



(Courtesy Lockheed Martin)

MAVEN overview

MAVEN is a NASA Mars Scout mission designed to orbit Mars and explore the state of the Martian upper atmosphere, the processes that control it, and current atmospheric loss. Scientists think this loss could be key to explaining changes in Martian climate over the last four billion years.

LASP's unique role

Leadership

The University of Colorado is the lead institution for the MAVEN mission, through the Laboratory for Atmospheric and Space Physics (LASP). MAVEN Principal Investigator Bruce Jakosky, a CU-Boulder professor and LASP research scientist, leads the project on behalf of NASA. Jakosky worked with a national team to conceive of and design the mission concept, spacecraft, and eight science instruments to take measurements as they orbit the Red Planet. Of the eight instruments, two were designed and built at LASP—benefitting from the laboratory's 65 years of experience in space science and space hardware development.

The Remote Sensing Package

The key to the Remote Sensing Package, built by LASP, is the Imaging Ultraviolet Spectrograph (IUVS) instrument. IUVS will determine global characteristics of the upper atmosphere and ionosphere via remote sensing.

The Langmuir Probe and Waves instrument

The Langmuir Probe and Waves (LPW) instrument is part of

Above: MAVEN team members deployed the solar panels before the spacecraft's delivery to Kennedy Space Center in Florida on August 2, 2013. MAVEN's Principal Investigator is based at the University of Colorado Boulder's Laboratory for Atmospheric and Space Physics (LASP).

Quick facts

Launch date: Nov. 18, 2013 (start of three-week launch period)

Launch location: Cape Canaveral Air Force Station, Florida

Launch vehicle: Atlas V-401

Mission target: Mars

Primary duration: One Earth year after start of primary mission

Mission description: MAVEN is a NASA Mars Scout mission carrying eight instruments designed to orbit Mars and explore its upper atmosphere.

LASP provides:

- Principal Investigator Bruce Jakosky
- The Imaging Ultraviolet Spectrograph (IUVS) instrument
- Langmuir Probe and Waves instrument (jointly with Space Sciences Laboratory)
 - LASP-built Extreme Ultraviolet Sensor
 - LASP-built electronics boards
- Science operations and data center
- Education and Public Outreach oversight

Other organizations involved:

- NASA Goddard Space Flight Center
- University of California, Berkeley
- Lockheed Martin Corp.
- NASA Jet Propulsion Laboratory
- United Launch Alliance

the Particles & Fields Package. The LPW instrument, built by the Space Sciences Laboratory and LASP, will measure thermal electron density and temperature. Its Extreme Ultraviolet Sensor, built by LASP, will measure solar input across three channels.

Science operations

The MAVEN Science Operations Center (SOC) at LASP will monitor and control the MAVEN instruments and provide a single science interface to the Lockheed-Martin Mission Support Area (MSA) mission operations center. The SOC will prepare instrument observing sequences and command loads, monitor the health and status of the instruments, coordinate data flow between the Instrument Teams and the Planetary Data System (PDS), and provide a web interface for data access by the MAVEN team, the science community, and for public outreach.

The SOC is part of the existing LASP operations center and is staffed by members of the LASP Space Flight Operations Team, currently comprised of professionals and students from the University of Colorado. Highly trained students are involved in all SOC activities, working closely with LASP professionals.

The SOC is responsible for the production, distribution and archiving of MAVEN data; it also provides payload data management. The SOC will ensure that data are provided for archive and distribution in a timely fashion for the MAVEN project.

Getting the public on board

The MAVEN team strongly believes in sharing its enthusiasm and excitement about Mars, space, and science in general. MAVEN's education and public outreach efforts, led by LASP, make possible this exchange with the public. MAVEN's education and outreach programs meet the needs of a range of audiences, including elementary, middle, and high school teachers; informal educators in museum and after-school settings; and members of the general public.

The next generation: student involvement

The MAVEN team at LASP has involved CU-Boulder undergraduate and graduate students at every step along the mission's path. Student participation in MAVEN builds on LASP's long history of student involvement in our work, including activities for the Student Nitric Oxide Explorer and the Student Dust Counter, as well as spacecraft operations.

Leading up to MAVEN at LASP

LASP has been building space hardware for 65 years; MAVEN's instrument heritage for IUVS and LPW benefits from a long history of experience. The Upper Air Laboratory—which became LASP—launched its first set of sounding rockets in 1948. These repurposed V-2 rockets carried ultraviolet spectrometers as part of their payloads and were some of the first instruments to clearly show that the Sun had significant ultraviolet emissions in



(Courtesy Aref Nammari/CU/LASP)

The LASP-built Remote Sensing package will rely on its Imaging Ultraviolet Spectrograph (IUVS) to offer scientists clues to how Mars might have lost its atmosphere.

excess of its blackbody continuum. LASP continued to specialize in ultraviolet spectrometry when it partnered with NASA in the 1960s on the Orbiting Solar Observatory (OSO) and Atmosphere Explorer (AE) missions.

LASP research involving ultraviolet spectrometers has spanned every decade since our inception. LASP provided instruments for a number of missions, including Mariner 6 and 7, which obtained the first information about the make-up of the Martian atmosphere; Mariner 9, which entered Mars orbit in 1971; and Pioneer Venus, which measured the detailed structure of the upper atmosphere and ionosphere of Venus for the first time in the 1980s.

LASP has collaborated in the past with the Space Sciences Laboratory to develop electric field and Langmuir probe instruments for Earth-orbiting, planetary, and solar missions. Instrument components have included sensors, deployable booms, and state-of-the-art digital signal processing electronics.

As LASP's instrument heritage shows, the laboratory has a long history of involvement in space missions, beginning in the 1940s and remaining strong today. MAVEN, as with many other missions, benefits from a wide range of LASP involvement. LASP keystone capabilities include science direction and research; development of individual instruments; engineering of entire instrument suites; mission operations of individual instruments; mission operations for spacecraft; and scientific data management and analysis.

Get connected!



<http://lasp.colorado.edu/home/maven>

The Laboratory for Atmospheric and Space Physics (LASP) combines all aspects of space exploration through our expertise in science, engineering, mission operations, and data management. As an institute at the University of Colorado Boulder, LASP includes students throughout our activities. Learn more at <http://lasp.colorado.edu>.