

Excerpt from "Sixteen Minutes From Home: The Space Shuttle Columbia Disaster"

CHAPTER SEVEN

RETHINKING THE FUTURE

The giant rotating wheel first appears just over Earth's limb, its white flanks a stark contrast to the rust-colored girders of its still-unfinished sections. As spacesuited construction workers pause to watch, the flight crew aboard the incoming passenger liner engages the automatic rendezvous sequence, locking the needle-shaped spacecraft into an imaginary path aimed at the space station's hangar deck.

As the ship's computers begin to turn it to match the station's slow rotation, the two craft seem to perform a ballet in the airless void. The brightly-lit hangar looms ever larger in the flight deck's windows until the commercial spaceliner enters the docking bay, delivering its passengers to orbit.

This scene from the motion picture 2001: A Space Odyssey was prophetic: As the year 2001 dawned, there was indeed an International Space Station in orbit around Earth. Although not as large as Stanley Kubrick and Arthur C. Clarke had envisioned in 1968, it is still a marvel of engineering and a tribute to the spirit of discovery that has always characterized humankind.

America's tradition of exploration goes all the way back to its first inhabitants, who roamed the prairies searching for food and discovering new hunting lands. With the landing of Christopher Columbus, the era of European exploration of the continent began, continued later by English settlers at Yorktown. Lewis and Clark's expedition later opened the western frontier, and the United States is now populated from sea to sea.

There were many reasons why immigrants left their homelands for the New World, or families in covered wagons departed the only civilization they knew to trek westward toward the unknown. But they all shared one pervasive trait: mankind's innate need to explore.

The going was rarely easy. In the early 1600s, the Jamestown settlement was nearly wiped out by disease. And in the 20-year period between 1835 and 1855 during the westward expansion, more than 10,000 people died on the Oregon Trail alone, usually from firearms accidents, cholera or smallpox. And yet the settlers kept coming.

Just as those early travelers understood that there was no guarantee they would reach their destinations alive, astronauts and cosmonauts know full well the risks of their chosen profession. As Columbia prepared to lift off for the first time, the world held its collective breath, waiting to see if this new flying machine would prove spaceworthy.

But as the years went by and shuttle flights became more common, awe gave way to complacency. Shuttle launches were given a paragraph or two in the paper or a minute of

coverage on the evening news. To the public, spaceflight had become routine.

But it was never routine for the people who flew those missions. Better than anyone, they understood the explosive potential of the liquid hydrogen and liquid oxygen fuels that make the shuttle a potential bomb. They knew that the solid rocket boosters, once lit, could not be turned off. And they knew that even a single micrometeorite strike in orbit could spell their doom. With a flying machine as complex as the space shuttle, there were many ways to die. And yet they not only flew the fire-breathing monster into space repeatedly, but competed for the privilege even after the Challenger disintegrated in the skies over the Kennedy Space Center in 1986.

After Challenger, naysayers emerged from the woodwork with their I-told-you-so's, claiming that human spaceflight was much too dangerous. Unmanned robots could explore both the solar system and the near-Earth environment without risking human life, they said, pointing to successful space probes such as Voyagers I and II as proof.

And they were partly right.

Exploring space is a dangerous business. As we continue to expand our influence beyond our planet, there will undoubtedly be more accidents, more loss of life. But if you ask the intrepid men and women whose lives are in the balance, you will not find a single one who would suggest we turn away from the human exploration of the cosmos. As Navy Rear Admiral Grace Murray Hopper once noted, "A ship in port is safe – but that's not what ships are built for."

The day after Columbia's tragic end, Laurel Clark's brother was asked to comment on the continuance of the space program. "We certainly all hope NASA keeps going and continues on with its mission," he said. "I think it's very important for humanity to keep this going." A few days later, Grace Corrigan, mother of Challenger astronaut/teacher Christa McAuliffe, echoed the sentiment. "There's a risk in it, and there will always be a risk in it," she said, "but there's no reason to shut the program down. It's done too much for humanity. If we didn't continue, they (the astronauts) would have died in vain."

Just two days after the accident, the families of Columbia's crew issued a joint statement: "On January 16th, we saw our loved ones launch into a brilliant, cloud-free sky. Their hearts were full of enthusiasm, pride in country, faith in their God, and a willingness to accept risk in the pursuit of knowledge – knowledge that might improve the quality of life for all mankind.

