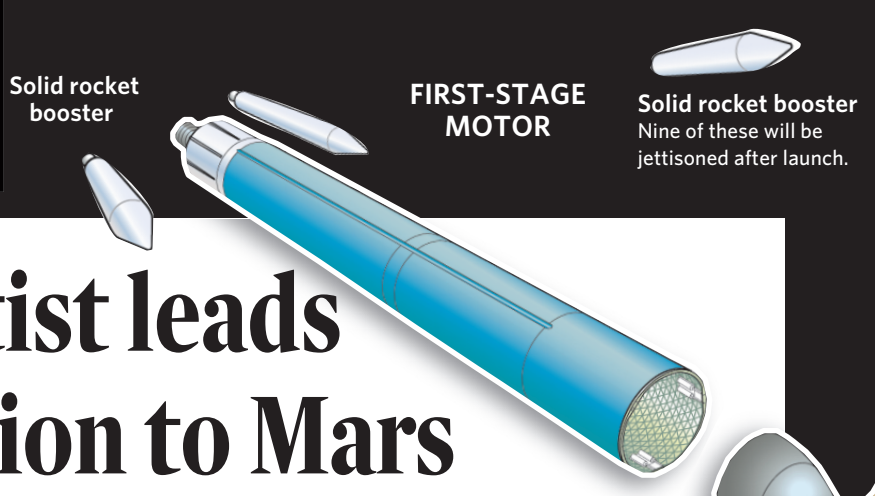
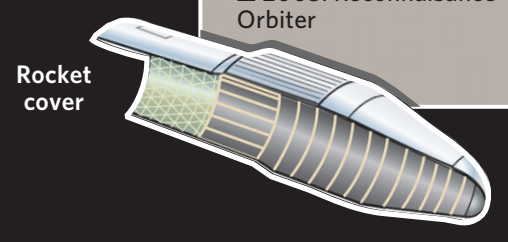
The journey of the Phoenix Mars Mission

The Phoenix Mars Mission is scheduled to launch Friday at 2:35 a.m. Arizona time from Cape Canaveral, Fla. The University of Arizona-led mission will send a stationary spacecraft to the Red Planet with the goal of analyzing soil and ice. Other instruments will take pictures and study the weather. Scientists want to know if the arctic soil could support life. The instruments won't be able to detect past or present life, but if scientists find that conditions favor life, future missions could target this area for further research.





Delta II

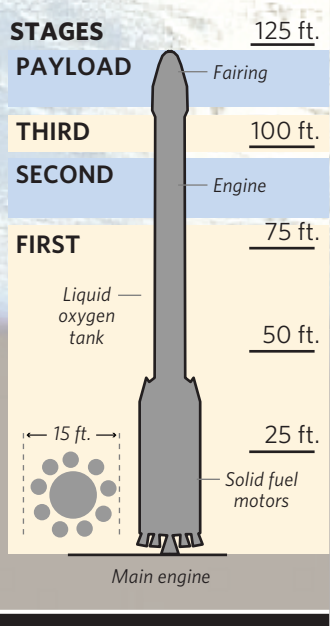
The three-stage Delta II rocket can carry payloads into near-earth orbits (100 miles) in space.

