

# Why do AntiGravity Water Rockets fly higher?

Most water rockets are made using the open neck of the pop bottle as the exhaust nozzle. Although this is convenient, the large nozzle is grossly mismatched to the job requirements. With most water rocketry, the real job is to lift a pop bottle, which weighs only 50 grams, into the air as high as possible. The open neck nozzle, with its thrust of about 55 pounds (25,000 grams) is about 40 times as much as we really need. And in rocket science, one bad design decision always leads to many more, in order to compensate. At AntiGravity, we take a different approach. Each very simple nozzle is sized exactly to the requirements of the job. In the list below, you can see what advantages come from having a properly sized nozzle.

**1** The open neck of a pop bottle, shown actual size, is a typical of most water rocket nozzles. It has 40 times as much thrust as is required, and expends its energy 40 times faster than required.



Rocket Car or upper stage of 2-stage



Single Stage rocket



On the right are the four different sizes of AntiGravity nozzles, each precisely cut, centered and sized perfectly for the intended job.

Payload rocket



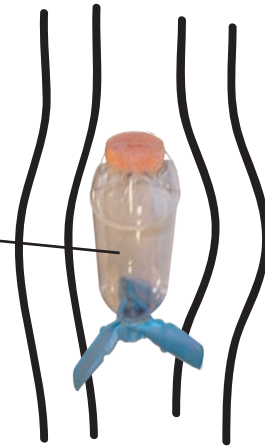
Booster Stage for 2-Stage rocket



**2** When a rocket travels too fast, it encounters much more air friction than when it travels slowly. The open-neck rocket has about ten times the air friction of the much slower-moving AntiGravity rockets.

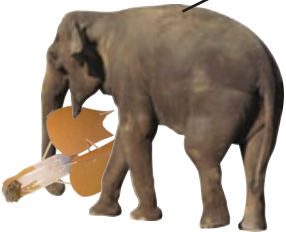


Open-neck rocket

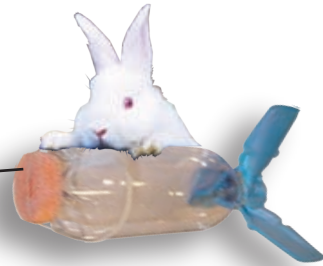


AntiGravity rocket

**3** When there is too much air friction, people try to compensate by adding more weight to the rocket so it will "coast" better. The open-neck rockets often weigh more than one pound (454 grams) empty. The extra weight adds no energy and is much harder to lift. And they have to lift about a kilogram of water.



AntiGravity rockets typically weigh only 60 grams empty and they only need to lift 100 grams of water. There is no energy spent lifting useless weight.



**4** The open-neck rocket has a burst of energy that is spent very quickly, somewhat like a pop gun.

Each AntiGravity rocket is powered almost all the way to the top of its flight, with an impressive vapor trail that makes it look and sound like it's going into orbit.

