

Mars/Viking 25th Anniversary Tribute

NASA's Legacy of Mars Exploration: The View from the Administrator

SPEAKER: DANIEL S. GOLDIN, NASA Administrator

THE OLD SAYING GOES that those who can do, and those who cannot teach. It's an old saying; it's not politically correct. In the world of sports it's those who can play, and those who cannot coach. When applied to the early days of the space program, back when the astronaut corps was only recruited from the nation's best fighter pilots, the saying most likely went something like this: When it comes to exploring new worlds and pioneering the future, those who can fly in space; those who cannot, like myself and like many others in the room . . . well, they become engineers and scientists.

I refuse to admit that we lack the right stuff; we just have different stuff. When I was very young, because of a physical disability, I found out I couldn't play action sports like my friends. And I remember my father insisting there's nothing wrong with being different. You can be different as long as you find something you love, work hard at it, and be good at being different.

Not long after that, when I was 7 years old, I found out exactly what it was that I loved. My father took me to the Hayden Planetarium, and I immediately fell in love with space and everything about it. And since that day my dream has been the same. I wanted to go to Mars. That's why I became an engineer, that's why right after college I went to work for NASA, and that's why I think being NASA Administrator is the very best job in the world.

Now, don't get me wrong; I love other things. But Mars is my focus. Of course, going to Mars wasn't my dream alone. It was shared by the very

person whose vision led to this conference. A man who was as kind as he was intelligent. The late Dr. Gerry Soffen, a man who I call my dear friend. Gerry wanted more than anything else to go to Mars with humans. And 25 years ago tomorrow, as a matter of fact, sooner than most people thought possible, he worked to get a robot to Mars.

July 20th, 1976; that's when Gerry, along with Bill Pickering, Jim Martin, Al Hibbs, George Sands, Ed Stone, the Viking flight team, as well as others at JPL worked through the night, as they had on so many other nights, to realize a dream come true. For the first time, a spacecraft had touched down on the Red Planet and was about to send back images.

I might point out that I had the privilege of working on the Viking Biology Life Detection Experiment. I felt part of that team, and for me it was an unbelievable moment when it happened. Many of us remember that. I didn't believe it was happening.

Yet literally, when I have discussed Viking, I have done so by comparing it with today's missions. How today we are faster, better, and cheaper. I think you all agree that when you are trying to sell a program to Congress, it is important to note that the Pathfinder, for instance, was a mere fraction of Viking's cost and took far less time to develop. But we can all agree on something else, too: There never would have been a Pathfinder if Viking hadn't made it to Mars first to set the pace.

Perhaps our entire view of our universe would

be different if it weren't for those landings by Viking on Mars. Simply put, Viking laid the foundation for our planetary programs. Not just where we have the ability to go, and not just where we should land, but what kind of things we should be looking for once we do.

Often at events like this we hear people say that it feels like whatever we're commemorating happened yesterday. Not so with Viking; not so with me. I think the fact that we landed a spacecraft on Mars a quarter of a century ago is astounding. In its own way it was a mission as bold as the moon landing that took place 7 years earlier. It was risky, it was bold, to think we could pull it off was practically audacious. But it was done, and that is because of America's spirit of exploration and discovery. It is because NASA is the greatest agency in the world, bar none. I love my international partners, I love American corporations, but NASA is the best organization in the world, bar none. And it's because the talented and dedicated people, like the ones I previously mentioned—and I wish I could list everybody's name, I wish I could, but I can't—are the best of the best.

For that reason and before I say anything else, I would like to announce that in September NASA will formally dedicate the Viking 2 lander to Gerry Soffen's memory. It is a fitting tribute, but not nearly enough. And even a more fitting tribute—and if Gerry were here I know he'd agree—is to press forward, push the envelope, and take that next step.

We must send astronauts to Mars!

Call me crazy—don't worry, you won't be the first—but if we could land a spacecraft on Mars with the technology and know-how of 25 years ago, shouldn't we be ready to send humans there very soon? I think so. I believe so. And that's why 9 years ago, after 25 years in the private sector, after being asked by the President, I came back to NASA.

My dream was and still is to send astronauts to Mars. And to be perfectly honest, I didn't think that we were moving anywhere near fast enough to get there. Upon arriving back at NASA, I quickly discovered that the problems weren't too different from the problems I encountered the first time I was at NASA, except that they were worse. It wasn't the missions, it wasn't the people, it was the bureaucratic culture that some accepted as imposed on NASA.

NASA was home to some of the best scientists and engineers in the world, women and men who more than anything wanted to pioneer the frontiers of space. And they were capable of doing it, but they were afraid to. For years, NASA had been building huge spacecraft that cost billions of dollars. NASA was trying to build more Vikings, even though the times and technology changed and wouldn't allow it. These temples to engineering took so long to build and cost so much, they literally paralyzed the agency, especially when they failed. Fear of failure equals paralysis: A thermovacuum test became a political event before the U.S. Congress.

