

## **The Retelling of**

### **“Women Are from Mars, Too!”**

*JPL Stories, November 16, 2000*

*Presenter: Jennifer Harris Trospen*

*Reteller: Marilyn Morgan*

Teresa Bailey of the JPL Library Stories team introduced the speaker to yet another room packed with space enthusiasts. But of course we knew her right away — she is a familiar figure to all of us who were glued to the monitors starting on Sol 1, the day Mars Pathfinder landed.

Jennifer Harris Trospen is from Ohio, obtained a BS degree in aerospace engineering from MIT, and began working at JPL shortly thereafter as a power subsystem engineer on advanced project design. She also contributed to the development of Cassini spacecraft ground software requirements. She took a year off to teach in the Ukraine, and in 1994 returned to JPL and also began work on a master's degree in aerospace engineering at the University of Southern California. She led Mars Pathfinder attitude and information management (AIM) subsystem operations development as well as the surface operations test program. In Jennifer's most public role, she was flight director for Pathfinder's first spectacular day on Mars — July 4, 1997. She continued as flight director for Pathfinder operations. She is staying on Mars, having become the Mars 2001 Odyssey system development manager for operations and lead for the payload integrated test program, as well as working as project system engineer on the 2003 Mars Exploration Rover (MER).

Mars Pathfinder — a huge success with its unusual bouncing air-bag delivery system to the surface and the very first Mars rover, Sojourner — was a “small” planetary mission. Cost-capped and with a short schedule for development and operations, it was seen as an engineering demonstration of key technologies and concepts for future Mars missions. Design lifetime (primary mission) for the lander was planned at 30 days and a mere 7 days for the rover. In the event, though, at the time of last telemetry received on September 27, 1997 (Sol 83), the lander had operated nearly three times longer than its design lifetime, while plucky Sojourner chugged on nearly twelve times longer than expected. More than 16,000 images from the lander and 550

from Sojourner were relayed to ecstatic Earthlings, in addition to science results and chemical analyses.

Jennifer started the presentation with video clips. First, a pre-launch computer animation of the launch, cruise, landing, and rover deployment; then the real launch on a Delta II on December 4, 1996; and finally, Sojourner's roll down the ramp and footage of the happy delirium amongst the team members. "This, said the speaker, "is my favorite Pathfinder video." The significant thing about Pathfinder, Jennifer told us, was the teamwork — "we were a full team, men and women." She returned to this theme repeatedly during the hour and gave examples of how individual actions were representative of the team's unity of purpose. Here were the elements that made them a cohesive group and that provided the impetus for the mission's success:

- Common goal
- Camaraderie
- Humor
- Empowered
- Generalists and specialists
- Committed
- Passionate

July 4, 1997 was overwhelmingly exciting for everyone. For the first time in more than 20 years, an American spacecraft sent an image from the surface of Mars. Jennifer said that she taped a photo on the steering wheel of her car so she could continue to marvel at it on the drive home on that first day. The team was anxious to get the rover off the lander and onto the surface, but those first photographs on July 4 revealed that the deflated airbags were bunched up around the edges of the lander's petals. If the airbags were not fully retracted, the rover might flip over on deployment. Commands to lift the lander's petals and retract the airbags were sent while Sojourner waited, still latched to her lander petal. Later, the front and rear ramps were unfurled, but a communications problem delayed the decision to allow the rover to descend to the surface. Finally the rover was commanded to go forth, and on July 5, 1997, Sojourner drove down the rear ramp and into history. The "six wheels on soil" image was received at 10:50 p.m. PDT.

The intense team spirit, Jennifer said, meant that people were empowered to make all sorts of engineering decisions. People took ownership, and the words "I am fully responsible" were true indications of the commitment that team members felt. People went wherever their skills fit in

order to get things done to meet common goals. The camaraderie that developed, Jennifer said, is the kind that will last a lifetime.

