



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> Nicholas A. Maggio	<b>Project Number</b> <b>J0118</b>
<b>Project Title</b> <b>The Effect of Water Level on the Altitude of a 2-Liter Water Rocket</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My objective was to determine what level of water would cause a 2-liter bottle rocket to reach its highest altitude. I believe that a 2-liter water bottle rocket will reach its highest altitude when filled with 1,000mL of water.</p> <p><b>Methods/Materials</b> I built a rocket launcher out of PVC pipe and fittings, a bicycle pump, and a string. My rocket was a 2-liter soda bottle. I placed an empty bottle on the launcher and pumped the bicycle pump until it reached 60 psi. I pulled the string to launch the rocket and measured the altitude with an angle finder. I launched the empty rocket 5 times and then added 200 mL of water after every 5 launches until the rocket was at full capacity (2,000 mL). For every launch, I maintained 60 psi as a constant.</p> <p><b>Results</b> My results were that the rocket reached its highest altitude (average of 88.62 feet) with 1,200 mL of water.</p> <p><b>Conclusions/Discussion</b> I concluded that my hypothesis that the rocket would reach its highest altitude with 1,000 mL of water was incorrect. The experiment was related to Isaac Newton's laws of motion. Newton's laws of motion are: Inertia, momentum, and action-reaction. This is how the water rocket works. The rocket is at rest on the launch pad (inertia). When air is pumped into the rocket, it gains momentum. When the rocket is launched, the force of the air pressure pushes water downwards, which means that the water pushes the rocket upwards so hard that it overcomes gravity and will fly. The amount of water in the rocket will determine the reaction. It should still launch without water because the air in the bottle has a mass. Because air is light, the bottle will empty itself but the force will not last long. That is the reaction. When the bottle is almost filled with water, it is heavy and the extra weight means that because there is less room for air, not enough pressure exists to push the heavy water out and the rocket will not reach a very high altitude. My hypothesis was that the rocket would reach its highest altitude with 1,000 mL of water because there would be an equal amount of water and air. My experiment taught me that slightly more water causes the rocket to reach a higher altitude. This combination of slightly more water than air causes the greatest action-reaction.</p>	
<b>Summary Statement</b> My project was about determining what level of water would cause a two liter water bottle rocket to reach its highest altitude.	
<b>Help Received</b> My mother helped type the report. My father helped build the rocket launcher. My teacher helped organize the report.	