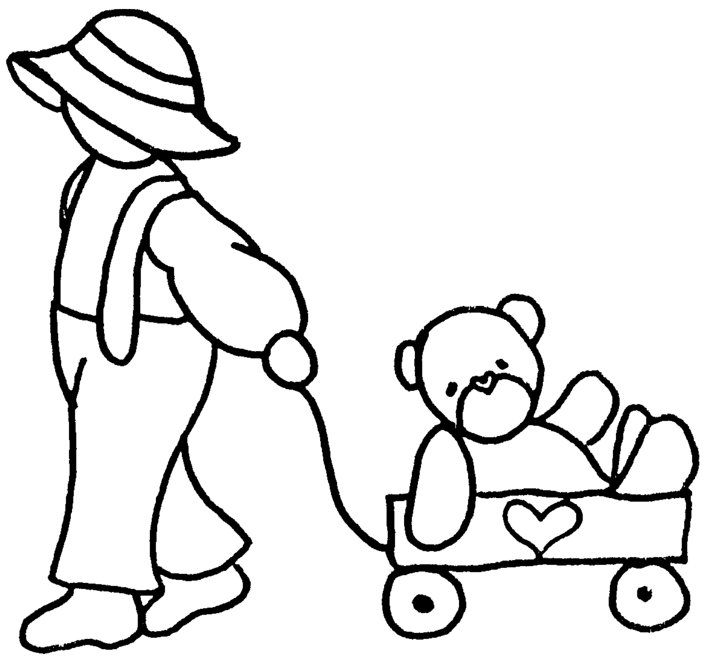
Applied Science

Our Technological World

SIXTH GRADE

TECHNOLOGY



3 WEEKS
LESSON PLANS AND
ACTIVITIES

APPLIED SCIENCE
OVERVIEW OF SIXTH GRADE

SCIENCE AND MATH

WEEK 1.
PRE: *Investigating critical thinking.*
LAB: *Exploring topology of a closed surface.*
POST: *Exploring how math and science are related.*
WEEK 2.
PRE: *Exploring how mathematical sequences are found in nature.*
LAB: *Exploring design.*
POST: *Designing an experiment.*
WEEK 3.
PRE: *Discussing how fibers become fibers.*
LAB: *Comparing and contrasting different fibers.*
POST: *Investigating fibers present in your home.*

PHYSICS

WEEK 4.
PRE: *Investigating matter and its interactions.*
LAB: *Exploring the nature of motion.*
POST: *Exploring the different laws of motion.*
WEEK 5.
PRE: *Exploring the motion of fluids.*
LAB: *Observing and recording motion of fluids.*
POST: *Investigating fluids in motion.*

TECHNOLOGY

WEEK 6.
PRE: *Investigating Bernoulli's principle.*
LAB: *Experimenting with different types of gliders.*
POST: *Exploring forces that affect gliders.*
WEEK 7.
PRE: *Exploring how design can overcome friction.*
LAB: *Investigating aerodynamic design.*
POST: *Comparing rockets and airplanes.*

BUILT ENVIRONMENT

WEEK 8.
PRE: *Exploring living requirements in space.*
LAB: *Observing toys in space.*
POST: *Designing a space station.*

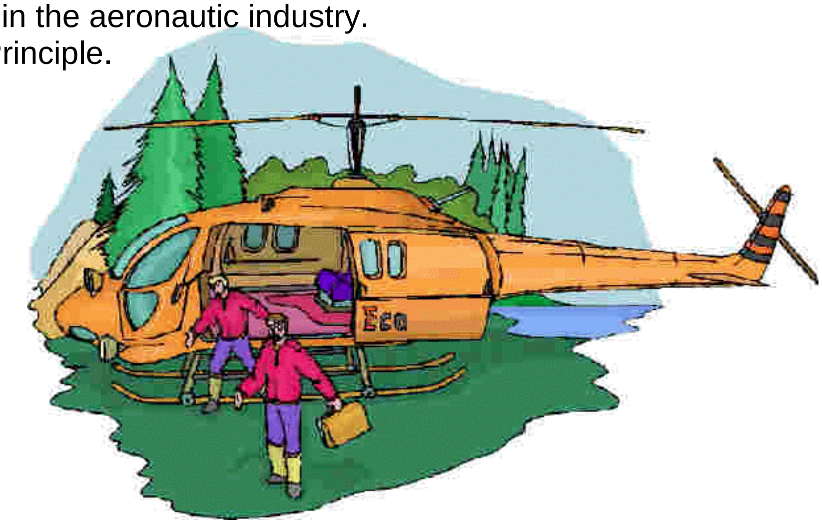
APPLIED SCIENCE - TECHNOLOGY (6A)

PRE LAB

Students use a worksheet to investigate Bernoulli’s Principle.

OBJECTIVES:

1. Exploring principles used in the aeronautic industry.
2. Investigating Bernoulli's Principle.



VOCABULARY:

lift
pressure
velocity

MATERIALS:

strip of paper, book

BACKGROUND:

Bernoulli is the name of a Swiss family of famous scientists and mathematicians, from 1650's to 1790's. Daniel Bernoulli (1700-1782) was the most famous. He was a doctor, mathematician, professor of botany, anatomy and natural philosophy. His most important work was *Hydrodynamica* dealing with the theory of statics and motion of fluids, the subject of this pre-lab.

The forces that lift an airplane and hold it up, are due in part to the air that flows swiftly over and under its wings.

