# 1

# PRE-FLIGHT BRIEFING

On November 14, 1969, lightning struck Apollo 12's Saturn V rocket at liftoff at the Kennedy Space Center, knocking many of the spacecraft's critical electrical power systems offline. This set off emergency alarms and a flood of warning lights, and caused a vast amount of erroneous and inexplicable data to be displayed to both the astronauts and the ground controllers in Houston. It also left the Apollo Command Module, now departing for the Moon, with batteries capable of only about three hours of power.

Neither the astronauts nor the Mission Control team knew about the lightning strike, so they were in the dark about what had happened. Only quick and clear thinking by NASA's John Aaron, a young flight controller in Houston's Manned Spacecraft Center, brought the onboard systems back online and avoided a potentially catastrophic mission abort.

John had recognized a pattern in the inconsistent numbers being displayed that indicated one of the onboard electronics systems had shut down. He quickly requested that the crew place an obscure cockpit switch, called Signal Conditioning Electronics, into its Auxiliary position. Once the SCE was switched to AUX, all of the spacecraft's correct data were restored, revealing the underlying problem, which allowed John to inform the crew of the actions needed to restore full power to their spacecraft. Apollo 12 went on to carry the third and

fourth human beings to a walk on the Moon and return them safely to Earth.

John Aaron is just one of the remarkable professionals who were central to achieving this nation's voyage of humans into space, landing on the Moon, and later, making the Space Shuttle fly. He and many other outstanding men and women played critical roles in the early success of NASA's manned space program flights, and more important, ensured that the astronauts who flew them returned home safely. The stories that follow will acquaint you with a number of these individuals, and reintroduce you to John. Many such extraordinary people inhabit this account, a diary that chronicles my time working beside them as part of that adventure.

# 2

# PREP FOR LAUNCH

*"But why, some say, the Moon?"*

On September 12, 1962, President John F. Kennedy gave his now famous "We choose to go to the Moon" speech at Rice University in Houston, Texas. On that sweltering day he asked his audience a question: "But why, some say, the Moon?" I've been asked a version of this question many times over the years. I've heard enthusiasts and apologists alike respond by citing the thrill of exploration, the Cold War, a quest for scientific understanding, the commercialization of Teflon, and the invention of integrated circuits. (Neither of the latter two is right, though one study found that every dollar spent by NASA on research and development ultimately returns seven dollars of value to the gross national product.)

But that day President Kennedy answered his question with what for me is the most compelling argument: "Because that goal will serve to organize and measure the best of our energies and skills." So it did. By accepting that challenge, NASA and the nation energized the imagination and spirit of a younger generation of Americans who embraced the study of engineering and the sciences, and many of whom took part in the president's grand enterprise. I was one of those. So when I'm asked what benefit came from the Apollo Program, I now respond, "Me and hundreds of others like me, who answered the President's call."

Apollo was the great adventure of our age. Though numerous books and films have celebrated the achievement, when people discover I had a part in it, their first question is often "What was it like?" Even after all this time, interest in Project Apollo seems undiminished. My answer is a personal one. I describe how I experienced the program as a newly minted "rocket scientist" and offer a glimpse through the narrow window my role provided into an unprecedented human undertaking. I find that when I talk about the tasks assigned to me on Apollo, and the world of technology available in the 1960s, people get a sense of the rest of it. And an appreciation for the staggering responsibility shouldered by the men and women of NASA and the private contractors who brought those parts together and put human footprints on the Moon.

Because, of course, I was only one of many. The efforts of the teams I worked with were integrated with those of scores of professionals, all applying their specialized skills to the construction of these systems. Hundreds of thousands of men and women, working in offices and factories and research centers and launch sites and tracking stations and military bases and on Navy ships around the world, added their talents to make Apollo a success. They were largely unfamiliar with our work; they had to trust us to take the same care as they did to ensure that all components worked together when called upon. When at last human footprints were imprinted on the Moon, many of those people who had pioneered mankind's first ventures into space went on to apply their hard-won experiences to developing the Space Shuttle, a way for humans to work and live in space and study the wondrous universe from a vantage point once only dreamed of.

I'm proud of the programs on which I worked, of the people whom I met and learned from and became friends with, and of what we accomplished for human spaceflight. I'll describe some of that work here; sketch a few portraits of those unknown pioneers; put on exhibit the tools they used—many now considered primitive—and explain the risks they took and the mistakes they made in producing these brilliant creations. These are little told tales of the people who fashioned the computer programs that accompanied the human crews on these spacecraft, and of the astronauts who relied on them for the directions

to their destination, for the guidance on how to get there, and for control of their fate during the journey—and, when the space travelers completed their often perilous tasks, to return them safely to the Earth.

In the opening of his 1947 novel *Tales of the South Pacific* James Michener wrote:

> They will live a long time, these men of the South Pacific. They had an American quality. They, like their victories, will be remembered as long as our generation lives. After that, like the men of the Confederacy, they will become strangers. Longer and longer shadows will obscure them until their Guadalcanal sounds distant on the ear, like Shiloh and Valley Forge.

So, I fear, could be the fate of the men and women who committed their energies and passions to provide humankind the promise of journeying beyond the narrows of Earth. As the years pass into decades and the technology we used seems increasingly akin to Stone Age hammerstones and flint flakes, let these people not become strangers.