

MAVEN to Explore Upper Atmosphere of Mars

Transcript:

David Mitchell: Several billion years ago, Mars was vastly different than it is today. From the evidence taken so far, it was a very wet environment – rivers, lakes, perhaps even oceans on the surface of Mars. A thicker atmosphere.

Narrator: Mars, as we know it, is a barren planet of extreme temperatures and the thinnest of atmospheres... an environment too hostile to sustain even microbial life. But has this always been the case? A variety of spacecraft launched in recent years have examined the Red Planet's landscape up close and surveyed it from above – and discovered intriguing signs of an ancient, watery world. Now scientists seek to understand what could have caused such a dramatic change... on a planet so near our own. A new NASA mission, called MAVEN, is heading to Mars to investigate.

Bruce Jakosky: MAVEN is the first mission that we've sent to Mars that has the primary goal of understanding the upper atmosphere. And what we're trying to do with MAVEN is to learn how the atmosphere changed over time, and why. We think that the atmosphere had a lot more water, a lot more carbon dioxide, early in history, when a lot of the water-related features we see on the surface were carved. What we're trying to do is to determine where did the water go? Where did the CO₂ go from that early environment?

Narrator: The nearly three-ton MAVEN spacecraft is designed to look at the Red Planet in a whole new way. Instead of focusing on the Martian surface, MAVEN will keep its "eyes" trained on the upper atmosphere. MAVEN, which stands for Mars Atmosphere and Volatile Evolution, is fundamentally different from the Mars missions that have gone before – rovers such as Curiosity, Opportunity and Spirit, and orbiters like Mars Odyssey and the Mars Reconnaissance Orbiter.

Bruce Jakosky: When you look at the other spacecraft that have gone to Mars, each one of them has explored a different piece of the Mars system. With MAVEN, we're exploring the single biggest unexplored piece of Mars so far.

Narrator: After a 10-month journey from Cape Canaveral, Florida to Mars, MAVEN will arrive at the Red Planet on Sept. 22, 2014. The spacecraft then will slip into Martian orbit, and after another five and a half weeks of checkout, it will be ready to spend the next Earth year carrying out its assignment. The Laboratory for Atmospheric and Space Physics at the University of Colorado Boulder leads the scientific portion of the mission, while NASA's Goddard Space Flight Center in Maryland is responsible for the overall mission management. MAVEN is an eight-foot cube weighing about 5,400 pounds at launch – as much as a fully loaded sport utility vehicle. With its twin pairs of gull wing-shaped solar panels fully extended, it stretches 37 feet from wingtip to wingtip. MAVEN brings with it eight instruments designed to take a variety of measurements throughout Martian orbit in every region of "Near-Mars" space. Built by Lockheed Martin Space Systems, the spacecraft makes the most of every available spot for these scientific sensors. After a series of tests to prove the spacecraft can handle the rigors of launch and the extremes of deep space, it was flown to NASA's Kennedy Space Center in Florida aboard an Air Force C-17 cargo aircraft. With MAVEN on site at the spaceport, the final preparations for liftoff intensified – and excitement continued to build as the milestones were checked off.

Guy Beutelschies: It makes it all so real to see all this right in front of you. So there's a tremendous amount of excitement, not only from the team but our friends and family coming down to watch this launch, it's kind of the culmination of a lot of years of hard work by the team.

Narrator: Getting MAVEN safely off the ground and on its path to Mars is the job of NASA's Launch Services Program, based at Kennedy.

Omar Baez: LSP has been preparing for MAVEN for about five years, and maybe a little bit longer if you look at the announcement of opportunities that came up before that. So it's been quite a while. It's coming to maturity now.

Narrator: The MAVEN mission only has 20 days to launch before its window of opportunity closes for about two years. That's because of the periodic alignment of the Earth and Mars.

Chuck Tatro: Mars orbits the sun about half as fast as the Earth does. So that means that every 26 months, the Earth and Mars are sort of aligned again, so that it takes the least amount of energy for a rocket to deliver a spacecraft to Mars.

Narrator: MAVEN's ride to space is the Atlas V rocket, a reliable workhorse with a history of success for NASA missions – including the Mars Science Laboratory mission featuring the Curiosity rover. While the Atlas V was readied for flight in a hangar at Atlas Space Operations Center, or ASOC, on Cape Canaveral Air Force Station, MAVEN was sent to Kennedy's Payload Hazardous Servicing Facility for one last round of checkouts, tests, and closeouts. The processing team did face one significant challenge with less than two months until liftoff: a 17-day government shutdown that briefly halted prelaunch activities.

Omar Baez: It's kind of like a hurricane. We have hurricane plans, but we don't have a government shutdown plan. So that's a hurdle. We overcame it, we're moving forward, and we're ready to hit the beginning of the window. Luckily our launch vehicle contractor was not affected as much by the shutdown and the work continued there, so we're able to press forward. We were able to get a limited crew in here to be able to work things.

Narrator: Today, MAVEN is still aiming for the same launch period the team targeted from the start, and with liftoff right around the corner, everyone is looking forward to seeing this spacecraft begin its mission of discovery.

David Mitchell: Way back in 2008, we proposed for a launch date of Nov. 18, 2013, and we're running right to it. It's quite an accomplishment by the team. We're really excited. We're so close now. I mean, we're headed to Mars.

Bruce Jakosky: This is all-consuming. I don't know how to do anything except talk about MAVEN anymore, at least that's what my wife tells me. And to see it come together now, to see it today, just about ready to go, I'm beside myself.

Narrator: When launch day arrives, managers and controllers from NASA's Launch Services Program, United Launch Alliance and the U.S. Air Force, along with the spacecraft team, will report to their consoles in launch control for the start of the countdown. By this time, the MAVEN spacecraft is sealed in its protective payload fairing atop the Atlas V rocket on the launch pad at Cape Canaveral's Complex 41.

Chuck Tatro: Everybody has butterflies going into launch day. No matter how much you plan and how much you practice, there's always things that come up at the last second that make you nervous. We have a very good team to overcome those, but you never know what's going to come up and grab your attention and so you have to be ready and able to do that.

Bruce Jakosky: The launch team, the launch vehicle people, the spacecraft people – these are the ultimate professionals who are doing their best to make sure everything works properly, not only on launch day but for the whole mission. And I've got absolute faith in their ability to deliver.

Narrator: A spectacular liftoff might be the most visible milestone on launch day, but a successful climb to space is only the beginning. After the Atlas booster and Centaur upper stage have carried MAVEN out of the grasp of Earth's gravity, another critical element remains. The spacecraft must deploy its solar arrays and let its caretakers on Earth know that it's healthy and on the right path.

Chuck Tatro: When you get a positive confirmation that the spacecraft has successfully separated from the second stage, and it's on its trajectory and on its way to Mars, that's always very exciting. All that work that you've done over the past five to seven years pays off.

Narrator: What will MAVEN discover? What will we learn about our neighboring planet's past – and what might this new information teach us about our own planet?

Bruce Jakosky: I'm just hoping that we'll get there and get the data to answer these questions about where did the water and the CO₂ go. I don't really have a prediction or an expectation of what the answer's going to be. I'm just hoping we can get that answer.

David Mitchell: The thing about exploration is, sometimes you don't know what you're going to find until you get there, and so we're going to be exploring this planet, and there's going to be discoveries I believe that scientists hadn't quite thought of, that are going to be very compelling to unlocking the secrets of Mars.