Make a wing by placing one end of the strip of paper between the pages of the book so the other end hangs over the top of the book as shown in the diagram on the right. Move the book swiftly through the air, or blow across the top of the strip of paper. It flutters upward.

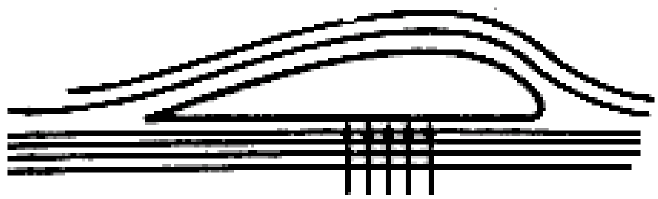
It doesn't matter whether you move the air over the strip of paper by blowing or whether you move the paper rapidly through the air, either way it rises.

Bernoulli's principle states that an increase in the velocity of any fluid is always accompanied by a decrease in pressure. Air is a fluid. If you can cause the air to move rapidly on one side of a surface, the pressure on that side of the surface is less than that on its other side.

PROCEDURE:

1. Draw the following picture on the board.

fast air - less pressure

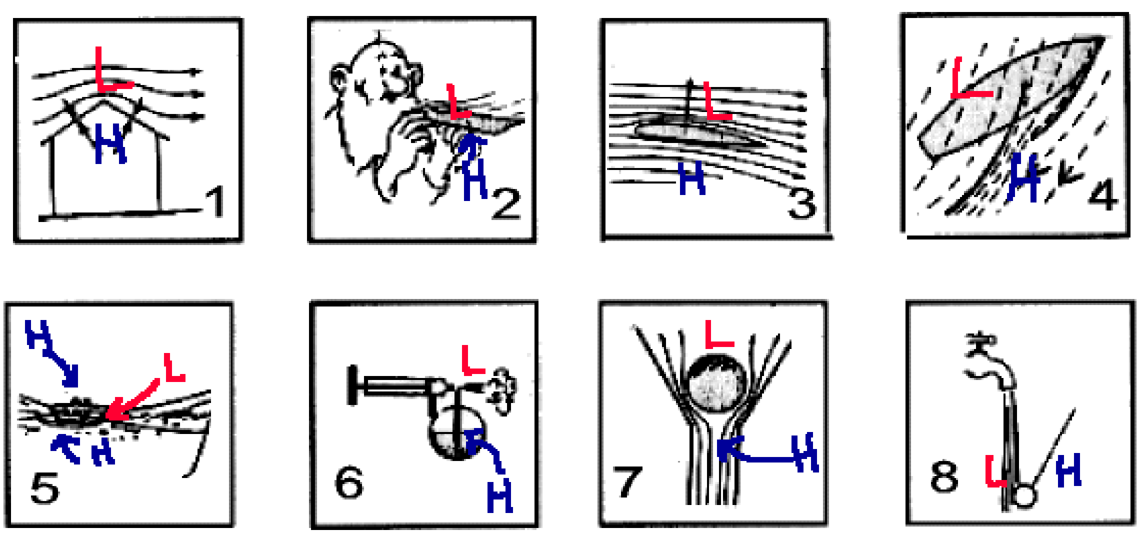


slow air - more pressure

2. Bernoulli's principle works with an airplane wing. In motion, air divides at the leading edge of the wing. Some of the air moves under the wing, and some of it goes over the top. The air moving over the top of the curved wing must travel farther to reach the back of the wing, consequently it must travel faster than the air moving under the wing, to reach the trailing edge (back edge) at the same time. Therefore, the air pressure on top of the wing is less than that on the bottom of the wing.

3. On the worksheets, students determine where the higher and lower pressures can be found. Instruct students to put a H for high pressure and L for low pressure on each of the diagrams.

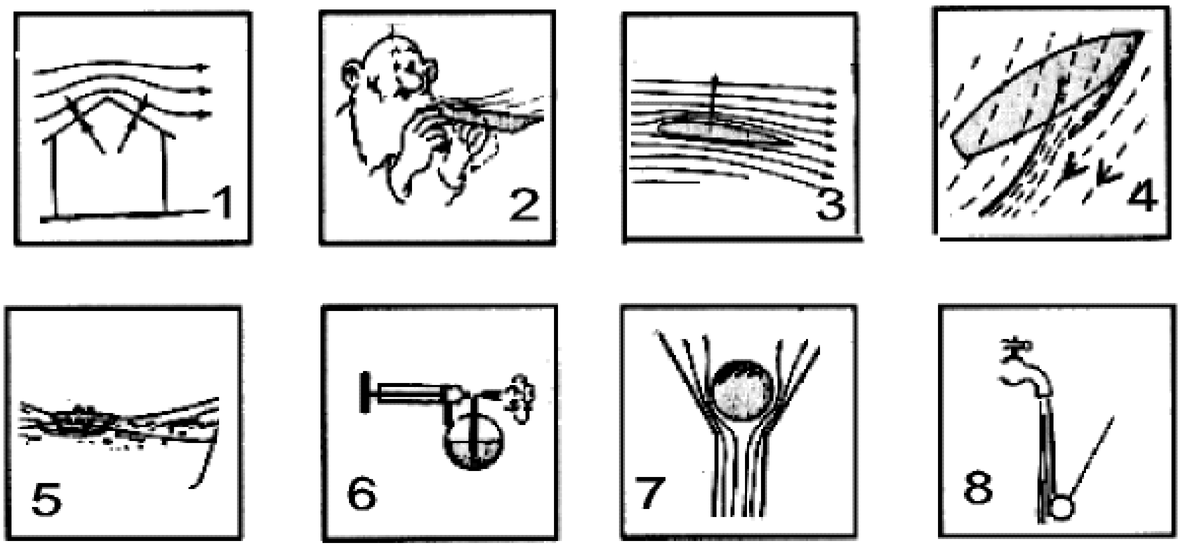
4. Answers



APPLIED SCIENCE - TECHNOLOGY (6A) PRE

APPLICATION OF BERNOULLI'S PRINCIPLE

Draw on the pictures below an H for high pressure and a L for low pressure. The higher pressure will move the toward the lower pressure, with sometimes disastrous results.



