

MARTIN MARIETTA

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Destination:  
MARS



# Viking I on way to Mars; Viking II delayed

Cape Canaveral, Fla.—Hurrying as if it intended to make up for a nine-day delay, a Titan III/Centaur flew Viking I into a trans-Mars trajectory from here August 20.

Springing to life precisely at the planned 5:22 pm (EDT) the Titan/Centaur rose, turned southeast over the Atlantic Ocean, and disappeared into space, beginning man's most intriguing exploration mission.

By the next day, Viking I had crossed the Moon's orbit, and seven days later performed the first course correction to set its arrival at Mars for June 19. A landing date has not been selected yet, but it appears to be about July 7.

Traveling at 10,380 mph, Viking I is carrying 11 sophisticated instruments on the most ambitious science program yet flown by the National Aeronautics and Space Administration. Viking has three major goals: 1) to increase man's understanding of the origin and evolution of the solar system, 2) study the origin and evolution of life, and 3) to examine the dynamic processes that shape man's terrestrial environment.

Martin Marietta is the principal industrial contractor to NASA for project Viking, scientific experiments, and mission integration. Martin Marietta is also the principal contractor for the Titan III/Centaur launch vehicle.

The excitement of the launch was nearly over-shadowed by the nine-day drama of switching spacecraft when technical troubles delayed the original flight on August 11.

The initial delay came with less than 120 minutes left in the launch countdown due to a malfunction of a thrust vector control valve in a solid rocket motor. The valve, one of 24, was deemed unfit to fly, and a three-day delay ordered to change it.

During the change, on August 13, an electrical switch mysteriously turned the spacecraft to internal power, and before discovery, the orbiter's batteries lost a considerable portion of their power. A decision was made for a second delay, while the Viking spacecraft were switched, and the batteries changed.

The operation, while extremely active, went as planned: First, the Titan tank pressures were lowered to allow safe work to proceed. Next, the spacecraft was removed and returned to its assembly building. Then the second Viking was

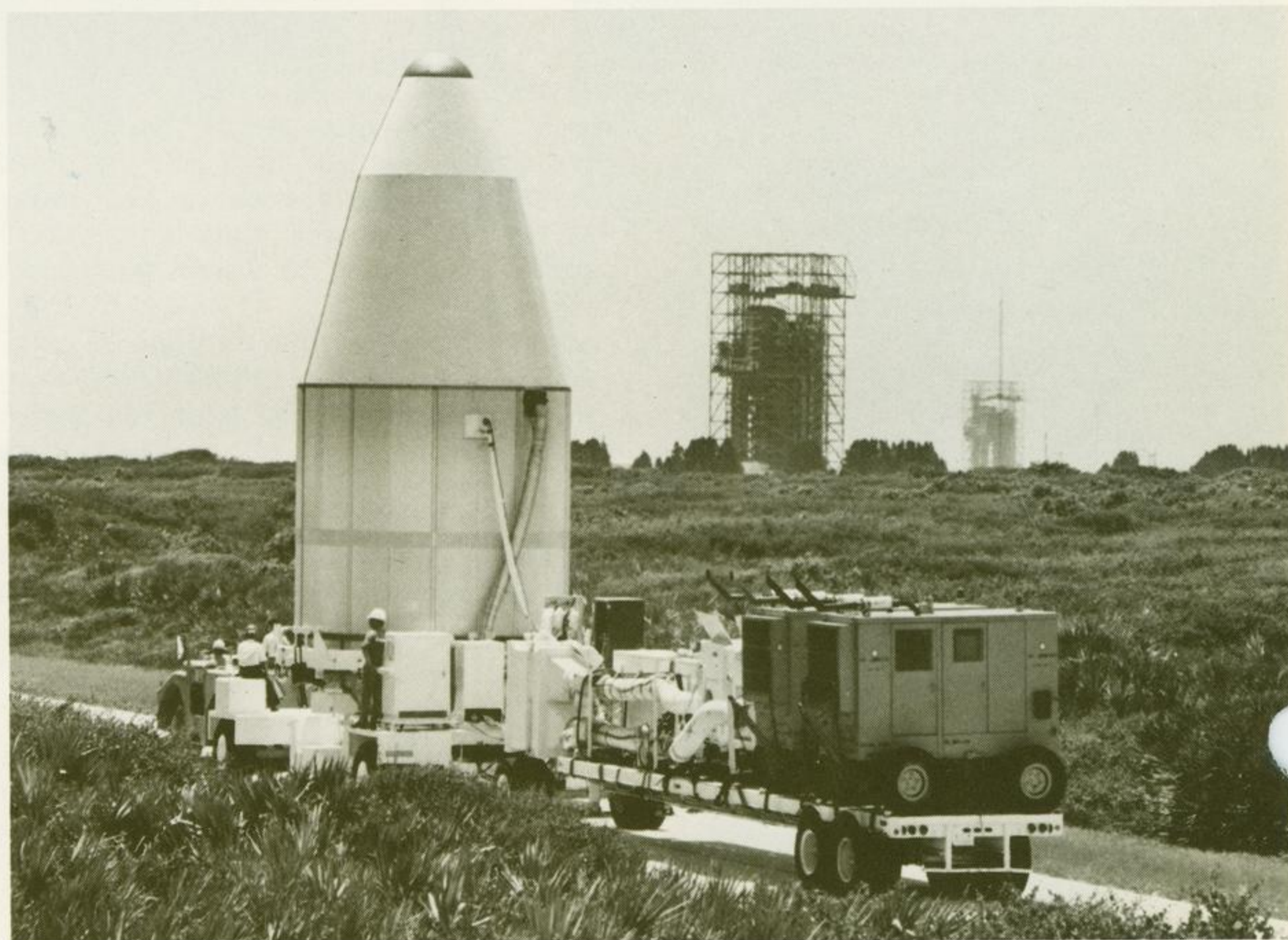
wheeled to the launch pad and hoisted atop the Titan/Centaur. Then three days of checkout, and flight computer updates. The countdown started at 5:45 am on August 20. This time the operation went smooth as silk and ignition came right on time.