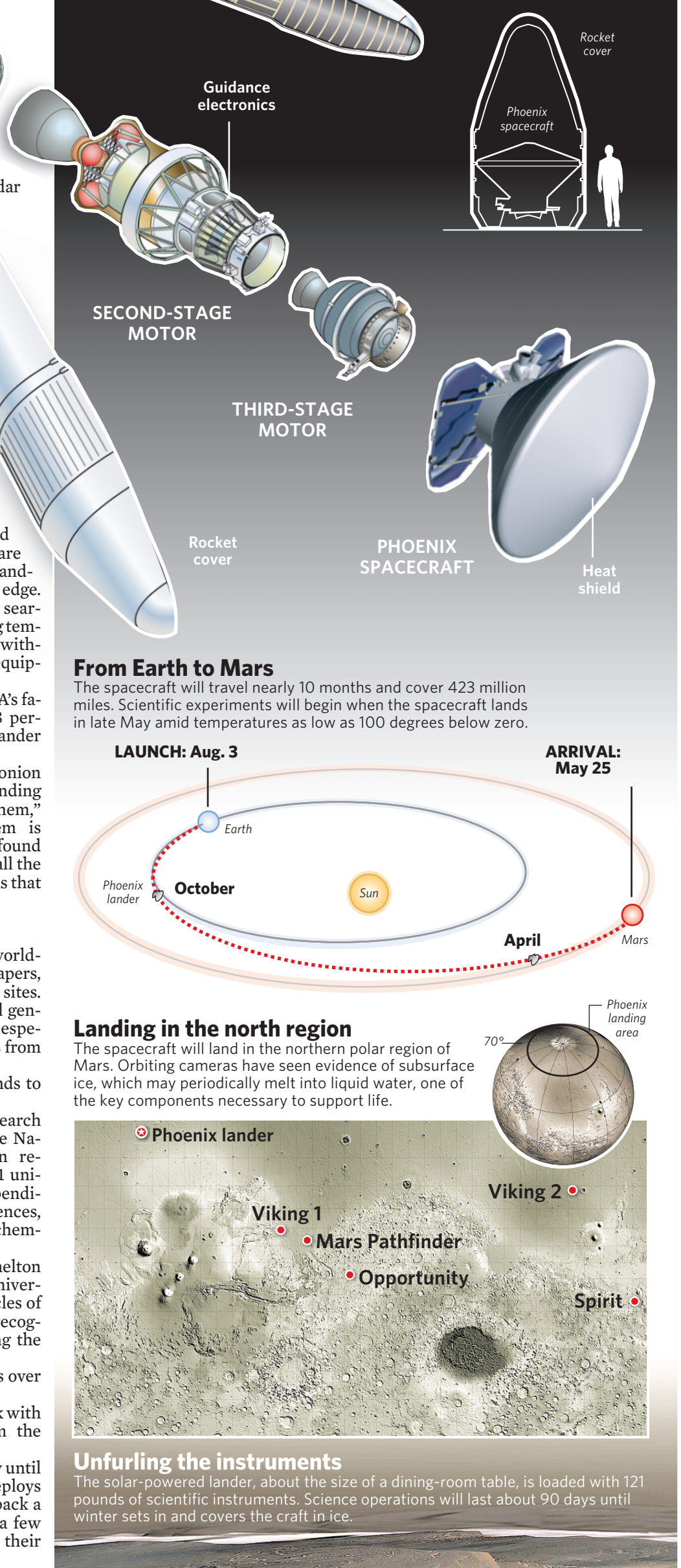
BY THE NUMBERS

Maiden flight: 1989.
Launches: 128.
Successes: 126.
Weight: 511,190 lbs.

OTHER MARS LAUNCHES

- 1975: Viking 1 and 2
- 1996: Pathfinder
- 1996: Surveyor
- 2001: Odyssey
- 2003: Rovers – Spirit and Opportunity
- 2005: Reconnaisance Orbiter





UA scientist leads new mission to Mars

MARS

Continued from A1

toward redeeming the earlier Mars failures and answer some age-old questions: Is Mars suitable for life? And if it's not now, was it ever?

The data Phoenix gathers will be one more small step in humans' effort to eventually send astronauts to Mars.

The mission takes its name from the mythical Phoenix bird and resurrects technology from the ill-fated Polar Lander and the Mars Surveyor Lander, a follow-up lander that was canceled.

The $420 million mission is groundbreaking on several fronts. Phoenix is the first Mars mission led by a university. The spacecraft will be the first to dig as much as 3 feet beneath the planet's icy surface, using an 8-foot robotic arm. No other spaceship has landed before in the northern polar region of Mars, where orbiting cameras have detected evidence of subsurface ice.

The ice may periodically melt, and where there is water, there could be life.

Getting ready

In a one-story stucco building about a mile from the UA campus, the pace of work is picking up.

This is command central, the headquarters for science operations. The building on Sixth Avenue blends into the neighborhood except for a brilliant mural that depicts the spacecraft's launch and cruise.

Computers and big screens are being brought in. About 50 scientists, engineers, support staff and students work at computers or go over paperwork. Some practice sending commands to a replica Phoenix lander housed in a gymnasium-size room.

In another room filled with PCs, Jet Propulsion Lab scientists will send commands to the Phoenix Mars instruments, using a communications link called the Deep Space Network. It tracks and controls the spacecraft using antennas in Spain, Australia and California's Mojave Desert.

Past the lobby is the heart of the center, where scientists overseeing the craft's seven instruments will decide what experiments to conduct. The mission is expected to draw scientists to Tucson from several American universities and around the world.

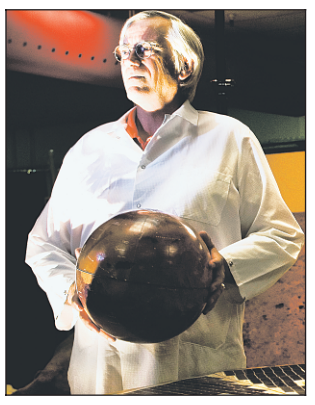
They will have to work fast. The solar-powered craft, which will land in May, has an expected life of 90 days before the Martian winter sets in and blankets the craft in ice, freezing it to death.

