be as helpful as possible, there is a sense of past exploitation, and it is important to be sure that an inappropriate (if unintended) impression isn't made. It helps to find someone who can serve as your entree into the community. In that way, Dave Nekomoto was our man in Kauai.

Dave is a fourth generation Japanese-American, born and raised in Hawaii. He was a former Executive Officer at the Navy base where we were conducting the flight tests. Like a lot of the Kauaians we met, Dave had more than one job. Primarily, he was the manager for the local branch of a support contractor on the base. In addition, he worked with the Kauai Economic Development Board in trying to bring more technology-based jobs to Kauai. He also worked as the Director of Operations and helicopter pilot for a local land owner, Mr. Bruce Robinson, whose family is a longtime sugar cane producer in Kauai. The Robinson family owns a third of the island of Kauai. Dave flies helicopter tours over the Hawaiian Island of Niihau, which is owned by Keith and Bruce Robinson. This private island, Niihau, was determined to be one of only a few options where our fragile aircraft could make a contingency landing on terra firma, making the difference between recovery and loss of the unique aircraft if an emergency landing had to be made. One thing Dave did for us was smooth the way with Mr. Robinson so that we could land on Niihau if we needed.

Dave also was our "ace" chase pilot, flying a videographer/photographer to document the flights with air-to-air shots near the islands. More importantly, Dave introduced us to the unique culture of Kauai and the Pacific Missile Range Facility (PMRF) where we operated, and helped us "fit in" and establish a good rapport with the local community.

Dave did favors like this because he liked us and considered this type of support part of his job(s). That was the main ingredient we found in any business dealings we did on Kauai. It was a culture where your personality always took you further than the size of your billfold. With Dave we endeared ourselves to him right away because among other things, we devoured all the tasty food he and his friends Vince and Johnny cooked for us in their giant (and I mean GIANT) woks, and sang with him. Yes that's right, we *sang*.

Dave had–how shall we say–a thing for karaoke. Anybody who was tight with Dave spent time with him at his house singing. This was Dave's way of relaxing at the end of the day, and he had quite an elaborate set up at his place for it. Microphones, speakers, and acoustics any garage band would kill for..., plus, he must have owned every song ever recorded. The lyrics flashed across a television screen,so all you had to do was punch a button on a computer and there was the song, sans vocals of course. It was up to you to fill them in, and heaven help you if you were bashful.

No one on the Pathfinder team had a Sinatra voice, but we managed to get everyone to sing something. Even those who were painfully shy managed a few lines of "Happy Birthday." It was all in good fun,and more importantly it showed we had the "right stuff," in that we weren't afraid to risk embarrassment and that we all trusted each other with our most important possession, our egos.

One could not possibly overstate the importance of these karaoke nights at Dave's in terms of their bearing on the success of our project. Dave invited many folks from the base that we worked with each day. Also, the whole NASA and AeroVironment team was there, along with spouses, children, and other friends that had come over for a visit. It brought the team together and it made friends with our Hawaiian and military hosts. Without Dave's karaoke parties we probably still would have eventually ingratiated ourselves with the community, but developing a social relationship certainly broke the ice and formed a basis of trust.

From Dave we learned things about Kauaian culture that we didn't know beforehand, for instance, the utmost regard Kauaians have for those who educate their children. Hence, in planning our marketing strategy on the island–yes, we had a market-

> *It was a culture where your personality always took you further than the size of your billfold.*

> *No one on the Pathfinder team had a Sinatra voice, but we managed to get everyone to sing something.*

(CONTINUED)   Our Man in Kauai

> " One could not possibly overstate the importance of these karaoke nights at Dave's in terms of their bearing on the success of our project. "

> " We came to Kauai not knowing exactly how the human dimension would figure into our activities, but we knew whatever way it worked itself out was going to be critical to our success. "

ing strategy, don't you have one for your project?--we developed educational programs in the schools and put together displays at the local museum. We ourselves helped to write the lesson plans and NASA Public Affairs Education Outreach professionals led training workshops for the teachers to show them what we were doing so that they could share this with the kids. The Kauai Community College sponsored a solar powered racecar which was a jewel in their crown of technical achievements. We involved the community college by hiring students to work for us at PMRF, exposing them to advanced solar technology by being part of our team. This was done on Dave's advice and he put us in direct touch with the right people at the college--it helped that his brother in law is the Dean of Instruction there. Working with the base commander and public affairs office, the NASA and AV team orchestrated an open house that brought in approximately 1000 local schoolchildren to see the Pathfinder, its payloads, and key parts of the PMRF support equipment. We jokingly called this event the "1000 Kid March," and the name sort of stuck. It was tremendously successful and students and teachers from across the state participated in this memorable event.

The community, to put it immodestly, fell head over heels in love with us. "This is a good thing," people were saying. "These people are doing something special." That kind of talk has a way of making things happen. Dave was quick to let Hawaii's political machine know what was going on with our project at PMRF, which resulted in Hawaii's entire congressional delegation sending a letter to NASA commending us on the success of our program. Suddenly money that hadn't been available before appeared and this gave the project some extra lift, so to speak, making our attempts at a world record altitude flight a viable goal. Also, people on the island that worked at places we stayed, places we ate, and the airline and car rental agencies all got to know many of the team. When we had to make travel arrangements that were subject to change with events in our flight schedules, this relationship proved very important.

By the time we left, every Kauaian knew about Pathfinder and what we were trying to accomplish--and, more importantly, they were behind us a hundred percent. To vouchsafe this, we made sure that they felt like Pathfinder was as much their project as it was ours. Everyone on the island was welcome to come out and see the airplane. In busloads they did. When we broke the world record, we held a flight celebration and invited all of our hosts and PMRF support personnel to join us at one of the parks near the base. We provided all the food and entertainment. It was a bash.

Our Man in Kauai (C O N T I N U E D)

Mars Pathfinder Lander Preparations.

> None of us can do much by ourselves, it is only with the help of others that we do great things.

Indeed, nothing paid off more for us than cultivating friendships in the community. A small example of this is the day after the big celebration. When we got to the base the next morning and discovered a problem with our phone system, within ten minutes someone was there and it was fixed. A bigger example of course is we got the permission we sought to fly outside FAA airspace. We managed to accomplish this with less red tape than what we were required to go through at our home base in California.

I'm sure the cynics will look at this and say all we were doing was wooing the community to get what we wanted. For those inclined to see the world this way, you can bet they make little distinction between a friend and an asset. The way I see it, we had friends on the island; if they were assets too, that's beside the point. We enjoyed sharing our accomplishments with everyone who wanted to be part of the team. The world record was all of ours.

