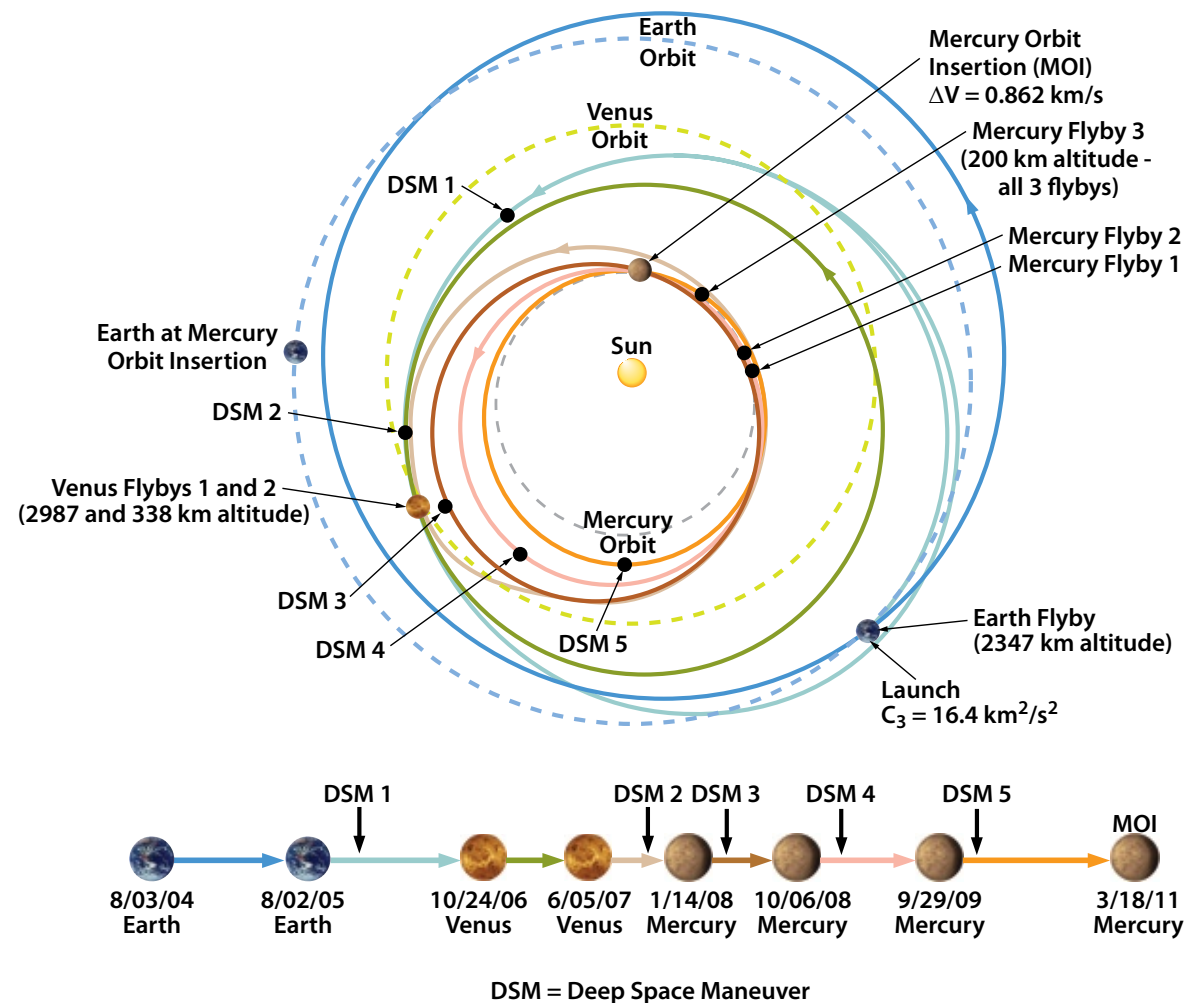


## MISSION OVERVIEW

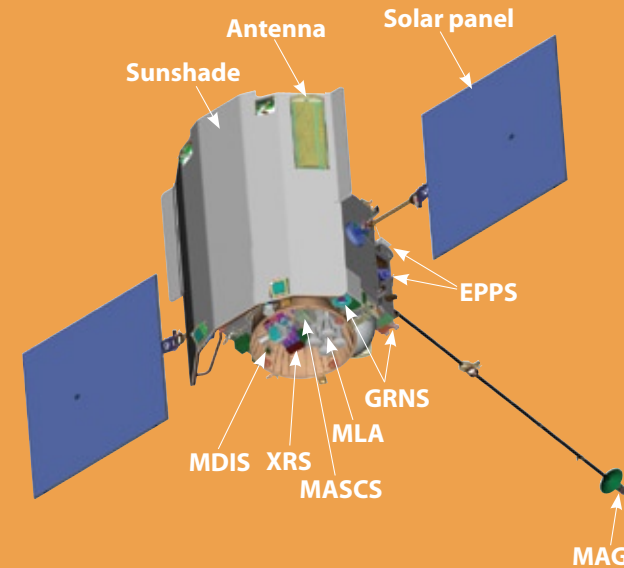
Understanding Mercury and how it formed is critical to better understanding the conditions on and evolution of the inner planets. Fortified against the searing conditions near the Sun, MESSENGER will provide the first images of the entire planet. The mission will also collect detailed information on the composition and structure of Mercury's crust, its geologic history, the nature of its thin atmosphere and active magnetosphere, and the makeup of its core and polar materials. On a 4.9-billion mile (7.9-billion kilometer) journey that includes 15 loops around the Sun, MESSENGER's

trajectory includes one pass at Earth, two by Venus, and three by Mercury, before easing into orbit around its target planet. The Earth flyby in August 2005, the first Venus flyby in October 2006, and the Venus 2 encounter in June 2007 used the pull of the planets' gravity to guide solar-powered MESSENGER toward Mercury's orbit. The Mercury flybys in January 2008, October 2008, and September 2009 fine-tune and slow MESSENGER's track while allowing the spacecraft to gather data critical to planning the mission's orbit phase.

## TRAJECTORY PROFILE



## SCIENCE PAYLOAD



MESSENGER's science payload was carefully chosen to answer the mission's six key science questions. Most of the instruments are fixed rigidly to the spacecraft's body, so coverage of Mercury is obtained by spacecraft motion over the planet.

Those instruments are:

- **Mercury Dual Imaging System (MDIS)** – Applied Physics Laboratory
- **Gamma-Ray and Neutron Spectrometer (GRNS)** – Applied Physics Laboratory