## On the cover--

**Titan III/Centaur leaps from its launch pad at Cape Canaveral August 20, beginning the long journey to Mars for Viking I. Arrival at Mars is scheduled for June 19.**

*Moving with a protective caravan, the first Viking spacecraft scheduled to land on Mars, rolls towards its launch pad in the background at Cape Canaveral, Fla.*



Cape Canaveral, Fla.—Launch of Viking II was delayed for the second time due to a faulty radio signal receiver in the orbiter portion of the spacecraft.

The spacecraft was removed from its Titan III/Centaur launch vehicle and returned to its assembly building where the receiver problem was corrected.

Earliest launch schedule for Viking II is Sept. 9 at 2:30 p.m.

This spacecraft was removed from the Titan/Centaur earlier when there was fear the orbiter batteries had been drained of power and damaged when the spacecraft was inadvertently switched to internal power.

## Book available

*The Viking Mission to Mars*, a book prepared by the public relations department for newsmen, libraries, business and political leaders, is being made available to employees of the company.

The 150-page illustrated book will be sold for \$3 per copy through the plant services department. The sale will be restricted to lunch periods in the main cafeterias of the Engineering Building and the Space Support Building.

The book contains three chapters. The first deals with the history of Mars, and mankind's long-standing fascination with the Red Planet. The second chapter is a condensation of interviews with leading Viking scientists who discuss the question "Why Explore Mars?" The final chapter is a description of the Viking spacecraft and its experiments.

# MARS: The Mysterious Planet

**Editor's Note:** This is a condensation of a section of "The Viking Mission to Mars," a book prepared by Martin Marietta for use by journalists who write and comment on U.S. efforts to land on Mars. The section was written by Robert M. Powers, a free-lance writer and a member of the Royal Astronomical Society of Canada.)

Mars and its fascination has been with us for a while. How long ago mankind first turned a face to the heavens and recognized there a red glittering point that moved across the sky is hidden in the shadow years of history.

At some ancient time, Man thought of Mars. It was not when he lived as a savage in open-air camps, nor when he painted crude art on cave walls in France, but later, when there was a curiosity about the sky, about the stars and the wandering ones, and their meaning.

No written records seem to exist giving a description of the birth of Mars, either as a planet, a diety, or a question mark in some obscure ancient's philosophy.

Mars was, in numerous, but perhaps not quite official ways, the national god of the Romans. March, the third month, was a signal for the beginning of military campaigns initiated by a festival of priests who carried weapons and sang the triumph of the god of war. In Roman mythology, Mars was born of Jupiter and Juno and terrifying associations surround him.

## Abode of a god

To the astronomer-priest of Babylon or to the observer in ancient China, the planets and the Moon were not worlds. Mars was not a solid body two-thirds the diameter of this world and moving along a path around the Sun. It was only an abode of a god, distance and physical conditions unknown. It was only the duty of the observer to note positions and movements.

But as time passed, astronomers and observers became more concerned with physical conditions and less concerned with residences of gods.

The Moon was the subject of many observations. And many observers thought it was inhabited.

Philolaus felt the Moon had plants and animals. Xenophanes remarked it was inhabited and a land of many cities and mountains. Metrodorus bluntly said, "It seems absurd that in a large field only one stalk should grow and in infinite space only one world exist."

## Copernicus: Sun is center

Plutarch wrote that the Moon was a second Earth and inhabited. If the dark ages had not intervened, it would not have been long before the entire heavens would have been believed inhabited and Mars would probably have been a first likely candidate.

Man was beginning to form his own ideas about space.

Nicolaus Copernicus proposed a world-shaking theory: The Sun, not the Earth, was the center of the solar system. He did not, however, discover the true nature of the solar system. He still believed the planets followed circular paths.

Tycho Brahe, born three years after Copernicus died, made some of the most accurate observations of the positions of the stars and planets made until long after the invention of the telescope. It was from his observations

that Johannes Kepler, an assistant to Tycho, began a detailed study of Mars.

Without Copernicus' idea, Tycho's observations, and Kepler's use of both in developing laws of planetary motion, there would be no rockets to Mars — there would be no way to calculate the trajectory that would get a rocket there.

The great change in Man's concept of the solar system was followed by an even greater change, brought about by the discovery of the telescope. For the first time, the heavens could be examined to a level of detail impossible with the naked eye. Man now had the ability to really learn about other worlds.

In 1646, Francesco Fontana of Naples saw belts on Jupiter and a marking on Mars — a marking later named Syrtis Major.

