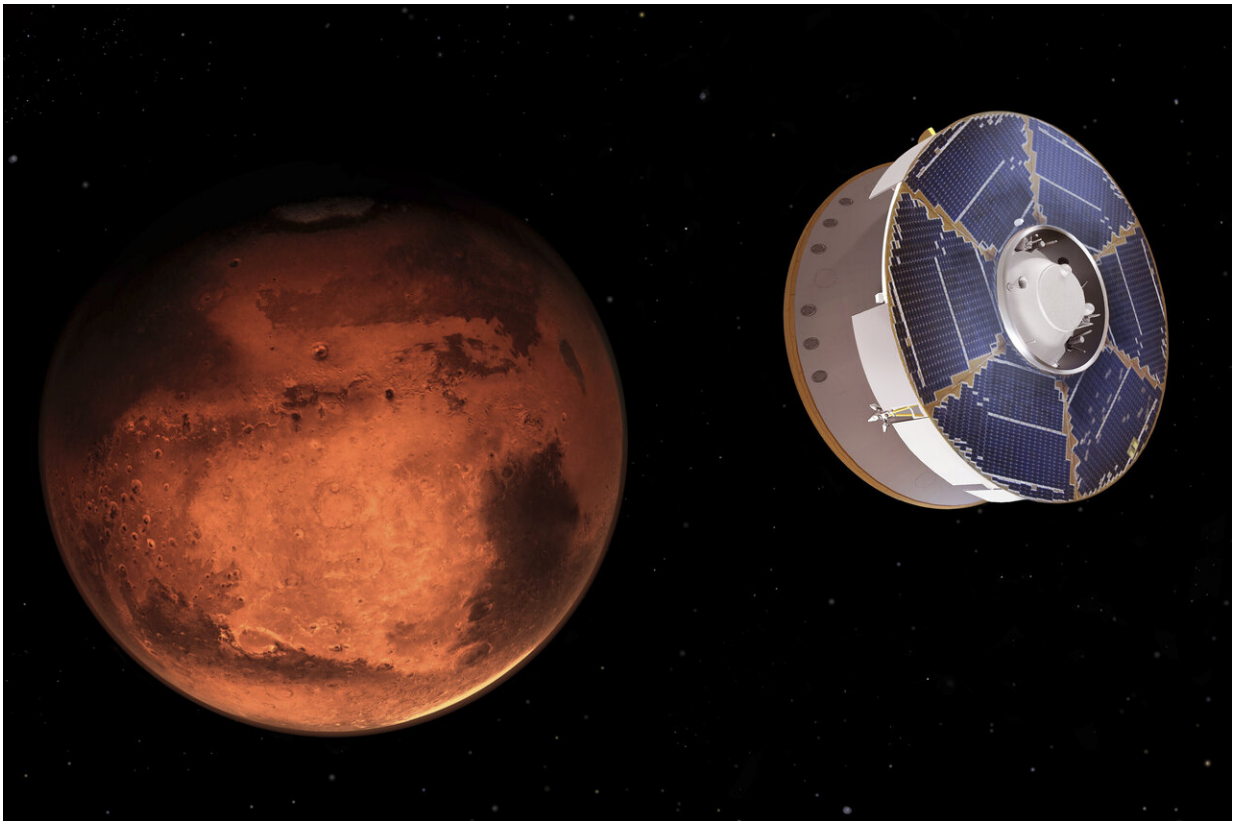


# NASA rover attempting most difficult Martian touchdown yet

February 17 2021, by Marcia Dunn

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This illustration provided by NASA depicts the Mars 2020 spacecraft carrying the Perseverance rover as it approaches Mars. Perseverance's \$3 billion mission is the first leg in a U.S.-European effort to bring Mars samples to Earth in the next decade. (NASA/JPL-Caltech via AP)

Spacecraft aiming to land on Mars have skipped past the planet, burned

up on entry, smashed into the surface, and made it down amid a fierce dust storm only to spit out a single fuzzy gray picture before dying.

