Book Reviews

Challenges of Space Flight, Then and Now

by Marsha Freeman

Failure Is Not an Option
by Gene Kranz
New York: Simon & Schuster, 2000
413 pages, hardbound, $26

Off the Planet: Surviving Five Perilous Months Aboard the Space Station Mir
by Jerry M. Linenger
New York: McGraw-Hill, 2000
259 pages, hardbound, $24.95

Every voyage of discovery has had its dangers, and those of space exploration are no exception. But the difference in the way these risks are viewed by people of different generations is striking, as is evident by comparing these two recent books, and even their titles.

Most people became familiar with Gene Kranz after viewing the movie *Apollo 13*, in which he was portrayed by actor Ed Harris. The title of his book comes from the phrase used by Kranz in that film, and throughout his years in Mission Control, to characterize his approach during the many perils of the manned space flight program. As he says in his first chapter, his slogan "failure is not an option" was, in Mission Control, a "creed that we all lived by."

Kranz was born in 1933 in Toledo, Ohio. He was commissioned in the Air Force in 1954, after the Korean War, and flew high-performance jet fighters, watching Soviet "MiG aircraft making contrails high in the sky over the demilitarized zone in Korea." In 1960, Kranz joined the NASA Space Task Group and was assigned as Assistant Flight Director for Project Mercury. He retired from NASA in 1994 after 37 years of service.

Jerry Linenger was one of seven American astronauts to live aboard the Russian Mir space station, during the 1995-98 joint Shuttle-Mir missions. He was born in 1955 in Michigan, graduated from the U.S. Naval Academy, and received a doctorate in medicine and other medical degrees. He served as a naval flight surgeon and joined the astronaut corps in 1992. He left NASA following his five-month stay aboard the Mir.

There is no question that both men are very accomplished, and were very capable in what they did. The difference seems to be that one grew up at the end of World War II and during the Korean War, and the other, during the political and social confusion of the 1960s.

Every Mission Is Life-Threatening

Reading Kranz's personal account of manned space flights, from Alan Shepard's first sub-orbital mission in 1961 to the last Apollo mission in 1972, one quickly realizes that each mission had its moments of high anxiety. While one might suppose that it was the astronauts in the spacecraft who had command over their fate as crises arose during each mission, Kranz vividly describes how the flight controllers in Mission Control, make the sometimes split-second decisions that determine the successful, or tragic, outcome of each flight. And, in the beginning, many of the these flight controllers were around 24 years of age. "Outside of wartime," Kranz states, "I do not believe that young people had ever been given responsibilities so heavy or historic."

During the Mercury program, rocket scientists and flight controllers were asked to do what America had never done before—send a man into space. "We [in the Mission Control Center] fully expected to lose one or two astronauts in Mercury," Kranz states.

Kranz describes the first orbital flight in the Mercury program in the following way: "When I look back, I find it hard to believe that when we launched John Glenn we had had a total of three orbits' worth of experience during the two preceeding missions. Two of the Mercury-Atlas rockets had failed. . . . We were rolling the dice in a way that would not be allowed in today's space program."

The driving force was to beat the Soviet Union in the new race for space. But each man working in the program knew that sailing on "this new ocean" would be the greatest adventure, and the defining accomplishment of this country, for this century. The real driver was the leadership from the White House. "I saw [President John F.] Kennedy when he came to visit Mercury Control at the Cape with Shepard and Glenn," Kranz relates. "His energy and charisma were electrifying; he made believers out of all of us, even the most skeptical."

For many younger Americans, the assassination of President Kennedy in 1963 led to disillusionment and despair. But in the space program, Kranz relates, "none of us will ever forget what it was like to live through that incredibly sad weekend when America came to a stop, stunned by this tragedy. At Mission Control and throughout NASA, in our hearts we resolved to honor John Kennedy's memory by meeting the challenge he had set for us."

The major determination a flight controller makes in the

Eugene Kranz (with cigar) in the mission operations control room during the Apollo 13 splashdown, April 17, 1970.

process of launching the spacecraft, and at each critical point in continuing the mission, is a "Go/NoGo" decision. During the two-astronaut Gemini program of the mid-1960s, the decision time to abort the mission after launch, by activating the ejection seats and jettisoning the crew, was two to four seconds. There was no time to consult with colleagues, or to ask the opinion of the supervisor. Each man, based on his knowledge, experience, and training, made that sovereign decision. His judgment could determine whether or not the astronauts would survive. The "ultimate standard," Kranz states, was that "failure is not an option."

'A Bright Glow of Promise in a Dark and Anxious Era'

The year 1969 would be the "year of Apollo," but throughout the country, the counterculture and moral decline of the nation were evident.

