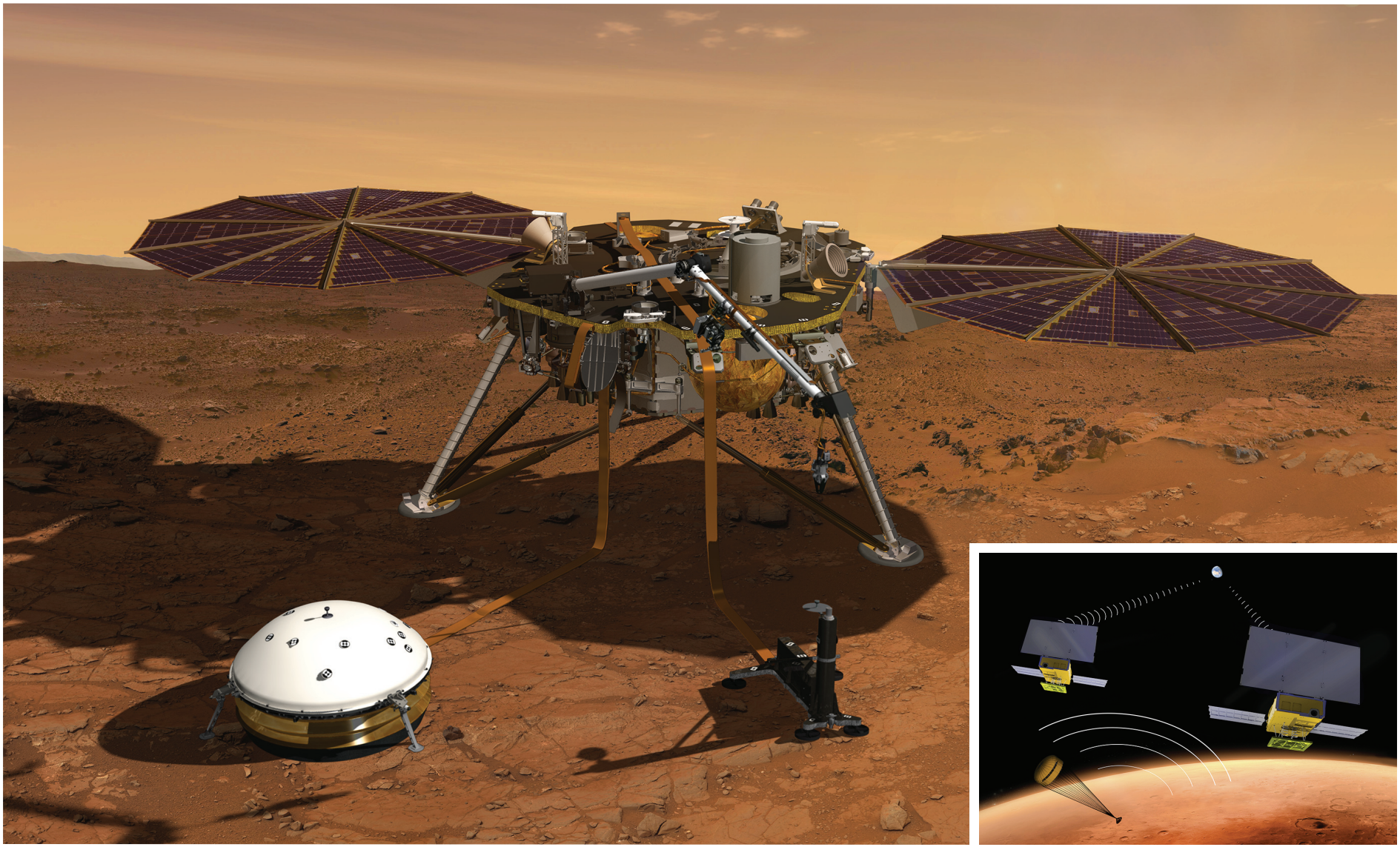
National Aeronautics and Space Administration



InSight *(**IN**terior Exploration using **S**eismic **I**nvestigations, **G**eodesy, and **H**eat **T**ransport)*
Inset: **MarCO** *(**M**ars **C**ubesat **O**ne)*

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#JOURNEYTOMARS

InSight *(**IN**terior Exploration using **S**eismic **I**nvestigations, **G**eodesy, and **H**eat **T**ransport)*

Revealing How Rocky Planets Form
InSight is the first outer space robotic explorer to study in-depth the "inner space" of Mars: its crust, mantle, and core. Studying Mars' interior structure answers key questions about the early formation of rocky planets in our inner solar system – Mercury, Venus, Earth, and Mars – more than 4 billion years ago, as well as rocky exoplanets. InSight also measures tectonic activity and meteorite impacts on Mars today.

