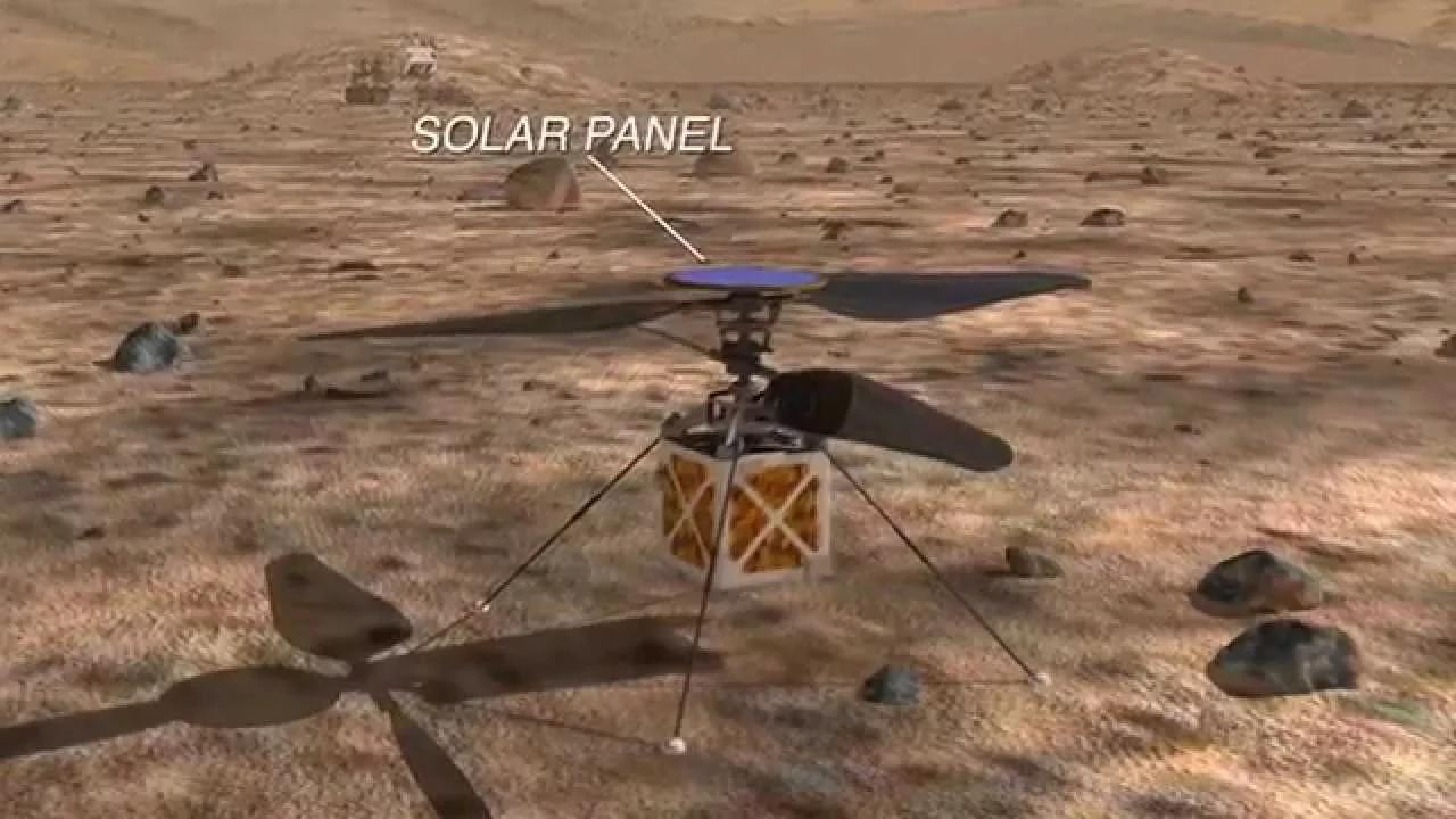
SOLAR PANEL

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Hey guys! We've all seen these RC helicopters before. They're everywhere. They're a ton of fun.

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But we were thinking at JPL, could we fly one of these on Mars?

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We're going to talk about that on this episode of Crazy Engineering.

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(Music)

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So why would we want to put a helicopter on Mars? If I'm the rover right now,

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I can't really see the terrain behind me.

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But if I had a helicopter with a camera on it, all of a sudden, I can see a whole lot more.

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If our rover was equipped with its very own helicopter that could see over tall objects in front of it,

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it would allow us to make decisions much more efficiently on which way to command the rover.

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You might think it's actually easier to fly one of these helicopters on Mars

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because it's actually 3/8th the gravity we have here on Earth, but it's a hundred times less atmosphere.

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The way any of these helicopters work is the rotor blades spin up

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and they produce lift because of the density of the atmosphere.

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So once you lose that density, you've got to spin even faster or get bigger rotor blades or get lighter.

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How are we going to solve that problem if we go to Mars?

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Let's go talk to an expert and see if we can figure this out.

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All right guys, I think we found our expert. This is Bob.

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Bob, can you tell us where we're at right now? This is one of our robotics labs at JPL

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where we have a full scale mockup of one of the Mars helicopters we've been working on.

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What are the challenges you have to overcome in order to produce lift on the surface?

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Right, so there is the challenge of the very low density of the atmosphere.

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There's the challenge of keeping the whole mass of the system small

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so that we don't overwhelm the lift capability of this system.

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It has to be autonomous in terms of being able to fly and maintain stable flight.

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And then this system has to repeatedly take off and land on natural rocky terrain like you see out here.

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And then the other one is that it has to survive the harsh environment of Mars.

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So we're early in the design stages of this thing. What kind of testing,

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what kinds of results have you seen so far?

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So over the course of the last year we have done a number of tests in our 25-foot vacuum chamber

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using scale models where we pump down to Mars densities, demonstrating lift of these kinds of blades.

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00:01:58,000 --> 00:02:01,000
So how fast do these blades have to spin to produce lift?

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00:02:01,000 --> 00:02:04,000
They have to spin at about 2400 rpm to provide lift.

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Could you tell us a little bit about this helicopter's capabilities when it's on Mars?

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So the system is designed to fly for 2-3 minutes every day.

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There's a solar panel on the top and that provides us with enough energy for that short flight,

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as well as to keep us warm through the night.

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So in those 2-3 minutes, we expect to have daily flights of about half a kilometer or so.

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What are the next steps? How do we get this thing ready for a future rover mission?

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Because this thing is going to take off every day and land every day,

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we want to make sure we have a bulletproof landing system, and landing is the riskiest part of any mission.

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EDL had 7 minutes of terror. We have 7 seconds of terror everyday.

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Bob thanks so much for teaching us about the helicopter.