

BALLOON POWERED CAR

Source: NASA Rocket Racer, Modified for the EAA

Concepts Illustrated:

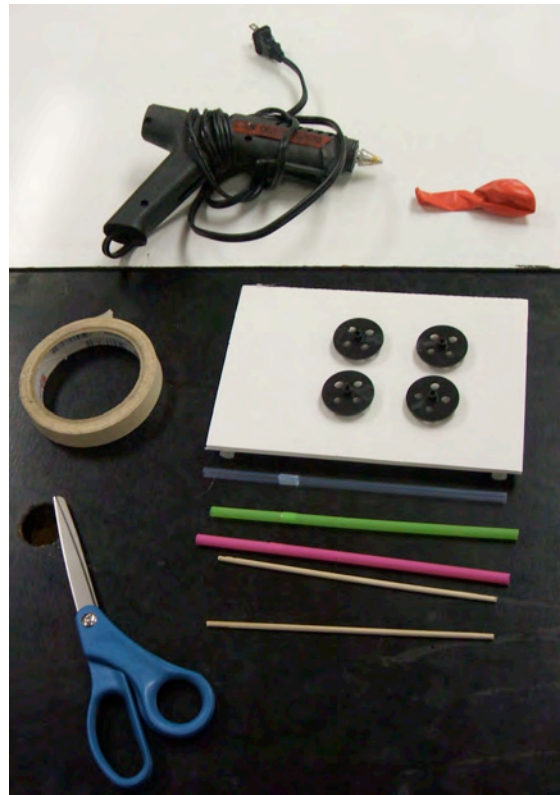
- (1) Newton's 3rd Law
- (2) This demonstration provides an introduction to the emission of pressurized gas, resulting in the thrusting of a vehicle.

Time Requirements: 5 minutes

Grade Level of Audience: This qualitative demonstration is suitable (and enjoyed) by students at all age levels.

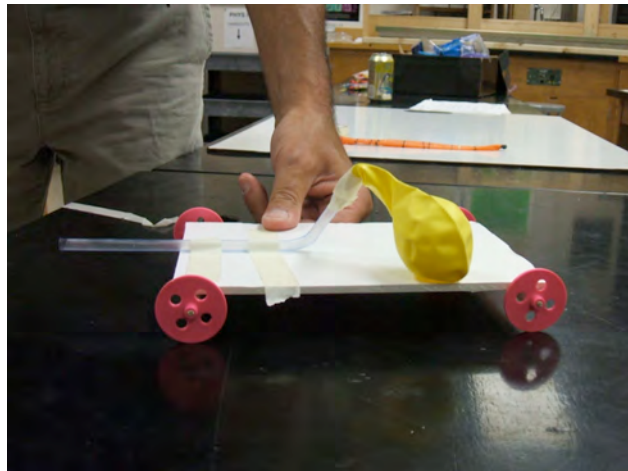
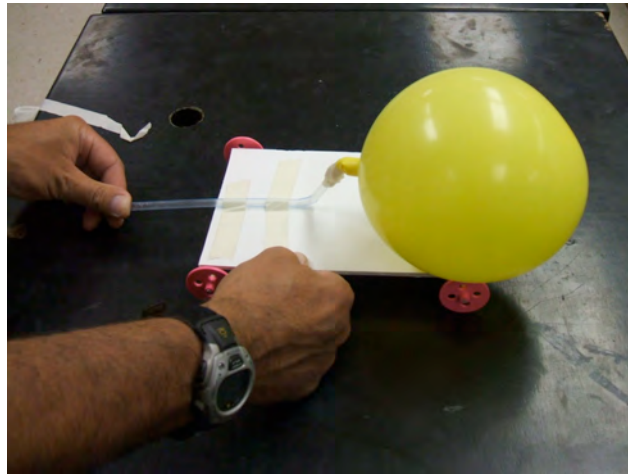
I. Materials and Equipment Utilized

1. A 4" by 6" piece of 3/16" white foam project board
2. One or two flexible drinking straws
3. Duct tape
4. One or two rubber balloons
5. Four GT-F wheels (Pitsco Scientific \$11.00 for 100)
6. Two, 1/8" x 5" axels (1/8" wooden dowels work great)
7. Two drinking straws (non-flexible)
8. Hot glue gun and hot glue sticks



II. Description of Set-up and/or Construction of Apparatus

1. Cut the two non-flexible drinking straws down to 4". Hot glue or duct tape the straws, $\frac{1}{2}$ " in from the front edge and back edge of the foam board.
2. Place the $\frac{1}{8}$ " by 5" axle through the straws and add wheels to the ends of all axels.
3. Bend up the flexible end(s) of the drinking straw(s). Using four, 4" by $\frac{1}{2}$ " pieces of duct tape, tape the straw(s) in place, such that, about 1" of the non-flexible end are hanging off of the top surface of the foam project board.
4. Duct tape a rubber band to the flexible end of each straw. Be sure to wrap the duct tape several times to ensure an air tight connection.





III. Details of Student Implementation

1. Ask students what will happen if the balloon is blown up and released? Will anything happen to the cart itself?
2. After discussing student predictions, blow up the balloon and release. Discuss the observations. Repeat the process, using two blown up balloons instead of one. Make observations of the results.
3. The idea is that the rubber balloons push the air backwards. According to Newton's 3rd Law, the air will push back on the rubber balloon with an equal force in the opposite direction. This push provides the thrust to move the car in the opposite direction. Notice, when two balloons are used instead of one, more thrust is produced. This can be related to the deflection of air by wings and other control surfaces and the resulting effect on the plane.