



## Curiosity Guide #307

### Rockets

Accompanies Curious Crew, Season 3, Episode 7 (#307)

#### Model Rockets

Investigation #5

#### Description

Examine the parts of a purchased model rocket, and then hold a launch!

#### Materials

- Model rocket, Estes or other brand
- Model rocket engine
- Igniter
- 12-volt car battery
- Alligator clips
- Wires, at least 15 feet long

#### Procedure

- 1) Go outside and find a nice clearing.
- 2) Place the launch pad on the ground.
- 3) Examine the cartridge for the model rocket engine.
- 4) Notice there is a small igniter that fits in the hole of the engine.
- 5) The igniter is held in place with a small plug.
- 6) The cartridge is placed within the model rocket and clipped in place.
- 7) Place the rocket onto the launch pad.
- 8) Attach the two igniter clips to the alligator clips.
- 9) Secure the wire leads to the alligator clips, being careful not to touch the alligator clips together.

- 10) Stretch out the wires, leaving a clearance of at least 15 feet to the launch pad.
- 11) When ready, touch the wire leads to the two battery electrodes.
- 12) What did you observe?

## My Results

### Explanation

When the battery is connected, the battery sends a charge through the igniter and catches the propellant on fire. Inside the cartridge is a narrow nozzle that funnels the exhaust out the bottom. The narrow shape of the nozzle increases the pressure of the exhaust going down. According to Newton's third law of motion, "Every action produces an equal and opposite reaction." Therefore, the action of the exhaust escaping one way forces the rocket to travel in the opposite direction.

The engines themselves have different combustible materials that serve different purposes. Most of the engine acts as fuel for the rocket. When that fuel is used up, another layer of light material ignites and gives the rocket additional time to propel forward from the original thrust.

At this point, the engine releases a tracking smoke, making the rocket easier to see. Finally, the engine hits a small charge that pops up through the top of the engine cartridge, striking a clay cap. That internal force causes the nose cone of the rocket to pop off and deploys the parachute.

**Still curious? Investigate further!** Use your internet search engine to find photos and diagrams of rockets and their parts. You can also find many video clips of rocket launches and flights.

Launching a rocket requires a lot of energy leaving the rocket's nozzle. This happens at very high speeds.

As impressive as a rocket launch truly is, a couple of basic ideas make the whole thing work. First, the fuel and oxidizer each get pumped into a chamber to ignite. Second, the burning exhaust escapes through a nozzle. The shape of the nozzle is really important. The nozzle is shaped like two funnels, causing the exhaust to increase in velocity and making more thrust going up. Our little rocket used a solid fuel but many rocket engines use a liquid propellant which is easier to control. Now that's rocket science!

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