Grade 6A & 6C: Science

Name: _ _ _ _ _ _ _ _ _ _

Date: _ _/_ _/_ _ _ _(dd/mm/yyyy)

Topic B: Flight

Overview:
Students apply their knowledge of aerodynamics to design, build and test a variety of flying devices. In constructing models, students develop a basic design, build it, test it, and solve the problems that inevitably arise. Through teamwork they learn that planning, communication, cooperation and flexibility are important to the overall result, even though parts of a task can be worked on individually. In the process, students learn about the parts of an aircraft, their role in controlled flight and the differences between aircraft and spacecraft.

General Learner Expectations
Students will:
6–6 Construct devices that move through air, and identify adaptations for controlling flight.

Classroom assessment is divided into three types: assessment *for* learning (Diagnostic Assessment: **D**), assessment *of* learning (Summative Assessment: **S**), assessment *as* learning (**F**).

Lesson #	Curriculum Specific Learner Expectations	Lesson (s) Tittle	Agenda **	Done
1		➔ Introductory Activities: Classify things that fly	□ WS: KLEW chart **(D)** □ Introductory Activity: Up in the air (Master 1) **(F)** □ Air and Aerodynamic PowerPoint (Throughout the unit) ➔Interactive PowerPoint notes	
2	1	➔ Conduct tests of a model parachute design	□ Activity: Breaking Your Fall **(F)**	
3	2	➔ Raise and falling of a hot air balloon	□ Activity: On the Raise (Master #4 and #5) - Lab book record **(F)**	
4	3, 4 and 5	➔ Test and modifying design of a glider	□ Activity: Make of Glider (Master #6, Master: 7a, 7b, and 7c) **(F)** □ Activity: How to Overcome Air Resistance (Master 8) - Lab book record **(F)**	
5	6	➔ Build and test propellers model aircraft	□ Activity: The Heliostraw (Master 11) - Lab book record **(F)**	
6	7	➔ Construct a balloon rockets	□ Activity: Balloon Rockets (Master 13) - Lab book record **(F)**	
8		Unit Tasks:	□ **Task: (S)** ➔ Mind Map: Air and Aerodynamic ➔ Reflection on Learning: KWEL, I Can Statement, and How Did You Do? ➔ Unit Portfolio: Flight ➔ Unit Test	

** **If the class work is not completed during class time, must be done for homework.**

I have read and went over this "*Flight- Unit Plan*" with my child. JazakAllahu khayran

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Parent/Guardian name (print)

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Parent/Guardian signature

_ _/_ _/_ _ _ _ **(dd/mm/yyyy)**

Grade 6A & 6C: Science

Topic B: Flight

K What We Think We Know	L What We Learned	E What Evidence We Have	W What We Still Wonder

- Glossary -

Ailerons: Sections of the wing which can move up or down and control roll.

Air Pressure: The amount of force air exerts on an object.

Aircraft: Any weight-carrying structure designed to navigate through the air which can be supported either by its own buoyancy or by the action of the air against its surfaces.

Airfoil: An object designed to obtain maximum lift when moving through the air (wing, rudder).

Archimides' Principle: Any object placed in a fluid is pushed upward by a force equal to the weight of the fluid it displaces.

Attitude: The direction in which an airplane is pointing in relation to the earth's surface (banking, pitching, yaw) or the relation of the wings and nose to the horizon.

Basket: The container that transports people in a hot air balloon and is located below the silk.

Bernoulli's Principle: Moving air creates a low pressure area.

Buoyancy: The ability of an object to float or rise when placed in a fluid.

Control Surfaces: Small surfaces that can be moved to alter airflow and change an airplanes attitude.

Dihedral Angle: Upward slanting of wings away from the fuselage.

Drag: The resistance air exerts on a flying object.

Elevator: The horizontal part of a plane's stabilizer used to control pitch.

Envelope: The balloon which holds hot air in a hot air balloon.

Fuselage:	The main body of the plane.
Gliders:	Aircraft that have no engines.
Gravity:	The force of attraction that pulls objects earthward.
Lift:	The force opposed to gravity which lifts the airfoil.
Pitch:	Up or down attitude of the nose of the plane.
Rocket:	Any devise propelled by the ejection of gases and air
Roll:	Rotation of the fuselage.
Rudder:	The hinged section of the tail of the airplane which helps the plane move right or left; that is yaw.
Shroud Lines	The connecting lines on a parachute.
Stability:	The ability of an airplane to control pitch, roll and yaw in order to maintain altitude after a disturbance.
Terminal Velocity:	The maximum velocity of a falling body.
Thrust:	The force produced by an aircraft which pushed the plane upward.
Vacuum:	Where there is no air pressure.
Weight:	Relative heaviness.
Yaw:	Left or right attitude of the nose of a plane.

Grade 6A & 6C: Science

Topic B: Flight

Interactive PowerPoint Notes

Parachutes:

➔ **What types of features improve the design of an effective parachute?**

Earth's gravity pulls objects towards it's surface. A parachutes purpose is to slow down that process. It does so by creating drag.

➔ **What s drag?**

It is the push on something from air or water.

The bigger the surface area the more drag is created.

An affective parachute is very light, has a very large surface area (which catches a lot of air to create a lot of drag which makes it slow down.)

Hot Air Balloons:

➔**Describe the design of a hot air balloon and the principles by which the rise and fall are controlled. How does it ascend and descend?**

Draw a picture and label a hot air balloon:

Hot-air balloons create lift because the burner fills the envelope with hot, less dense, air so it begins to rise in the cool, denser, air surrounding it. To keep a hot-air balloon ascending you need to keep putting hot air into the envelope using the burner. To make the hot-air balloon descend you must release the hot air through the valve at the top of the balloon.