"Columbia's 16-day mission of scientific discovery was a great success, cut short by mere minutes – yet it will live on forever in our memories. We want to thank the NASA family and people from around the world for their incredible outpouring of love and support.

"Although we grieve deeply, as do the families of Apollo 1 and Challenger before us, the bold exploration of space must go on. Once the root cause of this tragedy is found and corrected, the legacy of Columbia must carry on – for the benefit of our children and yours."

On the day of the disaster, President George W. Bush reiterated his continued support for the

space program in a speech from the White House Cabinet Room: “The cause in which they died will continue. Mankind is led into the darkness beyond our world by the inspiration of discovery and the longing to understand. Our journey into space will go on.”

In the aftermath of NASA’s second in-flight space disaster, it’s obvious the majority of Americans still want a space program. But exactly how we will recover from the latest shuttle tragedy and what the program will look like afterward is uncertain. Columbia was an amazing spaceship – but she was 22 years old. Most automobiles last less than half that long, let alone a craft that is expected to blast into orbit in one long controlled explosion, operate as a spacecraft for several days and then return to Earth as a glider, braving blast-furnace temperatures.

NASA had long considered a follow-on to the shuttle program, but the perennially cash-strapped agency cancelled those plans a few months ago and instead was preparing to upgrade and refurbish the existing orbiters, hoping to make them last until 2020. Instead of a shuttle replacement, NASA decided to spend \$2.4 billion to develop an Orbital Space Plane that would carry astronauts to the International Space Station and serve as a space lifeboat. The job of conducting science missions and ferrying cargo would have been left to the aging shuttle fleet.

Undoubtedly, those plans will now change. Dr. Harrison Schmitt, geologist and Apollo 17 astronaut, told Space.com: “I suspect this tragedy will add new impetus to the Orbital Space Plane, more than likely changing its direction to become not just a rescue vehicle but also a vehicle for access to space.”

Shortly after the Challenger disaster in 1986, Dr. Sally Ride, America’s first woman in space, wrote a paper entitled “Leadership and America’s Future in Space” in which she detailed the need for the country to reassert its role as the world’s leading spacefaring nation. As the paper noted, “Leadership cannot simply be proclaimed – it must be earned. As NASA evaluates its goals and objectives within the framework of National Space Policy, the agency must first understand what is required to ‘maintain U.S. space leadership,’ since that understanding will direct the selection of national objectives.”

Dr. Ride’s report called for certain steps that would reestablish the country’s leadership role in space: a “Mission to Planet Earth” program that would study our planet from orbit; the continuing exploration of the Solar System with robotic probes; the establishment of a permanent scientific outpost on the moon; and an eventual manned landing on Mars.

In the intervening years, the first two of those objectives have been met, but America is no closer to returning to the moon or a Mars landing than we were when the report was written. Some say NASA has lost its vision, delaying outward expansion through the Solar System in favor of near-Earth-orbit missions such as the Columbia’s, which advance scientific knowledge but continue to travel the same trail blazed by many previous spacecraft. If America is to regain her role of space leadership and truly explore the unknown, it is obvious an entirely new generation of spacecraft will be needed.

Gregory Benford, University of California professor of physics and astronomy and noted science

fiction author, says that NASA now stands at a crossroads: “This is an historic moment, one of great opportunity. NASA can either rise to the challenge and scrap the shuttle, or just muddle along. An intermediate path would use the shuttles on a reduced schedule, while developing a big booster capable of hauling up the big loads needed to build more onto the station. This would be cost-effective and smart.”

In the near term, there are still three astronauts orbiting Earth every 90 minutes or so aboard the International Space Station. Astronauts Ken Bowersox and Donald Pettit and Cosmonaut Nikolai Budarin, collectively called Expedition 6, were scheduled to come home in March 2003. There is a Russian Soyuz vehicle docked at the station which could bring the three back any time, but the crew has enough food and supplies to stay in orbit until June. With the shuttle fleet grounded, ISS Mission Control is debating an early Soyuz mission to swap out the crew and keep the space outpost staffed until shuttle flights can resume.

