Air Jet Vehicles

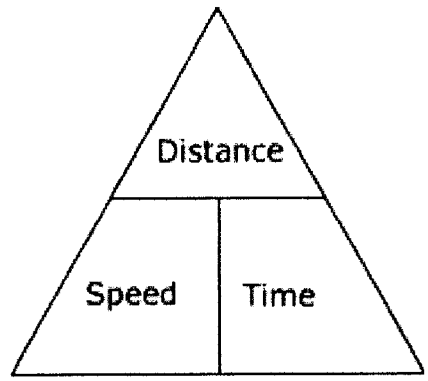
Objective:

The air jet propelled vehicles consist of two parts - the vehicle and the launcher. Newton's Third Law of Motion states that when two objects interact, the force from each acts on the other with the same magnitude but in the opposite direction. This law is also known as the law of action and reaction. Students will assemble an air powered vehicle that has the **optimum speed.**

In the field:

Students will assemble the Air Power vehicle and compare with others. After assembly, students will calculate speed using the following formula:

Speed = distance / time



Supplies:

Measured space
Stop watch
Scale
Scissors

Model I- ROCKET CAR

GROUP A
Distance______ m
Time_________sec
Weight_______kg
Final Speed = _______ m/s

GROUP B
Distance______m
Time_________sec
Weight_______kg
Final Speed = _______ m/s

Model II- EXCAVATOR

GROUP A
Distance______m
Time_________sec
Weight_______kg
Final Speed = _______ m/s

GROUP B
Distance______m
Time_________sec
Weight_______kg
Final Speed = _______ m/s

Model III- HEAVY MOTORBIKE

GROUP A Distance______m
Time_________sec Final Speed = _______ m/s
Weight_______kg

GROUP B Distance______m
Time_________sec Final Speed = _______ m/s
Weight_______kg

Model IV- FORKLIFT

GROUP A Distance______m
Time_________sec Final Speed = _______ m/s
Weight_______kg

GROUP B Distance______m
Time_________sec Final Speed = _______ m/s
Weight_______kg

Model V- ANTIQUE CAR

GROUP A Distance______m
Time_________sec Final Speed = _______ m/s
Weight________kg

GROUP B Distance______m
Time_________sec Final Speed = _______ m/s
Weight_______kg

Extensions:

What are some of the factors that you considered when designing and building your vehicle?

What would you have done differently if the goal would have been power instead of speed?

Fundamentals of Physical Science – Escape Velocity

Name ________________________________ Date _________ Class_________

There are many factors that go into sending an object into space. One that is relatively easy to calculate is escape velocity. This is the average velocity that a space craft needs to reach in order to escape the gravity of the body that it is leaving and travel into space. We can calculate this velocity by using the following formula:

$$v_{esc} = \sqrt{\frac{2GM}{R}}$$

V = Escape Velocity in meters per second

G = Gravitational constant (6.67×10^{-11} m^3/kgs^2)

M = Mass of the body you are leaving

R = Radius of the body you are leaving

To calculate the escape velocity from Earth, we need to know its Mass and Radius. If we have these two pieces of information, we can calculate the escape velocity of any body in the Solar System by using the formula and the Gravitational Constant.

1) Earth's mass = 5.98×10^{24} kg Earth's radius = 6.37×10^{6} m
   Calculate the Earth's escape velocity

2) Mars' mass = 6.46×10^{23} kg   Mars' radius = 3.39×10^{6} m

3) Mercury's mass = 3.35×10^{23} kg   Mercury's radius = 2.44×10^{6} m

4) Venus' mass = 4.9×10^{24} kg   Venus' radius = 6.06×10^{6} m

5) Number these Solar System objects from 1 to 9 with 1 having the highest escape velocity and 9 having the lowest.

Sun	Mercury
Venus	Earth
Mars	Jupiter
Saturn	Uranus
Neptune	

6) What are some of the other factors you would need to consider when trying to send an object into space?