



To the Moon and Beyond!

Article

PART 1

NEW DELHI, India. Both India and China are exploring space. Both countries sent spaceships up in 2013.

India

India launched its first spacecraft to Mars on November 5, 2013. The craft spent almost a month in Earth's orbit. Then, on November 30, 2013, the orbiter headed toward Mars.

The 3,000-pound (1,350-kilogram) orbiter is called Mangalyaan. That means "Mars craft" in Hindi. It must travel about 300 days to get to Mars. It should get there in September 2014.

The orbiter will take pictures. It will also collect data. Scientists want to learn about Martian weather. India also hopes to learn what happened to water that used to be on Mars.

The orbiter will also look for chemicals needed for living things. Experts say the information will help them understand how planets form. They will also learn more about places where life is possible.

The orbiter should have six months to study the planet's surface and sky. It will get as close as 227 miles (365 kilometers) from Mars.

Some have questioned India's trip to Mars. It is costing \$72 million. The country has many people who are poor and hungry. But the government said the trip to Mars is good. It gives jobs to scientists and engineers.

The space program also offers technologies for solving problems on Earth. These problems include finding where fish can be caught by fishermen. What else? Knowing when storms and floods might happen. Then a country can be ready.

If the orbiter is successful, India will become the fourth space program to visit Mars. The Soviet Union, the United States, and Europe have already done this.

China

Meanwhile, China is busy exploring space, too. It sent up a rocket carrying the rover "Yutu," or "Jade Rabbit." Yutu was sent off aboard Chang'e 3 spaceship on December 2, 2013. Yutu arrived on the moon just 12 days later. The ship is named after "Chang'e." That's a mythical Chinese goddess of the moon. "Yutu" is Chang'e's pet.



Photo credit and all related images:
Arun Sankar K/AP

*India sent its first spaceship to Mars
in November 2013.*

It was the first soft landing on the moon in 37 years. It made China the third country to do this, after the United States and the Soviet Union. A soft landing does not damage the craft.

The solar-powered rover was sent to survey the moon's surface. It was also sent to set up a telescope to observe Earth's plasmasphere. That is an area of dense, cold material around our planet.

However, after about a month, China said that Yutu was having problems. The solar-powered craft wasn't shutting down for the moon's night, which lasts more than two Earth weeks. The temperature during that time drops to -292 degrees Fahrenheit (-180 degrees Celsius).

Yutu made it through its first night. Then, something happened. Leaders believe that moon dust got onto one of the solar panels. This may have blocked it from folding up and would have left Yutu unprotected from the cold. Would the lander still work? In late January 2014, no one was sure. But China's engineers had not given up.

China sent its first astronaut into space in 2003. It has made great advances since then. China wants to have a space station and also plans to put a person on the moon.

"We [work] for our space dream as part of the Chinese dream of national [growth]," said Zhang Zhenzhong. He is head of the Xichang Satellite Launch Center.

Information for this story came from AP.



Photo credit: AP/Xinhua, Li Gang
China sent its first spaceship to the moon in December 2013. China will study the planet.

PART 2

Dig Deeper

Most research is done with spacecraft that have no crews. The unmanned spacecraft carry instruments. These instruments test the compositions of planets. They also test the planets' characteristics. Data and images are sent back to Earth. They are sent as radio signals. Onboard computers guide the spacecraft; so do radio signals from Earth. Different kinds of spacecraft were made for these missions.

Some spacecraft are made to study a planet over a long period of time. They are called orbiters. What happens when an orbiter reaches its target planet? Rocket engines are fired. They slow the spacecraft down. It then goes into orbit around the planet.

The spacecraft orbits for several months to several years. It stays near a planet much longer than a flyby spacecraft. So, it can view most or all of the planet's surface. An orbiter can also track changes over time. These could be changes in weather. Or they could be changes in volcanic activity.

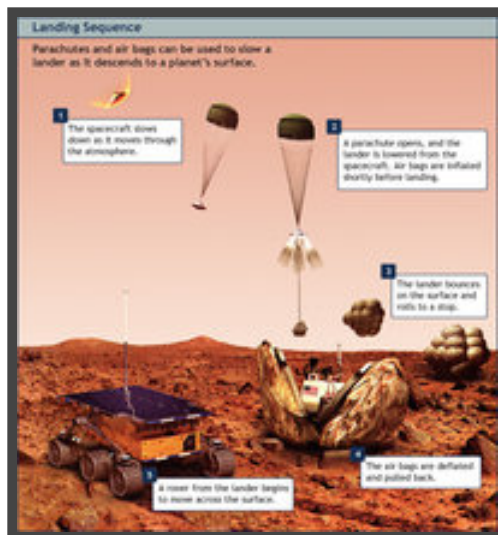
- Orbiters allow astronomers to make detailed maps of planets.
- Most orbiters have cameras. They take pictures of planet surfaces.
- Orbiters may also carry other instruments. One might figure out the altitudes of surface features. Another could measure temperatures in different areas.
- Some orbiters do not explore planets. Instead, they are made to explore moons. Or they are made to explore other bodies in space.
- It is possible to change the body a spacecraft orbits. The spacecraft can be sent to orbit a planet. Then, it can be moved. It could be moved to orbit one of the planet's moons.

Landers and probes allow for exploration. They do this by landing instruments on a planet. They also send instruments through a planet's atmosphere. This kind of mission gives more information about a planet. It gives more information about the planet's features. It also gives more information about the planet's properties. It can even provide clues to what a moon or planet was like in the past.