- **X-Ray Spectrometer (XRS)** – Applied Physics Laboratory
- **Magnetometer (MAG)** – joint Applied Physics Laboratory and NASA's Goddard Space Flight Center
- **Mercury Laser Altimeter (MLA)** – Goddard Space Flight Center
- **Mercury Atmospheric and Surface Composition Spectrometer (MASCS)** – Laboratory for Atmospheric and Space Physics, University of Colorado at Boulder
- **Energetic Particle and Plasma Spectrometer (EPPS)** – joint Applied Physics Laboratory and University of Michigan
- **Radio Science (RS)** – Applied Physics Laboratory

**MESSENGER**  
Mercury Surface, Space Environment, Geochemistry, and Ranging

The first  
space mission  
designed to  
orbit the  
planet closest  
to the Sun



The Johns Hopkins University  
APPLIED PHYSICS LABORATORY

<http://messenger.jhuapl.edu>



# MESSENGER

MErcury Surface, Space ENvironment, GEochemistry, and Ranging



## QUICK FACTS

### MISSION

**Launch:** August 3, 2004, from Launch Pad 17B at Cape Canaveral Air Force Station, Fla., at 2:15:56 a.m. EDT aboard a Boeing Delta II rocket

**Gravity assist flybys:** Earth, August 2005; Venus, October 2006, June 2007; Mercury, January 2008, October 2008, September 2009

**Enter Mercury orbit:** March 2011.

Total distance traveled from Earth to Mercury orbit: 7.9 billion kilometers (4.9 billion miles). Spacecraft circles the Sun 15 times from launch to Mercury orbit

**Primary mission at Mercury:** Orbit for one Earth year (equivalent to four Mercury years, or two Mercury solar days), collecting data on the composition and structure of Mercury's crust, its topography and geologic history, the nature of its thin atmosphere and active magnetosphere, and the makeup of its core and polar materials

