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mariner sets sail

Nineteen sixty-two was the year Marilyn Monroe died. *West Side Story* won best picture at the Academy Awards, author Ken Kesey published *One Flew Over the Cuckoo's Nest*, and television viewers of NBC's *Tonight Show* were getting used to the program's new host, a little-known personality named Johnny Carson.[1]

Nineteen sixty-two was also the year of John Glenn, Scott Carpenter, and Wally Schirra. These three astronauts became the first Americans to rocket to orbit during NASA's Mercury program. But NASA was thinking about Mars as well.

While Americans responded to President Kennedy's challenge to put a man on the Moon, NASA would make its first step toward the red planet with unmanned probes. Future crewed missions, with astronauts facing challenges similar to those posed by the western frontier in the eighteenth and nineteenth centuries, would wait for a later date.

The process of launching robotic explorers to Mars would leave scientists at the space agency to cope with centuries of public fascination with Mars. Some vocal proponents hoped there might be a civilization on Earth's nearest neighbor waiting to welcome visitors with open arms. Building the first spacecraft to go to Mars was partly the job of a University of Iowa graduate student.

Stamatios Krimigis was known to his friends as Tom. He got the college assignment of his life while studying for his master's degree by working on radiation detectors. Krimigis was called to the office of one of his professors. Space exploration was still in its infancy, and the profession had few legends at that time. The short list of names included rocket pioneer Wernher von Braun. As a boy, his interest in space travel

had been fueled by the science fiction writings of H. G. Wells and Edgar Rice Burroughs. The 1923 nonfiction work *Die Rakete zu den Planetenraumen* by Hermann Oberth asserted that space missions weren't simply the stuff of dreams. The young von Braun took that idea to heart and studied mathematics and later built rockets for Nazi Germany. Following World War II, he would accompany a small band of German rocket scientists to the United States to form the nucleus of NASA's efforts to send men to the Moon. Along with von Braun, the name of Krimigis's college mentor would be etched in space lore as well. He was James Van Allen.[2]

When the Soviet Union launched the basketball-size *Sputnik* in 1957, America was left unnerved as the battery-powered satellite sailed over New York and Washington, D.C., showering the United States with the rhythmic beeping of its radio transmitter. The White House wanted a quick response. Von Braun proposed sending up a thirty-pound U.S.-built artificial satellite on an army rocket. He also guaranteed he'd do it three months after the success of *Sputnik*. The concern had been raised about spaceflight being a stunt as opposed to an act of scientific merit. Van Allen created a radiation detector to ensure there was at least some scientific purpose to the mission of *Explorer 1*. The device discovered the belt of radiation, named after Van Allen, that encircles Earth.[3]

Now Mars beckoned.

Tom Krimigis knocked on the professor's door, not knowing what to expect. The room was cluttered with books, manuscripts, and photographs, and the legendary scientist sat at his desk. He wasted little time in stating what was on his mind.[4]

"How would you like to build an instrument for the first mission to Mars?" he asked. Specifically, Van Allen had something in mind called a trapped radiation detector. It would ride on an interplanetary spacecraft traveling to the red planet. During the lonely trip, the device would further study the Van Allen belt around Earth and see if something similar was going on around Mars. Krimigis responded that he didn't know how to build anything like that.

"That's alright," quipped Van Allen. "You can learn along the way."

Krimigis's opportunity followed a discussion between two NASA space centers on how best to explore the red planet. The fight was between the Goddard Space Flight Center in Maryland and the Jet

Propulsion Laboratory (JPL) at the California Institute of Technology in Pasadena. Goddard was the namesake of rocket scientist Robert Goddard, who conducted some of the first experiments on liquid-fueled rockets in the United States. The center that bears his name is perhaps best known for managing NASA's Hubble Space Telescope. JPL, on the other hand, is home to every major interplanetary mission NASA has attempted, including the two Voyager spacecraft to the outer planets and *Pioneer 10*, which became the first man-made object to leave the solar system. Back in the early 1960s, the space effort was new, and the pecking order at NASA was still being established.[5]

Venus or Bust

Goddard favored an ambitious mission to Mars featuring an orbiting spacecraft and a robotic lander. JPL suggested a less-demanding flight with a flyby trip using one of its Mariner spacecraft. The vehicle had already proven itself by traveling past Venus that year. A flyby of Mars meant the probe would coast past the planet, but not attempt to enter a stable orbit. There would certainly be no landing.[6]

Venus had long been one of the brightest objects visible from Earth, and also one of the most mysterious. Its thick, cloudy atmosphere shrouded the planet, leaving scientists to speculate about what surface features lay out of sight on the mustard-colored planet. During the 1962 Venus mission, *Mariners 1* and *2* each carried infrared and microwave instruments designed to try to pierce the cloud-tops. Powering these first two spacecraft was less of a concern since Venus is closer to the Sun than Earth. Two solar electricity panels would be attached to the probes to soak up sunlight. The data from Venus would be transmitted back to Earth on a circular high-gain antenna on a mast, resembling a big lollypop.[7] Four solar wings would be needed on the future Mariners going to Mars, where sunlight is much dimmer.

The flight of *Mariner 1* was also a test of the Atlas-Agena rocket that would carry the spacecraft. The idea of building two copies of a spacecraft wasn't to double the amount of data coming back to Earth. Instead, it was a way for NASA to hedge its bets because a launch-day disaster was a pretty good possibility. Rocket blastoffs from Cape Canaveral routinely ended in spectacular explosions, which provided a

convenient, though expensive, fireworks show for residents as far east as Orlando. Losses mounted for nearly every type of rocket launched from the Cape, including one type called the Navajo, which locals nicknamed "the never-go." If one of JPL's Venus-bound Mariner vehicles didn't make it, its sister spacecraft might have a chance.

