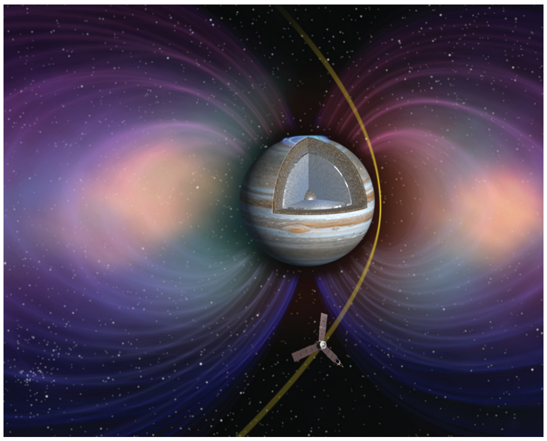
Juno Mission to Jupiter



With the exception of the sun, Jupiter is the most dominant object in the solar system. Because of its enormous size and the fact that it was likely the first of the planets to form, it has profoundly influenced the formation and evolution of the other bodies that orbit our star. NASA's Juno mission will allow us to examine this gas giant planet from its innermost core to the outer reaches of its enormous magnetic force field.

During its mission, Juno will map Jupiter's gravity and magnetic fields to learn what the planet's interior structure is like. The spacecraft also will observe the composition and circulation of the deep atmosphere and improve our understanding of the forces that control the planet's powerful auroras. In addition to expanding our knowledge of the solar system's largest planet, these investigations will provide clues about what conditions in the early solar system were like when Jupiter was forming. Improving our knowledge of Jupiter's origins and evolution will also help us to better understand the many planetary systems being discovered around other stars.

The History of the Solar System

Despite all we have learned about Jupiter and the early history of our solar system, there are some basic things we don't understand very well. We don't know how much oxygen the planet holds, and this happens to be the most important missing piece in our understanding of how our solar system formed. Some theories about Jupiter's formation predict that the planet's oxygen weighs as much as 20 Earths! We also don't know if the planet has a solid core, or precisely how and where its powerful magnetic field is produced. Further, it is unknown how deeply rooted Jupiter's colorful, banded clouds and planet-sized spots are. And scientists yearn to understand what powers the auroras — Jupiter's northern and southern lights. These mysteries make it clear that although Jupiter's colorful clouds get most of the attention, some of the most enticing mysteries are hiding deep inside the planet.

A Five-Year Journey

Juno's trip to Jupiter will take a total of about five years. Though the journey may seem long, this flight plan allows the mission to use Earth's gravity to speed the craft on its way. The spacecraft first looped around the inner solar system, and then, two years after launch in 2013, it swung past Earth to get a boost to propel it onward to its destination.

In July 2016, Juno will fire its main engine and slip into orbit around the giant planet to begin its scientific mission.

A Solar-Powered, Spinning Spacecraft

Jupiter's orbit is five times farther from the sun than Earth's location, so the giant planet receives about 25 times less sunlight than Earth. Juno will be the first solar-powered spacecraft designed to operate at such a great distance from the sun, and its solar panels must be quite large to generate sufficient power there. To meet this challenge, three solar panels extend outward from Juno's hexagonal body, giving the spacecraft an overall span of 66 feet (20 meters).

Juno's orbit and orientation are carefully designed so that the solar panels face the sun most of the time. While orbiting Jupiter, the spacecraft will spin twice per minute, both for stability and to allow each instrument a chance to view the giant planet.

Orbiting Jupiter's Poles

Once at Jupiter in 2016, Juno will circle the planet on a path that passes over the poles. Because polar orbits are best for mapping and monitoring a planet, many satellites that study Earth follow a similar path. Until now, this type of orbit has not been tried at Jupiter, so Juno will be the first to get a detailed look at the planet's poles.

Juno will take 14 days to complete each orbit, while Jupiter spins every 10 hours. Mission planners designed the flight plan so that the spacecraft passes over a different section of Jupiter during each orbit. After completing its 33 planned science orbits, Juno will have covered the entire planet.

