
Rockets:

How they work and how to build them

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Title and description

Rockets: How they work and how they are built is the main idea of my research paper.

Introduction and Background

Rockets are not as new as they seem, people have been building rockets for a long time. I will start with the history of a payload. A payload is something that a rocket carries. Some of the earliest payloads were fireworks developed by the Chinese people in the 1200's (1). While in World War II, the German V-2 rockets carried payloads of several thousand pounds of dangerous explosives (2).

Research of Rockets

Most of what I learned about how rockets fly came from Sir Isaac Newton. He studied the laws of motion. The first law of motion is about inertia, an object at rest stays at rest and an object that's moving stays moving unless a force is used against it. With rockets, this means when the rocket is on the launch pad, it needs a push of force to make it launch. His second law was about acceleration which depends on the force that's pushing it and how big it is. For rockets, this means the fuel that they use must be enough to push the exhaust out as quickly as possible. The third law says that every action has an equal and opposite reaction. With rockets, this means when the rocket pushes the exhaust down, it pushes the rocket up (2). Newton's third law also lets rockets work in space when there is nothing to push against. The rocket pushes its exhaust backward which lets the rocket move itself forward (3).

The rocket launchpad has two very important things, the launch tower and the flame trench. The tower holds the rocket up and steady before the launch. The flame trenches redirect burning gases sideways to prevent damage to the rocket and launchpad (3).

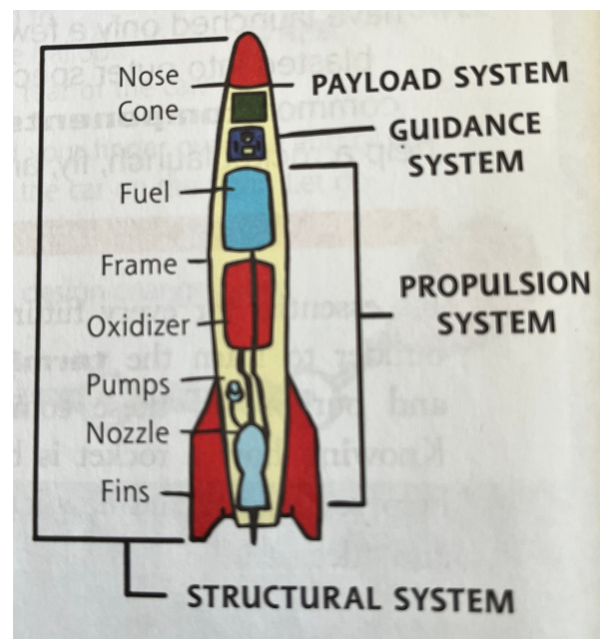
Rockets come in many different shapes and sizes, and some can be more powerful than others. Heavy lift rockets can be among the most powerful. They can send people beyond

the moon (3). A rocket has four different systems; structural system, payload system, guidance system, and propulsion system. A rocket's structural system includes its frame, body and control fins (2). A multi-stage rocket is actually several small rockets stacked onto a large rocket. Each piece or rocket is a stage in the flight. As the stage is completed, that part of the rocket is dropped. The next stage is lighter and then the rocket can escape the earth's gravity. A payload system is something the rocket carries. The guidance system steers and keeps the rocket stable during flight. It is built with computers, radars and other equipment to control the rocket in flight. The propulsion system includes fuel, oxidizer, pumps and a combustion chamber. When the fuel and oxidizer chemicals are mixed the mixture causes a chemical reaction in the combustion chamber of the rocket, which in turn produces a gas of hot exhaust which propels the rocket (2). To escape earth's gravity, rockets must travel around 25,000 miles per hour (3)!

Possible solutions

Since rockets have typically been only one way travel, they cost a lot of money. NASA tried to solve this problem with the space shuttle program. With the airplane-like space shuttle, astronauts could control their own landing (4). The rocket boosters and the shuttle could be reused but the external tank did not get reused. It would be better if they could all be reused.

Data



More to Study

There are many different ideas for the future of space travel. Spaceplanes could use runways and take passengers on trips to space hotels. Spaceships may even take astronauts to Mars and beyond to help us learn more about space (5).

Conclusion and Reflection

I learned a lot about rockets, including how they work which is amazing to me. The books had lots of information to help me learn about all the amazing parts of how rockets work and how they are built. There were a lot of surprises in this including learning the laws of motion studied by Isaac Newton. Those helped me think differently about the world around me as I see those laws everyday but never really thought about them before.

Bibliography

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