1. Air pressure above the roof is less than air pressure beneath the roof.

2. The paper rises when air is blown across its top surface.

3. Air pressure is less above the wing than below the wing.

4. The smaller sail acts as a channel that speeds up the air passing over the main sail.

5. Two toys boats are side by side. A stream of water is directed between them. The boats will draw together and collide.

6. A vaporizer forces air past the upper end of a tube, reducing the pressure. The greater atmospheric pressure outside the tube forces the liquid up into the tube where it is carried away by the stream of air.

7. A hair dryer can keep a ping pong ball trapped in the center.

8. Pressure is greater in the stationary fluid (air) than in the moving fluid (water stream). The ball is pushed by the atmosphere into the region of reduced pressure.

APPLIED SCIENCE - TECHNOLOGY (6A)

Students test different paper gliders.

LAB

OBJECTIVES:

1. Exploring friction and drag.
2. Experimenting with different types of gliders.

VOCABULARY:

air resistance
drag
friction

MATERIALS:

paper models
scissors
tape measure

BACKGROUND:

Objects that fall through the air experience a frictional force of air resistance. The objects rate of falling depends on four things; the physical dimensions, length, height, and volume of the falling object, the speed of a falling object, and the design of that body, and surface characteristics.

A feather dropped in air will appear to "float" before it hits the bottom surface. This happens because the air resistance acting on the feather has enough force to keep suspended in air. A pencil, falls quickly. You or your students should demonstrate this with objects like tissue, balls, or anything handy. Students should predict how the object will fall before it actually drops.

PROCEDURE:

1. In this lab the students will use 5 different models of gliders (see enclosed drawings on how to make them). Assign one glider per group. Give them the appropriate information from the enclosed directions. You may want each student to make one glider each, or to work in partners. Make sure there are at least two of each of the models.

2. After the students construct their model have them see which glider travels the farthest into the direction of wind and with the wind. Use an area on the playground that you have already measured from a starting point. This will make it much easier to measure for the students. We recommend using the metric system.

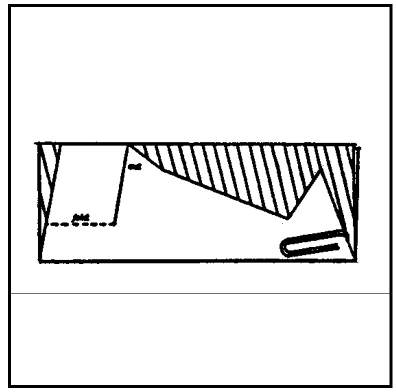
3. Students should follow their lab sheet and obtain information from 10 trials; then determine the average from the data. Have them record the data and resulting averages.

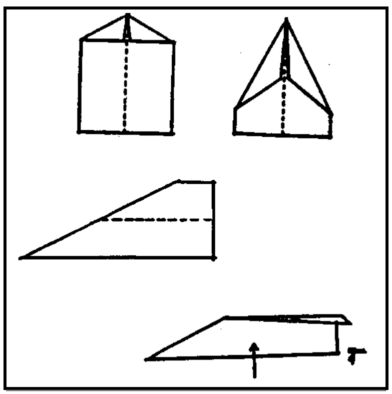
4. Use 20 lb paper (normal writing paper) to make the gliders.

5. This data will be used for the post lab to construct a graph of the results.

DIRECTIONS FOR CONSTRUCTING GLIDERS

Glider 1. Use a 10 x 15 cm piece of stiff paper. Fold the paper lengthwise down the middle. Then draw the glider design as shown. After you draw the design, keep the paper folded while you cut away the shaded areas with a pair of scissors. Now cut down about two thirds of the way as shown in the drawing. Make this cut while the paper is still folded so the two wings will be of equal size. Fold each wing downwards and crease it. Now slip a small paper clip over the nose of the glider so it holds both sides together. With the paper clip firmly in place, make sure the wings stand out horizontally from the body of the glider.

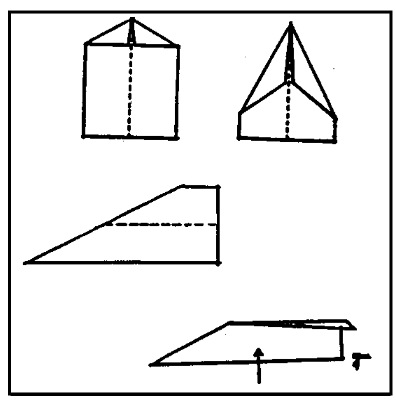




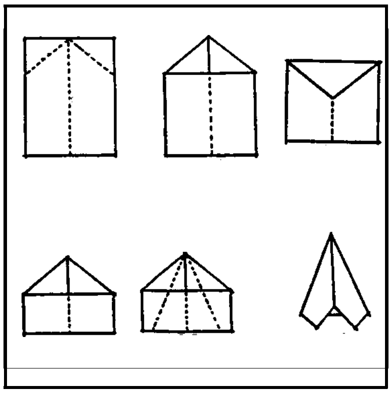
Glider 2. Use a piece of paper fold it lengthwise down the middle then unfold it. Now fold the two upper corners towards the center and crease them into place as in the diagram. Next fold point A toward the middle and crease it firmly. Do the same for point B. Refold your glider along the middle crease and place it on its side as shown in diagram. Fold the top side so it reaches the bottom. Crease it firmly. Turn the glider over and do the same with the other side. Now that you have constructed the glider's wings, its ready to fly.