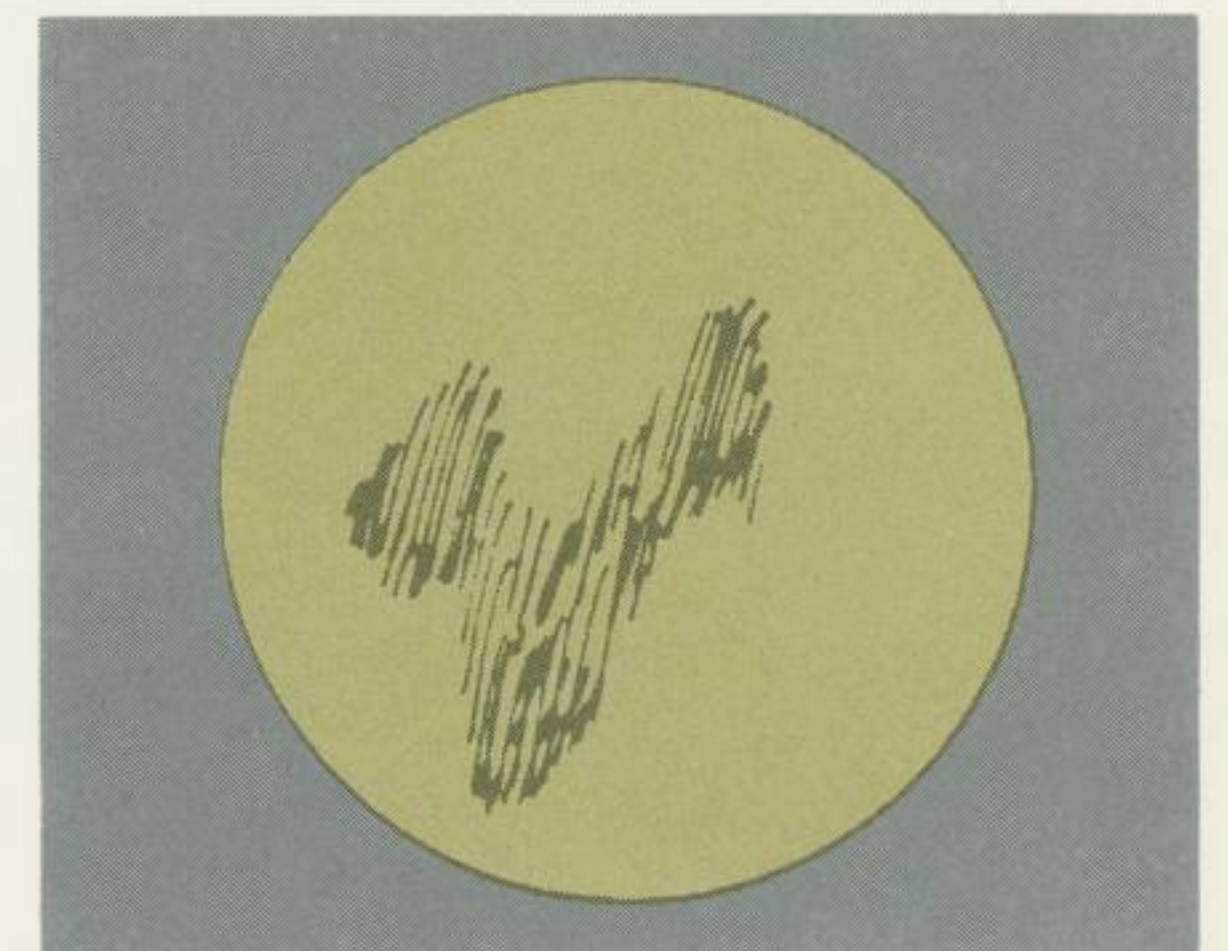
In 1659, Christian Huygens made a drawing of Mars as seen through a telescope. About the same time, Robert Hooke in England drew markings on the planet and in Italy Giovanni Cassini first observed the characteristic Martian white polar caps which brought to mind the image of ice and snow.



*Ancient Map of the Skies*

Mars first appeared in Babylonia as a term for a god and apparently for a red wandering star, or planet, called "Nergal." The references date from fifteen hundred or more B.C., perhaps earlier. By the eighth century, the planet and Nergal were important figures, and unpleasant ones. Nergal was the god of fire, king of battle, lord and power of might.

To the Greeks, Mars was Ares (until recently, physical study of Mars was referred to as areography), master of war, god of disaster. To the ancient Persians, he was a celestial warrior.



*Huygen's Original Drawing of Mars*

The English astronomer Sir William Herschel suggested in 1784 the polar caps of Mars were definitely ice and snow, largest in winter, melting in spring and early summer, and at a minimum in late summer.

He also saw color changes on Mars and could identify the beginning of spring. He wrote Mars had an atmosphere and clouds and was probably one of the first to mention possible inhabitants. He thought they must have a life "in many respects similar to our own."

J. H. von Malder established the first topographic map of the surface of Mars about 1840. From that time on, Mars was an objective of study for nearly

# "That Mars is inhabited... we may consider as certain..." Lowell

everyone with a telescope. Maps of the planet began to appear regularly.

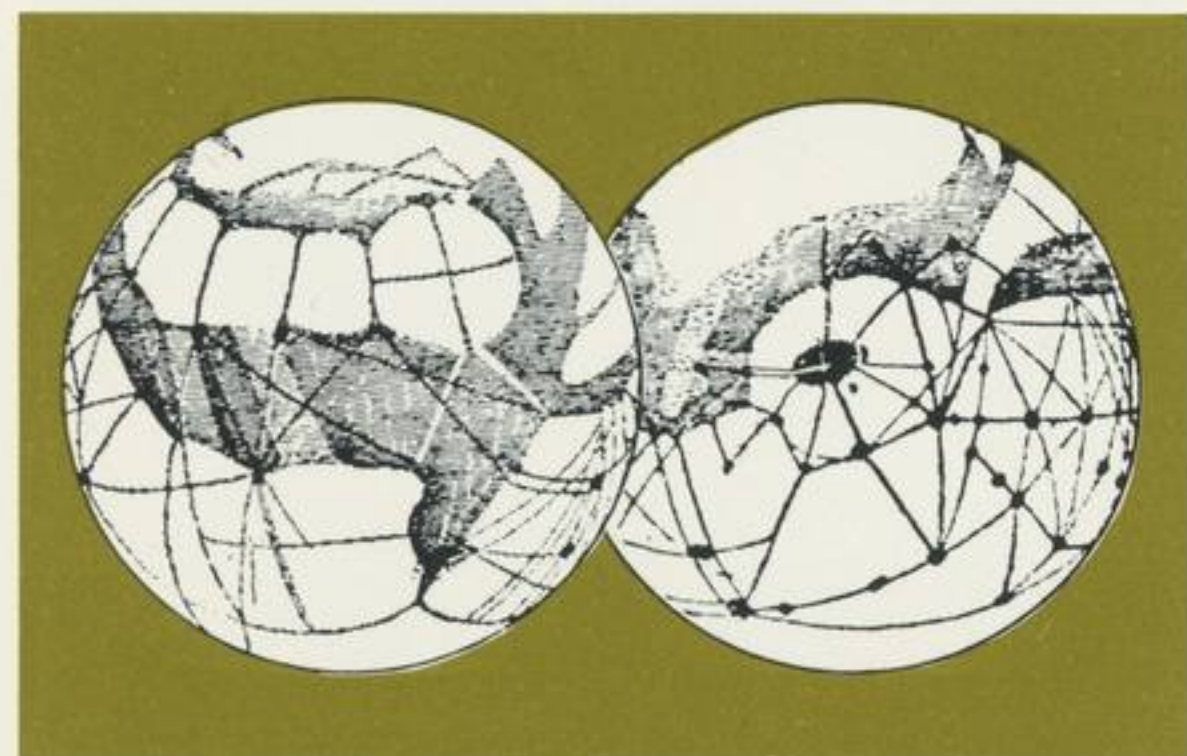
1877 was one of the biggest years for discoveries on Mars. The canals were recorded in detail by Giovanni Schiaparelli; Mar's two tiny moons were found revolving in odd orbits by Asaph Hall.

