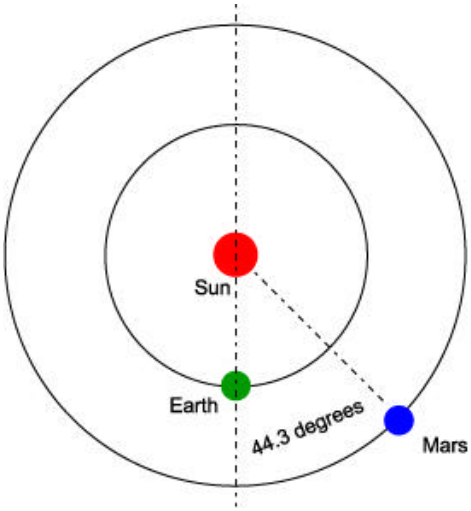
Getting to Mars

Routes and travel time

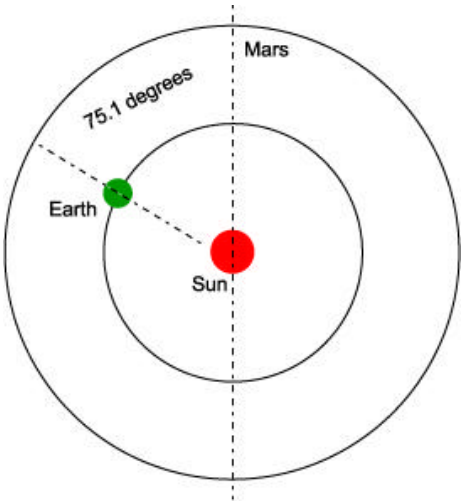
By: Elisabeth Ambrose

There are many different possible routes to take when sending a spacecraft to Mars. As each trip covers a different distance, each takes different amounts of time and fuel.

Perhaps the most familiar type of route involves sending the spacecraft out when Mars is about 45 degrees ahead of Earth in its orbit. This happens once every 26 months. The spacecraft powers outward and catches up with Mars in about 260 days. For the return trip, which also takes 260 days, the spacecraft simply leaves Mars when Earth is slightly ahead in its orbit, and spirals into Earth's orbit, catching up with the planet. In this scenario, a team arriving on Mars would be able to spend 460 days there. The entire trip would take about two and a half years. This type of route is known as a conjunction class route because the spacecraft arrives on Mars or Earth when that planet is in conjunction with where the other planet was when the spacecraft left.



The Sun, Earth, Mars configuration upon launch from Earth.



The Sun, Earth, Mars configuration upon arrival at Mars.

A different type of route is known as an opposition class route, which is similar in style to conjunction class routes. It is called opposition class because Earth and Mars make their closest approach sometime during the trip. A spacecraft would have to leave Earth when Mars was significantly ahead in its orbit, and the trip would take 220 days. During the return trip, the spacecraft would spiral inside Earth's orbit and catch up to the planet from the back. The return trip would take 290 days. To time the orbits correctly, there would only be 30 days available to stay on the surface of Mars.

Lower thrust rockets can also travel to Mars using less direct means. These types of spacecraft spiral out of Earth's gravitational field, and arrive at Mars in 85 days. Part of the ship detaches to drop off the astronauts and their gear, and the return module continues to fly by the planet. The return module will rendezvous with Mars again in 131 days, allowing the astronauts to catch their ride home.

There are many other proposed ways to get astronauts to and from the red planet. For example, one scenario envisions astronauts launching from Earth and landing on one of Mars' moons. The astronauts could then set up a base of operation from which they could make many trips to the surface of the planet. In another proposal, a space station that acts as a permanent ferry

could be put in orbit between the two planets. Smaller spacecraft could then taxi astronauts between Earth and the space station and between the space station and Mars. This situation would allow many more frequent trips for many more travelers back and forth between the planets.

The Benchmark Lessons were developed with the help of the following sources:

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