Almost 50 years after the first casualty at Mars, NASA is attempting its hardest Martian touchdown yet.

The [rover named Perseverance](#) is headed Thursday for a compact 5-mile-by-4-mile (8-kilometer-by-6.4-kilometer) patch on the edge of an ancient river delta. It's filled with cliffs, pits, sand dunes and fields of rocks, any of which could doom the \$3 billion mission. The once submerged terrain also could hold evidence of past life, all the more reason to gather samples at this spot for return to Earth 10 years from now.

While NASA has done everything possible to ensure success, "there's always this fear that it won't work well, it won't go well," Erisa Stilley, a landing team engineer, said Tuesday. "We've had a pretty good run of successful missions recently and you never want to be the next one that isn't. It's heartbreaking when it happens."

A look at NASA's latest mission:

## MARS MASTER

NASA has nailed eight of nine landing attempts, making the U.S. the only country to achieve a successful touchdown. China hopes to become the second nation in late spring with its own life-seeking rover; its vessel entered orbit around Mars last week along with a United Arab Emirates spacecraft. The red planet's extremely thin atmosphere makes it hard to get down safely. Russia has piled up the most lander losses at Mars and moon Phobos, beginning in the early 1970s. The European Space Agency also has tried and failed. Two NASA landers are still humming along: 2012's Curiosity rover and 2018's InSight. Launched last July,

Perseverance will set down some 2,000 miles (3,200 kilometers) away at Jezero Crater, descending by parachute, rocket engines and sky crane. The millions of lines of software code and hundreds of thousands of electric parts have to work with precision. "There's no go-backs. There's no retries," deputy project manager Matt Wallace said Wednesday.



In this illustration provided by NASA, the Perseverance rover fires up its descent stage engines as it nears the Martian surface.. This phase of its entry, descent and landing sequence, or EDL, is known as "powered descent." (NASA/JPL-Caltech via AP)

**TOUGHEST LANDING YET**

NASA has equipped the 1-ton Perseverance—a beefier version of Curiosity—with the latest landing tech to ace this touchdown. A new autopilot tool will calculate the descending rover's distance to the targeted location and release the massive parachute at the precise moment. Then another system will scan the surface, comparing observations with on-board maps. The rover could detour up to 2,000 feet (600 meters) while seeking somewhere safe, Neil Armstrong style. Without these gizmos, Jezero Crater would be too risky to attempt. Once down, the six-wheeled Perseverance should be the best driver Mars has ever seen, with more autonomy and range than Curiosity. "Percy's got a new set of kicks," explained chief engineer Adam Steltzner, "and she is ready for trouble on this Martian surface with her new wheels."

## LOOKING FOR SIGNS OF LIFE





This illustration provided by NASA shows the Perseverance rover, bottom, landing on Mars. Hundreds of critical events must execute perfectly and exactly on time for the rover to land safely on Feb. 18, 2021. Entry, Descent, and Landing, or "EDL," begins when the spacecraft reaches the top of the Martian atmosphere, traveling nearly 12,500 mph (20,000 kph). EDL ends about seven minutes after atmospheric entry, with Perseverance stationary on the Martian surface. (NASA/JPL-Caltech via AP)

