



MAVEN

Mars Atmosphere and Volatile Evolution Mission

The Mars Atmosphere and Volatile Evolution, or MAVEN, mission will orbit Mars to explore how the sun may have stripped Mars of most of its atmosphere, turning a planet once possibly habitable to microbial life into a cold and barren desert world. MAVEN will be the first spacecraft mission dedicated to exploring the upper atmosphere of Mars.

Previous missions to Mars have shown us that the atmosphere and climate have changed over time and found evidence of abundant liquid water on the surface in ancient times, though not today. Scientists want to know what happened to the water and where the planet's thick atmosphere went. The MAVEN mission will study the nature of the red planet's upper atmosphere, how solar activity contributes to atmospheric loss, and the role that escape of gas from the atmosphere to space has played through time.

MISSION OVERVIEW

MAVEN will launch from Cape Canaveral, Fla., during a 20-day period that begins on November 18, 2013. The trip to Mars takes 10 months, and MAVEN will go into orbit around Mars in September 2014. It will take 5 weeks for the spacecraft to get into its final science-mapping orbit, test the instruments, and test science mapping sequences. After this commissioning phase, MAVEN has a 1-Earth-year primary mission during which it will make its key measurements.



The MAVEN orbit will be elliptical. At its closest point to the planet, it will be 93 miles (150 kilometers) above the surface. At this altitude, the spacecraft will pass through the upper atmosphere on each orbit and can sample the gas and ion composition directly. At its highest point, it will be more than 3728 miles (6000 km) above the surface and can carry out ultraviolet imaging of the entire planet. This combination of detailed point measurements and global imaging is a powerful way to understand the properties of the upper atmosphere. The altitude in the MAVEN orbit will be lowered for five "deep-dip" campaigns during the mission. In each deep dip, the spacecraft will take measurements down to an altitude of about 77 miles (125 kilometers). These measurements will provide information down to the top of the well-mixed lower atmosphere, giving scientists a full profile of the top of the atmosphere.

The MAVEN spacecraft will make measurements in all regions of “near-Mars” space. These measurements will allow scientists to characterize the current state of the upper atmosphere and ionosphere, determine the rates of loss of gas to space today, and extrapolate backward in time in order to determine the total loss to space through time.

SCIENCE PAYLOAD

MAVEN will carry three instrument suites. The Particles and Fields Package (PFP), provided by the University of California at Berkeley Space Sciences Laboratory, contains six instruments that characterize the solar wind, Mars’ ionosphere, and their interactions. Four of the instruments were built by the Space Sciences Laboratory, one was built jointly with the University of Colorado at Boulder Laboratory for Atmospheric and Space Physics, and one was built by NASA’s Goddard Space Flight Center in Greenbelt, Md.

The PFP includes:

- Solar Energetic Particle (SEP)
- Solar Wind Ion Analyzer (SWIA)
- Solar Wind Electron Analyzer (SWEA)
- SupraThermal and Thermal Ion Composition (STATIC)
- Langmuir Probe and Waves (LPW)
- Magnetometer (MAG)

The Remote Sensing Package, built by the University of Colorado at Boulder Laboratory for Atmospheric and Space Physics, will determine global characteristics of the upper atmosphere and ionosphere. The Neutral Gas and Ion Mass Spectrometer (NGIMS), built by NASA Goddard, will measure the composition and isotopes of neutrals and ions.

SPACECRAFT

The MAVEN spacecraft was built by Lockheed Martin in Littleton, Colo., and builds on heritage from previous Mars orbiters. It is solar-powered, with a high-gain antenna that can be pointed to Earth for twice-weekly communications sessions.

Spacecraft specifications:

- Length: 37.5 feet (11.4 meters)
- Spacecraft Dry Mass: 1991 pounds max (903 kilograms)
- Wet (Fueled) Mass at Launch: 5622 pounds max (2550 kilograms)
- Power: 1135 watts (when Mars is furthest from the Sun)

MAVEN carries an Electra telecommunications package to relay data from rovers and landers on Mars back to Earth.

MAVEN PARTNERS

MAVEN is led by its Principal Investigator, Dr. Bruce Jakosky, from the University of Colorado. The university provided science instruments and leads science operations, as well as education and public outreach, for the mission. NASA Goddard Space Flight Center, Greenbelt, Md., manages the project and provided two of the science instruments for the mission. Lockheed Martin built the spacecraft and is responsible for mission operations. The University of California at Berkeley’s Space Sciences Laboratory provided science instruments for the mission. NASA’s Jet Propulsion Laboratory in Pasadena, Calif., provides navigation support, Deep Space Network support, and Electra telecommunications relay hardware and operations.

For more information, please visit our web sites:

<http://www.nasa.gov/MAVEN> and
<http://lasp.colorado.edu/MAVEN> or follow us on Facebook and Twitter at **MAVEN2Mars**

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