Although Schiaparelli retired from observing in 1890 because of his eyesight, the cause of the canals and their origin was taken up by William H. Pickering and the famous Percival Lowell. Lowell was to dominate thinking about Mars for the next 30 years.

Lowell was convinced Mars was inhabited by intelligent beings who created the canals. Thus, he created the *Martians*.

In his second book, Lowell said, "That Mars is inhabited... we may consider as certain as it is uncertain what those beings may be."

Others wrote of life on Mars, mostly in books of fiction, and Mars was launched as a place for life in the public mind.

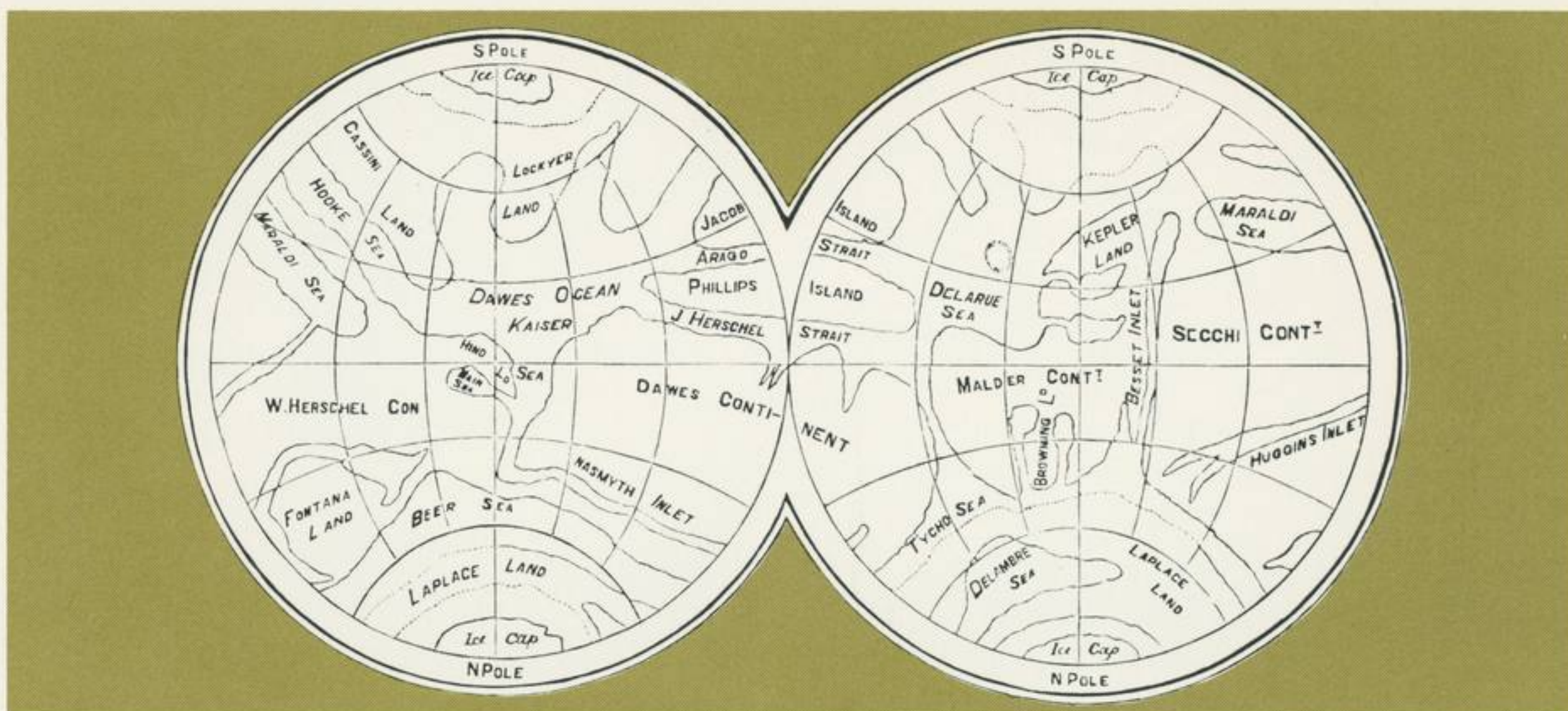


Lowell Map of Mars Drawn in 1895

While much of the world was fascinated by the prospects of life on another planet, an intelligent life, the scientific community was not entirely in agreement and went on to pursue facts instead of fancies. Scientists were trying to put the true puzzle of the Red Planet together.