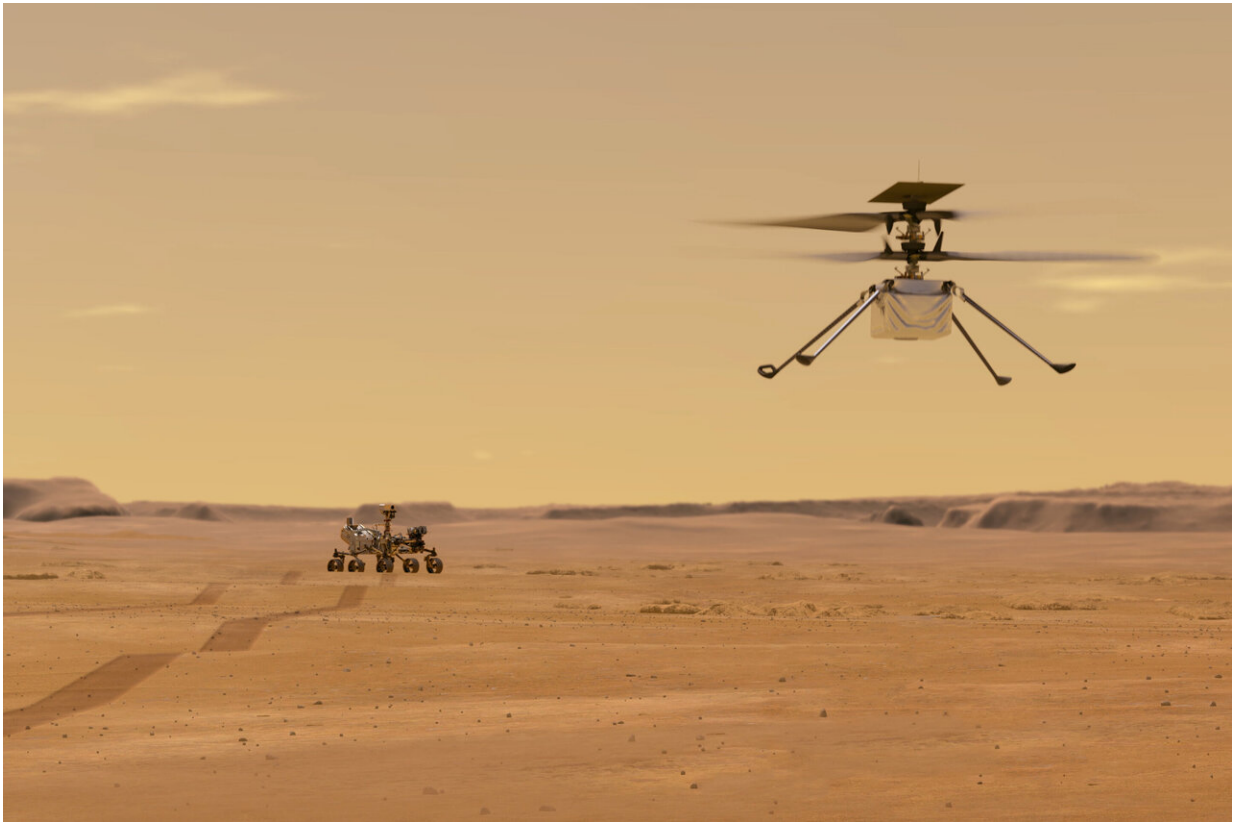
Where there was water, there may have been life. That's why NASA wants Perseverance snooping around Jezero Crater, once home to a lake fed by a river. It's now bone dry, but 3.5 billion years ago, this Martian lake was as big and wet as Nevada and California's Lake Tahoe. Perseverance will shoot lasers at rocks judged most likely to contain evidence of past microscopic life, analyzing the emitted vapor, and drill into the best candidates. A few dozen core samples—about a pound's worth (one-half kilogram) of rock and dust—will be set aside in sealed titanium tubes for future pickup.

