



Tulsa Air and Space Museum & Planetarium Stomp Rocket Review

1. Inertia- An object at rest will stay at rest. An object in motion will stay in motion. Both of these will continue until an outside force acts on it.



Newton's First Law

Applied to Rocket Liftoff

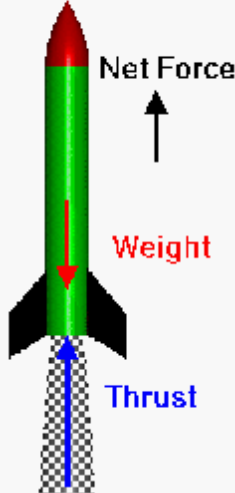


"Every object persists in its state of rest or uniform motion in a straight line unless it is compelled to change that state by forces impressed on it."


Before firing:
Object in state of rest, airspeed zero.

Engine fired:
Thrust increases from zero.
Weight decreases slightly as fuel burns.

When Thrust is greater than Weight:
Net force (Thrust - Weight) is positive upward.
Rocket accelerates upward
Velocity increases





2. Force/Acceleration- a force causes something to accelerate. In this case, the force is coming from the fuel and energy at the bottom of the rocket. This causes the rocket to move or accelerate.



Newton's Second Law

Definitions





Differential Form: Force = change of momentum with change of time $F = \frac{d(mv)}{dt}$

or:
Force = change in mass X velocity with time $F = \frac{(m_1 V_1 - m_0 V_0)}{(t_1 - t_0)}$

With mass constant: Force = mass X acceleration $F = m a$

*Force, acceleration, momentum and velocity are all vector quantities.
Each has both a magnitude and a direction.*

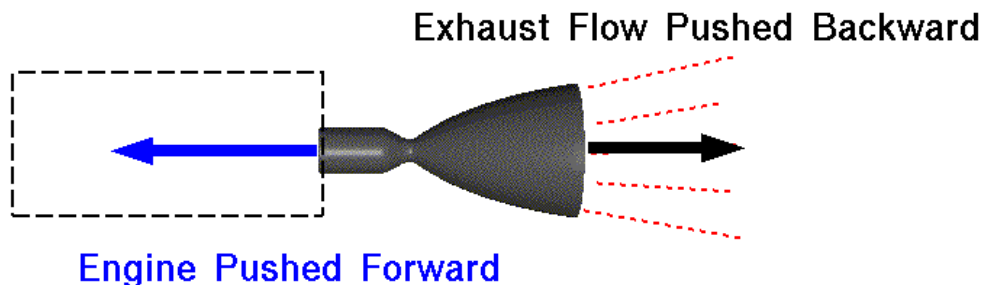
3. Action/Reaction- For every action, there is an equal and opposite reaction. In this case, the action is stomp; the reaction is the rocket launching. Use the launcher as a physical example.



Newton's Third Law



Rocket Engine Thrust



For every action, there is an equal and opposite re-action.

The Rocket

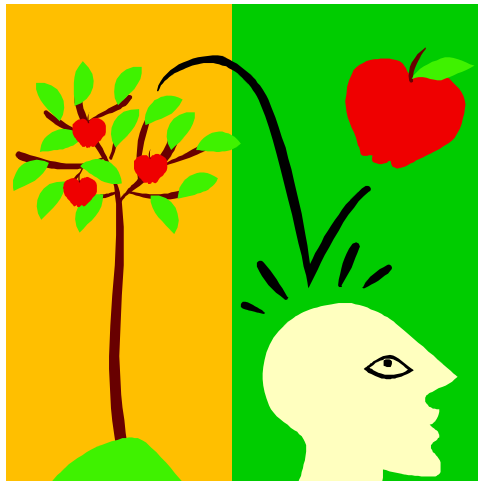
1. Fuselage- The "body" of the rocket. Much like our own bodies, the fuselage is in the center of the rocket (torso). This part holds all of the mechanical parts (like our organs) that make it work. Cylinder shape.
2. Fins- The fins create a streamlining effect. They cause the rocket to fly smoothly. Triangle shape.
Ex: fins on a fish.
3. Nose Cone- This is also used for streamlining.
Ex: Ask the students if they like to swim. Have them show how they would dive into the water. By putting their hands in a point position, they are "cutting through" the water. Much like the nose cone cuts through the air.

Gravity

Pre-Test / Post-Test

Name _____

1. How many "Laws of Gravity" did Sir Isaac Newton develop? _____
2. What will stabilize the flight as the rocket accelerates into the sky? _____
3. What is INERTIA? _____
4. The nose cone of a rocket reduces or increases resistance? _____
5. What is the main body of the aircraft called? _____
6. What shape are the fins on the rocket?



Gravity

Pre-Test / Post-Test Answer Guide

7. How many Laws of Gravity did Sir Isaac Newton develop? Three
8. What will stabilize the flight as the rocket accelerates into the sky? Fins
9. What is INERTIA? A body at rest will remain at rest, unless acted upon by an outside force.
10. The nose cone of a rocket reduces or increases resistance? Reduces
11. What is the main body of the aircraft called? Fuselage
12. What shape are the fins on the rocket? Right triangle