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Game-Changing,
Award-Winning
Projects

Resilience

The New Reality



The New Space Race



“Mars is potentially a place that humans could establish a settlement in. That’s something that always drives us forward.”

—Matt Wallace, NASA, Stevenson Ranch, California, USA

Talk about timing. When Earth and Mars aligned at their closest points in two years, in July, aerospace leaders around the world jumped at the chance to explore the red planet. Following successful launches, spacecraft from China, the United Arab Emirates and the United States are on their way to searching for signs of past life and potential habitability on Earth’s closest neighbor. Another mission, ExoMars by the European Space Agency and Russia’s Roscosmos, aimed to join the fray but faced delays and must now wait for the next opportune planetary alignment in 2022.

Because of both its proximity and similarity to Earth, Mars has become the new frontier of space exploration.

“Mars has always held a special place for those of us that inhabit Earth,” says Matt Wallace, deputy project manager of Mars 2020 at NASA’s Jet Propulsion Laboratory, Stevenson Ranch, California, USA. Mars 2020 is the US\$2.7 billion program that includes the Perseverance mission, which left Earth on 30 July for a seven-month journey to Mars’ Jezero Crater. “The fundamental question that the science community is trying to answer is: Could life have evolved somewhere other than our planet?”

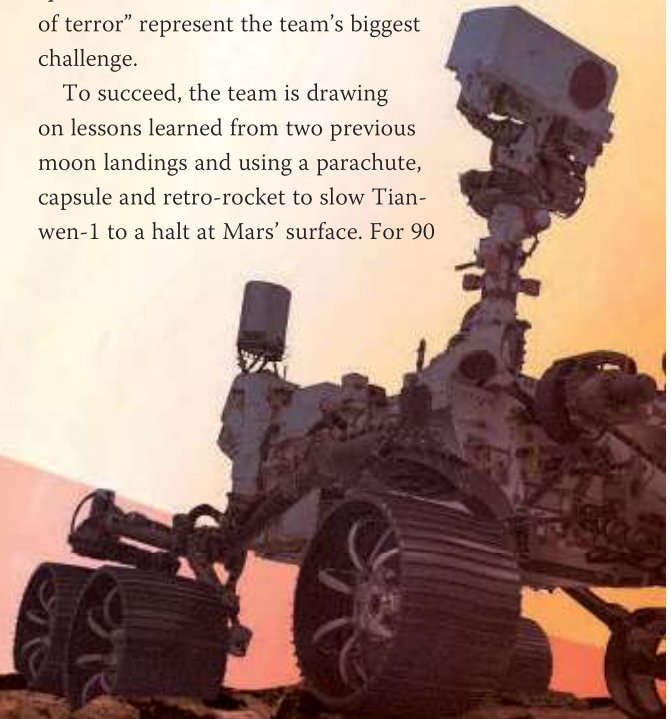
Launch Window

Though the target may be the same, each project team has faced unique challenges. The US\$200

million Emirates Mars Mission is the United Arab Emirates’ first interplanetary initiative. To get the team up to speed, project leaders consulted with scientists around the world to define an achievable scope: landing a probe that will spend nearly two Earth years studying weather and atmosphere.

China’s Mars mission is also landmark. If Tianwen-1 touches down in February, the nation will become the second to land and operate a rover on the planet after the United States. But the team must first overcome the entry, descent and landing phase. Bao Weimin, chief of China Aerospace Science and Technology Corporation, told *Space News* that those “seven minutes of terror” represent the team’s biggest challenge.

To succeed, the team is drawing on lessons learned from two previous moon landings and using a parachute, capsule and retro-rocket to slow Tianwen-1 to a halt at Mars’ surface. For 90



Artist impression of NASA’s Mars 2020 rover

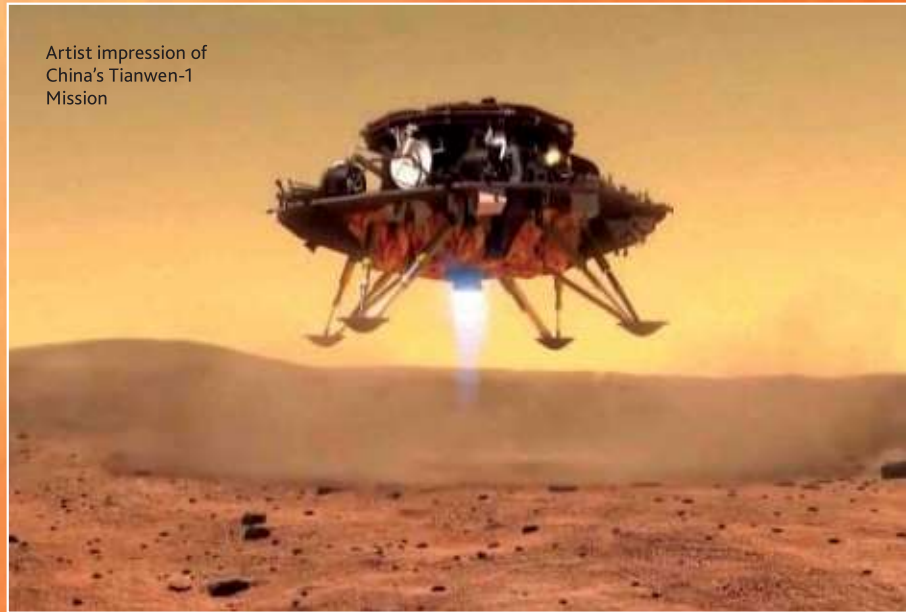
Martian days, its rover will explore Utopia Planitia, a plain where scientists hope to find ground-level evidence of subsurface water pools that were previously detected from orbit. An orbiter will study Mars' atmosphere and magnetic field for one Martian year (nearly two Earth years).

"Tianwen-1 is going to orbit, land and release a rover all on the very first try, and coordinate observations with an orbiter," the team wrote in a *Nature Astronomy* paper, calling the first-ever attempt at this maneuver—if it succeeds—"a major technical breakthrough."

Adapted Orbit

For Russia and the European Space Agency, the decision to delay the ExoMars mission on 12 March came after scientists realized they were short on time to test the rover's parachutes before the launch window. The team also identified bugs in the equipment that supports the rover's descent module and ultimately decided to delay the mission until Mars and Earth are closely aligned again.

To wait may have been fortuitous, as the global pandemic cast uncertainty on many projects. For NASA, it became a dash. "There was a point where I was very uncertain as to whether we could get it finished," Wallace says. "We didn't have the margin to shut down for a month and make the launch date."



Artist impression of
China's Tianwen-1
Mission

To stay on schedule, he assembled a team called Safe at Work whose role was to keep team members shielded from COVID-19 as they continued to drive toward the launch date. The risk mitigation paid off, with a successful—and on-time—launch.

Though the rovers launched in July are still en route to Mars, project teams are already thinking about subsequent trips. The United States and China are planning return missions within the next decade.

"Mars is potentially a place that humans could establish a settlement in," Wallace says. "That's something that always drives us forward."