## ROUND-TRIP TICKET

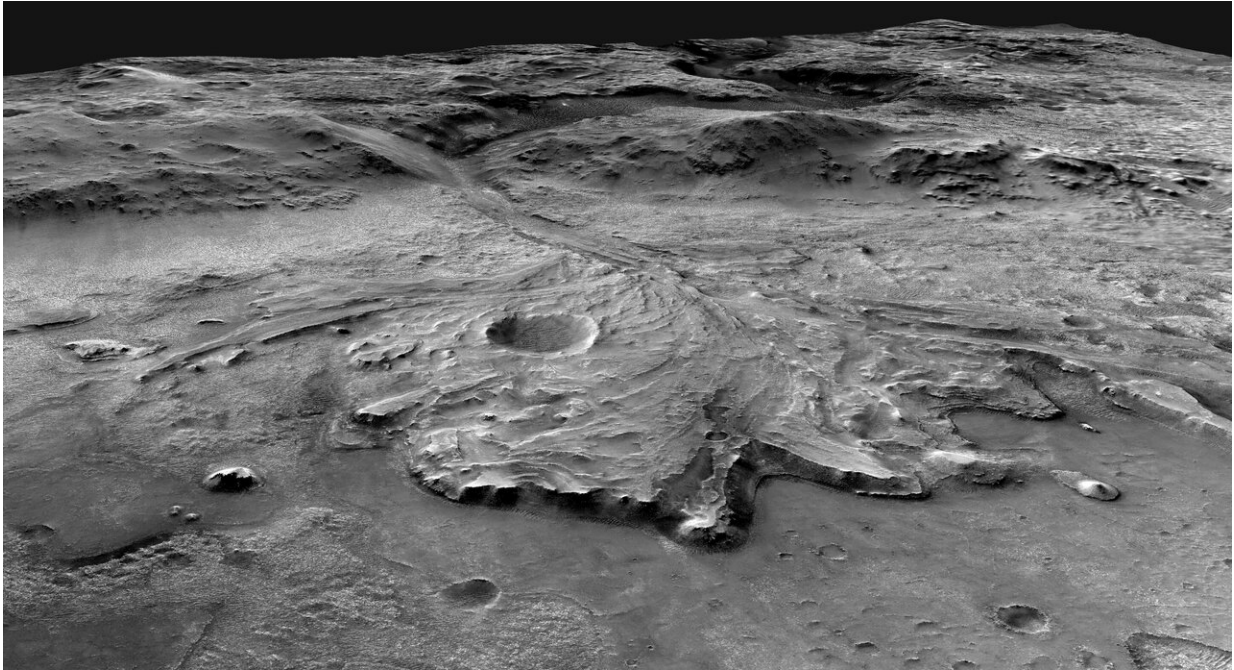
Scientists have wanted to get hold of Mars rocks ever since NASA's Mariners provided the first close pictures a half-century ago. NASA is teaming up with the European Space Agency to do just that. The bold plan calls for a rover and return rocket to launch to Mars in 2026, to retrieve Perseverance's stash of samples. NASA expects to bring back the rocks as early as 2031, several years before the first astronauts might arrive on the scene. The rover's super sterilized sample tubes are the cleanest components ever sent into space, according to NASA, to avoid any contaminating traces of Earth.



In this Dec. 17, 2019 photo made available by NASA, engineers watch the first driving test for the Mars 2020 rover, later named "Perseverance," in a clean room at the Jet Propulsion Laboratory in Pasadena, Calif. (J. Krohn/NASA via AP)