This was to be a peak year for space station construction, with 10 shuttle flights to the orbital outpost scheduled. Components of the station’s backbone, a truss that supports the solar arrays and houses cooling mechanisms, would have been added to extend it from its current length of 134 feet to 310 feet, nearly tripling the length of the ISS. Now all construction will halt until the shuttle flies again.

The long-term implications of the Columbia’s death are even murkier. It is hoped the tragedy will not affect NASA’s ability to launch unmanned probes to Mars and the outer Solar System, especially if its budget is increased in the wake of the accident. Two identical Martian Rovers are scheduled for launch in 2003, with much more range than the small Pathfinder rover that explored a tiny area of the planet in 1997. Each of the upgraded vehicles will be able to cover about 110 yards of Martian landscape per day, and unlike the short-lived Pathfinder, they’re built to last for a year or more.

Further out, NASA has plans to send a succession of robotic spacecraft to the Red Planet in the next few years. In 2005, the agency plans to launch a powerful scientific craft, the Mars Reconnaissance Orbiter, which will look for water on the planet and survey Mars close-up at an amazing resolution of 8 to 12 inches – great enough to spot a Martian basketball on the surface if one existed. Its followup is planned to be a roving science laboratory with even greater capabilities than the twin 2003 rovers, followed by small “scout” missions which might involve aerial vehicles. Around 2014 NASA would like to launch a spacecraft that would scoop up some Martian dirt and return it to Earth.

Already on the drawing boards is a next-generation nuclear propulsion system called Prometheus, which would provide a much faster trip to the outer planets. A project called the Jupiter Icy Moons Tour would test the technology, zipping around the Jovian system while sending back photos and data of the giant planet.

Because Prometheus would make it possible to get to Mars in only two months instead of the six months it takes with traditional rockets, there has been speculation that a nuclear engine could make human spaceflight to Mars a possibility long before previously thought. But in the wake of

the Columbia disaster, Mars seems farther away than ever.

And yet, as Benford put it, “A Mars expedition would be the grandest exploit open to the 21st Century. It would take about 2.5 years, every day closely monitored by a huge Earthside audience and fraught with peril.

“This is what we should be doing. Such an adventure would resonate with a world beset by wars and woes. It has a grandeur appropriate to the advanced nations, who should do it together.

“The first step will be getting away from the poor, clunky shuttle, a beast designed 30 years ago and visibly failing now. How we respond to the challenge of this failure will tell the tale for decades to come, and may become a marking metaphor for the entire century.”

Benford, a long-time NASA advisor, notes that the International Space Station has been touted as a waystation, a jumping-off point for missions to Mars and the rest of the Solar System. But before that can happen, he says, two new technologies must be in place: “First, development of a true closed biosphere in low or zero gravity. The station recycles only urine; otherwise, it is camping in space, not truly living there.

“Second, we must develop centrifugal gravity. Decades of trials show clearly that zero. g is very bad for us. The Russians who set the endurance records in space have never fully recovered. Going to Mars demands that crews arrive after the half year journey able to walk, at least. No crew returning from space after half a year ever have, even for weeks afterward. So we must get more data, between one gravity and none. Mars has 0.38 g; how will we perform there? Nobody knows.

“Spinning a habitat at the other end of a cable, counter-balanced by a dead mass like a missile upper stage, is the obvious first way to try intermediate gravities. The International Space Station has tried very few innovations, and certainly nothing as fruitful as a centrifugal experiment. Until a livelier spirit animates the official space program, the tough jobs of getting into orbit cheaply, and living there self sufficiently, will probably have to be done by private interests who can angle a profit from it. But not right away.”

Still, there is no doubt humans will someday explore our Solar System and then beyond. Images from the Voyager and Galileo space probes have given us tantalizing images of erupting volcanoes on distant moons and frozen seas where life may have arisen and still survive beneath the ice. Places that were once just points of light in a telescope are now revealed as worlds in their own right, keeping secrets yet to be discovered. Although we’ve barely dipped our toe in the ocean of space, those small ripples are expanding ever outward, and we’ll someday follow them to those new worlds, and eventually the stars.

As he paused to contemplate the cosmos during a Moonwalk near Hadley Rille on Apollo 15, astronaut David Scott summed it all up: “As I stand out here in the wonders of the unknown at Hadley, I sort of realize there’s a fundamental truth to our nature. Man must explore. And this is exploration at its greatest.”