Think about this: In the 1960s, when we were literally first trying to get our agency off the ground, NASA had 37 failures and 134 successes. Let me say that again. Thirty-seven failures and 134 successes. We have had 10 failures and 160 successes. And yet, I walk around and they say, "Oh, what's happening at NASA."

We've got to get rid of this fear of failure.

By the 1980s NASA only had two failures, but we only launched 54 things. In my opinion that wasn't good enough. Not for a pioneering agency like NASA. It certainly didn't come close to reflecting the talent, the aspirations, the dreams and hopes we had.

But what if you tried to do something different? Well, there were two problems, and I'll try to be diplomatic, which is not my strong suit. First, you have to dodge all the asteroids sent your way for suggesting you wanted to make a change. Then, to get it done, you'd have to navigate infinite black holes of red tape.

But I wanted to go to Mars.

So I implored the NASA work force to try something different. Take a new approach: Faster, better, cheaper. To be bold once again and take some risk. To realize that regardless of what they'd been led to believe, having no failure is rarely a sign of perfection, rather it is a sign that you're setting mediocre goals to play it safe. And without some failure, you cannot—you *cannot*—have true success.

I said, "Do your best and do not worry if you encounter a setback. The science won't be denied; it'll just be delayed. Hardware can always be replaced. So don't build monsters in your minds out of fear of failure."

In fact, I went around NASA, and specifically to JPL, and told the employees exactly that, and

I held encounter groups. I called them the "Catch-22" meetings because this is what some of the NASA employees told me. They said, "Mr. Goldin, I hear what you're saying. We even have some innovative ideas that will knock your socks off. But if we take a chance, if we use new technology, if we try new managerial theories, if we develop that new exciting design that will take us to Mars, the powers that be will ask, 'Is it risk free? Has it flown before?'"

"We will say, No, it hasn't flown before. It's new and different, and it won't fly unless you fly it. They will say, 'OK. Fine. Sounds good. Bring it back to me when it's flown before.'"

It was a real problem, but the dream was Mars, and I made a pledge—and, by the way, these are exactly the words that were said to me in the spring of 1992—and it didn't get said to me once, it got said over and over and over again; so I made this pledge: Take risks and push the envelope. If there's a failure, we'll fix it together. Your courage will be rewarded. Now, you can't have malice of forethought or gross incompetence; then you will be punished. But anything other than that and you will be rewarded for your courage.

And NASA's courage was rewarded. NASA's courage was rewarded in each and every area. In the 1990s we launched three times as many payloads as we did in the 1980s, and space science led the way. In the days of Viking, planetary spacecraft used to be launched twice a decade. Now they launch each and every year in astonishing numbers, and for a fraction of the cost.

Let's look at some of our missions. NEAR Shoemaker; the mission to Eros. It landed on an asteroid. Mars Pathfinder and the Sojourner Rover. Mars Global Surveyor; it takes a lickin' and still goes on tickin'. The array on Global Surveyor didn't come out, woe was us, we got it working. And the Lunar Prospector, and on and on and on.

If that wasn't enough, in the wake of the controversial Mars rock discovery came Pathfinder. Just as Viking had done almost 19 years earlier, NASA captivated the world again. Mars Pathfinder and its Rover sent back images like never before, and not long after that Mars Global Surveyor sent back proof of ancient riverbeds and valleys on the Red Planet.

I wanted to go to Mars. And we were on our way. We were pushing back boundaries and discovering the unknown like never before.

But then we hit a snag. Once again the world was watching and waiting for a NASA spacecraft to send a signal from Mars, and this time the signal never came. We failed. Both the Mars Climate Orbiter and the Mars Polar Lander failed to reach their destinations. It was a crushing blow to an agency that had so many successes.

Upon a necessary review chaired by Tom Young we learned that some of the mistakes could have been and should have been avoided. And it seemed that maybe a bad trend was developing. We had to step back and reassess our missions. And, to be frank, it hurt. But it was good. It was cleansing. We learned from our mistakes.

And let me interject. One of the scientists from JPL, Bruce Murray, sat down with me during the meetings we were having with Tom, and said, "You know, Dan, we're really lucky. We're lucky that we had two failures. What if we had squeaked by, gotten the Mars Climate Orbiter into orbit, and it worked, and we'd just lost the Mars Polar Lander. We might have been proceeding down that path."

Bruce was right. We found out early that we had some significant problems. No one was bad, but we had problems. And we fixed them. Tom, thank you, thank you, thank you.

As Administrator, and as I promised to NASA employees, I took full responsibility for those failures. Complete and full responsibility. I told our employees that they didn't fail, if anything I pushed too hard. We got a factor of 3; I wanted another factor of 2. I'm never satisfied. I pushed too hard.

But one of the driving factors for reorganizing the agency, changing the culture, and developing smaller and less expensive projects was that when failures did occur, they wouldn't cripple us because we had redundancy in number and function. And, we could do it faster.

