



## Decorate Your Own Rocket

### History of Rocketry

People have been fascinated with rockets for thousands of years. From the early days of discovery and experimentation, rockets have developed from simple devices into giant vehicles that can travel to outer space.

2,000 years ago, the first rockets were more like toys or curiosities – people were amazed that steam could make a small object move. Around the year 1200, Chinese scientists invented the first true rockets. They attached a tube to a stick, filled the tube with powder made of special chemicals and lit the powder. The powder exploded creating thrust, and the tube flew through the air; the stick made tube fly up instead of along the ground.

For hundreds of years, different people experimented with rockets. They tried different combinations of chemicals. They tried different shapes for their rockets. They experimented with ways to make their rockets fly straighter and farther.

In the early 1900's, Robert Goddard built a rocket that used liquid oxygen and gasoline. His rocket flew for 2 seconds, went 36 feet high, and landed in a cabbage patch – it was the beginning of modern rocketry! Goddard experimented with different fuels and designs. He added flight control and parachute recovery systems to safely return the rockets and instruments. His rockets became bigger and flew higher, but they could not escape the gravity of Earth.

Then, in 1957, everyone in the world was surprised when Russia launched Sputnik. This satellite was able to escape Earth's gravity and orbit the Earth. Other countries built powerful rockets and launched Earth-orbiting satellites. The United States created NASA (National Aeronautics and Space Administration) to explore space.

### How Rockets Work

Rockets produce the force needed to move an object forward very quickly. Rockets are used to launch spacecraft and fireworks! Did you ever blow up a balloon and let it go? The air in the balloon shoots out with great force, and the balloon moves in the opposite direction. Rockets work in the same way – exhaust gasses coming out of the engine at high speed push the rocket forward.

Earth's gravity holds everything down – if you drop something, it falls to the floor. Gravity is very strong. Rockets need to go very fast to escape Earth's gravity - 25,000 miles per hour! They need a lot of fuel. Most rockets are made in three parts or stages. Each stage carries fuel that burns and gives off hot gas. The gas shoots out from the back. This force, called jet propulsion, pushes the rocket forward.

When the first stage uses up all its fuel, it drops off to make the rocket lighter. The stage falls back to Earth (usually in the ocean) or burns up in the atmosphere. Then the second stage fires to keep the rocket moving. Finally, the third stage fires. Really big rockets have boosters - smaller rockets attached to their sides.

**Decorate Your Own Rocket** (continued)**How to Become an Astronaut**

Many astronauts say they wanted to be an astronaut ever since they were very young boys and girls. Becoming an astronaut takes education, hard work, and dedication. Would you like to be an astronaut?

Astronauts study science, technology, engineering and math. You can take classes in school or online. You can join an engineering or robotics club. You can go to fairs or camps to learn new skills and design solutions to problems. You need to have a job for at least 3 years. Teachers, pilots, scientists, or doctors can become astronauts.

Astronauts work with many different people so they must be good communicators, good leaders, and team players. An astronaut must be good a listener and a good speaker. Sometimes an astronaut must make good decisions. Other times an astronaut must follow orders.

Astronauts go to astronaut training school for 2 years. They learn survival skills, study foreign languages, fly airplanes, operate robotic arms, and practice space walks in a deep swimming pool. Then they might be assigned to help in the Astronaut Office in Houston to support a current mission, or help NASA engineers design spacecraft. Sometimes astronauts are assigned to a mission in space.

**Space Exploration – Past, Present, and Future**

People have been observing the sun, moon, planets, and stars for thousands of years. But when large powerful rockets that could carry spacecraft were developed in the 1950's, physical space exploration became a reality.

The first space flight was a small unmanned satellite called Sputnik. It orbited the Earth and burned up on re-entry. More flights followed. A dog named Laika was the first animal in space.

Then people orbited the Earth. Everyone in the world was excited when astronauts landed on the Moon in 1969.

Since then, spacecraft have visited Mars, Venus, and other planets. The space probe Voyager I was launched in 1977. It flew close to Jupiter and Saturn and left our Solar System in 2012 to enter interstellar space. It will never return to Earth.

Some space exploration is done by powerful telescopes, robots or computers that gather information electronically and send it to scientists on Earth. This information helps scientists learn about the planets, stars, and even our own Earth.

Other space exploration is done at the International Space Station. Six astronauts from many different countries work together 250 miles above the Earth. They maintain the space station and perform experiments in astronomy, biology, meteorology, medicine, and more. Sometimes students can join the experiments using radio, video link, or email communications. Working in the Space Station is very hard, so astronauts take turns every year.

In 2020, a huge rocket called Atlas V left Earth. Atlas V carried the rover Perseverance to Mars. It took a year to get to there! Perseverance will take lots of photographs and soil samples. It will look for water and signs of life. It will send information to scientists so they can bring the rover and all its samples back to Earth in 2030. What will we learn from Perseverance's mission to Mars? What other things can we explore in space?