The pressures of carrying out the mission were kept at bay with humor. In one instance, Harris wrote up a problem with some software; during the next test of the command, the words *IS THIS BETTER JENNIFER?* popped up. Dave Gruel, a member of the AIM integration and test team, was assigned to think of things that could go wrong. He became known as the “airbag gremlin” when he took on the significant job of deciding when faults got injected during airbag testing, but his gremlin role had even wider application. He left messages and reminders where people would be sure to notice them; once when Jennifer forgot to lock her workstation, the screen was totally black the next day. They had accomplished something really remarkable by just landing successfully, no matter what happened next, and Earth’s satisfaction with the invasion was embodied in a cartoon that was circulated. It illustrated two Martian Air Force officers staring at Pathfinder, with one saying to the other, “Put out the usual statement — another weather balloon crash.”

As generalists, team members were called upon to take over various tasks and solve dozens of problems in real time. Extensive testing prior to launch made the team confident that issues that arose in a variety of scenarios could be successfully addressed and their commitment to common goals meant that they would fully support each other. Committed, passionate, persistent — these characteristics were demonstrated over and over again. She mentioned one example: in the first tests, the airbags failed, and “outsiders thought it was a dumb way to land, a crazy idea.” The commitment to making the airbags work grew out of cost considerations, but also, according to Donna Shirley (manager of the JPL Mars Exploration Program), it was thought that airbags could land in rougher terrain more safely than retrorockets could. Accelerometer data from the first few sols showed that the lander in the airbags bounced at least 15 times and continued to bounce and roll for another 60 seconds — a total of about 2 minutes of bounding along the Martian surface — before safely halting. The lander even came to a stop in the right-side-up position and nearly level. A more thorough vindication of trust in your design can hardly be imagined.

Jennifer spoke a little about her background. Her father was a chemical engineer who worked on Zeus and Thor missiles, predecessors to the Delta. Exciting tales and photographs about rockets were familiar fare to her while growing up on a farm in Ohio. The value of persistence was

familiar as well — she keeps a copy of her father’s favorite quotation from Calvin Coolidge and shared it with the audience:

*Nothing in the world can take the place of persistence. Talent will not; nothing is more common than unsuccessful men with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. Persistence and determination alone are omnipotent. The slogan “Press On” has solved and always will solve the problems of the human race.*

Jennifer told two stories about public awareness of space exploration. While at a car rental counter on a trip to Washington, D.C., she was asked about her reason for visiting. “Remember the recent Mars mission? I worked on it,” she responded, and an astonished clerk exclaimed, “You were on MARS??” Then there was a journey to San Francisco to give a talk. During a cab ride, the chatty driver, who seemed to know something about the Pathfinder mission, was describing local attractions, including a theme park that featured a thrilling ride. “But then,” he said, “it wouldn’t be that scary for you — you being an astronaut and all.”

Fame was mostly fun and even had an unexpected result. Prefacing it with the statement, “I owe Pathfinder a lot,” Jennifer recounted this story. A photograph of her appeared in the widely distributed “Parade” Sunday magazine, generating many letters from people. One day she received a letter from a lady in Dallas who asked if Jennifer might provide a tour of JPL for her son, who was in the Air Force. Jennifer did eventually give him a tour of the Laboratory, and this turned out to be a life-changing event — “we were married five months ago.”

During the Q&A session, an audience member asked if a mission like Pathfinder could be done again at JPL. “Of course, it can be done again and better,” was the response. But, she said, she is finding that working on the Mars Exploration Rover project is different; the Pathfinder team had more freedom. What, someone asked, should JPL be doing? The answer: JPL should focus on what will make the mission work — “let’s let people do what they need to do.”

Embracing this philosophy, and remembering Calvin Coolidge’s axiom, sounded like fine advice.

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### Web Sites of Interest

<http://mars.jpl.nasa.gov> — JPL's main Mars website.

<http://mars.jpl.nasa.gov/default.html> — Mars Pathfinder gateway to the websites at the beginning and end of the mission.

<http://mars.jpl.nasa.gov/MPF/ops/prm-thmb.html> — Mars Pathfinder image archive.

<http://quest.arc.nasa.gov/mars/ask/> — An interesting Q&A site about Mars topics, including Pathfinder.

<http://mars.jpl.nasa.gov/MPF/rovercom/pixt.html> — Many photos of rovers from concept vehicles to Sojourner (back when she was called a “microrover”); plus rover animation files and photographs of Sojourner on Mars.

<http://www.passporttoknowledge.com/lfm/photos/mars.html> — A few more Mars photos, including a Viking image of Ares Vallis with superimposed Pathfinder landing ellipse.

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