Video/ Slide show

Watch a film showing the launch of a space shuttle.

spacecraft - "a vehicle, or machine designed to fly in outer space. Spacecraft are used for a variety of purposes, including communications, earth observation, meteorology, navigation, space colonization, planetary exploration, and transportation of humans and cargo".
Source: https://en.wikipedia.org/wiki/Spacecraft

The structure of a rocket
A **rocket** is a kind of spacecraft, i.e. a vehicle that can fly beyond the Earth's atmosphere. A rocket is built from a hull or main body, which can withstand extreme pressure, ailerons, which stabilize flight, as well as ballast (load). See: http://en.academic.ru/pictures/enwiki/86/V-2_rocket_diagram_(with_English_labels).svg

What happens at the moment a space shuttle is launched?
At the moment of launch, the main engines start. However, by themselves they would not be able to lift the entire shuttle, so afterburners at the side are switched on. These provide the shuttle with most of the force it needs to get off the ground.

Do rockets fly straight upwards?
After its launch a rocket begins turning quite rapidly. This manoeuver is known as the “gravity turn”. This is based on the principle that the rocket’s payload has to get into orbit, i.e. reach a certain height as well as move at a specific velocity. The cheapest way of achieving this is by turning just after launch. The rocket’s engines help control its position.

How fast can a rocket fly?
For a rocket to fly in a circular orbit around the Earth it must move at approximately 8 km/s, i.e. 29,000 km/h! – 18012 miles/h!

How much can a rocket weigh?
The greater a rocket’s payload that has to reach orbit, the heavier the rocket will be. Rockets usually weigh several hundred or even several thousand tons. However, the majority of their initial mass is made up of fuel. This means that after only a few minutes of flight they can weigh several times less than they did at the launch.

Experiment

The students observe what happens when an inflated but untied balloon is released into the air and find out what forces act on it.

If we don't tie up the balloon the air will begin to escape from it. We can in very short time intervals observe the forces acting on the balloon. At the beginning, as soon as the "valve" was opened, the air began to escape outside. Each particle of air has its own weight, and has its own velocity when it leaves the balloon. Because each particle of air moves in the same direction, their momentum builds up and as a result the balloon flies in the opposite direction.

According to Newton's Second Law of Dynamics, if forces acting on a body are not in equilibrium the body will accelerate constantly. In the experiment with the balloon, the source of this imbalance between forces is pressure. The pressure in the balloon is greater than it is outside – the same force, i.e. the air surrounding the balloon, acting on each side of the balloon.

Conclusions

Which rocket flew the highest?

Conclusions: A rocket filled with water more or less up to ½ the height of the bottle flew the highest. The more water we pour in it, the heavier the rocket becomes and if the rocket is too heavy it won't rise up.

On the other hand – if there is not enough water, it won't provide sufficient propulsion for the rocket. In the experiment, the water is ejected downwards. In a real rocket it is exhaust gas that rushes downwards, pushing the rocket upward as a result.