Glider 3. Fold lengthwise a stiff paper (file card) that is 10 x 15 cm. Use the glider 3 model and copy the glider.

Cut out the glider with the paper still folded. Fold the dashed lines at A, B, and C. Fold A outwards, B inwards, and C outwards as in the figure. Place two paper clips at point D on the gliders nose as in diagram. Put one clip on either side. Do not clip the two sides together. The body of the glider should remain open. Give the darter a quick toss and off it goes.



DIRECTIONS FOR CONSTRUCTING GLIDERS



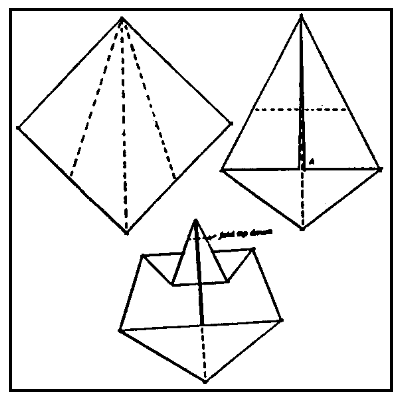
Glider 4. Fold paper lengthwise down the middle. Crease it then flatten the paper out as in the diagram. Use the middle fold for a guide line. Now fold the two upper corners towards the middle and crease them. Fold the triangular paper of the paper toward you. Next fold the top right corner towards the center line and crease it. Do the same with the top left corner.

Make the two folds at the dotted lines as show in diagram. The completed glider should look like the last diagram.

Glider 5. This glider flies in one loop and comes back to the same place. Start with a 20 cm square of paper. Fold it in half diagonally as show in the diagram. Crease the paper and unfold it. Then make the two side folds as indicated. Crease these folds and do not unfold the glider as in the diagram.

Fold the tail down and make the point of the tail extend about 2.5 cm past point A. Next fold the tail upwards so the tip of it extends about a 3 cm above the body of the glider. Now fold the tip of the tail downwards about 1 cm.

Fold the glider in half and put the bottom flap down.



APPLIED SCIENCE - TECHNOLOGY (6A)

PROBLEM: Which glider design is the best for keeping airborne?
PREDICTION:____
PROCEDURE:

MATERIALS: instructions for the following gliders 1-5, scissor

Construct the model glider assigned to you. Go out to the designated area and measure how far it traveled in the space below. You will use this data to plot the results in the POST LAB. Do more than one test, and make sure you measure this accurately with your partner. Do 10 trials and then take the average of your 10 trials and record this in the appropriate place. This is the number that will be used for graphing the data. Each test must be conducted with wind coming from behind you and from in front of you.

glider used: ____

TRIAL	DISTANCE TRAVELED	
	WIND-FRONT	WIND-BACK
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

total (wind-back) ______________ divide by 10: ____________ the average is: _____
total (wind-front)______________ divide by 10: ____________ the average is:______
State whether the wind direction was from behind or in front.

____

Does this make a difference in the flight pattern of your glider? Explain.

____

____

CONCLUSION: Why do you think your glider traveled the way it did? Any problems.

____

APPLIED SCIENCE - TECHNOLOGY (6A)

POST LAB

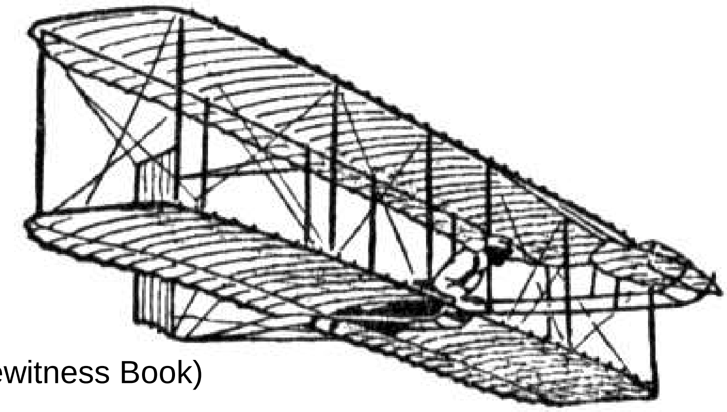
Students will analyze data obtained from gliders.

OBJECTIVE:

1. Exploring forces that affect gliders.
2. Comparing and contrasting data on different gliders.

VOCABULARY:

aviation
glide
soar



MATERIALS:

worksheet
Flying Machine by A. Nahum (Eyewitness Book)

BACKGROUND:

Gliding is a part of flight where a bird or aircraft descends on an inclined path toward ground. Man-made gliders are heavier than air, so they have to understand how to take advantage of air resistance with respect to their aircraft. Soaring is the term that refers to unpowered flight using the upward motions of the air or pulsations in the wind. Learning how to glide for humans was the precursor to understanding how to control the atmosphere to fly. The great pioneers of aviation such as Samuel Langley, Octave Chanute, and Wilbur and Orville Wright had to rely on the efforts of many inventors before them who experimented with gliders.