Many times in our projects we think that just being smarter than someone else or having the best idea is all we need. That helps, no doubt, but you've got to understand the human side of things. We came to Kauai not knowing exactly how the

(CONTINUED)   **Our Man in Kauai**

human dimension would figure into our activities, but we knew whatever way it worked itself out was going to be critical to our success. That's why we set aside money in our budget specifically for the kinds of activities described here. Call it marketing, but by the time we left Kauai, we were probably spending up to 20 percent of the project time on it.

Bottom line, people are the most important part of any operation. None of us can do much by ourselves, it is only with the help of others that we do great things. It is important we recognize our interdependence in any enterprise, and the earlier we do it, the easier things are, and the better they work.

Certainly, a lot of factors contributed to our success in the skies above Kauai. No doubt one very important factor is that the people of Kauai felt invested in our success and wanted to do whatever they could to help us reach our goals. Whatever advancements derive from our work on Pathfinder, the support of the Kauaians who helped make it possible must never be forgotten. And, our man in Kauai, Dave Nekomoto, was our guide in finding that support, walking us through blessings, celebrations, traditions, culture, sharing with us his local contacts and "mana'o", the Hawaiian word for wisdom.

Lessons

• Cultural differences can impact the success of a project and it behooves the Project Manager to learn how best to work with unique cultures.

• Soft is hard. All sorts of "crazy ways" of cooperation affect project success.

• When in Rome, behave like the Romans. Adjust to the demands of the local culture even if it means singing karaoke.

? Question

Would you please share an example in which you sang karaoke (figuratively) to the benefit of your project?

The Lawn Dart

by Michael Jansen

The Voodoo Crew

It wasn't too long after I agreed to be the Thermal Integration Manager for the Space Shuttle Advanced Solid Rocket Motor (ASRM) program that I gained an appreciation for why the thermal community was always viewed by the Shuttle Program Office as a group of "out-there" voodoo practitioners.

Because it was, well, *true*.

Despite a technical background that included aerothermodynamics, I was still surprised by the degree (no pun intended) to which cutting edge predictions of Shuttle ascent aerodynamic and plume heating depended on educated guesses and extremely murky empirical formulae. My new team, comprised of highly seasoned experts from two NASA Centers and a half-dozen contractor companies, apparently based its products on equations laden with fudge-factors, the values of which were argued strenuously at each meeting of the governing Thermal Panel–which I now chaired. To each prediction,a margin of safety was attached, the magnitude of which also depended on the much-argued consensus of the Thermal Panel. With this being the state of the art, no wonder our craft was viewed by outsiders as black magic.

One of the major components of ascent heating, the radiation produced by the Shuttle's two solid rocket booster plumes, was known to depend on the size and distribution of individual aluminum-bearing particles throughout each plume. Estimates of this crucial variable were crude at best, and were based on extrapolations of data collected from firings of much smaller motors with different propellant mixtures than that of the ASRM. As a result of this uncertainty, the factor of safety applied to radiation predictions was typically on the order of 100%. Such large uncertainty margins presented a significant impact to the design of the Shuttle launch vehicle's thermal protection system, as well as to the vehicle's ascent profile. The effect on the Shuttle system's payload-to-orbit capacity was not good.

But how to improve the accuracy of the prediction? Conventional means of collecting particles would have required a significant test equipment design effort; even if we could piggyback on already-planned tests, we'd have to design and build instrumented test stands able to withstand the harsh plume environments. And we had no budget for such an endeavor.

Fortunately we had our share of out-of-the-box thinkers on our voodoo team,and the thought *du jour* was... Lawn Dart!

ABOUT THE AUTHOR

Michael Jansen is currently the Manager for Launch On-need at Johnson Space Center in the External Carrier's Office of the International Space Station Program Office. He also serves as ASK Magazine's Associate Editor for Practices.

> With this being the state of the art, no wonder our craft was viewed by outsiders as black magic.

(CONTINUED)   The Lawn Dart

QM-6 test firing at Wasatch Operations, Morton Thiokol, Utah.

> Once the lawn dart team learned to shoot straight, we were set for a test with a real plume as target.

Seeds of Our Magic

One of the analysts had spent his early career with the Coast Guard, and was familiar with the harpoon-like guns used to hurl hawsers from Coast Guard ships to other boats to allow the two vessels to be lashed together for boarding. He assumed, and was correct, that such surplus equipment could be acquired via inter-agency requisition. His boss, a member of our Thermal Panel, proposed to me that he get a couple of these guns and have one of his co-operative education students design a particle-catching projectile for them to hurl through the plume. The scheme quickly drew the moniker "lawn dart."

Several upcoming subscale solid rocket motor tests would provide excellent opportunity to test and fine-tune the system and collect preliminary data. The major payoff would come later, if we could collect particles from the plumes of two full-scale test firings. The guns were free, the co-op needed a meaningful project to work on, and this organization's discretionary budget could handle the minor materials costs associated with fabricating whatever lawn dart design the co-op came up with.

Vital data at no cost to the program? How could I say no?

The co-op proved to be especially inventive, and devised a blunted aluminum dart, the bulbous head of which was covered with double-sided tape. The time to transit the plume was calculated short enough not to allow the contraption to melt. We secured the use of an electron microscope to allow an admittedly arduous counting of particles of

The Lawn Dart (CONTINUED)

various sizes per unit area of tape. The machine shop quickly produced several specimens, and the initial non-plume test firings initiated by remote control were successful.

Once the lawn dart team learned to shoot straight, we were set for a test with a real plume as target.

The first subscale motor test firing of the lawn dart was nearly its last. The motor sat in its vertical test stand with the exhaust end pointed skyward. Once the motor was fired and its plume was well established,the lawn dart team did its thing, whereupon the dart was promptly carried several hundreds of feet into the air with the plume, only to fall back to strike the test stand. Suddenly, the test director wasn't so sure he wanted to let our bunch near his equipment. After much cajoling, and once we reduced the dart's fin surface area, he gave us the OK for a second attempt. This one sent the dart through the plume, but not without another surprise: an unanticipated, plume-assisted journey several hundred yards out the other side--which required a determined search to find the darn thing. Nonetheless, the team was jubilant. The darts were surviving their journeys with only minor scorching, and the materials lab analysis showed we were indeed capturing excellent particle samples! After a second refinement of the dart's design, the lawn dart crew was ready for the full-scale motor tests.

