



SOARING OKLAHOMA: AEROSPACE & DEFENSE

Newton's Second Law of Motion

In order for an object to accelerate, an outside force must act upon it. The greater the **mass** of an object, the more **force** it will take to put the object in **motion**. Newton's Second Law of Motion or Law of Acceleration indicates that an increase in mass or acceleration will equal an increase in **object force**.

The following formula is used to calculate **FORCE**

$$\text{Force} = \text{Mass} \times \text{Acceleration}$$

This equation can also be changed to calculate **ACCELERATION**

$$\text{Acceleration} = \text{Force} / \text{Mass}$$

Things you should know:

Mass is the quantity of matter an object is made of.

Force is the strength or power of a motion. There are three types of force; contact force (e.g., when a baseball bat connects with a baseball), gravitational force (e.g., when a ball is dropped from a distance above the ground and gravity acts on the ball producing a downward motion) and friction (e.g., when the wind pushes against the surface of a kite to hold it in the air).

Motion is a change in an objects position.

Speed is a change in distance over time.

Velocity is a change in speed in a specific direction.

Acceleration is a change in velocity over time.

Try This:

View the following video:

<https://www.youtube.com/watch?v=iwP4heWDhvw>

After viewing this experiment, identify the following:

- 1) Do your research. What is a dependent variable? What is an independent variable? What are controlled variables?
- 2) Make a list of variables found within the experiment in the video and label them as dependent, independent or controlled.
- 3) Without performing the experiment, what prediction could you have made about which ball would go faster using the formulas above and what you know about mass and forces?
- 4) Discuss how Newton's second law of motion might affect how an aircraft or spacecraft is designed.

Design your own experiment that will allow you to test the effects of force and mass on acceleration. To do so you will need to:

- 1) Identify two objects that are the same shape but of varying masses.
- 2) Hypothesize which of the two objects will reach a higher acceleration.
- 3) Identify a consistent force that can be used to put both objects in motion.
- 4) Conduct your experiment.
- 5) Record your findings.