Smith, 59, oversees the mission from a narrow office off the main room. His days are long, as he ensures the mission is on track and his team practices operating the scientific instruments.

On a recent day, Smith raced to meet an 11 a.m. deadline on a slide presentation for a NASA safety review.

The low-key scientist doesn't sugarcoat the pressure his team is under, calling the 90-day window to complete experiments "pretty scary."

Smith has shuttled back and forth between Tucson and Colorado, Los Angeles and Florida to prepare for the launch. While UA leads the mission, the Jet Propulsion Laboratory and NASA get the craft to Mars and track and communicate with it.



CATHERINE J. JUN/THE REPUBLIC

Peter Smith

Title: Principal investigator, Phoenix Mars Mission.

Education: Bachelor's degree in physics from University of California-Berkeley. Master's degree in optical sciences from University of Arizona.

Age: 59.

Work history: A research scientist at UA since 1978. His research focused on Venus and Jupiter and then on Titan, Saturn's largest moon.

Achievements: Lead scientist for the color camera aboard the 1996 Mars Pathfinder Mission, which captured sweeping panoramic photos of the Red Planet.

How he got interested in science: His father was a medical researcher who developed an inexpensive vaccine for yellow fever and later became a professor of microbiology at UA. As a child, Smith overheard his father having long, technical discussions with other scientists who visited his house. Smith had his own chemistry set and tried to make explosives when he was about 10. Fortunately, that experiment failed.

Hobbies: Golf.

Family: He and his wife, Dana, a nurse practitioner and artist, have one daughter, Sara, who is a geology student at UA.

Risky business

Phoenix is viewed as a stepping stone to future Mars missions, part of a new NASA strategy to develop less expensive, innovative spacecraft.

"Our goals are not so much finding life itself but to find places where life could exist on Mars," Smith said. "And this is important because we haven't found those places yet."

Phoenix marks Smith's seventh Mars mission.

Ten years ago, he led the camera team on the Mars Pathfinder, capturing striking photos of the Red Planet. The most famous is the Twin Peaks image that shows close-ups of rust-colored rocks and two distant hills.

Smith hoped to repeat his success a few years later on the Polar Lander mission. But after NASA lost contact with the craft, disappointment sank in.

"Couldn't we get at least one picture?" he thought.

He still wonders what could have been.

"We were told the landing site ... was on the edge of a big depression, so our images would have looked across this whole sweeping view," he said. "It would have been absolutely spectacular."

If the Phoenix mission is successful, it will take away some of the sting.

The mission hasn't been without significant challenges so far.

Earlier this year, its $386 million budget ballooned past $400 million after the landing radar needed to be stabilized.

The search for a safe landing site has been difficult. Scientists thought the arctic region would be flat and featureless, but close examination showed boulders the size of small cars and buses.

To reach Mars, the spacecraft must travel 423 million miles, the equivalent of about 86,045 round trips from Phoenix to New York City.

The Aug. 3 launch and nearly 10-month cruise are the less risky parts. It's the landing that puts scientists on edge. The craft must withstand searing heat and below-freezing temperatures and touch down without damaging scientific equipment.

Still, the odds are in NASA's favor. The agency has an 83 percent success rate on Mars lander missions.

"We have peeled the onion down as far as we can go, finding problems and fixing them," Smith said. "The problem is there's no guarantee we've found all the problems and fixed all the problems. It's the unknowns that are left."

Mission's significance

The mission is getting worldwide attention from newspapers, scientific journals and Web sites. The May 2008 landing will generate even more interest, especially when the first photos from Mars are released.

UA's reputation also stands to benefit.

Thanks to large research grants in space science, the National Science Foundation recently ranked UA the No. 1 university for research expenditures in the physical sciences, which include astronomy, chemistry and physics.

UA President Robert Shelton said it's important for a university to have certain "pinnacles of excellence" where people recognize the university as being the best.

"That recognition carries over into other areas," he said.

UA could deepen its mark with scientific discoveries from the mission.

Smith won't breathe easy until the craft lands on Mars, deploys its solar panels and sends back a clear signal. Then, within a few days, scientists can begin their search for signs of water.

Smith's eyes shine at the possibility of finding an environment favorable to life. "I think it will stimulate future missions to go to that region of Mars, perhaps one day bringing back samples to Earth laboratories where we could actually find out what kind of life it is," Smith said. "If it's there."

Reach the reporter at anne.ryman@ arizonarepublic.com (602) 444-8072.

Solar panel

azcentral.com

- See a slide show from mission control.
- See a video from the University of Arizona's Phoenix Mars Mission.
- Watch an animated video of the Mars voyage.