As it turned out, the crew did an expert job; the darts launched during the two critical tests flew beautifully, intersected the plumes at the points of interest, and collected particle samples that allowed the analysis team to develop a repeatable particle size distribution model. Along with the concurrent radiometer measurements our team took, and the factoring in of some computational fluid dynamics predictions of the plume flow's structure, the particle data allowed us to refine our radiation models to the point that the prediction uncertainty level could be reduced from 100% to 10-15%. This represented a major leap forward in the state of the art, all made possible by some out-of-the-box thinking.

Gotta love that voodoo engineering!

Lessons

• In a problem-solving situation, all ideas (no matter how "out-there") should be considered.

• We shouldn't be so focused within our professional specialties that we forget we are the sum total of our life-experiences; the solution to a work-related problem may well lie within the memory of some totally non-work-related experience.

? Question

How often do project managers use "alternative" resources to solve technical problems?

This is Michael C. Jansen's third story to appear in ASK. Like Mike's writing? Read his other two stories, Natural Relationship and Garage-Style Engineering, in previous issues.

The Hour Glass and the Project Manager-
Part 2: Improving your Hierarchical IQ by W. Scott Cameron

ABOUT THE AUTHOR

W.Scott Cameron is Capital Systems Manager for the Food & Beverage Global Business Unit of Procter & Gamble. He has been managing capital projects and mentoring other capital man-agement practitioners for the past 20 years at Procter & Gamble within its Beauty Care, Health Care, Food & Beverage, and Fabric & Home Care Businesses.

In Part 1 of this article, I asked you to think of the Project Manager's (PM's) job in terms of an hourglass. In this analogy, the top of the hourglass is the PM's hierarchy, the bottom the project team,and the connecting tube the PM. The hourglass sand can be anything from proposals, directions, data, and other forms of articulated communication to the unstated forms of communication like assumptions, perceptions, and/or prejudices that pass between the two parts. A PM's success is often determined by his or her ability to effectively manage this passage of sand!

In Part 1, I focused mainly on the PM's role in managing the project team. Here I will consider the other end of the glass, the hierarchy. I base much of what I know on my own observations. You have probably noted that little is written or taught about how PMs should manage their hierarchy. The "Dilbert" cartoon strip may even be the most widely cited authority on this subject. My experience derives primarily from an opportunity I once had to report directly to a manager four levels above me and to assist in managing his project teams and his hierarchy for two years. This, perhaps, could be the most insightful experience of my career. I learned what was important to five separate levels in my organization!

What PMs Say About Their Hierarchies

The comments I hear from PMs regarding their hierarchies generally tend toward varying states of bewilderment:

"They want me to manage everything and don't want to be disturbed."

"They've done this before...they should know how tough it is!!"

"They can't handle the truth!"

"They can't make up their minds and its hurting my project"

"They're busy and don't have time to spend with me."

"My hierarchy wants to meet with me regularly to follow my project's progress."

"They know what needs to be done, why don't they just do it?"

"Hierarchy was totally aligned to my project 6 months ago. What could have changed?"

The Hour Glass and the Project Manager-
Part 2: Improving your Hierarchical IQ

(CONTINUED)

Things to Keep in Mind

Some things PMs must realize about hierarchy:

• Hierarchy is comprised of individuals, each with his or her own biases, assumptions, experiences, expectations, concerns, and knowledge about the project, the project team, and the PM. When a PM lumps all these individuals together, "they" become much harder to manage than any one individual.

• Hierarchy is comprised of levels. The individual needs and expectations of one level toward the PM may be at odds with those at other levels. A PM needs to understand what the needs and expectations are at each level and determine a strategy to address them.

• Not all hierarchy has decision-making rights on a project. A PM has to be able to understand and differentiate what each level can accomplish.

• Hierarchy has information about future events that can impact the PM's project. The PM must gain the hierarchy's trust and confidence to obtain this information as soon as possible to properly manage the project team.

Your Hierarchical IQ

I believe PMs should take the following steps to measure and then improve their hierarchical IQ:

• Understand your authority on the project and what items require decisions from outside the project team.

• Learn, early in the project's life, about all organizations whose hierarchy may impact your project.

• Learn the name and level of the individuals in the hierarchy you plan to maintain a communication link with. Understand what decisions pertinent to your project each level is able to make.

• Hold regular meetings (group or 1:1) with specific members of the hierarchy to better understand each one's needs and expectations throughout the life of the project.

• Bring the hierarchy together on a regular basis to review the project. Too often the PM assumes the hierarchy discusses the project and the PM's concerns with one another. This is not always a safe assumption.

If you don't understand who your hierarchy is and how they can impact your project, you don't have a very high hierarchical IQ!

> **"** You have probably noted that little is written or taught about how PMs should manage their hierarchy. **"**

The Hour Glass and the Project Manager-
Part 2: Improving your Hierarchical IQ

> *Don't allow hierarchy to try and guess what you want from them.*

Communicating With Hierarchy

Once you take the above steps, you need to improve on the following two areas to better influence your hierarchy and increase your hierarchical IQ.

1. Sharpen your listening skills. Surprisingly, few PMs really listen to what their hierarchies are trying to tell them. If you ever wanted to be that infamous fly on the wall, remember that flies aren't known for being big talkers. PMs want to communicate their thoughts, ideas, plans, etc. to the hierarchy. This is good and expected of you, but the key is to listen to what the hierarchy is telling you about your project. Learn what could positively or negatively impact it, and then act accordingly.

2. Sharpen your proposal making skills. PMs should be very clear what they want the hierarchy to do. Don't allow hierarchy to try and guess what you want from them. If you want them to do something, you should have the conviction to ask for it. If you don't want them to do anything, you should state this clearly. PMs should understand what they want of their hierarchy prior to meeting with them either in group settings or in 1:1 meetings.

This wraps up my thoughts on the Hour Glass and the Project Manager. Now it's time to go out and practice what you've learned. Hurry now, as the sand is always flowing in your hourglass.

The Art of Scheduling

by Terry Little

Most managers I know think that constructing a schedule is primarily a technical activity. I have found over the years that creating a realistic schedule for a complex project is mostly an art–one requiring lots of intuition, judgment and guesswork. I don't profess to know all there is to know about scheduling, but I have a few thoughts that might be useful.

First, "the system" will measure a project's success by how closely it meets the original schedule. This is true regardless of how thoughtful, complete, or realistic the schedule. You would think then a wise manager would develop a schedule that provides some slack for uncertainty, risks and inefficiencies. Guess what, this is often more difficult than it would seem.