The most famous of the pioneers in understanding how to soar was undoubtedly Otto Lilienthal who experimented in 1867. Lilienthal realized that data from the study of birds was needed. He realized the superiority of the cambered or curved surface over the flat plate as a lifting surface. Aviation history is fascinating. You may want to assign a research project for students to write about the history of flight.

PROCEDURE:

1. Hopefully students will recognize two major factors from their gliding experiments. The movement of air and wind can control their glider. Some designs of gliders can keep them up longer than others.

2. Have students graph the information on graph paper. Use the following labeled axis for a bar graph. The x axis should be labeled "Groups" and the y axis should be

labeled "meters traveled."

3. Have them show the different groups by shading in different colors or patterns. You will have to construct two graphs, one for each of the data sets above. Emphasize with students that they should make two graphs, into the wind and with the wind.

4. The results may differ from class to class depending on the skill of each group.

APPLIED SCIENCE - TECHNOLOGY (6A) POST

RECORD THE AVERAGE DISTANCE FROM EACH STUDENTS' EXPERIMENT (OR GROUP)							
WIND IN BACK							
Glider 1.							
Glider 2.							
Glider 3.							
Glider 4.							
Glider 5.							

RECORD THE AVERAGE FROM EACH STUDENTS' EXPERIMENT (OR GROUP)							
WITH THE WIND							
Glider 1.							
Glider 2.							
Glider 3.							
Glider 4.							
Glider 5.							

GRAPH THE INFORMATION ON THE DATA CHARTS BELOW OR ON GRAPH PAPER.

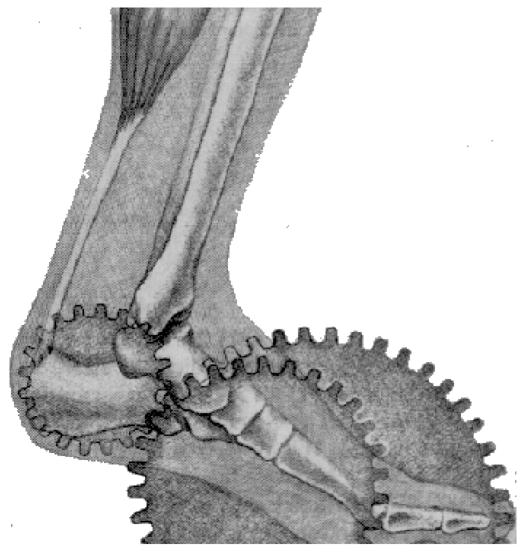
APPLIED SCIENCE - TECHNOLOGY (6B)

PRE LAB

Students use a worksheet to explore friction.

OBJECTIVES:

1. Explaining how simple machines help reduce friction.
2. Exploring how design can overcome friction.



VOCABULARY:

drag
lift
thrust

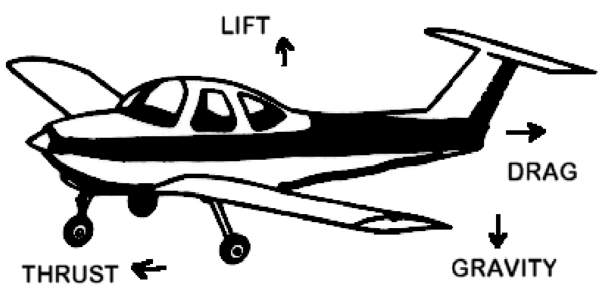
MATERIALS:

worksheet
board
objects to roll down

BACKGROUND:

Friction is a force that acts on objects that retards motion of that object. If there were no friction, cars would be able to go much faster than with the same energy used. Friction arises from the irregularities in the surface of sliding objects. The irregularities act as obstructions to an object in motion. Even very smooth surfaces have irregular surfaces on the microscopic level. Not only surface friction has to be dealt with, but air resistance caused by friction of air and object. For example, a modern passenger car reaches 65 kilometers per hour, 80% of the energy is devoted to overcoming air resistance. The direction of the frictional force is always in a direction opposing motion.

Remind students that friction is in fluids as well as solids. To overcome air resistance airplanes and helicopter have to take advantage of how fluids behave. For example, airplanes are common to students, but many do not know why they fly. It is important that they realize that the forces of lift, gravity, thrust and drag are all working on an airplane in the air. Some aid and some impair the airplane's flight.



Gravity pulls down on the plane opposing the lift created by air flowing over the wind. Thrust is generated by the propeller and opposes drag caused by air resistance to the airplane. During take off and flight, thrust force must be greater than drag force and lift force must be greater than or equal to gravitational forces. For landing thrust must be less or equal to drag to slow down to and/or maintain landing speed. Lift must be less than gravity.

LIFT is a force created above the surface of an airplane's wing causing the wing to be "lifted" upward. DRAG is a force which slows the forward movement of an airplane through the air. THRUST is a force created by a power source which gives an airplane forward motion. The propeller on a helicopter pulls the aircraft forward using the same principle as lift on the wing. The helicopter blades are rotating wings. Big propellers lifting the wingless aircraft. Jet aircraft uses explosive force directed to the ear to move aircraft forward. Remember the balloon and string experiment? GRAVITY is a force pulling down on the airplane.