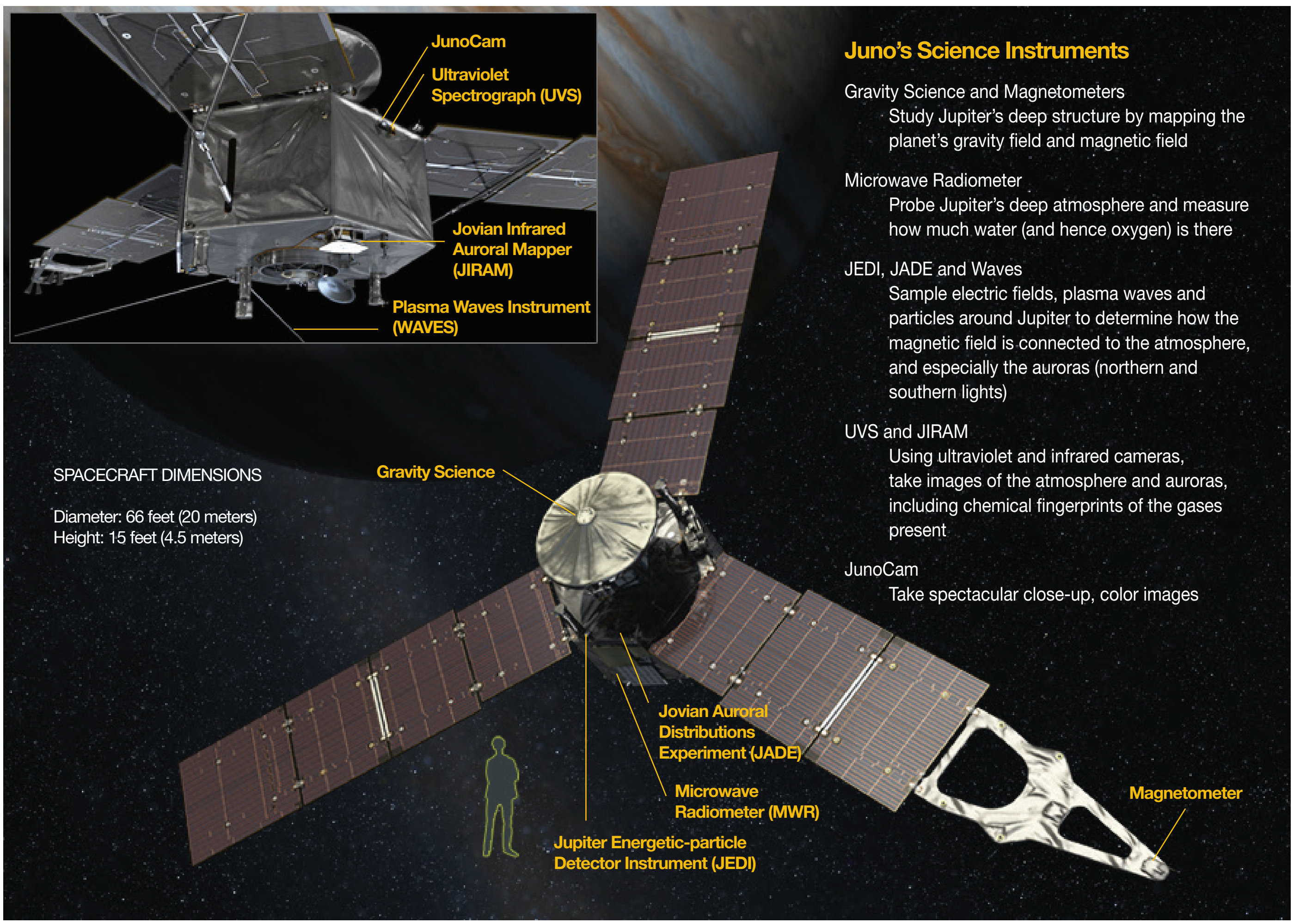
To make the most accurate measurements of Jupiter's gravitational and magnetic fields, Juno has to get very close to the planet. Thus, on each orbit, Juno comes within 3,100 miles (5,000 kilometers) of Jupiter's cloud tops. If Jupiter were the size of a basketball, the equivalent distance would be only one-third of an inch (about 0.8 centimeters).

Juno's close orbit also enables it to avoid the most intense region of Jupiter's harmful radiation, which is concentrated in a belt around the planet's equator. In this region, tiny particles — ions and electrons — zip around at nearly light speed. Even though they're small, they pack quite the punch, and they can damage a spacecraft's electronics.

Even with this special orbit, over about a year, the amount of radiation that's expected to bombard Juno is the equivalent of more than 100 million dental x-rays. This extreme dose of radiation is destructive to electronics and is the main limiting factor for the length of the mission. To help the spacecraft cope with this hostile environment, Juno's most sensitive electronics are housed within a titanium vault. Inside the vault, Juno's hardware will be exposed to radiation about 800 times less intense than outside. After about a year in orbit, Juno's mission will be complete and it will be commanded to dive into Jupiter's atmosphere, where it will burn up like a meteor. This protects Jupiter's potentially habitable moons from any threat of contamination by hardy microbes that might stow away from Earth.

Launch	August 2011
Earth flyby	October 2013
Jupiter arrival	July 2016
End of mission	February 2018

For more information about Juno, visit:
missionjuno.swri.edu
www.nasa.gov/juno



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