Typically, the project manager is under enormous pressure to be optimistic about the schedule. The pressure can stem from a variety of things: higher management (i.e., by way of mandated schedules or reduced cycle time imperatives), fiscal constraints, contractor promises, or simply from the need to "sell" the project. It's easy, albeit wrong, to succumb to these pressures and come up with an optimistic, "success-oriented" schedule as a starting point or baseline. The project manager must resist these pressures and write a schedule that is relatively conservative. I have found that viewing the schedule as a personal commitment or a contract, as opposed to merely an estimate, serves as a bulwark against the pressure to adhere to someone else's notion of what the schedule should be.

Second, the amount of work needed to complete a project will always expand to fill the time allotted to the project. This is especially true when engineers are involved. This seems to argue against a conservative schedule, but here I must distinguish between the "public" schedule and the "work-to" schedule.

The schedule I described above is the public schedule–the one that the project manager commits to on paper. The actual schedule that the team works toward should be more challenging than that–one that requires stretching, innovation and some luck to achieve. We have to be careful not to stretch too much, of course, and must remain focused on what we can realistically accomplish. But very often when the team challenges itself this way the project finishes earlier than the public schedule mandates. Having two schedules may complicate things, but I have found the benefits far outweigh the problems.

Third, I have found that you cannot separate how long work will take from who is doing the work. This seems obvious, but seldom finds its way into scheduling. Many project managers approach scheduling by considering technical risks, work scope and complexity, yet they ignore execution risk. Some persons, teams and/or

ABOUT THE AUTHOR

Terry Little is in the civil service with the Department of the Air Force, where he has been a program manager for five major defense acquisition efforts. He entered the Air Force in 1967 and served on active duty until 1975.

> Just as it is unreasonable to expect a draft horse to compete in the Kentucky Derby, so too is it unreasonable to expect a plodder to meet an ambitious schedule.

(CONTINUED)   The Art of Scheduling

companies work quickly while others are more methodical, plodding or mistake-prone. Just as it is unreasonable to expect a draft horse to compete in the Kentucky Derby, so too is it unreasonable to expect a plodder to meet an ambitious schedule. Because of this, I use the past performance of whoever is involved on the project as a major factor in putting together a schedule. This is what I consider as the execution risk, and why I am uneasy relying on so-called independent schedule estimates that ignore who is doing the work.

Finally, one of the major reasons for schedule slippages is uncontrolled requirements growth. In some cases, requirements growth is a fact of life. The manager may have to just accept growth, but, other things being equal, added work should equal a longer schedule. Too often I see managers who willingly agree to adding work without either increasing the time or money to do the work. In effect, this makes adding requirements seem "free." It is bad business and can turn a realistic schedule into wishful thinking.

> I have found it useful —and this doesn't come easy to me—to create a very bureaucratic process for changing requirements.

I have found it useful–and this doesn't come easy to me–to create a very bureaucratic process for changing requirements. Basically, I say there will be no changes in requirements until (1) decision makers understand the cost and schedule implications of the change, and (2) decision makers explicitly agree to those implications. It is quite amazing to see how a process that simply establishes accountability for requirements growth promotes better discipline and yields more realistic schedules.

Many project managers succeed or fail depending on how well they deal with scheduling. The champion or master project manager understands that creating a realistic schedule is one of the most crucial challenges he or she will face.

Refining Procedures: Calling All Stakeholders

by Ray Morgan

Background

For the longest time, we were not procedures oriented at AeroVironment. One guy at the top typically wrote flight procedures, and often that guy would leave out a whole bunch of stuff because, after all, he's just one guy... there were things he didn't think about.

Another problem that stemmed from having just one guy write the procedures was that not everyone used the same nomenclature. The guy who writes a procedure gets used to calling something by a nickname and that's how he identifies it in the procedure. But if other people who have to use the procedure aren't familiar with that nomenclature, you can imagine their frustration in trying to understand what the author of the procedure is talking about,not to mention the potential for disaster that exists because of this.

But the most significant problem we found with autocratically handing down procedures was that people were far less likely to follow procedures that they neither created nor could change. Procedures are tools. Like tools, they need to be sharpened and honed. Any good craftsman wants to sharpen his (her) own tools. What's more, people feel less stress when they can control how they perform their tasks.

When developing small, quick-and-dirty prototypes, it is often most economical to just "fly it" and see what kind of problems there are. Sloppiness is intolerable when you work with expensive and essentially irreplaceable sophisticated airplanes like the unmanned, solar-powered vehicles that we specialized in at AeroVironment. With unmanned airplanes, what the pilot does is just a tiny fraction of what the airplane is trying to do. To fix a problem, you usually need to get a grasp of an entire system. If you've got a bunch of people who understand parts of the system, you bring them together to make intelligent decisions using each of their areas of expertise.

Hence, we realized a couple of common sense things to help refine our methods of writing procedures: (1) one person is not as smart as a group, and (2) a person at the top may not understand things the same way as does someone looking at it from a different perspective, such as a technician who is actually performing the task.

Creating the Procedures

Our first rule was always to "put the person closest to the problem closest to the solution." Whenever possible, the person(s) who actually performs the task creates the procedure for it. Providing this type of ownership is invaluable. It is also the most efficient way to create the procedure. Certainly, we had people cross-check their procedures with co-workers, but we recognized that we had to provide a way with han-

ABOUT THE AUTHOR

Ray Morgan has recently retired as Vice President of AeroVironment, Inc., where he established the Design Development Center in 1980, the division of AeroVironment that develops and produces its aircraft, serving as Director until April 2000. Mr. Morgan has overseen more than 75 projects and the development of over 50 unique vehicles, including over 35 Unmanned Aerial Vehicle's (UAV's) in his tenure at AeroVironment Inc. AeroVironment has been globally recognized as a pioneer in solar powered and electric aircraft, and has placed 5 of its vehicles in the Smithsonian Museums.

(CONTINUED) Refining Procedures: Calling All Stakeholders

dling the inevitable mistakes. This process of continuous improvement by the "owner" of the procedure accelerated the rate of development of the procedure, and allowed us to both rapidly refine a procedure and also allow for a quick response to changes in the system during the flight test program.

Refining the Procedures

1. We read through the procedure with a group of people who are involved. We also invite other people who are not directly involved with the procedure to provide some objectivity. We'll get a bunch of changes from that–that's generally where we catch the inconsistencies in nomenclature. On the next iteration the labeling is usually very close to being error free.