Friction can also be overcome by the design of simple machines. Gears will help reduce friction and also can increase friction, as any owner of a 10 speed bike knows. You can calculate the speed ratio of gear by dividing the teeth on the gear by the teeth on the pinion. The pinion is the smaller gear in a set. For instance if you have a pinion (follower) with 12 teeth and a gear (driver) the gear ratio is 12/24 or ½. If you have more than 2 sets of gears you multiply each of the ratio's to get the speed ratio. If the smaller of a gear pair (the pinion) is on the driving shaft, the pair acts to reduce speed and to amplify torque; if the pinion is on the driven shaft the pair acts as a speed increaser and a torque reducer. If the driven gear has twice as many teeth as the pinion, for example, the torque of the driven gear is twice the pinion torque, whereas the pinion speed is twice the speed of the driven gear.

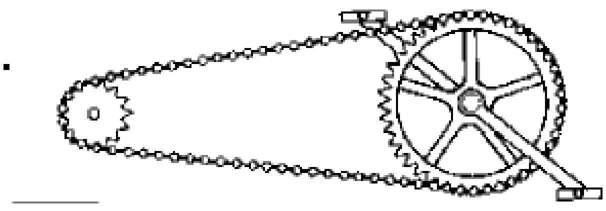
PROCEDURE:

1. You can demonstrate this easily by having an inclined board and try to "roll" objects down. Before you roll the objects, have the students predict which objects will be influenced more by friction than others (i.e. a marble or a toy car.) Discuss which irregular surfaces the object would have to overcome. Remember that gravity is the driving component of objects going toward a flat surface and friction is just retarding the pull of gravity.

2. If students are not familiar with simple machines, you may want to review material that was presented in lower primary under the Physics and Technology units.

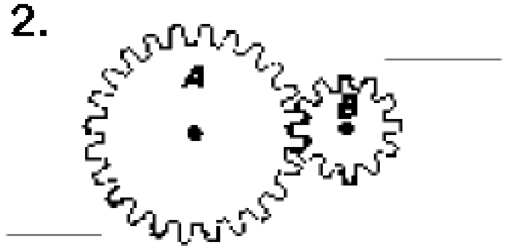
3. Answers: 1. 1/3; 2. ½; 3. ½; 4. 1/4

1.



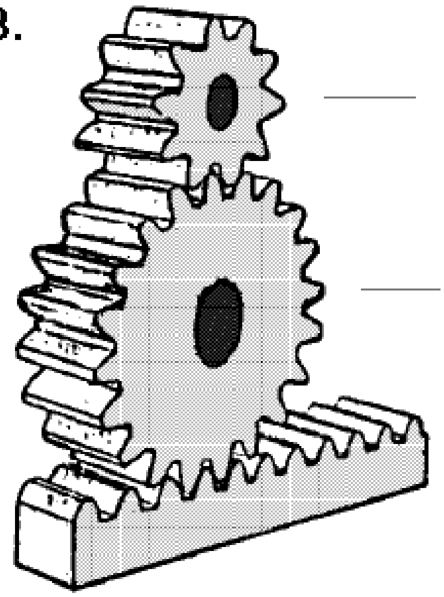
Gear ratio __________

2.



Gear ratio __________

3.

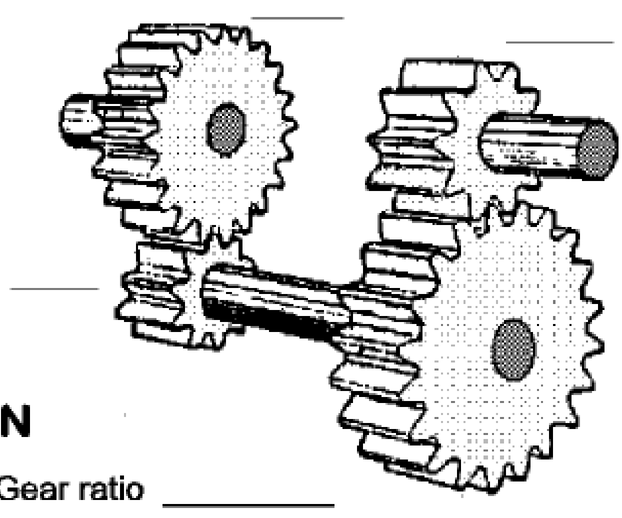


Gear ratio __________

$$\frac{\text{teeth on gear}}{\text{teeth on pinion}} \times \frac{\text{teeth on gear}}{\text{teeth on pinion}} = \text{gear ratio}$$

$$\frac{\text{teeth on gear}}{\text{teeth on pinion}} = \text{gear ratio}$$

4.



GEAR RATIO

MAKING A MACHINE RUN

Gear ratio __________

APPLIED SCIENCE - TECHNOLOGY (6B)

LAB

Students explore designs that are aerodynamic.

OBJECTIVES:

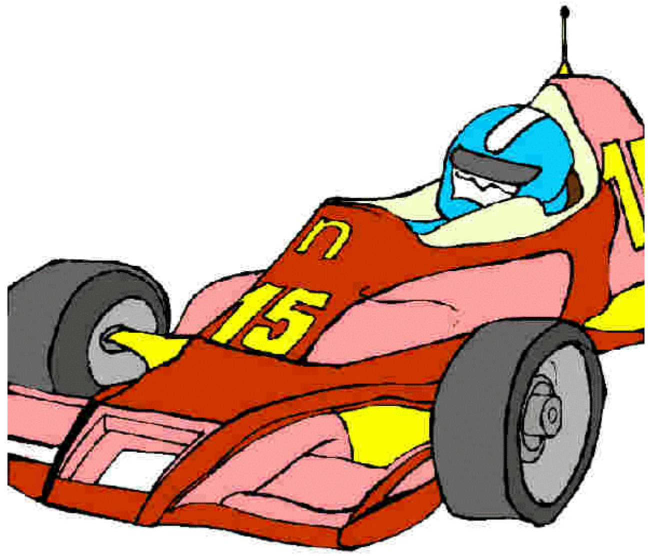
1. Investigating aerodynamic design.
2. Identifying aerodynamic design.