We're back on our way with the Mars Odyssey. And I'll always remember and live by what I told NASA's employees when I first arrived: Never allow failure to detract us from our goals. Never allow it to cloak us in the shroud of the timid. Never let it paralyze us in a straitjacket of indifference and inactivity. What makes America's space program strong, relevant, and vital is what makes life fulfilling, even on the most individual basis. It is not how we react to our successes, of which there have been many, but how we learn

from failure, of which there have been so very few. When we get knocked down we will get up, dust ourselves off, and move on. We will learn from it and continue to imagine what might be possible. And, by God, we will continue the effort started by those responsible for Viking to land on Mars and one day very soon send astronauts there. Our mission to explore the frontiers of space and enrich life here on Earth is too exciting, too inspiring, and too important to do anything else, and that's exactly what we have done.

We took the review seriously, so we revamped our Mars program. Today, the managers who oversee the Mars program are not different, but they're better. The plans we are using to get there are better plans. The robots that will ultimately make it are better robots.

Mars Odyssey will arrive in less than 100 days and begin to map the elements and look for water. In 2003 we will continue the search with twin rovers far more mobile than the Pathfinder and far more capable, and these rovers are to be joined on Mars by the European Space Agency's Mars Express Mission. In 2005 we'll launch the Mars Reconnaissance Orbiter, and in 2007 we're going to send a robust, precision lander. It will be an active control system and will go exactly where we want to go, and we'll get there safely.

We will also be starting PI-led discovery missions, and hopefully in this decade there will be planes flying on Mars, drills going down and looking for water, and a variety of other implemented ideas to generate resources. In 2009, we're going to send a mobile laboratory. In 2011 we will begin return missions that will conclude in 2014, and by that time we'll be almost ready to launch astronauts to Mars. And we will continue to move forward with scout and sample return missions, and life is going to be wonderful. And during that time we'll be doing other things.

Ladies and gentlemen, I can tell you this: The pioneering spirit is alive and well at NASA because its employees, our associates in academia and industry, are vibrant and excited. Some of us may have gray hair on our heads and a little extra weight, and maybe a little less hair, but we're all alive along with the bright young people coming in today. And that is vitally important. Because the robots in the missions I just mentioned, combined with what we learn with our International Space Station partners about long-duration space flight and integrating humans and robots, will provide us with the information we need so

that one day we can make that bold decision to send human explorers to Mars.

I just returned from a meeting of the International Space Station heads of agencies, and the unbelievable cooperation that we have will enable us to better understand the critical areas that are required to safely embark on a mission to Mars, such as deep space radiation, microgravity, telemedicine, and reliable space flight systems. But most of all we will not have Star Wars in our Solar System because we're going to do it together. We don't need to extend bad habits on Earth to other planets in our Solar System and beyond.

A dream will have come true in no less than 10 and no more than 20 years. A spacecraft will land, a hatch will open, a ladder will drop. Then the world will watch as an astronaut in a white space suit with a NASA logo on one shoulder and an American flag on the other—and, yes, there will be other astronauts with other flags, I'll be politically correct—steps down and crunches her boot on the dusty red surface of Mars. A dream will have come true, and not just mine.

My father died about 5 years ago. It was right around the time of the discovery of the Mars rock, and it is controversial, but possible, that we may have found ancient bacterial life from Mars. We don't give up.

I remember when the three scientists from Houston came into my office and briefed me on their findings. Imagine being in charge of NASA and have people come into your office and say, "We think we've discovered fossilized life that started on Mars, independent of Earth."

I couldn't believe it; I was overwhelmed. I asked every possible question I could think of. I bored virtual drills into their heads for 2 hours. And afterward—the meeting lasted for hours—after they'd left, I was convinced that they had a reasonable explanation.

That night I couldn't control my excitement. I had to share the discovery with the man who'd brought me to the Hayden Planetarium when I was a young boy and introduced me to what has become my life's passion. I called my father in the hospital. My father graduated from college with a biology degree during the Great Depression. He couldn't get a job for years. He worked in the Post Office, and finally he became a teacher and found his passion. Even though he was weak and dying of cancer, we spoke for over an hour. He was as excited as I was. He absorbed everything and

asked more questions than I did of the two guys and gal who were in my office.

At the end of the call, I said, "Dad, you have to do me a favor. You can't tell anybody about this for weeks, at least. It's top secret right now. Very few people know about it."

My father replied, and I quote, "Dan, who am I going to tell. I'm in the hospital dying of cancer, you idiot."

Well, a few weeks later, we made the announcement. My father passed away a few days after the announcement. I can't help but believe that what helped keep my father alive until the announcement was made was in large part his life-long love of exploration and learning. Not just the stars above but exploring and learning about everything life had to offer. He was a vibrant man. And it wasn't enough; he had an irrepressible desire to see his only son do the same.

It's OK to be different.

Find something you love, work hard, and be good at it. I believe with all my heart that somehow the fact that I could play an albeit small role in solving one of the mysteries of life literally gave my father more life. That's the power of discovery. That's the power of taking the next step, whether it be Mars or somewhere else. That's the power of the human spirit.

Now, I'm not sure if our journey to the Red Planet, a journey that started when Viking landed 25 years ago, will shed more light on our history or illuminate our destiny. I hope it does both, and I can't wait to find out.

Thank you.

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