2. We then get everyone together for another read through. This time we have the actual hardware in front of us, and we'll practice just as we would as if we were going through a flight–a prototype of sorts. This time we catch, for example, that the pilot has turned the damping switch off before he started another test that required the damping switch to be on. The guy who owns that process–it may be the pilot, it may be a stability and control engineer–will take note of that and be responsible for correcting the current version of the procedure.

3. The next time we will sit at the ground control stations–we have a stationary one and a mobile one (that follows the aircraft during takeoff and landing). We'll go through the whole process again with the same people, using the latest rewrite. This is the last run-through before the actual flight.

4. After the flight, we get a group together to look at whether there were any abnormalities that could be attributed to a procedure or discuss any "red-marked" changes to a procedure made during the flight. The person who is the owner of a procedure captures any issues that came up and corrects the procedure before the next practice.

Tips

This process allowed us to come up with a procedure that everyone understood and could follow to the letter. You must see it as a continuous improvement process. With a group of people working together you can probably turn out a perfect procedure in no more than 2 to 3 iterations, depending on how complicated a procedure it is of course. Another benefit is that more people feel ownership for the procedure. Not every project may require such a rigorous approach for developing procedures as we used at AeroVironment for developing flight procedures, but certainly all projects benefit from this sort of attention to detail.

Refining Procedures: Calling All Stakeholders   (CONTINUED)

Example: Surf/Beach/Shallow water crash of Aircraft

Symptom:
- Aircraft crashes in or near surf. Aircraft is close enough to shore that it could migrate onto beach with wind and wave action.
- Aircraft crashes on sand, but is exposed to surf spray that wets surface.

Rules:
- If Aircraft crashes in deep water, the aircraft will be allowed to sink, or scuttled, and not recovered.
- If Aircraft crashes in the surf, where it is evident it will be moved on shore by the winds and currents, it must be recovered.

SHOCK HAZARD (120VDC)
- It is possible to receive a lethal shock from the aircraft whenever it is in the sunlight, if surfaces/components have been exposed to salt water. The solar array will continue to produce power in the daylight, and the saltwater could provide conduction of lethal voltages and currents in an unpredictable fashion. Unless fuses are blown, Li batteries also provide shock hazard, even at night.

Pilot Tasks
1. Turn all motor switches off.
2. Contact Aircraft Pilot if airborne and request visual assessment of crash site and relay to Mission Director.

Engineer Tasks
1. Provide GPS location to Mission Director

Mobile 1 Tasks
1. Drive Mobile GCS to within visual range of Aircraft, if near runway, to get best signal path from Mobile 1 to Aircraft, and allow Mission Director to assess situation.

Mission Director Tasks
1. Proceed with MISHAP PLAN

General Comments:

(CONTINUED) **ASK talks with Jerry Madden**

Jerry Madden retired from NASA in 1995 as Associate Director of Flight Projects at Goddard Space Flight Center. During his distinguished 37-year career, he was considered by many of his peers to be one of NASA's "premiere" Project Managers. Outside the Agency, Jerry is widely recognized--and often quoted--for his "100 Lessons Learned for Project Managers," a collection of mostly serious, sometimes funny (128 actually) observations about project management that he compiled over the years.

Since his retirement, Jerry has remained active by serving on several NASA review boards, by working part time at the Smithsonian Institution's Air and Space Museum, and by sharing his wealth of knowledge about project management with anyone who has a mind to tap his abundant generosity and frankness.

ASK: How do you like being a reviewer? Does it feel like you're on the other side of the fence, so to speak?

Madden: Unfortunately, you get the same feeling. At least I do. You feel responsible for the mistakes that are made. That's what you're there for, to make sure these people don't make any mistakes. You hope when you go to a meeting you find nothing, that things are fine. But that doesn't happen too often.

ASK: What advice would you give a young project manager at NASA today? Let's say someone who has just been assigned his first project.

Madden: The first thing I tell them to think about when putting together their team is look at who you have available to you and what are their backgrounds. Once you've put together a good working team and explained to them how you are going to run the show, the next thing you've got to do is get a cursory knowledge of what you're going to be doing. Learn the basics of the project. If you're going to fly a scientific mission, the least you've got to do is go out and learn about the science that's going to be done. Get a couple of general books. Don't try and get too detailed an understanding because you'll never be able to catch up if you aren't already knowledgeable in the subject. Read so that you understand the nomenclature and to get a grasp of the basic principles. One thing that a manager has to know is the nomenclature and what it means. When I first started in this business, I was a mathematician and was working on telemetry data. I didn't know anything about telemetry, so I went down to Radio Shack and got a simple book on telemetry. When an engineer came in and started spouting off about this stuff, he couldn't believe that I knew what he was talking about. It's very painful to listen to a presentation of supposed facts and you don't even understand the language. I've been to meetings where somebody gets up to explain something using the language that goes with that trade and all of a sudden you'll notice eyes glass over because they've lost it. You can't afford to be one of those glassy eyed guys if you're the project manager. You've got to understand what people are saying.

ASK: What's the greatest difference between the world of a NASA project manager today and when Jerry Madden was a NASA project manager?

Madden: Project management itself hasn't changed. What has changed is that the systems have gotten so much more complicated. In the old days, you could hold the whole spacecraft in your mind. Now you can't hold one subsystem in your mind. In the early days, the people who were building the hardware knew what they were building, knew all its functions, and if someone gave them a piece to build that wasn't right they'd know it. Now they don't. It's too complicated.

ASK: What should a project manager be doing then in this sort of environment?

Madden: You still go out and get the best people you can. You give them the authority to do their job. You give them the most resources and money you can. For instance, you get a systems engineer who understands his main job is the requirements and interfaces. To me a failure today--and it was a failure before, and it will probably always be a failure--is that you don't have someone interfacing with the people who are actually doing the work. You have to have someone on your project that understands manufacturing and building hardware and can talk with the technicians who are putting it together and find out if they are having any problems. The same is true with the software. Someone has to understand how the stuff is organized. One program I was reviewing we looked at the software and everything was going along fine, but something didn't feel right and we could never put our finger on what it was until it blew up. If someone had gone down to the people who were doing the programming and putting the subroutines together, you would have found out that these people were concerned and worried,but they had to get the work out, and they were getting it out, right on schedule--it's just that the work didn't WORK.

ASK: If you were a project manager at NASA today, what would you be doing differently than 15 or 20 years ago?

