



# Spaceship Designer!

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## Science Topics: Space Travel

Flying into outer space would be an amazing experience! Of course, at some point, you would want to return to Earth. Unless you wanted to spend the rest of your life flying through space!

Space travel poses several challenges and potential problems. We can't fly an airplane to the moon. Why not? List the challenges.

Space travel requires specially designed ships (see <https://www.spacex.com/>) Even with highly specialized vehicles, travel through space poses special problems requiring special solutions. The launch has to overcome the forces of gravity, stability of the rocket, and carrying fuel.

## Three Important concepts to Understand:

1. Gravity: The force that pulls objects to the earth. Its cause has never been completely understood, but the effects of gravity are everywhere on the planet.
2. Newton's Third Law of Motion: An action produces an equal and opposite reaction  
Example: Release the air in a balloon, the balloon flies in the opposite direction.
3. Inertia: Newton's First Law of Motion states that an object at rest tends to stay at rest and an object in motion tends to stay in motion unless other forces act upon the object.

## Space Travel – Four Problems to Solve:

1. Overcoming the forces of Gravity: Describe ways in which Newton's Third Law of Motion would help a spaceship overcome the forces of gravity.
2. Carrying Fuel: What is your solution and explain how this relates to space travel.
3. Maintaining Orbit: Explain how gravity and inertia would work together to help your ship stay in orbit. Analyze the results, and apply this knowledge to space travel
4. Returning to Earth: Returning from the vacuum of space into the Earth's atmosphere poses another set of problems and challenges. Think of the earth as an orange. The orange peel is the atmosphere and the fruit itself is the Earth. The atmosphere protects the Earth, like the peel protects the fruit. A spacecraft trying to re-enter the Earth's atmosphere has to "pierce" the atmosphere, slow down and then land safely on the surface. There are 3 considerations:
  - Speed of re-entry (fast enough to pierce the atmosphere)
  - Angle of Re-entry (too shallow, the ship bounces off; too steep, re-entry is too fast)
  - Friction (heat builds up very quickly and could cause the ship to burn up)

## Space Ship Designer

Based on these factors and your knowledge of space travel and outer space, design a spaceship that could travel into space, maintain orbit around the earth, and then safely return to the surface of the planet.

Presentation: Create a drawing of your spaceship and include notes on your sketch that explain your design and address all Four Problems to Solve. Have fun; be creative!