### SPACECRAFT

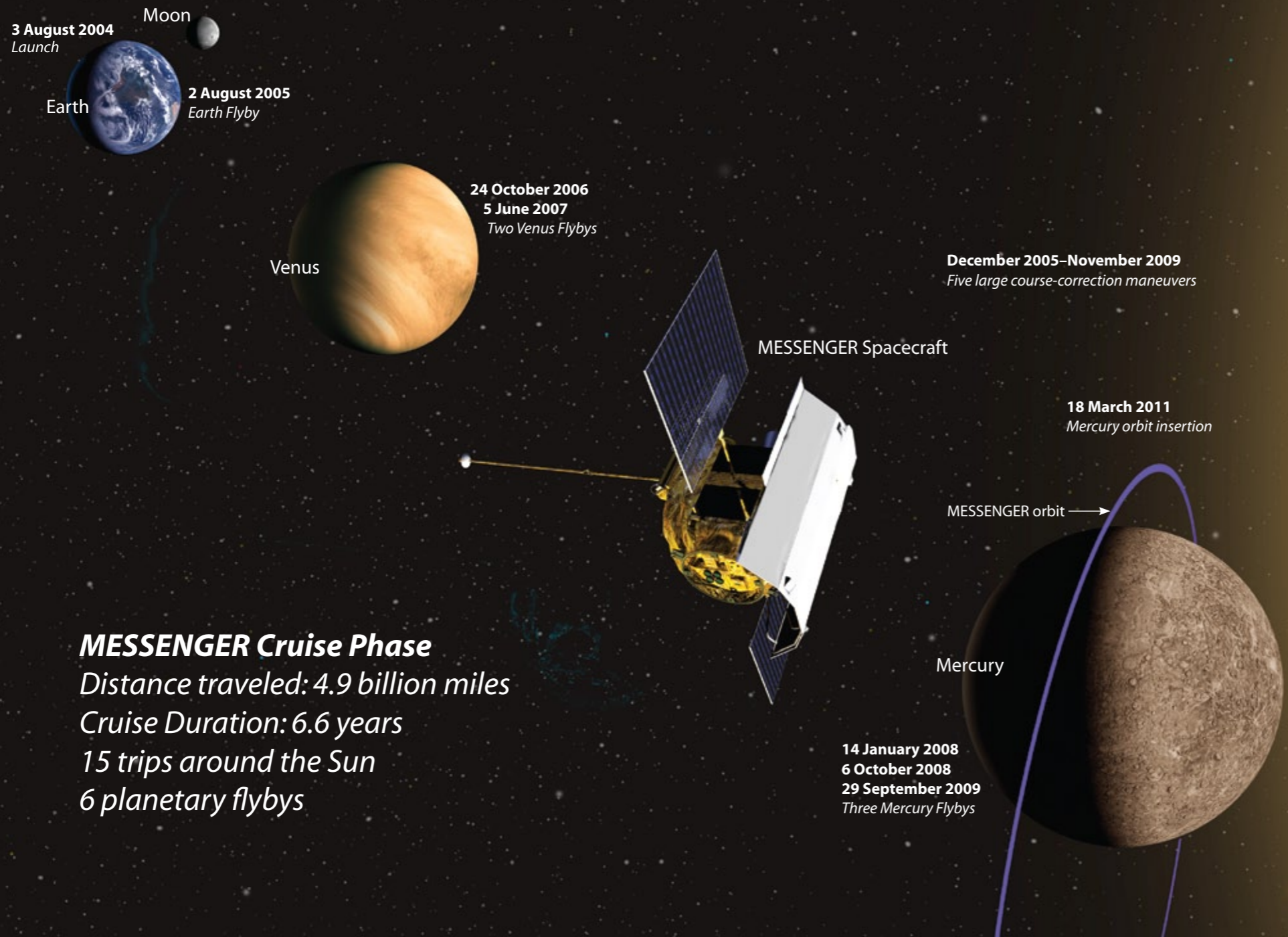
**Size:** Main spacecraft body is 1.42 meters (56 inches) tall, 1.85 meters (73 inches) wide and 1.27 meters (50 inches) deep; front-mounted ceramic-fabric sunshade is 2.5 meters tall and 2 meters across (8 feet by 6 feet); two rotatable solar panel "wings" extend about six meters (20 feet) from end to end across the spacecraft

**Launch weight:** Approximately 1,107 kilograms (2,441 pounds); includes about 599 kilograms (1,320 pounds) helium pressurant and propellant and 508 kilograms (1,121 pounds) "dry" spacecraft and instruments

**Power:** Two body-mounted gallium arsenide solar panels; nickel-hydrogen battery

**Propulsion:** One bipropellant (hydrazine and nitrogen tetroxide) thruster for large maneuvers; 16 hydrazine-fueled thrusters for small trajectory adjustments and attitude control

**Science instruments:** Wide-angle color and narrow-angle monochrome imager; gamma-ray and neutron spectrometer; X-ray spectrometer; energetic particle and plasma spectrometer; atmospheric and surface composition spectrometer; laser altimeter; magnetometer; radio science experiment



### MESSENGER Cruise Phase

Distance traveled: 4.9 billion miles

Cruise Duration: 6.6 years

15 trips around the Sun

6 planetary flybys

MESSENGER Spacecraft

December 2005–November 2009  
Five large course-correction maneuvers

18 March 2011  
Mercury orbit insertion

MESSENGER orbit

Mercury

14 January 2008  
6 October 2008  
29 September 2009  
Three Mercury Flybys