Madden: Paperwork. I'd be doing lot's more of it. Managers today have so much damn paperwork to do. They spend maybe 40 percent of their time, if they spend that much, managing the actual work they think they're managing. The paperwork has multiplied in every direction.

ASK: Paperwork I suppose is a byproduct of the complexity, but is it possible to manage a project today without all that paper?

> **"** In the old days, you could hold the whole spacecraft in your mind.

(CONTINUED) ASK talks with Jerry Madden

Madden: Oh no, you need all that paperwork just to identify everything that's going on. You also need to have a risk management plan. We used to laugh when the first risk management reports appeared. If a project manager didn't know the risks he was facing, he shouldn't be building anything. Now much of the risk is buried in the details and is hard to evaluate from the top so a good analysis of risk has to be done.

ASK: Were you a risk taker?

> " With the early spacecraft there were definitely things you could do that you couldn't get away with today. "

Madden: Of course I was. A project manager has to be. More importantly, though, you've got be able to learn from your mistakes. Some of the risks I took in the early days were foolish, but I learned. One time I had a weight problem and threw out the inertial dampers. When it came around to another program and we had a weight problem again, one of my men came to me and said, "Are you going to get rid of the dampers again?" and I told him, "No because I only need to make an ass of myself once." That's the truth; once was all I needed.

ASK: Was it easier to be a risk taker in those days?

Madden: With the early spacecraft there were definitely things you could do that you couldn't get away with today. That's because they weren't as expensive as they are today. The more money that is at stake, generally the less risk you could take. In the old days, we used to have a saying, 'The freight train leaves.' The scientists knew exactly what we meant by that. If you don't make the flight on time, we're not waiting for you. On a mission where there were 15 or 16 scientific instruments, we wouldn't give a second thought to flying without one. We'd fly without two. We used to say we'd put a lead brick on board to cover the weight. On the present space craft all the instruments are so damn expensive you don't lift off without one of them.

ASK : What do you think about the Faster, Better, Cheaper culture?

Madden: The Faster, Better, Cheaper culture is fine, but if you're doing something Faster, Better, Cheaper it has to meet those criteria. A small satellite in the $100 million range you can do Faster, Better, Cheaper, but everyone has got to understand you're taking a risk. You can't do something extremely complicated Faster and Better. You can do it maybe Better, but you can't do it Faster and Cheaper too. It takes a cer-

ASK talks with Jerry Madden (C O N T I N U E D)

tain amount of time. You also have to have extremely good people on the Faster, Better, Cheaper project–better than you have on the bigger projects. To do something Faster, you normally have to cut corners. To do it Cheaper, you cut some of the manpower. You've got to make sure you are cutting the right manpower.

ASK: In your "100 Lessons Learned for Project Managers," you said it's not the big things that do a project in, it's the little.

Madden: You rarely get clobbered by the esoteric things. If you go and look at most of NASA's failures, it's usually something small that someone overlooked. The one that got me was a very simple power supply. We had flown over 60 of these. The people putting it together were brand new, so why not give them something simple. They were easy to build and therefore it was supposed to be a mundane task. We ended up losing the spacecraft because a screw was too long and it shorted the power supply. On another spacecraft, the screw was too short. A screw for one of the modules was holding on by less than a thread. Nobody looked at it. We were lucky that time. The point is, it's not unusual for that kind of thing to happen.

ASK: When you selected your people for a project, what criteria did you use?

Madden: I wanted people who would take charge. Someone who would say this is my piece of the puzzle and wanted to manage it. I would give my people the greatest leeway I could. There were only a few things they couldn't do, and they knew what those were. Other than that, whatever decisions were made in that area were made by them. I didn't micromanage. I think anyone who tries to micromanage today is a fool. There's too much detail. Somebody has to be very familiar with what's going on in great depth,and the project manager can not do that. He has to count on his people to do it for him.

ASK : Would you suggest that the project manager handpick every individual on the project?

Madden: Normally I would let the people in charge of areas of the project make their own choices. But the project manager should try and know everyone. It also doesn't hurt to know the people not on your project. I remember one time we were in deep trouble and needed help so we asked the Center to give us some backup sup-

> *"* If you go and look at most of NASA's failures, it's usually something small that someone overlooked. *"*

port. We gave them a list of 12 people who could fill our needs. None of the names we asked for was available, so they offered us a couple of others. We didn't take anybody they offered because we knew we would have been worse off than with nobody.

ASK: Do you think that management itself has evolved over the course of your career and in recent years?

Madden: I think the basic management principles are the same, but the tools are better. The computer gives you a lot of different methods of looking at what is going on. The ability to have your data laid out in nice graphs and charts so that you can visualize where you're at, that's certainly nice to have. Provided the data is accurate. That's something that's always worried me. I've seen too many beautiful plots and charts where the data underneath crumbled if you touched it. I think the computer really helps the modern-day manager if he uses it correctly, but the first thing is you have to be able to trust the data.

ASK: Is there any single characteristic that you've recognized among the superior project managers?

> I've seen too many beautiful plots and charts where the data underneath crumbled if you touched it.

Madden: The best project managers are the ones who pick the right people to manage the day-to-day work of the project. In some ways, he's fundamentally nothing more than that, someone who picks good people.

ASK: How do you learn to do that?

Madden: By working with people. If you're not a people person, you really shouldn't be a project manager. There are good ones who aren't,but for some odd reason that no one can account for they still manage to get the right people to work for them.

ASK: Is that the only talent you feel is worth noting?

Madden: Yes. Because people are what make a project.

The following comments we received regarding Dr. Edward Hoffman's column "From the Director's Desk" in ASK Volume 4. We're always delighted to hear from our readers, and in this case it's especially pleasing as we learn that the ASK audience reaches all the way to the Land Down Under.

Dr. Hoffman wrote:

"The starting point seems to be acknowledging the new nature of working with others - understanding who WE are - and then moving from there to form a great team."

In response, Adam Pearson wrote:

I like that - recognize the situation/problem first then deal with it. I work as a consultant project manager - that is to say that I work in a large consulting organization, 80% of whose work is as a project manager on behalf of a client. We work mainly in the construction industry. The company is Bovis Lend Lease - you can find us at www.bovislendlease.com. I work in the consulting arm of the organization. My colleagues and I are always the 10%(actually maybe the 1%!) that must work to create a team for a construction project. We start with helping our client with project definition, then move on from there, appointing design consultants and contractors as we go.