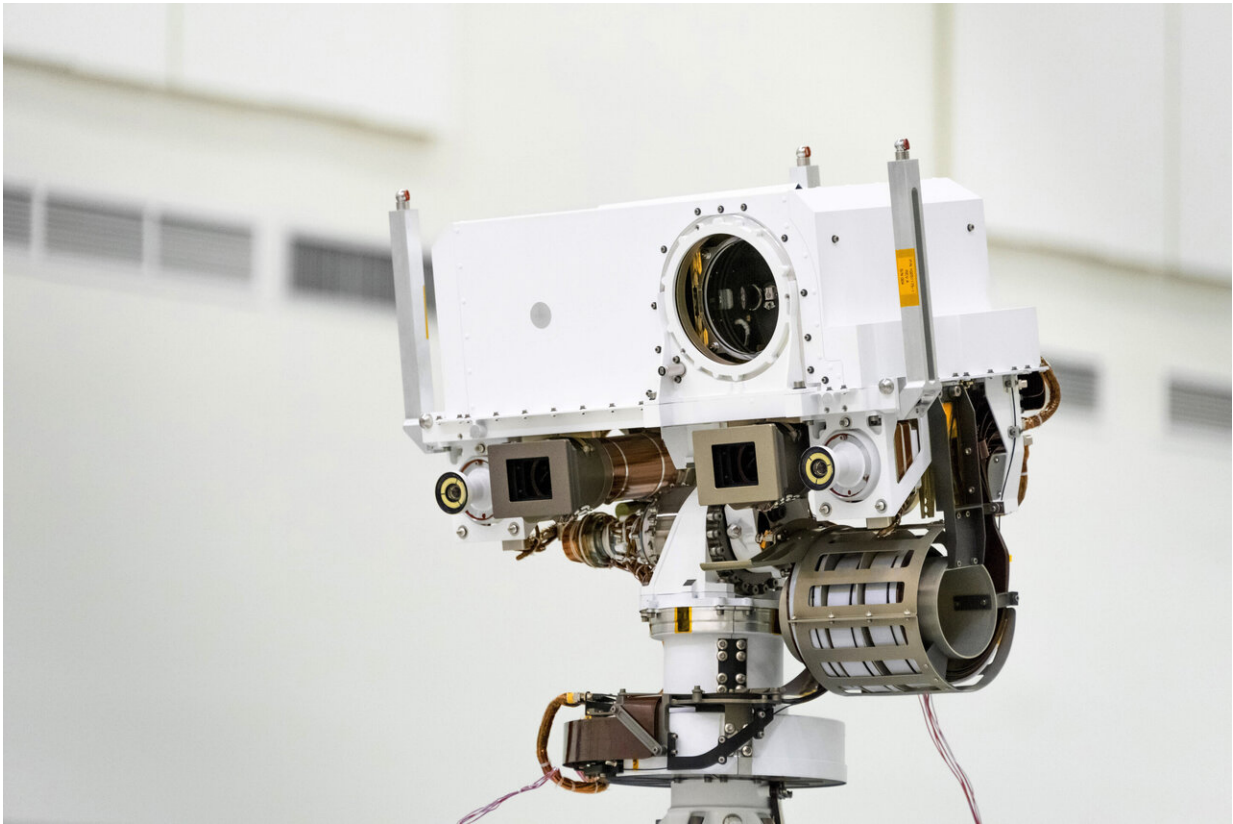


This illustration made available by NASA depicts the Ingenuity helicopter on Mars after launching from the Perseverance rover, background left. It will be the first aircraft to attempt controlled flight on another planet. (NASA/JPL-Caltech via AP)



This image made available by NASA depicts a possible area through which the Mars 2020 Perseverance rover could traverse across Jezero Crater. This mosaic is composed of aligned images from the Context Camera on the Mars Reconnaissance Orbiter. (NASA/JPL-Caltech/USGS via AP)





This July 23, 2019 photo made available by NASA shows the head of the Mars rover Perseverance's remote sensing mast which contains the SuperCam instrument in the large circular opening, two Mastcam-Z imagers in gray boxes, and next to those, the rover's two navigation cameras, at the Jet Propulsion Laboratory in Pasadena, Calif. The robotic vehicle will hunt for rocks containing biological signatures, if they exist. (NASA/JPL-Caltech via AP)

## COVID-19 PRECAUTIONS

Speaking of clean, NASA's Mars Mission Control has never been so spotless. Instead of passing around jars of peanuts right before Perseverance's landing—a good luck tradition going back decades—masked flight controllers will get their own individual bags. It's one of many COVID-19 precautions at California's Jet Propulsion

Laboratory. The landing team will be spread over multiple rooms, with NASA bigwigs and journalists watching remotely. Launched last July, the aptly named Perseverance bears a plaque honoring health care workers battling the virus over the past year.

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