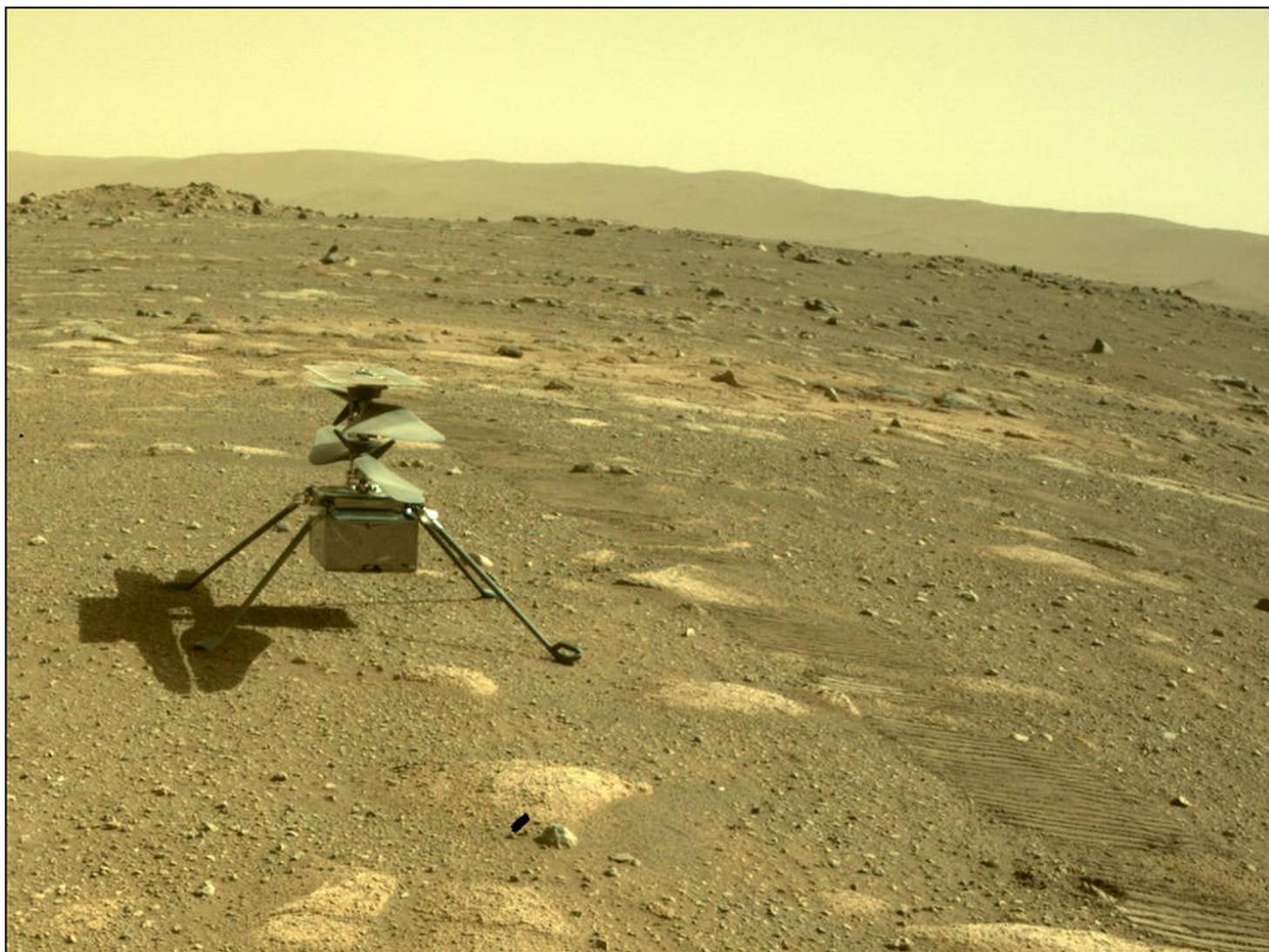


MIT grad is part of NASA team that will determine whether helicopter can fly on Mars

By **Charlie McKenna** Globe Correspondent, Updated April 6, 2021, 4:56 p.m.



NASA's Ingenuity helicopter can be seen on Mars, as viewed by the Perseverance rover's rear hazard camera on

Sunday. NASA/JPL-CALTECH

NASA's Mars helicopter, Ingenuity, is slowly building up toward its ultimate goal — proving that flight is possible in the Red Planet's atmosphere — after surviving its first night alone on the surface.

Ingenuity was designed by scientists at NASA's Jet Propulsion Laboratory and went to Mars aboard the Perseverance rover, which touched down in February.

Farah Alibay, a systems engineer at JPL who earned a PhD at the Massachusetts Institute of Technology, is the liaison between the Perseverance and Ingenuity teams. Ingenuity is a technology experiment with the goal of achieving flight on Mars, a major challenge considering Mars' extreme cold, lack of atmosphere, and different gravity.

“What it's doing, it's just demonstrating that we can fly on Mars,” Alibay said. “On Earth, when we're talking about lift, which is the force that lifts up a plane or helicopter, you use the air and the atmosphere to lift you up and so that's what provides that force, so we only have 1 percent of that force on Mars, which makes it a lot more complicated to fly on Mars.”

The design of the drone, which weighs just four pounds, was specifically crafted and tuned to adapt to the different conditions on Mars and tested extensively on Earth, Alibay said.



“The way that we deal with that challenge is by designing a helicopter that’s really, really light, and only weighs about four pounds, and it has blades that are really big as compared to the body so the blades themselves are about four feet long and they’re counter-rotating,” she said.

Alibay described her role on the Perseverance team as “coordinating the dance, the closely crafted dance, between the helicopter and the rover.”

Scientists hope that Ingenuity can lay the groundwork for more aerial exploration of the planet. Thus far, Alibay said, two types of Mars exploration are possible: rovers like Perseverance and imaging from orbiters.

“If we are able to demonstrate flight, it could open up possibilities, incredible possibilities for future missions that could be scout helicopters for rovers or science helicopters for exploring Mars. It just opens up aerial explorations of Mars, then possibly other planets, too,” she said.

Aerial exploration of Mars could radically expand how much of the planet researchers can explore. Movement from rovers is relatively limited, about 10 to 20 kilometers in their lifetimes.

“Aerial vehicles kind of give you something in between, they don’t give you quite the same resolution as rovers do in terms of surface observation, but they give you much higher resolution than orbiters and they’re able to go into environments that rovers can’t go into,” Alibay said. “You could dream of helicopters or any other type of aerial vehicle flying . . . up some of those ancient mountains on Mars or into the craters. And they’re able to explore much faster.”

Surviving the night on Mars was the first step for Ingenuity, which still has several benchmarks to clear before it undergoes its first flight — hopefully next weekend, Alibay said.

Alibay said seeing Ingenuity survive on Mars was like “a parent watching a child.”

“Every step is a huge milestone [and] . . . we’ve cleared a few milestones already. We deployed from the helicopter, we’ve charged the batteries using the solar panels, and then we’ve survived that first night,” she said.

“Even being able to check out that ‘Wow the helicopter survived the whole journey and landing’ . . . was also an incredible step, but we certainly have a lot of other milestones to go.”

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