

**IF THE TRIP DOESN'T KILL YOU,  
LIVING THERE MIGHT.**

# MISSION TO MARS

By National Geographic staff

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**Explorer**

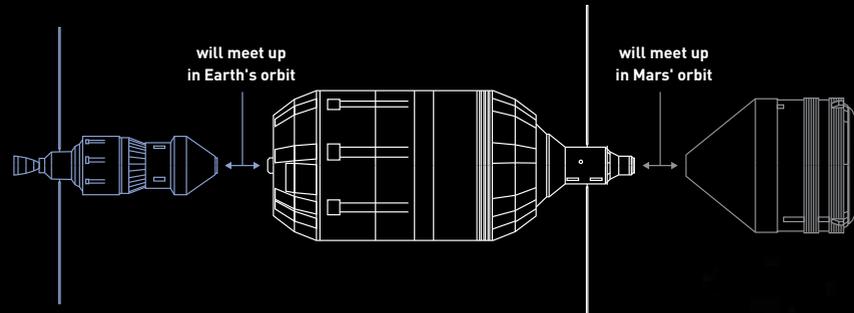
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# GETTING THERE

## A LONG JOURNEY

Mars is 55 million kilometers (34 million miles) away from Earth. That's more than 140 times farther than the moon. A new kind of spacecraft would be needed to send six astronauts to Mars. It would need to be comfortable. It would need to shield the crew from radiation. And it would need to carry supplies for an 8-month-long trip. Look at the picture below of what the craft might look like.

Three vehicles in one:



*Crew vehicle* would carry the crew into Earth's orbit. It would dock with the habitat module.

*Habitat module* would be where the crew lived and worked during the trip to Mars.

*Mars descent vehicle* would be sent ahead to orbit Mars. It would carry the crew to the surface after they arrived.

## PRECIOUS RESOURCES

Each astronaut would need about 4.5 kilograms (10 pounds) of air, water, and food a day. That's 816 kilograms (1,800 pounds) every month! That's too much to carry on the ship. Instead, the ship would recycle air and water. The crew could grow food in wall gardens.

## A FEW FAVORITE THINGS

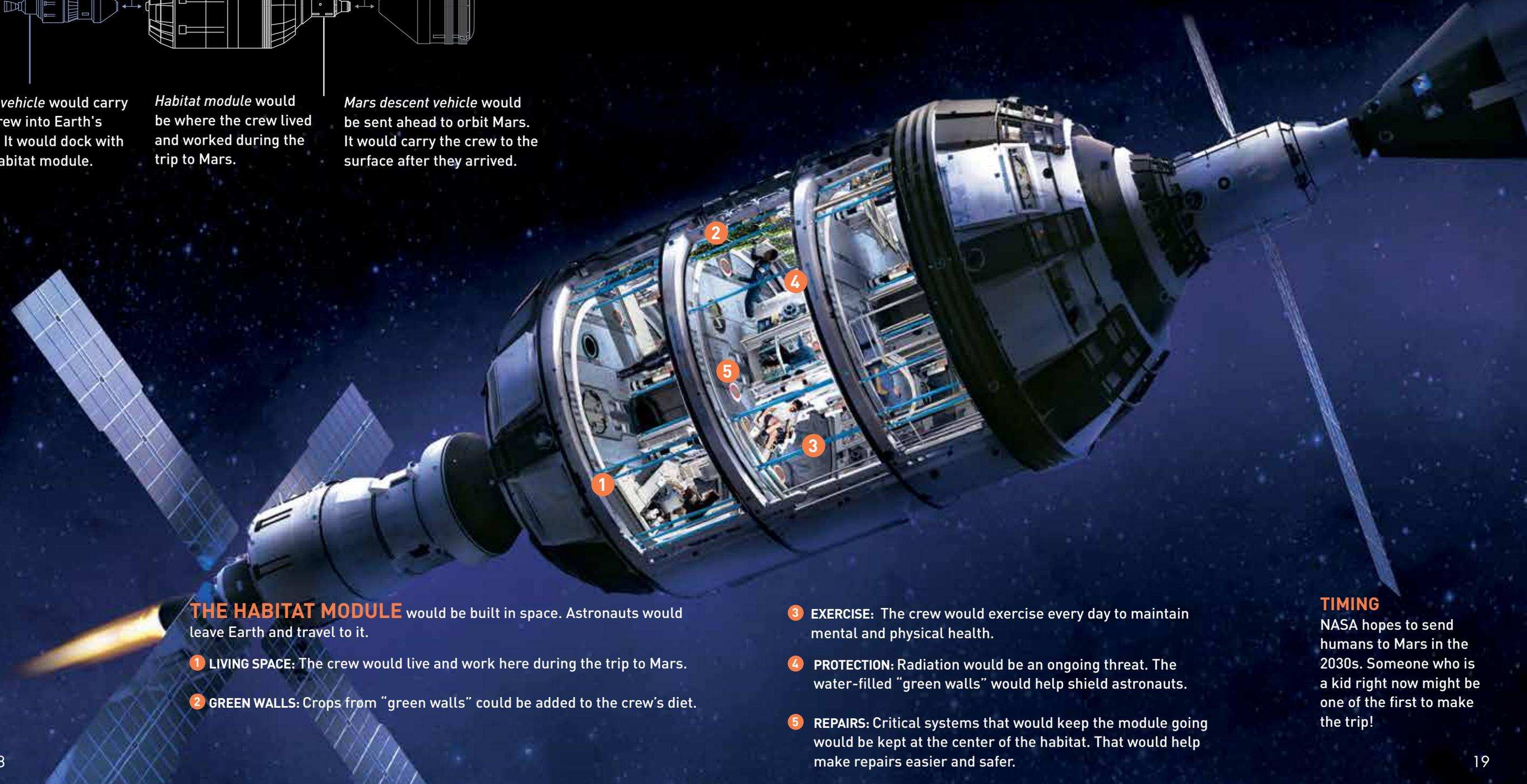
Each astronaut would only be allowed to take 2.2 kilograms (5 pounds) of personal items. Choosing what to pack might be hard. Here's what some other astronauts brought:

**2007:** The lightsaber belonging to Star Wars' Luke Skywalker was taken on a mission to the International Space Station.