1957, the dawn of the space age. Mars was believed to have polar caps of a few inches, probably composed of ice, with dark areas probably composed in part of a covering of some form of lowly vegetation. The bright areas were thought to be large tracts of mineral wastes. The atmosphere was said to be less than one-tenth sea level pressure on Earth, and as for life, Mars was at least "far more inviting than Venus or the Moon, and the indications are that it is a living and not a dead world."

In 1965 it was being said there was considerable evidence organisms of some sort were present on Mars. But the organisms were microscopic.



Map of Mars by English Astronomer Richard Proctor

Gone are most of the Martians of literature, gone are the fascinating forests with red flowers and towering trees. The brilliant, sometimes evil beings of the Red Planet were no more real than the outmoded gods of Mount Olympus.

Microorganisms, however, are still life of a sort. But we had not been there.

However, the dream of travel to another planet was coming true, or as close to being true as possible before Viking.

Not long after midnight, July 16, 1965, Greenwich Mean Time, Mariner IV gave us the first close-up photography of Mars and we suddenly had a different planet — more like the Moon than anything else.

On July 31, 1969, Mariner VI passed less than 2000 miles from the surface of Mars. And on August 5, 1969, Mariner VII began photographing. The twin mission showed more craters, an atmosphere mainly of carbon dioxide, and thin nearly beyond imagination if it's our kind of life you're thinking about. The Martian atmosphere, as shown by the three Mariners, was little, if any, use as a screen against violent radiation from the Sun.

The polar caps seemed to be carbon dioxide in solid form, no ice or water, and the darker regions of Mars, so long to be thought to be low vegetation, were not.

Mariner IX, launched in May 1971, sent back 7329 photographs of the surface of Mars and the two tiny moons. It showed, that perhaps at sometime in the past, the Martian atmosphere was much denser than it appears now.

Canyons which once seemed to have been river beds opened up under the photographic lens of Mariner IX. There are other curiosities revealed with which to wile away the mind. Was there life on Mars? Was Lowell ultimately right and there was some kind of dying Martian life? What is the explanation for the strange tributary systems, oddly resembling those on Earth, though apparently dry?

For all we have thought and discovered, Mars still holds us at bay. We have changed our minds about the construction of the solar system several times. We have modified and discovered, pondered, and theorized a dozen times on this planet and other planets. We have seen Mars close up and it still holds from us the secret we want most to discover.

Is there life on Mars?

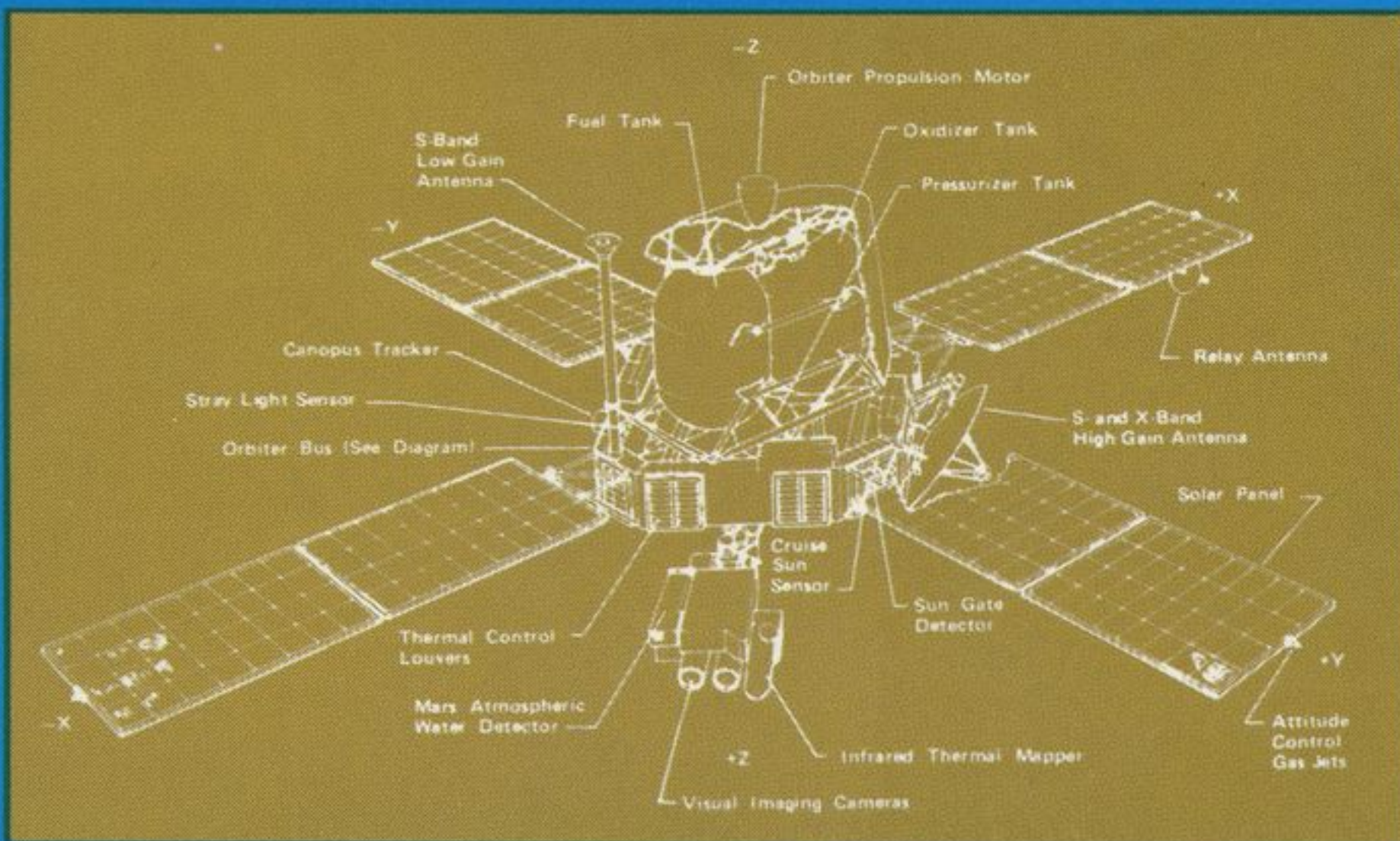
We will travel across deep space with our fragile instruments to land on another planet, to seek out the great adventure for some kind of life in the universe other than our own — on Mars. Lowell, for all his faults, would have been glad to see this time.