In August 1967, Kranz had gone to the University of California, Santa Cruz campus to brief scientists on Mission Control's responsibilities. "It was my first live encounter with the hippie generation," he recalls. "When I left I was glad to get back to a world I understood. But would these young people comprehend the meaning of all we had been trying to accomplish for so many years—the greatest use of economic and technological power in history for peaceful purposes? . . . I returned from that campus in California wondering what the young people I saw there would make of the legacy we were trying to pass on to them—and to the rest of mankind."

As the astronaut crews and Mission Control prepared for the first manned landing on the Moon, Kranz reports, "All around us the tumult of the 1960s continued. . . . Campuses across the land were seething as students protested the war in Vietnam and marched for civil rights. Race riots had broken out in major cities in the summer of 1967. Then, after Martin Luther King was shot and killed on April 4, 1968, there were riots in more than a hundred cities. In June, Robert F. Kennedy was killed while campaigning for the Democratic nomination for President. Even the space program was picketed, and bomb threats were reported. Everything we carried into the Mission Control Center was inspected. Security guards roamed our parking lots during missions. Fortunately, the public's support for the lunar program remained high. Apollo was a bright glow of promise in a dark and anxious era."

The mettle of the men of space was severely tested during the first Apollo lunar landing, but each Apollo mission had its heart-stopping moments. On Nov. 14, 1969, thirty seconds after the launch of Apollo 12, "observers saw a brilliant flash of lightning in the vicinity of the launch complex," Kranz relates. The consoles in Mission Control, which provide the controllers the detailed information about the status and performance of the millions of component parts in the rocket and spacecraft, went blank. When the data came back up, it was all a jumble.

Twenty-four seconds after the blackout, spacecraft Commander Pete Conrad reported that the gyroscopes used to determine the spacecraft's orientation and velocity, were not

functioning. As Kranz states, "The crew was literally flying blind, without instruments they could trust."

An engineer a few years out of college, who was responsible for the electrical systems on the spacecraft, had precious little time to decide whether the crew should continue its mission. While the rest of Mission Control prepared for a possible abort, John Aaron got instructions to the crew which fixed the problem. No abort command was issued.

The performance of Mission Control through the crisis aboard Apollo 13 is legendary. After the explosion in the oxygen tank on the spacecraft, Kranz reports, "Our objective from here on was survival. The crew's only hope was Mission Control." Speaking to astronauts and engineers who were assigned the task of devising a plan to keep the Apollo 13 crew alive as they swung around the Moon, and then working out a plan to bring them back to Earth, Kranz told them: "When you leave this room, you must leave believing that *this crew is coming home*. I don't give a damn about the odds and I don't give a damn that we've never done anything like this before. Flight control will *never* lose an American in space. You've got to believe, your people have got to believe, that this crew is coming home. Now let's get going!"

Summing up the triumph of Apollo 13, Kranz reports that the day after the crew landed safely, the lead flight directors received the Presidential Medal of Freedom from Richard Nixon, on behalf of the mission operations teams. In part, the medal read: "Their [the mission operations teams] extraordinary feat is a tribute to man's ingenuity, to his resourcefulness and to his courage."

The Human Factor

The human factor is the critical one in space exploration. As Kranz states, "It isn't equipment that wins the battles; it is the quality and determination of the people fighting for a cause in which they believe." Only people can make the mission work, when the equipment doesn't.

In his book recounting his five-month stay aboard the Mir space station, former astronaut Jerry Linenger takes great pains to state, somewhat defensively, that he was well-prepared for his long-duration mission, because there had been criticisms of his ability to work effectively with his two cosmonaut crew members, and with Mission Control in Moscow.

One problem was that when Linenger started training for the Mir mission, he was still pretty much a rookie, having flown one Shuttle mission, which, as he says, "I was assigned quickly partly in order to qualify me to be able to go to Mir." Older, more experienced astronauts observed that this lack of experience helped account for Linenger's traumatized reaction to the crises that would face him on the space station.

Linenger also felt that the time was right for him to undertake this adventure when he volunteered for the Mir mission, because he had no children. In an interview with this author, for the book *Challenges of Human Space Exploration* (Chichester, U.K. and New York: Praxis-Springer, July 2000), astronaut Michael Foale, who was on board the Mir when it had a collision with an unmanned Progress supply ship, stated that a person's family situation is an important factor in space flight. He said, for example, that he was not going to train for a long-duration mission to the International Space Station until he felt that his young son was old enough to do well without him for a while.

But while Linenger and his wife were in Russia for his training, she became pregnant. As he states in his book, "Astronauts with young children also opted out [of Mir]." He found himself worrying about his wife, wondering whether, if anything happened to him, he would ever see his infant son again.