VOCABULARY:

aerodynamic

MATERIALS:

balls (soccer, football, ping pong, or any other ball used in sports)
vehicles (toy cars, motor cycles, construction machines, etc)
How Things Work by Steve Parker



BACKGROUND:

Students hear about cars that are aerodynamically designed in many advertisements on television. They probably have a sense of what it means, because most of these cars are sleek and low. Cars are designed this way to minimize resistance and allow them to go faster. The overall design is streamlined which "cuts" the air. When a vehicle is aerodynamically designed it can save fuel, because it takes less energy to travel. For race cars and road cars this is important. However some vehicles do not want to go faster as much as they need to accomplish a certain goal. For instance, a farm tractor is not designed to go fast, it is designed to do a job.

The outside of a car is designed to make use of aerodynamics, but the inside of the car tries to make an efficient machine that will do work. There are many other laws of physics in just one vehicle. You may want to go over how a car works just to illustrate to students that cars are a physical design created by engineers.

A car is a complex compound machine, that is fueled by gasoline to create motion. In a car, the engine is responsible for producing the power that causes the wheels to turn. The engine turns a rod called a crankshaft which is connected to the drive shaft which in turn is connected to the axle which of course is connected to the wheels.

Gasoline is pumped into the gas tank of the car. From the gas tank, the fuel travels through the fuel line and reaches either the carburetor or fuel injector. From this point the gas flow is controlled by the amount of pressure placed on the accelerator. The fuel is converted into a mist much like a perfume by the carburetor. This "perfume" is then released into the cylinders where it is compressed, ignited, and exploded. Each time an explosion takes place the pistons are forced down, causing the crankshaft to turn. With each turn of the crankshaft comes a turn of the drive shaft and with each turn of the drive shaft, comes a turn of the axle and consequently the wheels.

A car is a complicated and complex machine that is dependent upon the laws of physics for both efficiency and performance. Nearly all the laws of physics can be found in the workings of an automobile. Friction between the rubber tires and asphalt ground is the reason the car moves (aside from all the workings of the engine). To better improve friction, tires are built and designed with tread patterns that grip the asphalt road more efficiently.

Aerodynamics is also a great factor when it comes to designing cars. Air resistance can contribute greatly to low gas mileage and poor efficiency. As a result, car manufacturers design automobiles with pointed fronts, rounded bodies, and streamlined patterns. With these designs the air can be "cut" so it does not act like a block stopping the car. A good way to test the notion of air resistance is to put a hand out of a car when going down the freeway. A vertical hand pointing straight up will encounter great air resistance while a horizontal hand will hardly encounter any. This is the reason cars are pointed in the front and not flat.

Work done by the engine is transferred to different parts of the car through gears and levers until this work reaches the axle. Once the work has reached the axle the tires can be turned and the car can move. For this work to be created, however, requires the presence of such items as carburetors, pistons, crankshafts, spark plugs, gasoline, and many other components. A car is about the best example of all the forces of physics coming together for one purpose, motion.

PROCEDURE:

1. This lab allows students to look at a model helicopter, airplane, tractor, trucks, and automobile. They will determine what the design is trying to accomplish. In the previous labs on design and motion of fluids, students looked at some of the background reasoning for large vehicles.

2. The key objective of this lab is for students to start realizing that many of the products we use everyday all had great thought, design, and scientist behind the object. You can add any other models that you may have so students have a chance to think about the design. This lab emphasizes aerodynamic design and not how the inside of the vehicle works.

3. You may also want to look at *How Things Work* to see how the other vehicles that are used in this lab, work.

4. Part of this lab looks at the design of balls. Yes, even balls are designed. For this part you might want to add a football, soccer, and basketball from the gym. Room is left on the lab sheet for this purpose.

5. The answers can vary with your students. However, they should notice that land vehicles are not as aerodynamically designed as airborne vehicles. A tractor does not really care about aerodynamics as much as to accomplish work. A truck is for more traction and is considered a work vehicle. Large tires on a vehicle help the vehicles have traction, not to go fast.

6. Different balls are designed for different sports. The football is designed to be thrown, notice the streamlined shape. The basketball and soccer balls are not aerodynamically designed but are designed to work well with the hand (basketball) and foot (soccer). Notice that a golf ball isn't like a ping pong ball. The little "pimples" are designed to be more aerodynamic. A ping pong ball would not go too far if hit by a golfer!

APPLIED SCIENCE - TECHNOLOGY (6B)

PROBLEM: Is the design of vehicles and balls for aerodynamic reasons?
PREDICTION:

____

MATERIALS: models of different vehicles, balls
PROCEDURE: Look at the vehicles or balls at your station. Try and determine if the design is aerodynamic. If it is not, state why. Try to figure out why the vehicle or ball was designed that way.

VEHICLE/BALL	AERODYNAMICALLY DESIGNED	WHAT IS THE DESIGN MEANT TO ACCOMPLISH

CONCLUSIONS:

____

____

APPLIED SCIENCE - TECHNOLOGY (6B)

POST LAB

Students make model rockets.