**2010:** Shannon Walker carried aviator Amelia Earhart's watch. Earhart wore it in 1932 when she crossed the Atlantic Ocean by herself.

**2008:** Garrett Reisman brought a tube of dirt from the pitcher's mound at Yankee Stadium.

**2012:** Japan's Satoshi Furukawa brought Legos.



**THE HABITAT MODULE** would be built in space. Astronauts would leave Earth and travel to it.

- 1 LIVING SPACE:** The crew would live and work here during the trip to Mars.
- 2 GREEN WALLS:** Crops from "green walls" could be added to the crew's diet.

- 3 EXERCISE:** The crew would exercise every day to maintain mental and physical health.
- 4 PROTECTION:** Radiation would be an ongoing threat. The water-filled "green walls" would help shield astronauts.
- 5 REPAIRS:** Critical systems that would keep the module going would be kept at the center of the habitat. That would help make repairs easier and safer.

## TIMING

NASA hopes to send humans to Mars in the 2030s. Someone who is a kid right now might be one of the first to make the trip!

## LIFE IN SPACE

Exploring something new means taking risks. Even with careful planning and training, there are two roadblocks that can't be avoided: Space is dangerous. And the human body isn't built for space.



illustration of space junk

## SPACE IS DANGEROUS.

How do we escape Earth's atmosphere? A rocket must travel faster than 40,000 kilometers per hour (25,000 miles per hour). Once it clears Earth's gravity, it passes through a minefield of junk.

There are more than 17,000 objects orbiting Earth. Each is at least the size of a softball. Some of these objects are pretty big. There are about 4,000 satellites, for example. Add objects smaller than 10 centimeters (4 inches), and the count jumps to around 500,000 objects. At the speed they are moving, even a fleck of paint could cause serious damage.

There are other dangers, too. Beyond Earth's atmosphere and magnetic field, subatomic particles zip around. This is space radiation. It can harm humans.

# THE HUMAN BODY ISN'T BUILT FOR SPACE.

- 1 MIND** After about six months in space, astronauts begin to feel mentally tired. Sleep is interrupted. High levels of carbon dioxide, radiation, and other stressors from the environment can cause this.
- 2 EYES** Without gravity, fluids shift upward. This puts pressure on the optic nerve and eyeball. And this can affect an astronaut's vision.
- 3 IMMUNE SYSTEM** This system protects the body against disease. It slows down in space. This can weaken an astronaut's ability to fight off sickness.
- 4 DIGESTION** Microorganisms in the gut are needed to digest food. Radiation and a limited diet can damage this system.
- 5 BLOOD** On Earth, the heart works against gravity. It pumps blood and keeps it from pooling in the legs. In space, there's no gravity to pull blood down. Instead, blood goes to the chest and head. Astronauts can develop puffy faces and skinnier legs.
- 6 EARS** Weightlessness may cause inner ear problems. As a result, astronauts might experience motion sickness. They might also have balance problems.
- 7 HEART** The heart doesn't work as hard in space because it isn't fighting against gravity.
- 8 MUSCLES** Muscles need Earth's gravity to stay strong and toned. After five months in orbit, an astronaut can lose muscle mass by as much as 40 percent.
- 9 BONES** Bones become brittle in space. They lose valuable calcium and minerals. Bones stay strong when they bear weight, like the pelvis does. Exercise can help.



## DID YOU KNOW?

An astronaut can grow up to 3 percent taller in zero gravity. Without the pull of Earth's gravity, the spine can expand and relax. The gain doesn't last, however. An astronaut's height returns to normal after a few months back on Earth.

### 3% TALLER



# ON MARS

Astronauts on Mars would be in for a long stay. The crew would need to spend about 500 days on the planet before the right window opened for them to return to Earth. The crew would need air, water, and places to live and grow food.

## FIRST STEPS

- 1 SHORT-TERM SHELTER:** NASA is testing a flexible structure that recycles all water, air, and waste. Astronauts would live here at first.
- 2 LONG-TERM SHELTER:** Resources would be shipped to Mars ahead of time to build permanent structures. Another option is to use Martian soil to create building materials.

- 3 GETTING AROUND:** Pressurized vehicles could be used to explore. This model can carry two people for two weeks. It can travel about 97 kilometers (60 miles) at a time.
- 4 SPACE SUIT:** State-of-the-art space suits would protect the crew on Mars.



## SOLUTIONS FOR LONG-TERM SURVIVAL

For a longer stay on Mars, a colony would need to find or create new ways to make Mars more habitable.

### AIR

Air could be made by using carbon dioxide from Mars' atmosphere.

### FUEL

Fuel would be made from Mars' natural resources. It will be needed for the return trip to Earth.

### WATER

There are small amounts of water on Mars. This could be collected and used.

### FOOD

It may be possible to grow some food crops using Martian soil.