A lander is made to land on a planet's surface. What happens once it lands? Controllers on Earth send it commands. They command it to collect data. Landers have been placed on the Moon. They have also been placed on Venus and Mars. Some have worked for months or years at a time.

- Landers take images. These images are more detailed than those taken by an orbiter.
- Landers offer close-up views of a planet's surface. They also measure properties of the planet's atmosphere and surface.
- A lander may have a mechanical arm. It uses this arm for gathering soil and rock samples.
- A lander may contain a small vehicle. This vehicle is called a rover. A rover can move past the landing site.

One successful space mission was that of *Mars Pathfinder*. It landed on Mars in 1997. *Mars Pathfinder* and its rover sent back thousands of photos. These photos showed evidence that water once flowed on Mars. Another lander was sent two years later. But it failed to work after it reached Mars.



Some spacecraft are made to work only for a short time. This is before they are destroyed by conditions on a planet. A probe is a spacecraft that drops into a planet's atmosphere.

- The probe travels through the atmosphere. As it travels, its instruments identify gases. They also measure properties. Pressure and temperature are examples.
- Some planets, like Jupiter, are giant. They have deep atmospheres. Probes are important for exploring these atmospheres.

A lander or a probe can work together with an orbiter. Is there an example? Yes. In 1995, the orbiter *Galileo* was sent into space. It began orbiting the planet Jupiter. It sent a probe into Jupiter's atmosphere. The probe sent data back to the orbiter. It sent data for nearly an hour before it was destroyed. The orbiter passed the data on to Earth. *Galileo* continued to orbit Jupiter for 8 years. Future space missions may use even more complex combinations of spacecraft.

Dictionary

data (noun) information; facts

lander (noun) a spacecraft made to land on a planet's surface

probe (noun) a spacecraft that is sent into a planet's atmosphere or onto a solid surface

rover (noun) a car-like machine that moves around on a planet or moon in order to study it

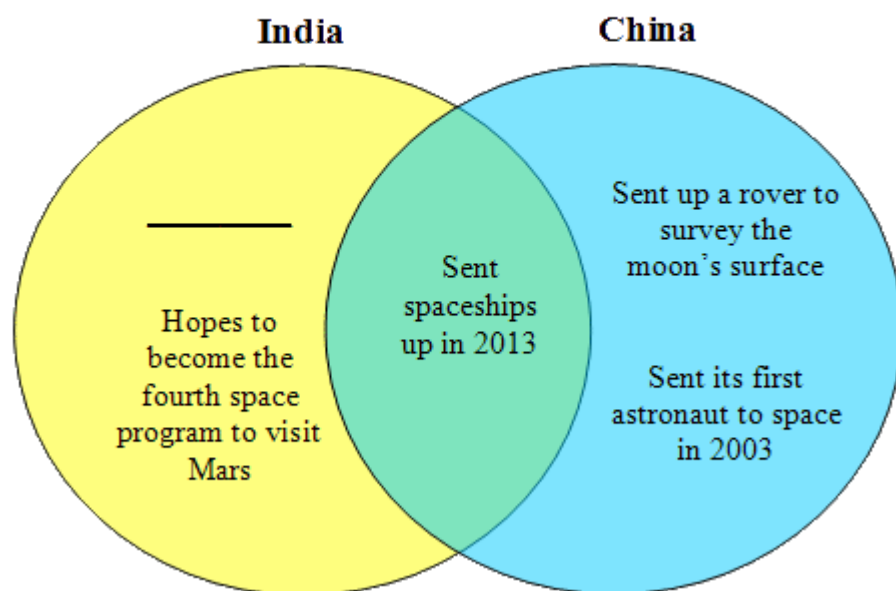
technology (noun) the use of science to make new things

Activity

PART 1

Question 1

How Are These Alike and Different?



Based on the article, which fits best on the blank line above?

- (A) Launched a spacecraft to Mars
- (B) Named its rover after a goddess' pet
- (C) Plans to put a person on the moon
- (D) Used solar power on its spacecraft

Question 2

The article talks mainly about _____.

- (A) The ways in which China and India are exploring space
- (B) The first soft landing on the moon
- (C) The differences between Mars and the moon
- (D) The reasons it's worth spending millions to explore space

Question 3

Which is the closest **synonym** for the word *survey*, as it is used in the article?

- (A) Change
- (B) Damage
- (C) Plan
- (D) Chart

Question 4

Monika wants to learn more about the Mangalyaan. She would find the most information _____.

- (A) In a news story about helping the poor in India
- (B) In a book about Chinese gods and goddesses
- (C) In a news story about India's space program
- (D) In a book about the first spacecraft to reach Mars

Question 5

According to the article, the reader can tell that _____.

- (A) China's leaders don't know about India's trip to Mars.
- (B) India doesn't care about China's rover.
- (C) The U.S. hasn't spent much money on space travel.
- (D) Exploring space is important around the world.

Question 6

The article states:

Would the [Yutu] lander still work? In late January 2014, no one was sure. But China's engineers had not *given up*.

Which must mean almost the **same** as *give up*?

- (A) Start
- (B) Try
- (C) Watch
- (D) Quit

Question 7

Which question is **not** answered by the article?

- A Why did China decide to observe Earth's plasmasphere?
- B How much is India spending on the trip to Mars?
- C When did China send its first astronaut into space?
- D How much does India's Mars orbiter weigh?

Question 8

Which statement from the article best supports the idea that China hopes to learn more about space?

- A China sent its first astronaut into space in 2003.
- B Leaders believe that moon dust got onto one of the solar panels.
- C ...After about a month, China said that Yutu was having problems.
- D China wants to have a space station and also plans to put a person on the moon.