That turned out to be a smart move.

Mariner 1 blasted off on July 22, 1962, and it was a short trip that ended in failure. Every time a rocket takes off from either Cape Canaveral Air Force Station or the Kennedy Space Center, a range safety officer sits with his finger on the self-destruct button for the vehicle in case something goes wrong. Populated cities like Titusville and Cocoa Beach are perilously close to the launchpads at the Cape, so a wayward rocket could pose a genuine threat.

As *Mariner 1* blasted off aboard its Atlas-Agena, the rocket began to go the wrong way. The destruct button was pushed, and the rocket and *Mariner 1* were blown to bits. *Mariner 2*, waiting in the wings, would go next. The backup vehicle took off on August 27, 1962, and it survived the trip to space.[8]

The cruise to Venus turned out to be as much of a challenge as the blastoff. One solar panel failed, and the spacecraft began to overheat as it sailed closer and closer to Venus and the Sun. As *Mariner 2* glided past Venus at a distance of 21,000 miles, its instruments scanned the planet's cloud-tops and found them to be relatively cool compared to its broiling surface. Three weeks later, JPL lost radio contact with *Mariner 2*.[9]

Still, this was the first time a man-made spacecraft traveled to another planet, so the trip was considered a rousing success, and Mars was next. It also meant that Tom Krimigis's headaches were just beginning.

Aerospace contractor Martin Marietta, later to be known as Lockheed Martin, was hired to build the Mars spacecraft. It included an octagonal main body, which contained the radio transmitter and computers. Four solar panels formed an "X" across each vehicle. The one thing the main contractor wouldn't do is build the experiments that would go along for the ride. Those gadgets were considered the passengers to be added on by the scientists who envisioned them.[10] If the trapped radiation detectors Van Allen asked Krimigis to make for *Mariners 3* and *4*

were going to fly, the grad student would have to do the work. "In those days, it was a do-it-yourself project," Krimigis recalled. "You did the electronics, you were the power supply person, you were the mechanical engineer who built it. Each investigator laid out the design of their own device, built the equipment by hand, and delivered it." He found a Chicago-based company that made the kinds of radiation detectors he needed, but there was a serious time crunch.[11] Krimigis began building his trapped particle device in January 1963, and the launch of *Mariner 3* was scheduled for November 1964. The mission would proceed whether or not the experiment was ready. "There's no way you could design, build, and approve an instrument for a NASA spacecraft in just sixteen months these days," says Krimigis. Back then, he was expected to do exactly that. The job meant he would see a lot of John Casani.

Casani joined JPL in 1962, and was named head of the design team for *Mariners 3* and *4*. That meant when people like Tom Krimigis arrived with their science experiments, Casani was the traffic cop who would decide where the gadgets went on the spacecraft. "We developed an understanding," says Casani of the list of guest scientists on the mission. "We had to figure out where the instruments would go, how they would be bolted on, how much power they would need, and what wires went where." The result was a lot of cooks in the kitchen for a space mission that was more ambitious than NASA had ever attempted, even compared to the successful flight of *Mariner 2* to Venus.

That mission was a bit of a shortcut for JPL. The Venus vehicle was basically a copy of the Ranger spacecraft that had gone to the Moon.[12] Sending a probe to Mars would be a completely different job, and require a different machine. "It was pretty brand spanking new," says Casani, referring to the Mariner craft bound for Mars. "The structure was different, and we had a different destination. I mean going to the Moon only took a couple of days. Going to Mars would be a couple of months." Explaining the difficulties of a 1960s-era space mission required a 1960s explanation back then. When pressed for an answer by the public, Casani gave one inspired by the science fiction television show *The Outer Limits*. Each episode began with a mysterious narrator proclaiming, "We will control the vertical, we will control the horizontal." That referred to two little knobs on the front of the black-and-white television sets in many American homes. One controlled the

vertical hold on the screen, and the other worked the horizontal. "We determined the complexity of *Mariner 4* was like having 200 TV sets all lined up," recalled Casani. "The vertical and horizontal all had to work consistently all the time for the nine-month trip from the Earth to Mars. It was tough!"

All Tom Krimigis worried about was his little part of *Mariners 3* and *4*. His two radiation detectors resembled boxes with a "V"-shaped antenna like the "rabbit ears" you might see on an old television set. He delivered the prototype to JPL and breathed easy, for a little while anyway. Krimigis was back in Iowa, and sound asleep, when a phone call from California jarred him awake.

"Your detector's not working," said the voice on the other end of the line.

That prompted a flight back to Pasadena, so Krimigis could pull his device off the spacecraft to see what was wrong. "It turned out to be a loose connection," he says.

The Changing Face of the Space Program

NASA and the nation underwent great triumphs and tragedies while *Mariners 3* and *4* were being readied for flight. Astronaut Gordon Cooper made the last flight of the Mercury program. He helped to pilot his *Faith 7* space capsule during the perilous and fiery reentry into Earth's atmosphere. He would be the last American to fly in space alone. Astronaut Alan Shepard lobbied President John F. Kennedy for one extra flight, so he could gain experience in orbit before NASA moved on to manned missions to the Moon during Apollo. The White House said no, and the country moved on to building the two-man Gemini capsules, which would hone the skills of rendezvous and piloting that would be needed to put men on the lunar surface.[13]

Several gunshots in Dallas ended the life of NASA's greatest advocate at that time. The death of President Kennedy put Lyndon B. Johnson in the oval office, and some noticeable changes occurred at NASA. The Launch Operations Center along Florida's Atlantic coast was rechristened to be the John F. Kennedy Space Center. A much bigger surprise was coming for the residents of the nearby city of Cape Canaveral. The town gained world notoriety during the days of the Mercury missions