He would have understood it.

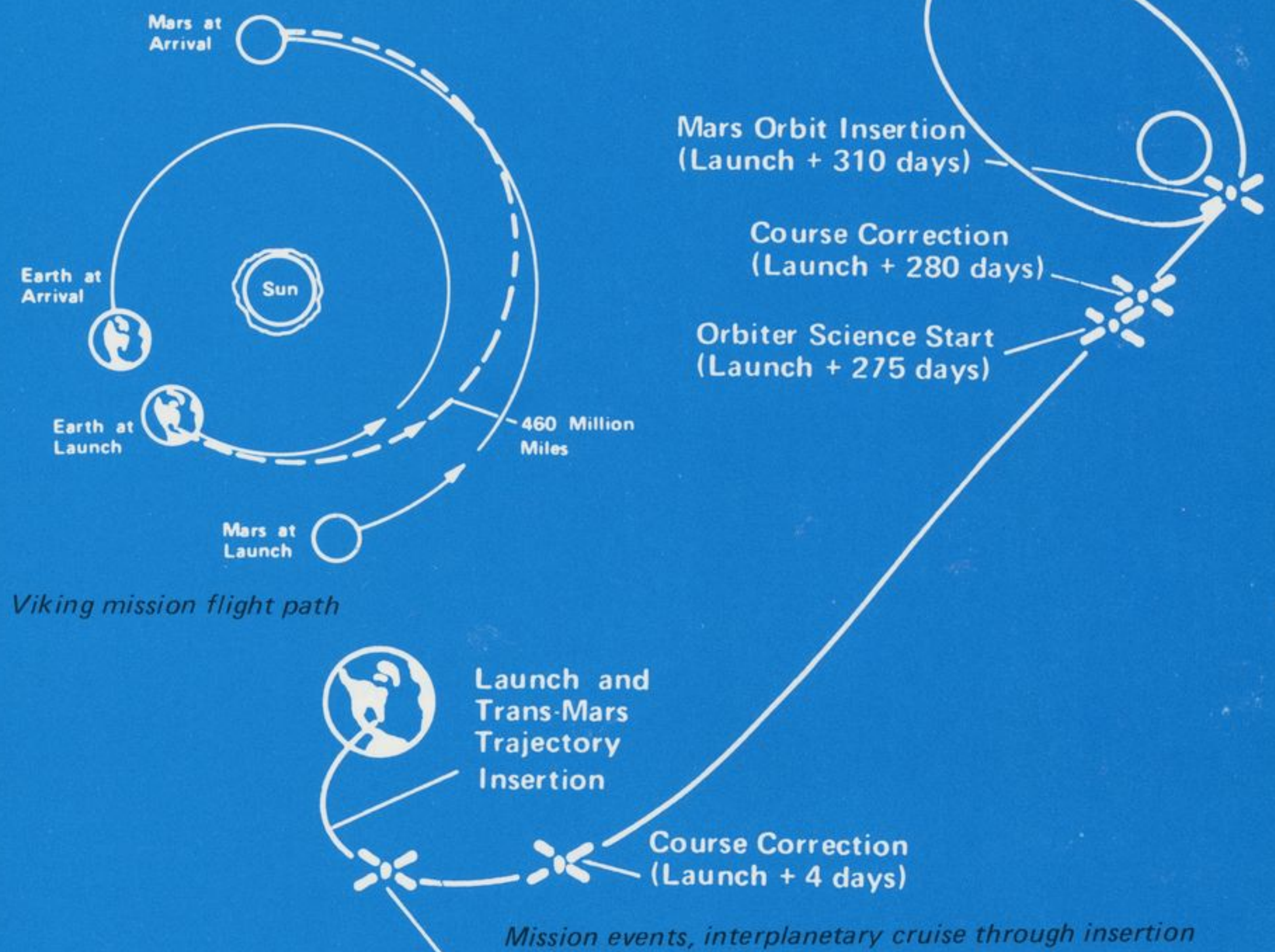
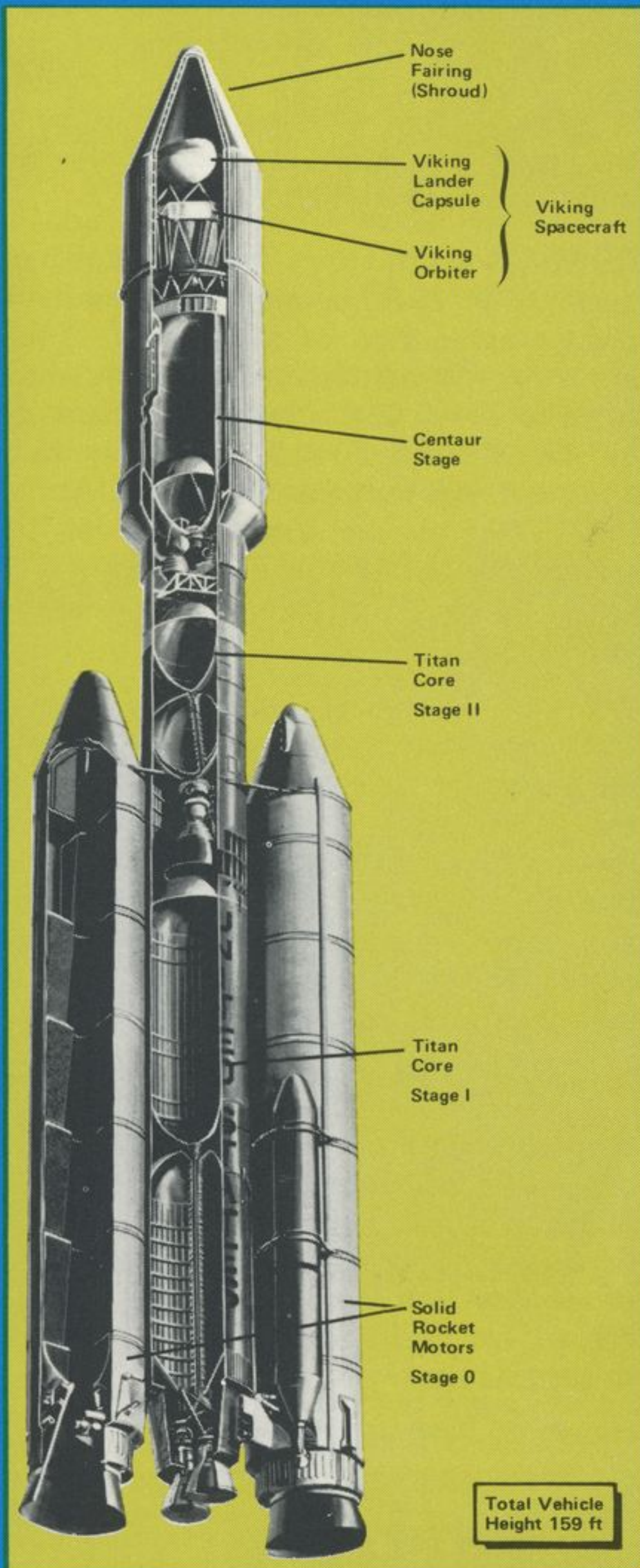
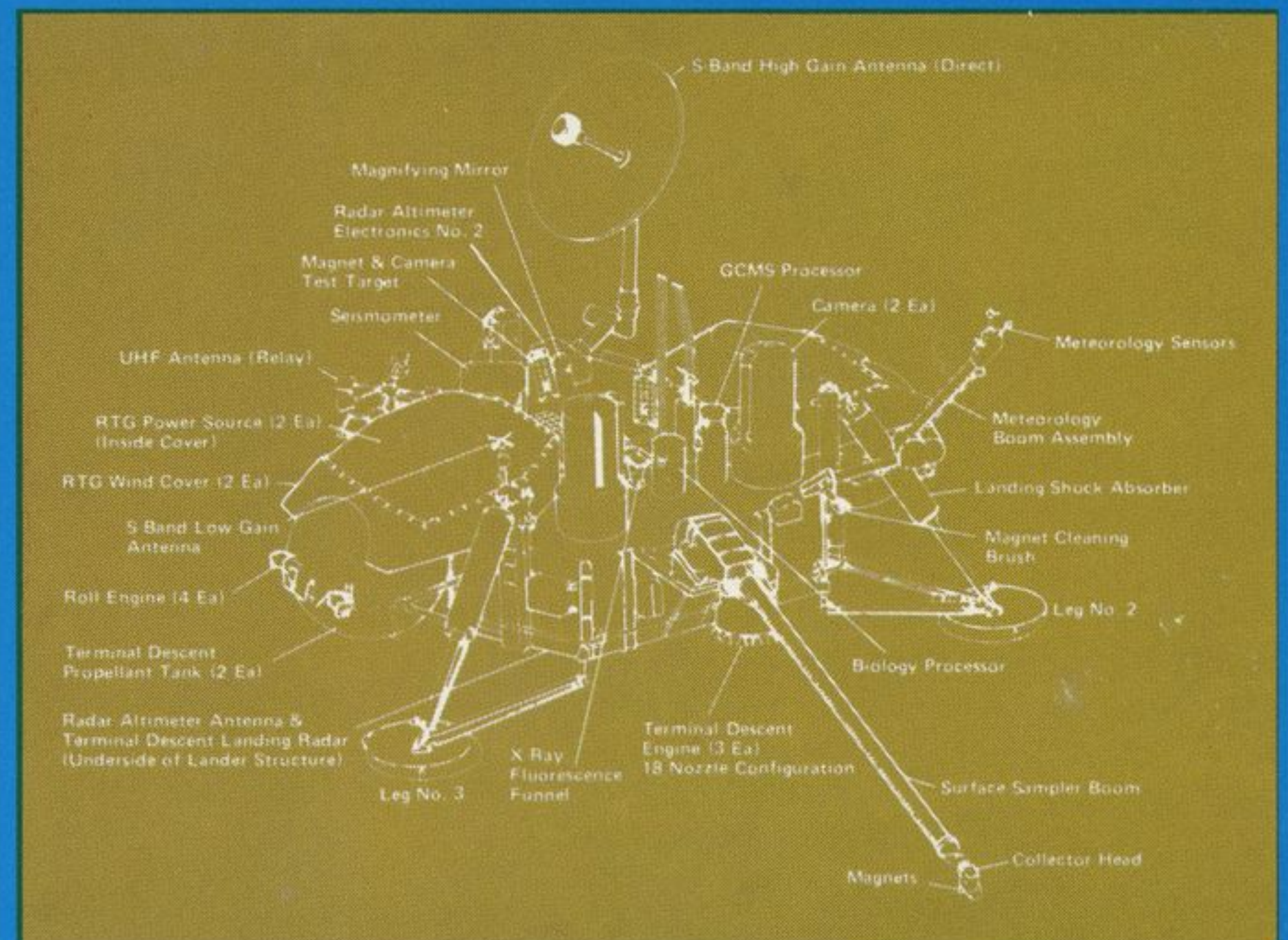
"I predict that, in the first week or two after a successful Viking landing, we will learn more about Mars than in any other single period in man's history.