Why Mars?
After our solar system formed, convection in Mars' interior slowed dramatically or may have come to a complete stop, unlike here on Earth. The interior of Mars thus preserves a record of how the core, mantle, and crust of rocky planets form. Data on tectonic activity, the average composition of the mantle and core, and the rate at which heat escapes from the deep interior can reveal the structure of Mars today and the processes that acted on Mars in its first 100 million years.

The Lander and its Science Instruments
InSight relies on the successful design of NASA's Mars Phoenix lander. InSight's 7-foot-long (2.1-meter-long) robotic arm lifts a seismometer and heat-flow probe from the deck and places them on the surface. Two cameras on the lander provide color 3D views of the landing site, instrument placement, and activities. Sensors measure weather and magnetic field variations. InSight's main instruments are:

- **A Seismometer (SEIS)**: InSight measures seismic waves from "marsquakes" and thumps of meteorite impacts all over the planet. It is so sensitive, it can detect ground motions smaller than a hydrogen atom! It can also detect tidal flexing of the solid planet due to the Martian moon Phobos.
- **A Heat Flow Probe (HP^3)**: InSight uses a self-hammering, spike-shaped probe ("the mole") to dig about 16 feet (5 meters) below the surface. That is deeper than any arm, scoop, drill, or probe on prior Mars missions. As it descends, the "mole" pulls a ribbon-shaped cable behind it. Sensors in the ribbon measure underground temperatures to detect the amount of heat rising from the interior.
- **An X-band Radio for Precision Doppler Tracking (RISE)**: Since the lander is in a fixed place on Mars, precise tracking of it from Earth can measure small variations in the planet's rotation, revealing how Mars wobbles as it rotates on its axis. This measurement tells scientists the size and composition of the core and how much it has cooled.

QUICK FACTS

InSight Objectives
- Uncover how a rocky body forms and evolves to become a planet by investigating the interior structure and composition of Mars
- Determine the rate of Martian tectonic activity and meteorite impacts

InSight Instruments
SEIS — Seismometer (Seismic Experiment for Interior Structure)
HP^3 – Temperature Probe (Heat Flow and Physical Properties Package)
RISE – Precision X-Band Radio (Rotation and Interior Structure Experiment)
Environmental Sensors – Air Pressure, Temperature, and Wind; Magnetic Field Variations
Cameras – Color Medium-Resolution Camera and Color Fish-Eye Camera

InSight Lander
Length — About 20 feet (6.0 meters) long with solar panels deployed ("wingspan")
Width — About 6.5 feet (2.0 meters) wide (lander deck diameter)
Deck Height — About 4.5 feet (1.3 meters)
Weight — 794 pounds (360 kilograms)
Electrical Power — Two solar panels, each about 7 feet (2.2 meters) in diameter

InSight Mission Details
Launch — March 2016 from Vandenberg Air Force Base on an Atlas V-401 rocket. First launch of an interplanetary spacecraft from California.
Cruise to Mars — About 6 months.
Landing — September 28, 2016. A saucer-shaped "aeroshell" slows down descent. Parachutes and retro-rockets bring it to a soft Mars landing.
Landing Site — Elysium Planitia, a broad, smooth plain with about 30-100 feet (10-30 meters) of loose soil and rocks overlying ancient lava flows.
Prime Mission — A little over 1 Mars year (~ 2 Earth years); 705 Mars days, or 725 Earth days.

MarCO *(**M**ars **C**ubesat **O**ne)*

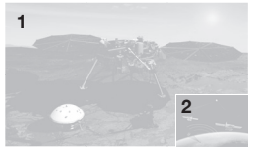
Paving the Way for Small Spacecraft
Two briefcase-size NASA CubeSats are hitching a ride on InSight's launch vehicle before separating and flying behind the lander on its cruise to Mars. This technology demonstration takes a bold step in testing the first interplanetary CubeSat, a class of small, low-cost spacecraft. The twin CubeSats fly by Mars and relay InSight's entry, descent, and landing data back to Earth. InSight's mission success does not depend on MarCO, which flies to Mars and tests communications independently.

Size – 23.6 × 3.9 × 3.9 inches (60 × 10 × 10 centimeters) each

InSight and MarCO both aid in NASA's Journey to Mars, in which robots make key discoveries and test novel technologies to pave the way for astronauts on Mars.

More Information
insight.jpl.nasa.gov
www.jpl.nasa.gov/cubesat/missions/marco.php
www.nasa.gov/topics/journeytomars
Facebook.com/NASAInSight
Twitter.com/NASAInSight

JPL, a division of the California Institute of Technology, manages InSight and MarCO for NASA's Science Mission Directorate. InSight is part of NASA's Discovery Program, managed by the Marshall Space Flight Center. Lockheed Martin Space Systems Company built the lander. International participation includes the space agencies of France (CNES), Germany (DLR), Switzerland (SSA), Poland (CBK), and the United Kingdom (UKSA), as well as Spain's Centro de Astrobiología (CAB).



1. Artist's concept of InSight
2. Artist's concept of MarCO

Credit: NASA/JPL-Caltech