

# Ten Years Ago: Touchdown on the Plain of Gold

"Touchdown! We have touchdown!"

It was July 20, 1976, seventh anniversary of Apollo 11's landing on the moon. But Richard Bender's shout, ringing over communications circuits at Jet Propulsion Laboratory (JPL) in Pasadena, Calif., and triggering a cacophony of whoops, cheers and applause, was no mere commemorative back-slapping for an achievement of a past decade. Bender, head of an assemblage of engineers known as the Viking Lander Performance Analysis Group, had just announced the first successful landing on Mars.

The Soviet Mars 3 craft had gotten there on Dec. 2, 1971, but its transmissions lasted only about 20 seconds, during which time it managed to gasp out perhaps a third of a single featureless, gray photo. The Viking 1 lander, designed to operate for 90 days, stayed on the job for more than six years, sending its last message on Nov. 13, 1982. For much of that time, it operated in concert with a second landing craft and a pair of orbiters. Together, the Viking quartet took more than 50,000 pictures of Mars and conducted a host of other activities, notably including the landers' search for signs of life — a question which, though surrounded by a generally negative consensus, has yet to be fully resolved. But that initial landing, despite all the space milestones that have been commemorated on various anniversaries over the years, is still a moment to remember.

Project Viking was, and still is, the most elaborate unmanned study of another world ever conducted. Under development for more than a decade (and beginning three years before it even had a name), it involved more than 10,000 people, cost a billion dollars, combined those four spacecraft working at the same time and advanced the technological state of the art in more than 100 separate areas. Even the flight team that would keep it running from day to day included about 800 members. Working through a horrendously intricate management structure that often saw as many as 30 meetings a day — more than many multinational corporations — the team held the capability of redesigning virtually the entire mission, spacecraft operations and all, in 16 days.

The Viking 1 orbiter and lander were launched together on Aug. 20, 1975, and took up orbit around their target planet on June 19, 1976. (The Viking 2 combination was launched on Sept. 9, 1975, and reached its Mars orbit on Aug. 7, 1976.) The plan was for the first lander to be sent down to the surface on the Fourth of July in '76, celebrating the 200th anniversary of independence in the New World

by landing on a new world. But it was not to be.

Caution was the watchword. At least four Soviet Mars-landing craft had attempted the feat, but besides the brief bleep of Mars 3, one of the others crashed, another stopped sending data before it reached the surface, and the last one, in 1973, missed the planet entirely. For Viking 1, a landing site, a backup site and a "super-safe" backup backup site were selected on the basis of photos taken in late 1971 and 1972 by the U.S. Mariner 9 orbiter. To check out the choices, Viking 1 began taking pictures even before it reached its orbit, and continued to do so once it was in position. A huge team of geophysicists, cartographers and others was charged with the task of "site certification," and pored over the growing stack of images throughout numerous meetings and skull-sessions, ever aware that there could be boulders, cracks, chasms and craters bigger than the lander itself yet still invisible to the orbiter's cameras.

Augmenting the photos were earth-based radar scans, sensitive to surface roughness on a scale of centimeters; but they, too, could not be blindly accepted as "proof" of adequately smooth terrain. In addition, radar interpretation was essentially a foreign language to the majority of the site-selection team members, who had seldom if ever had occasion to use such a tool.

As the task of looking for an exact site continued, possibilities fell by the wayside one after another. The days and weeks wore on, with the site team sometimes wondering aloud about whether they would ever find a site they could trust. The lander could stay coupled to its orbiter for months if need be, but if the search took too long, the flight team would find itself hunting for a site for the Viking 2 lander while Viking 1 was still in the busiest part of its operations schedule.

The Fourth of July came and went. Finally, the photo analysts found a site that seemed acceptable — "about as smooth a spot as we've seen on the planet," said one member of the team — only to have the radar analysts show up and report that the "mean slope" of the area seemed to be about twice the Martian average. As if to drive home the point, it was pointed out that even some of the larger features could be virtually invisible to radar. For example, a huge crack known as Hephaestus Fossae, 500 kilometers long and in places 1 kilometer wide, hardly showed up at all in the radar plots because its reflection was washed out by the stronger return from the smoother

areas on either side.

Most of the people studying the orbiter's photos had to accept the radar interpretations essentially on faith, but it was decided that the chosen site would have to be one that looked good by both methods.

On July 12, a consensus was finally reached, and it was unanimous. About 740 kilometers from the original July 4 site, it lay on the western slope of a basinlike feature in a vast plain known as Chryse Planitia, the Plain of Gold. The radar showed only modest slopes, and the photos showed only two impact craters large enough to have tossed appreciable numbers of boulders out onto the surrounding terrain. There were a few ridges similar to those in some lunar "maria," or seas, but those seemed obligingly to look more soft-edged in the portions near the precise landing area. Additional checks of the site were carried out, and the final checkout of the lander itself was conducted on July 18.

At 1:51 a.m. on July 20, the lander was separated from the orbiter, and it began its final descent at about 5:00 a.m. Thomas A. Mutch of Brown University in Providence, R.I., head of the lander imaging team, described the scene in *The Martian Landscape*, a NASA book that is still one of the most arresting accounts of that momentous occasion:

*Conversation stops — an overwhelming silence. We listen to the mission controllers as they call out each event. After years of waiting, hoping, guessing, the end rushes toward us — too fast to reflect, too fast to understand.*

The times and altitudes ring over the JPL public address system, and at 5:12:07 a.m., Bender's voice: "Touchdown! We have touchdown!"

Such events — at least on earth — abound with over-quoted clichés from the participants. One in particular came from project manager James Martin, a statement made meaningful by the fact that it came from a man with a third of a century's aerospace experience, deemed so crusty that when some of the assembled press corps cast a hypothetical movie about Viking, he was given "the John Wayne part — except that Duke is a bit lightweight." Said Martin, when he showed up in front of the press a few minutes later, "I had tears in my eyes."

— Jonathan Eberhart

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