For a number of years, I have been working on the theme of "creating effective teams". A couple of insights, if I may be presumptuous (Ed, you probably already know all this):

The team must embrace a common set of objectives - a set of objectives that each member of the team can wholeheartedly adopt. As you say, this must cross inter-organizational boundaries. The second vital component is that the team holds a shared set of values. These values must pertain to the product of the project - a building, a railway, a NASA project.... whatever - AND must include personal, behavioral values.

If the team really and truly commits itself to a shared set of objectives and a common set of values, then the groundwork is set for success. There are many aspects of teamwork to nurture along the way but the test for success is the quality of communications and relationships - a project's success is directly proportional to these.

I would love to write more on this topic but wanted simply to convey to you my experience in the importance of objectives, values, communications and relationships. I'll be delighted to answer any queries you have.

With thanks for the magazine and regards from Brisbane, Australia

Adam Pearson

Dr. Michelle Collins is the Managing Editor of ASK Magazine. She is currently on a one-year detail to NASA Headquarters from Kennedy Space Center where for the past five years she has conducted research on air pollution control technology. She also is responsible for the Knowledge Sharing Initiative within NASA's Academy of Program & Project Leadership.

This issue we also have reviews of two books we think you'll find interesting. ASK Managing Editor Michelle Collins reviews *All Hat and No Cattle: Shaking Up the System & Making a Difference at Work*, by Chris Turner, who was the keynote speaker at the 2001 NASA Masters Forum of Program and Project Managers. The other book is *Out of Control: The New Biology of Machines, Social Systems and the Economic World*, by Kevin Kelly. Jerry Mulenberg, who has been so helpful the last three issues reviewing books for us, is in great form once again. *Out of Control* is a big book and Jerry's review is commensurate with it for his thoroughness and insight.

All Hat and No Cattle: Shaking up the System & Making a Difference at Work, Chris Turner. (1999) Perseus, MA: Cambridge.
Reviewed by Michelle Collins, NASA Headquarters

This book is about recognizing what's really causing the "All Talk and No Walk" behavior in organizations, and identifying discreet ways that you can "nudge" changes in that behavior. At first, it may seem a little radical, but if you can suspend that feeling, you may find that Turner will stretch your mind in all sorts of interesting and positive ways. She talks about things you can do now. I like that! I find it's too easy to think that "there's nothing I can do - if management doesn't change, then nothing will change."

There are three main issues covered in the book: 1) changing a system by nudging the system, not by trying to drive the change, 2) creating a love-based environment, and 3) recognizing that people are everything (conversely, good leadership is essential, and people will gravitate to the true leaders). Turner references an eclectic group of thinkers including Mark Twain, Buddha, Peter Senge, and John Seely Brown, and she integrates their philosophies with her own based upon her experiences at Xerox.

Turner tackles most of the key issues that have been a source of frustration in the work environment in recent years. She talks about Performance Appraisals, Communications, Meetings, Training Courses, and the organizational fads of the year such as Quality Circles and ISO certification. Granted, efforts such as ISO Certification have the potential for high merit; however, the actual implementation of it has left most organizations operationally mired in employee ennui due to their frustrations with the *way* it was implemented. She tackles all of these issues head on and provides potential replies or actions that can be implemented immediately.

Organizations, agencies, and companies of every size, but most especially the behemoths, have been inflicting major new programs upon the workers at an alarming rate. They have consistently failed, and many employees have "disengaged." Why is that? Turner believes it is because the sponsors of change fail to understand what it really takes to implement change, and because they don't respect the people working for them. Change is a part of life and people are okay with it. There are natural and effective ways to implement the changes needed for an organization to survive the future, Turner argues. It boils down to one fundamental truth: "Companies aren't machines, they're living systems...If there is a disjoint between what the bigwigs say and what they do, then what you immediately get is cynicism."

Like Chris Argyris in his book *Flawed Advice and the Management Trap*, Turner focuses on the serious gap between the espoused theory and the theory in use. She says, this gap "is the biggest reason that people disbelieve 99 percent of organizational propaganda... It is the reason that folks don't buy in to efforts aimed at change. The idea that people resist change is hokum. Humans are designed for changes. It's the way we survive. People resist having change done to them. They resist idiocies that will disappear shortly to be replaced by the latest flavor of the month. People resist inane organizational programs because people are smart."

Turner suggests that the best way to make changes is for the individual to "nudge" the system rather than ramming full-scale changes, one on top of another, to no successful end. Imagine trying to move a herd of elephants (the behemoth organization) to a new and better grazing area. The management team hollers the announcement, gives a few minutes for questions, but doesn't have time to listen because they already have a plan they're sure will work. Ready, set, go - guns ablaze, a stampede starts, people are injured, and the elephants move, but in the wrong direction. Turner proposes a more incremental approach. A little pressure on one elephant, it moves a little, the herd makes a slight adjustment and they all settle down. Another "nudge," the same reaction. With patience, the entire herd can be successfully moved to the desired location and without people being injured.

A great manager once told me people want to do good work, they're usually just waiting to be given the opportunity. Turner echoes this same concept and asks, "What if we assumed that most folks come to work because they want to do a good job, to contribute in a meaningful way, to learn, and to grow?" She suggests that if we create a trustful environment at work, employees will gain self-confidence, become more responsible, and accept accountability for what they do. She calls for creating a "love-based" system, where fear is no longer holding us back from realizing our true poten-

tial. She bluntly states, "The appraisal is just another way of instilling fear in folks, of keeping the power structure in place." Turner gently reminds us "people only have power over you if you give it to them." She states her experience is that 99 percent of the time "when you trust the people you work with, they will continually exceed all expectations. People who feel good, do good."

Turner outlines approaches that can be used throughout organizations and ways that each person can shake up the system. She says, her book "is written for all of you who want to kick up dust because you can no longer stand things the way they are." Although there are any number of books and articles written on complexity theory and the idea that organizations are natural, self-organizing systems, Turner says, "The machine mind-set is firmly in place." She calls this the all-hat-and-no-cattle mindset. And it's hurting us in every way. She believes that fundamental change does not happen through official programs, but rather it happens moment to moment - in every minute of every day.

Reviewer Note: I implemented several of the author's suggestions recently with great success!

Ratings: ★★★★★
Usefulness to Job: ★★★★☆

*Out Of Control*, Kevin Kelly. (1994) Perseus, MA: Cambridge.
Reviewed by Jerry Mulenberg, Ames Research Center

If you want to challenge your thinking, this book will do it! The author says, "This book is based on my astonishment that nature and machines work at all...and was written to explain my amazement to the reader. The scientists and projects reported [in the book] have been concerned with harnessing the laws of design so that order can emerge from chaos, so that organized complexity can be kept from unraveling into unorganized complications, and so that something can be made from nothing." He ends the book with the question: "How do you make something from nothing?" and provides the answer with "The Nine Laws of God." These laws, he claims, are the "broadest, crispest, and most representative generalities" as organizing principles for complex systems.

