# SAMPLE

## Solar System Missions: Viking

The First Mars Landings

Aira Astralis

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# Introduction

In the summer of 1976, a machine the size of a small car fell through the thin cold air of Mars, slowed by a parachute and then by braking rockets, and settled onto a rock-strewn plain called Chryse. Within a minute it had sent home a photograph of its own footpad standing on the rust-colored gravel, and within a day the world had seen the first sharp views humanity had ever received from the ground of another world: a desert under a pink sky, boulders to the horizon, a landscape at once utterly alien and strangely ordinary. The craft was Viking 1, first of a pair, and the mission that carried it was, and remains, one of the boldest expeditions in the history of planetary exploration: two orbiters and two landers, launched together, flown across two hundred million kilometers, and set down on a world where nothing had ever landed successfully, to ask the largest question any mission has ever carried to another planet, whether Mars was alive.

The mission's story is the story of that question and its aftermath. The landers carried the most sophisticated robotic laboratories ever built into space at that date, three separate experiments to test the soil for metabolism, and their answer, decades in the interpretation, still shapes how science thinks about life and how it looks for it. The orbiters rewrote the planet's geology, mapping the canyons, volcanoes, and dry river valleys that revealed a warmer, wetter youth. And the four machines worked for years, far beyond their design lives, sending weather reports and soil analyses until human error, budget arithmetic, and simple exhaustion of hardware closed them down one by one, the last voice going quiet in 1982.

This book tells the whole story for the general reader: the missions that prepared the ground, the building and sterilizing of the twin craft, the crossings and landings of 1976, the strange results of the biology experiments and the decades-long argument they started, the weather and geology the four machines reported, the long operational decline, and the legacy that every later Mars mission stands on. The writing needs no technical background; the science is carried in plain narrative, and the human drama, engineers crying at touchdowns, scientists arguing for forty years over one instrument's readings, a software mistake silencing a beloved machine, is told as part of the science, because for the Viking program it was.

The chapters ahead run in the mission's own order. The first two carry the program from Mars's canal-era reputation through the flybys that ended it and into the building and baking of the twin craft; the middle chapters hold the arrival year, the landings, the first views, and the soil's famous verdicts, chemical, meteorological, and geophysical alike; and the closing chapters

follow the machines' long decline, the forty-year argument their biology results started, and the legacy that every later mission to Mars stands on. The account asks nothing of the reader but attention, and it repays it with one of exploration's great stories: a question asked too early, answered honestly and at full cost, and still, gently, open, waiting on the next machine and the one after that, exactly as the mission's own planners said it would be when they closed their files and pointed the way for everyone who came after them to the red desert and the two small machines that are still standing in it.

# Chapter 1: The Road to the Red Planet

The Viking mission began with a century of imagination and a decade of rude surprises. Mars had been the most observed planet of the nineteenth century, the one whose surface features were mapped and named, whose seasons could be seen in growing and shrinking polar caps, and whose famous "canals," linear markings reported by earnest astronomers, fed a popular belief that the planet hosted a dying civilization engineering water for its survival. The canal era collapsed in the 1960s, and its collapse was the work of the first spacecraft. The American flyby of 1965, twenty-two quick photographs of a cratered wasteland, revealed a moon-like desert with a whisper of atmosphere, and the public Mars of canals and cities evaporated in a year.

The robotic exploration that followed was rapid, and it set the problems Viking was built to solve. A series of American flybys and the Soviet Union's ambitious attempts at orbiters and landers followed through the late 1960s and early 1970s, most ending in failure, and the planet's reputation swung with each. The great success of the era was the American orbiter of 1971, the first spacecraft to circle the planet, which mapped the whole globe from orbit and found, as the earlier flybys had not, the evidence of a complicated past: vast canyons that would stretch across the United States, volcanoes the size of countries, and, most tantalizing, dry channels and flood scars, the fingerprints of running water in some vanished warmer age. The planet the orbiter mapped was dead and frozen, but its face carried the record of a different youth, and the question that flew with Viking was therefore double: what had the planet been, and did anything survive on it.

Those questions were sharpened by the era's other inheritance, the failures. The Soviet landings of 1971 had ended in a crash and a twenty-second transmission; the orbiters of both nations had struggled with the planet's dust storms and thin air; and the engineering lesson of the decade was that Mars punished improvisation. Viking was conceived in exactly that spirit, as the opposite of improvisation: a program of two full missions, each an orbiter to survey the planet and scout the ground and a lander to descend and work there, launched a month apart, so that the first could certify the ground before the second committed to its own.

The concept dated from the late 1960s, and its approval, for the American bicentennial year as it happened, committed the agency to the largest planetary program it had yet flown, at a cost of roughly a billion 1970s dollars, most of the planetary budget of its decade, and the mission earned, and carried, the name: Viking, the explorers who went everywhere and settled.

The name carried the program's ambition, and the ambition's problem was that nothing about the mission was known to be possible. The atmosphere of

Mars is one percent of Earth's, too thick to ignore and too thin to brake a falling spacecraft the way a parachute works at home; the designers had to invent a descent choreography, aeroshell, parachute, then rocket-powered landing on legs, that had never been flown anywhere. The landing sites were unknown terrain, and the landers, once down, would be beyond repair, so their laboratories had to work the first time or never.

And the question of life, the mission's reason for being, carried a paradox the program's scientists understood from the start: the soil of Mars was absolutely unknown, and the experiments designed to detect life in it had to work on soil whose chemistry might be unlike any soil on Earth. The next chapters tell how the machines were built for those problems, and how the landing solved the first of them, on the seventh anniversary of the first human footsteps on the Moon.

The bicentennial timing deserves a sentence of its own, because it nearly wrecked the landing. The program's managers had aimed the first touchdown for the Fourth of July, the national birthday, an irresistible target for the mission's publicists, and the orbiters' first close-up surveys, in June, were to certify the site in time for the fireworks; the surveys found the prime site boulder-strewn and unsafe, the delay cost the calendar its symbolism, and the landing slipped to the twentieth, the seventh anniversary of the first crewed landing on the Moon, a better anniversary by any measure. The program's old-timers liked to note that the lost date was saved by the caution that made the program work: the machines that were refused a premature touchdown lived to land twice, and the holiday the mission missed was the one its own discipline gave it, on a desert plain, seven years to the day after another desert, on another world, had taken humanity's first step.

End of free sample. The full book is available at putrabooks.github.io

# ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.