"One thing must be obvious. When that lander sits down on the surface of Mars, it will be the greatest day of my life and for many others... In a sense, I started work on Viking in 1960 before there was a Viking. On July 4, 1976, if that is the date, it will be 16 years of my life toward one moment, toward the actual landing. It would not be a surprise a hundred years from now to find a scientist stating that this 20th Century experiment most influenced his life."

— Dr. Gerald A. Soffen  
Chairman, Viking Science  
Steering Group



Schematic of Viking orbiter, above, shows major components of the spacecraft. At top is the orbiter propulsion motor used for critical course changes during the journey to Mars and to achieve orbit around Mars. The motor was built at the Denver division. At right is schematic of lander.



Acquire the Star Canopus Start Interplanetary Cruise (Launch + 42 minutes)



Camera operators from Denver's three network television stations filmed the Viking proof test capsule as it went through its paces at a press conference held prior to the first launch.

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## An Interview With W. O. Lowrie

### '... a stimulating way to live'

Many of us find it difficult to sustain our interest in a single project even a few months.

Walter O. Lowrie and his hundreds of team mates on the Viking project have kept their interest in the project high for at least six years, and some, like Lowrie himself, have sustained their interest for the better part of nine years.

Lowrie, who now heads the project for the division, worked on the original proposal and, except for brief assignments on other division projects, has worked solely on Viking for about nine years.

Before leaving for Cape Canaveral for the launch of two Viking spacecraft, Lowrie discussed his views of the project with Martin Marietta News.

"Your comment that sustaining interest in a long-term project may be accurate for some," Lowrie said, "but I haven't had any difficulty and I doubt many on the project have had any difficulty."

Why?

"The people have become personally involved in this fascinating project," Lowrie said. "We have been working on the frontiers of technology, discovering new ways to accomplish project requirements. That's a stimulating way to live."



Walter O. Lowrie

Lowrie said the blending of the young and the old — in terms of experience, not necessarily age — has helped sustain interest as well as helped meet project requirements.

"Some of our people came to the project right out of school. Others have grown up with the nation's space program," Lowrie said. "Both groups have had much to contribute."

"Those who have spent nearly all their working lives on space programs contribute good, solid experience. The young engineers contribute bright, fresh ideas, unhindered by a what-has-worked-before prejudice."

"This combination of people has worked well for us and I believe has made working with Viking scientists especially successful," Lowrie said.

The Viking scientists — 70 prominent people, forming 13 scientific teams — are the key to the most comprehensive scientific exploration of another planet.

Listening to their needs and desires and producing hardware and software to meet those requirements was critical to the success of the Viking project.

"Our people worked on a team-to-team basis with the scientists," Lowrie said. "We learned much about scientific investigation and the scientists learned much about hardware."

Although the "science" — as the investigation/hardware/software combination is called — has changed little from the original proposal and design, weight of the equipment has gone up, primarily because of added complexity of equipment.

"We have done well in handling the additional weight while maintaining the basic objectives of the mission," Lowrie said.

"Seeing people handle situations like this and then thermal design requirements has been most satisfying," Lowrie said. "My satisfaction has come from seeing the enjoyment of those on the project — enjoyment of a job well done."

The most difficult part of a project for Lowrie?

"Keeping track of all aspects of the project has been — and still is — a monumental task," Lowrie answered. "I have been on the road visiting contractors about half of each month. And, each Friday, my staff and I meet for an exhausting review of the total program."

This straight-forward, open discussion gives us all visibility in depth and provides a base for total communication on the program.

"These meetings have forced all problems out into the open," he said. "Nothing has been hidden from anyone on the project, especially not from the customer."

This openness will continue. Lowrie plans a full critique of the management of the program while the spacecraft are on their way to Mars.

"Wasn't it Mark Twain who said, 'Everyone talks about the weather, but nobody

does anything about it?'" Lowrie asked. "Well, everyone talks about teamwork — but we have done something about it."

"Viking has been — and continues to be — a real team effort. And I mean *real*, not just on organization charts, or to make progress reports sound good."

"That's why we will have two landers on Mars next year, sending exciting and usable scientific data to Earth — data leading to giant forward steps in expanding man's knowledge of Mars, the solar system, other planets, and Earth."

## Round-the-clock effort readies pad 41

A flurry of activity seldom matched in the space program began at Cape Canaveral's launch complex 41 at 5:22 pm August 20 when the huge and powerful Titan rocket roared away pushing the first Viking spacecraft toward Mars.

Before the rocket cleared the 170 ft. launch tower, a highly skilled team of firemen, electricians, and safety engineers were in vans speeding the three miles to the pad to assess damage and set the wheels in motion to make repairs.

By the time they reached the pad, with smoke from the launch still hanging overhead, the launch tower deluge system had poured out more than a million gallons of water to extinguish flames and reduce the heat left by Titan's two solid rocket motor engines.

This was the beginning of the intense effort to prepare pad 41 for an identical launch only twelve days later.

By the next day, an around-the-clock operation involving more than 200 Denver division people had repaired the pad and moved the second Titan, with its solid rocket motors and Centaur upper stage, into place.

Beginning before daylight on the eighth day they brought the second Viking spacecraft from its assembly and encapsulation building and hoisted it to the top of the rocket.

Complete systems checkouts and electrical tests followed each step in the preparation.

Ordinance installation, fueling, guidance tests, computer updates, launch dress rehearsals and pressurization of tanks followed in close succession, leading to early morning on the twelfth and final day when the system began its successful countdown for launch.