Among the unique qualities of the book are the intellectual challenges of understanding complex, distributed, networked systems. These challenges relate to the flexibility inherent in the sustaining self-organization, control, change, learning, adaptation, and stability of these systems. Using this context, the author examines both man-made and what he calls "being" systems (a hive of bees, school of fish, flock of birds or bats) that have only a few rules to govern their group behavior--don't bump into each other, keep up with your neighbors, and don't stray too far away. He says, it is as if "an invisible hand governs" their actions.

He uses evolution as a model of organized incremental change in complex systems--the kind of change that happens in decentralized systems that can learn and therefore adapt. One important concept he discusses is the need for control in systems going through organized change. This type of control, he says, is similar to the control used in herding sheep: "When we herd a flock of sheep, we know we are not in complete authority, yet neither are we without control." The need is for the system to retain a level of control to make at least some of its own decisions in order to, "learn from [its] experiences...how to do the right thing."

So what does this book have to do with NASA project management? Actually, quite a lot. It provides provocative ways for project managers to view how they approach their projects. It relates to how to think about and what to create as a project, and also how to behave as a project team. As complex systems themselves, projects need to self-organize into natural "chunks" that self-govern themselves as they change, learn, and adapt. Thought-provoking ideas presented in the book apply directly to NASA projects that often, due to their complexity, border on being *out of*
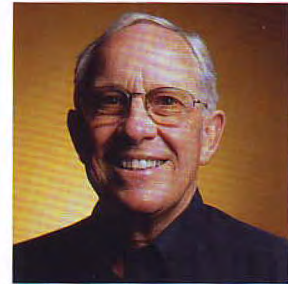
Dr. Gerald Mulenburg is the Manager of the Aeronautics and Spaceflight Hardware Development Division at the NASA Ames Research Center in California. He has project management experience in airborne, spaceflight, and ground research projects with the Air Force, industry, and NASA. He also served as Executive Director of the California Math Science Task Force, and as Assistant Director of the Lawrence Hall of Science.

control. However, the author points out that being *nearly* out of control is not necessarily bad but is an inherent characteristic of complex systems. Heeding the Nine Laws of God given below will challenge the way you manage projects.

THE NINE LAWS OF GOD

1. Distribute being:

"When the sum of the parts can add up to more than the parts, then that *extra being* (that something from nothing) is distributed among the parts." It doesn't seem like much of a stretch to say that really great projects contain more of that extra being than just a good project, and poor projects probably have lesser amounts of it.

2. Control from the bottom up:

"When everything is connected to everything...everything happens at once...[and] fast moving problems simply route around any central authority. [In this situation] governance must arise from the most humble interdependent acts done locally in parallel...[and] control must rest at the bottom within simplicity. In a rank hierarchy, information and authority travel one way, from top down. In a ...web hierarchy, information and authority travel from the bottom up, and from side to side...the chunking of control must be done incrementally from the bottom." In project-talk, those who find the problems must fix them. If they don't--or if they can't, but do not raise them to a higher level--a project can quickly go *out of control.*

3. Cultivate increasing returns:

"Each time you use an idea, a language, or a skill you strengthen it, reinforce it, and make it more likely to be used again...Success breeds success. Confidence breeds confidence. Order generates more order. Cooperation can emerge from self-interest." Increasing returns are the product of positive reinforcement within the system (project). Similarly, negative reinforcement makes unproductive attempts die and disappear.

4. Grow by chunking:

"The only way to make a complex system that works is to begin with a simple system that works. Complexity is created, then, by assembling it incrementally from simple modules that can operate independently." The underlying theme is that the world is full of complex, adaptive systems that learn as they evolve, and also "co-evolve" with other systems. In projects, if the *simple modules* work well, what remains is to ensure that the integrated "whole" made up of these modules works well also.

5. Maximize the fringes:

"Diversity favors remote borders, the outskirts, hidden corners, moments of chaos,

and isolated clusters. A healthy fringe speeds adaptation, increases resilience, and is almost always the source of innovations." Some of the most innovative ideas come from the project fringes. The difficult-to-deal-with anomalies that appear there force creative innovation. Although projects begin with well-defined plans, anomalies do appear, and only later through "retro-recognition" awareness of the anomalies begins.

6. Honor your errors:

"...The process of going outside the conventional method...is indistinguishable from error. Even the most brilliant act of human genius...is an act of trial and error. Error, whether random or deliberate, must become an integral part of any process of creation." The most fascinating project management stories are those that involve finding major errors that marshaled the team's talents to overcome them. And, more likely than not, to correct the error required going outside "conventional methods" to find some innovation, or by challenging the status quo.

7. Pursue no optima; have multiple goals:

"Rather than strive for optimization of any singular function, a large system can only survive by 'satisficing' making 'good enough') a multitude of functions." In complex projects, everything is subservient to the greater project goal. The project manager must ensure that optimization of subsystems doesn't happen at the expense of the overall system. If that goal is not achieved, nothing else matters.

8. Seek persistent disequilibrium:

"A good creation, like good jazz, must balance [a] stable formula with frequent out-of-kilter notes. ...Something [results from] persistent disequilibrium--a continuous state of surfing forever on the edge between never stopping but never falling." The author uses an interesting term, "pop," to describe the sudden eco-system stabilization in a saltwater fish tank, to describe what happens in organizations and teams when they suddenly begin working together as a creative organism (team). Perhaps after "popping," complex NASA projects should operate in a persistent state of disequilibrium to help prevent holes (at least large ones) from appearing in the whole of the fabric of a project.

9. Change changes itself:

"To get the most out of nothing, you need to have self-changing rules...If the rules of the game are composed from the bottom up...interacting forces at the bottom level will alter the rules of the game as it progresses...[and] the rules for change get changed themselves." Most project managers understand the need to be flexible, but have a few "inviolate rules." They also understand that there are times when even those few rules must change to adapt to unusual situations.

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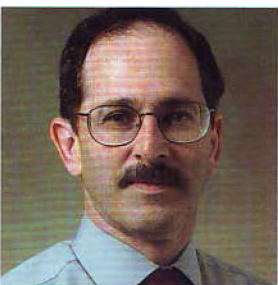
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