To further unsettle Linenger, his wife became pregnant again before his flight, with a due date two weeks after his planned return to Earth. He describes his taking leave of his wife and small son right before the mission, saying, "I was sorry that I had to leave right in the middle of [his wife's] pregnancy. . . . The only thing that worried me was leaving her and John behind."

While Linenger proposes that he did not have great concerns when he volunteered for the Mir mission, he states, "Russian technology was viewed as inferior and crude. And although the extent of the danger would not be known until after American participation in the joint flights began, Mir space station was suspected by most astronauts to be outdated, possibly unreliable and unsafe."

Describing his months of training at Star City in Russia for his Mir mission, Linenger makes an interesting comparison between himself and Foale. After complaining about the accommodations at the cosmonaut training center ("We had been promised Western-style duplexes"), and the fact that public bathrooms in Russia were "disgusting," Linenger states that Foale was "the perfect diplomat," with "fewer reservations than me about just how far the cooperative spirit between the Americans and Russians could be pushed." Linenger himself describes the joint program as being "conceived and thrust down NASA's throat by the Clinton administration as a form of foreign aid to Russia."

While there is no doubt that the Shuttle-Mir program was conceived as a political offering to the Russians, and that the Russian economy, thanks to "advice" from the likes of Harvard Prof. Jeffery Sachs and the International Monetary Fund, was collapsing, one would have hoped that the astronauts who had to live under the same conditions as the cosmonauts would come away from that experience, not complaining, but marvelling at what the Soviet Union and Russia had accomplished in space over 40 years with such comparatively meager resources.

That the fire aboard the Mir during Linenger's stay there was a serious event, there is no doubt. His description of it is graphic and frightening. And, unfortunately, although there

Left to right: John Blaha, Former NASA astronaut Jerry Linenger, and Mission Commander Michael Baker greet each other at the hatch opening as the Space Shuttle Atlantis crew was welcomed aboard Mir by Russian cosmonauts Valeri Korzun and Alexander Kaleri and Mir resident Blaha.

were two Soyuz capsules at the station, each of which can accommodate three passengers for a quick return to Earth in an emergency, the location of the fire blocked the pathway to one of them, and there were six astronauts on the Mir, during a change of crews.

Judging from his own description, in many ways, Linenger found living in the the Mir "like a cell," and at times, nearly intolerable. While he often congratulates himself on keeping an even psychological keel during the mission, he describes all of the typical mental afflictions of life in an isolated environment. He does admit: "I had underestimated the strain of living cut off from the world in an unworldly environment."

It is telling what Linenger chooses to report about his stay on Mir. Nowhere are mentioned the experiments he worked on, which were his ostensible reason for the mission. "I looked at the same two faces for months on end," he writes. "After a while, our conversations grew stale. . . . Family and friends existed only in some far-away place that we could see, but not physically touch. We were sucking down the same dehydrated food, day after day."

After the fire, and various equipment breakdowns, when Moscow Mission Control instructed Linenger to help the two cosmonauts with the repairs that were needed on the station, he told the NASA team there that that was "unacceptable"; that he intended to complete his assigned science experiments. Both Foale and Shannon Lucid would report after their Mir missions, that "pitching in" to help with repairs, and spending social time with the cosmonauts, at the expense of the science experiments, were important to maintaining positive relations among the crew.

Throughout the book, Linenger compares his astronaut "rugged individualism" to the "slavish" behavior of the cosmonauts vis-à-vis Mission Control. In his book, by comparison, Kranz describes the military-style discipline required, and enforced, in Mission Control.

After Linenger returned to Earth, he advised that the Mir was not safe for the remaining American astronauts to be sent there. While he states that there is risk in every flight that must be weighed against the benefits, he clearly believed that the risks on the Mir were too great. Judging from the book, he continues to think so, even though NASA Administrator Dan Goldin sent a top-level team, including Gen. Tom Stafford (ret.), who commanded the Apollo-Soyuz mission with the Soviet Union in 1975, to Russia before astronaut David Wolf was sent on board Mir, to assess the safety of the station. Stafford's evaluation was that it was safe enough to continue the program.

Linenger is one of the three astronauts who lived on Mir who has left the space program. The other four await new flight assignments.

The dedication of his book is to his children, reading: "May their lives be full of adventure." In his preface, he relates that he had read about Russian trials and tribulations in *War and Peace*. "I now read simpler books, mostly children's books, to my boys as bedtime stories. I enjoy them. They all have happy endings."

But not everything in life has a happy ending, and the sensible risks that space travellers are willing to take in the future, will determine whether space exploration continues.