OBJECTIVE:

1. Comparing rockets and airplanes.
2. Learning more about rocket technology.

VOCABULARY:

rocket
engine
rocket
jet propulsion

MATERIALS:

Estes Rocket kits (or other model rocket)
books on space exploration
to order: http://www.estesrockets.com

BACKGROUND:

Airplanes and rockets are very important to our society. Humans have invented and improved their design to control movement in the atmosphere and space. Airplanes are important for transportation into the atmosphere and rockets are important to travel in space and for defense.

Humans, to design such machinery, must have a good idea of the physics that will make them work. Airplanes and rockets are an excellent example of how physics is used in our everyday life to control our environment. Humans were not born with wings, but it should never prevent us from flying!

Airplanes uses aerodynamic design and an engine to overcome gravity. The airplane engine uses oxygen from the air to keep the engines working. Rockets must carry their oxygen for the engines to operate.

A rocket is a generic term for a wide variety of jet propelled missiles, research vehicles, thrust devices, and fireworks. Forward motion results from a reaction to a rearward action of hot gases (Newton's

Third Law of Motion). Rocket propellants by combustion provide the hot gases that produce reaction force (thrust) when ejected to the rear.

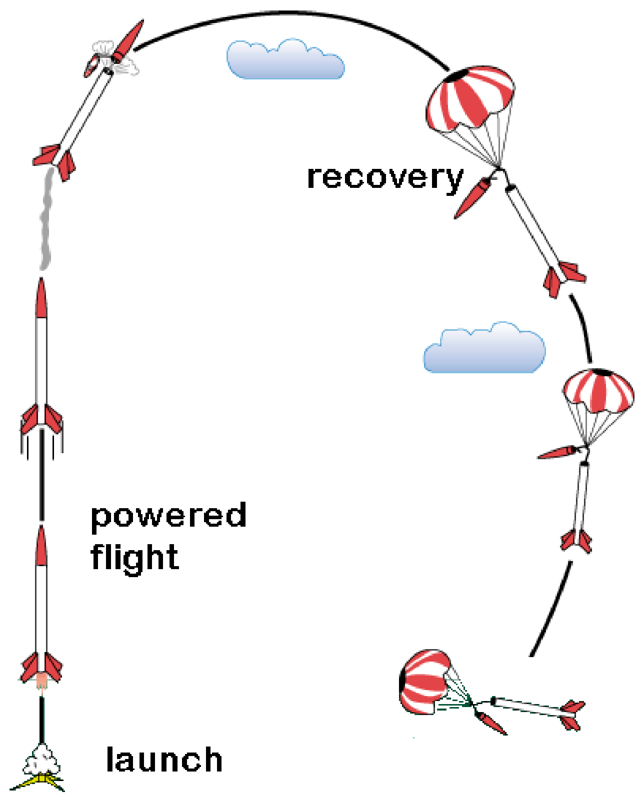
A rocket engine is unique in that the fuel and oxidizer are self contained. Jet propulsion engines carry fuel only and use air to get oxygen. Use the enclosed picture of a rocket and a jet propulsion engine to aid in your discussion.

Development of rockets has been key to space exploration and has been used both in military and peaceful purposes for hundreds of years. Until 1955 humans were passive observers to the physics of the sky, since then space exploration has recognized no limits except the velocity of light.

At present, the rocket is the only developed engine powerful enough to put a spacecraft into orbit. It is also the only kind that will work in the mini vacuum of space, where there is no air. It carries its own oxygen and burns fuel and oxygen inside a chamber in the motor. Space rockets use a vast amount of fuel to achieve the thrust necessary for space flight. The giant Saturn V moon rocket had a thrust of nearly 8 million pounds at lift off. Each of its rocket motors burned about three tons of kerosene and oxygen each second.

PROCEDURE:

1. An activity that students love, but takes time and commitment, is to make a rocket and launch it. We highly recommend either having the students make the rockets or have one that you can launch for students to observe. You may find a parent that loves rocketry that might want to demonstrate for the students. If you want to make rockets, this activity is longer than one normal post lab. You may want students to complete this at home.



2. Go over directions on how to construct a model rocket. If you choose to use the kit model ESTES rockets, each model will have the directions in the appropriate kit.

3. Draw a diagram of the expected launch on the board and point out that the laws of physics can explain

each part. Understanding the laws of physics enables design of machinery that performs better.

powered flight = for every action there is an opposite and equal reaction
coasts upward to peak altitude = the force of the action in our small rocket, is not great enough to free the rocket from the atmosphere, the rocket will come down due to gravitational attraction and frictional forces
recovery system opens - the parachute retards the downward descent, by increasing the air resistance

4. Launching the student's rockets can not only be an enjoyable experience, but also a learning event for the entire school. Depending on your school situation, you may want to share the launch with the rest of the school. This will allow all students in the school to anticipate this experience when they enter the sixth grade. Safety must be taken if you do a launch.

5. The launch pad does not have to be a fancy, expensive pad. It can be inexpensively made, or it can be purchased. Blasting off the engines just needs a battery to complete the circuit. You may want to have a parent who has done rocketry before to help in this launch.

6. Make sure you have a large, open space. Safety is important. ESTES rocket company has an excellent manual that can help your first launch be as successful as your tenth. Note that minor flaws in the rocket assembly or construction can cause large control errors. Things happen very quickly during rocket flight. Warning: Do not attempt launches when winds exceeds 10 m.p.h. Locate launch pad at portion of launch filed from which wind is blowing.

7. Also check city regulations by calling the local fire marshal. In some cities rockets are not allowed.