See **news.azcentral.com**.

From Earth to Mars

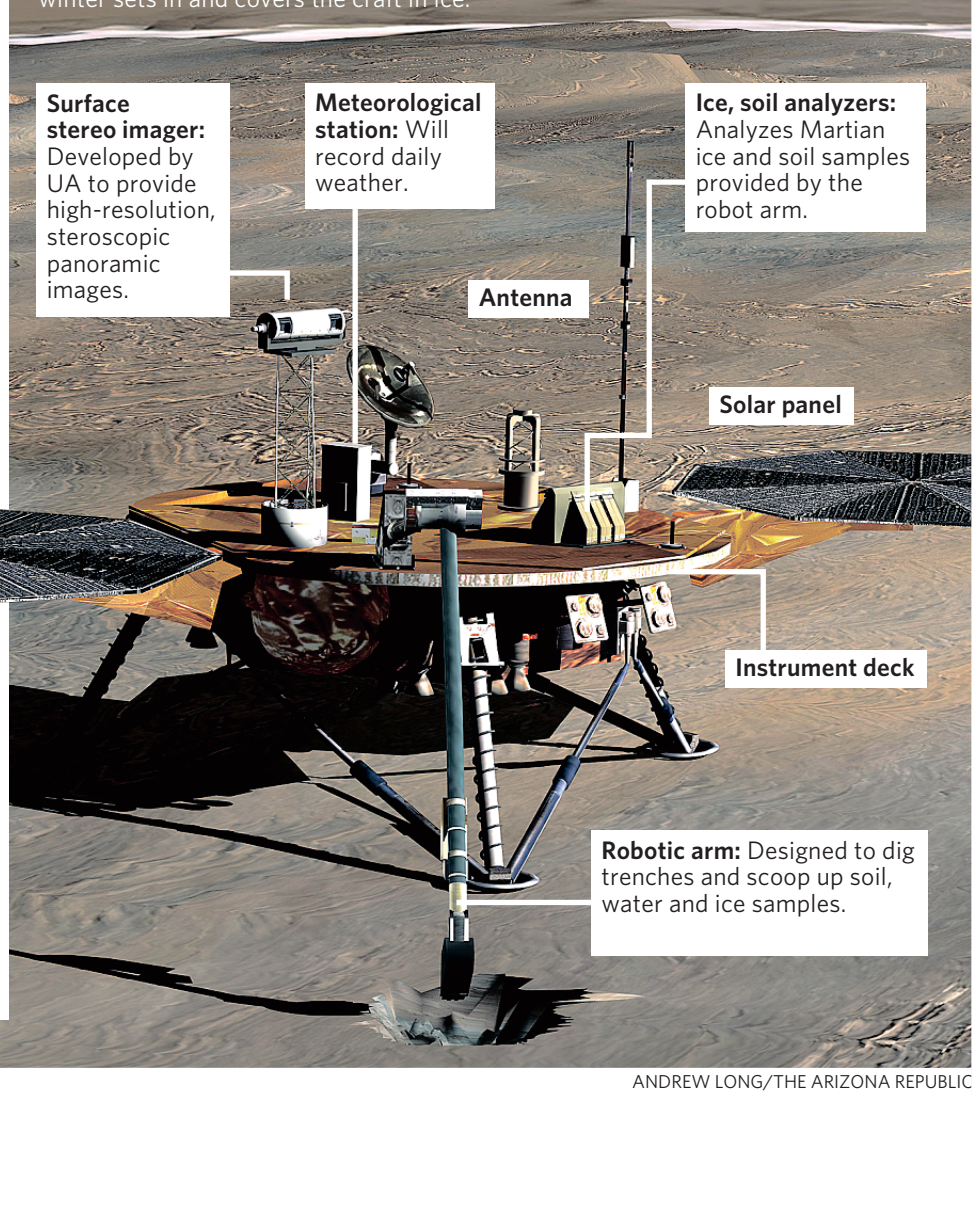
The spacecraft will travel nearly 10 months and cover 423 million miles. Scientific experiments will begin when the spacecraft lands in late May amid temperatures as low as 100 degrees below zero.

Landing in the north region

The spacecraft will land in the northern polar region of Mars. Orbiting cameras have seen evidence of subsurface ice, which may periodically melt into liquid water, one of the key components necessary to support life.

Unfurling the instruments

The solar-powered lander, about the size of a dining-room table, is loaded with 121 pounds of scientific instruments. Science operations will last about 90 days until winter sets in and covers the craft in ice.



Sources: University of Arizona, United States Air Force, NASA, Kevinforsyth.net

ANDREW LONG/THE ARIZONA REPUBLIC