Airplanes:

• **Nose:** The front of the plane that is streamlined to cut through the air. • **Cockpit:** Where the pilot sits and the controls are. • **Motor/Engine:** Gives airplane thrust • **Nose Landing Gear:** The landing gear at the front of the plane. The wheels engage when the plane is taking off or landing and tuck into the plane when in flight. • **Main Landing Gear:** The landing gear towards the center of the plane. The wheels engage when the plane is taking off or landing and tuck into the plane when in flight. • **Fuselage:** The main body of the plane. This is where the passengers sit. •**Wing:** These are the extensions that come out of each side of the plane which are specially designed to create lift. **Horizontal Stabilizers:** These are the rear wings that are located on the tail of the plane. They run horizontal/side-to-side.	• **Vertical Stabilizer:** This is the part of the tail that is vertical/up-and-down. • **Ailerons:** ARE HINGED FLAPS ON THE BACK SIDE OF AN AIRPLANES MAIN WINGS. • **Roll:**: ALSO KNOWN AS BANK, IS THE ROTATION OF THE FUSELAGE LEFT OR RIGHT BY THE change in the ailerons. To achieve the roll the aileron on one wing is raised and the other wing's aileron is lowered. • **Flaps:** Are located on the backside of the wings close to the fuselage. They aid in takeoff and landing. • **Elevators:** Are hinged flaps found on the horizontal stabilizer. • **Pitch:** Is the up and down movement of the airplane. Elevators control the pitch in a plane by moving it up or down. When the elevators are placed up the lift of the tail decreases making the plane move up. When the elevators are placed down the lift of the tail increases making the plane move down. • **Rudder:** Are hinged flaps found on the vertical stabilizer located on the tail of the plane. • **Yaw**: The side-to-side movement of the nose of the airplane. The rudder controls the left or right movement of the nose of the plane.

Gliders Vs Airplanes:

What makes a good glider?

➢ MAKE GLIDER AS LIGHT AS POSSIBLE ➢ MAKE FUSELAGE AS SLIM AS POSSIBLE ➢ MAKE IT STABLE, ADD VERTICLE STABILIZERS TO YOUR GLIDER (IT WILL HELP IT FLY STRAIGHT AND KEEP IT STABLE DURING FLIGHT) ➢ MAKE IS SYMMETRICAL—MEANING BOTH SIDES ARE IDENTICAL	➢ FOLD IT CAREFULLY, CRISP, SHARP EDGES ALLOW GLIDER TO FLY BETTER THAN EDGES FOLDED AND REFOLDED ➢ WINGS SHOULD BE SLIGHTLY CURVED SO THAT IT TAKES ON AN AIRFOIL SHAPE. (ALLOWING HIGH PRESSURE AIR TO BUILD UP UNDER THE WING AND GIVES THE PLANE LIFT) ➢ GLIDER WITH WINGS THAT HAVE A LARGE SURFACE AREA TAKE LONG SLOW FLIGHTS VS. GLIDERS WITH WINGS THAT HAVE A SMALL SURFACE AREA TAKE SHORTER QUICKER FLIGHTS

Propellers:

• There are two ways an aircraft can get thrust: A jet engine or PROPELLERS • Propellers are twisted wings that spin like powerful household fans. Propellers are shaped like airfoils which creates high air pressure and low air pressure areas which causes lift. These propellers cause a lift the moves the aircraft up and down instead of titling wings like on an airplane.	• Propellers used on planes usually have six long thin blades attached to an engine. They push air backwards forcing the airplane to move forwards causing the wings to cut into the air CREATING LIFT! • A jet engine gets thrust by burning fuel. The fuel mixes with oxygen from the air and lights up a spot in the engine. The exhaust gases are forced backwards really fast which pushes the plane forward.

Helicopters:

Helicopters	
Unlike fixed-wing aircraft, helicopters do not require forward propulsion to create lift. Instead, helicopters have a horizontal propeller called a rotor. Each of the long, thin blades of the rotor is shaped like an airfoil. The spinning blades create an area of high pressure under them and an area of low pressure over the top of them. This produces the lift needed to take the helicopter into the air. When the helicopter's blades are tilted, it flies in the direction of the tilt.	If a helicopter were designed with a single rotor it would be very difficult to control. The rotor, spinning in one direction, would send the body twisting in the opposite direction. To overcome this effect, some helicopters are designed with two rotors, each turning in the opposite direction; this is typical of large helicopters used to carry heavy loads. Most helicopters compensate for this twisting by adding a smaller, sideways facing rotor on the tail. It creates an equal but opposite twisting force to that produced by the main rotor.

Aircraft vs Spacecraft:

➔What's the difference between an aircraft and a spacecraft?

- Aircrafts get lift once the plane is moving forward. Spacecrafts get lift using rocket boosters and powerful engines that propel them UP not forward.
- Aircrafts and spacecrafts achieve thrust the same way: using jet engines. However, because there is no air in space spacecrafts have to carry their own supply of fuel AND OXYGEN.
- Spacecrafts have thrusters on them to move forward and side to side in space.

EXTRA NOTES:

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_____

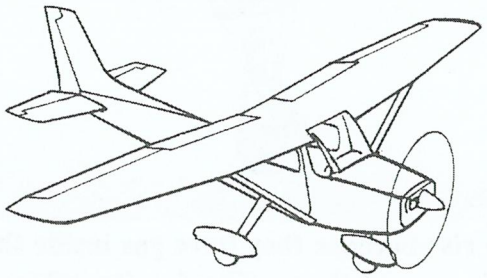
_____

Name: _____ **Master#1**

Date: _____

SORT IT OUT!

Floaters	Gliders	Powered Flyers



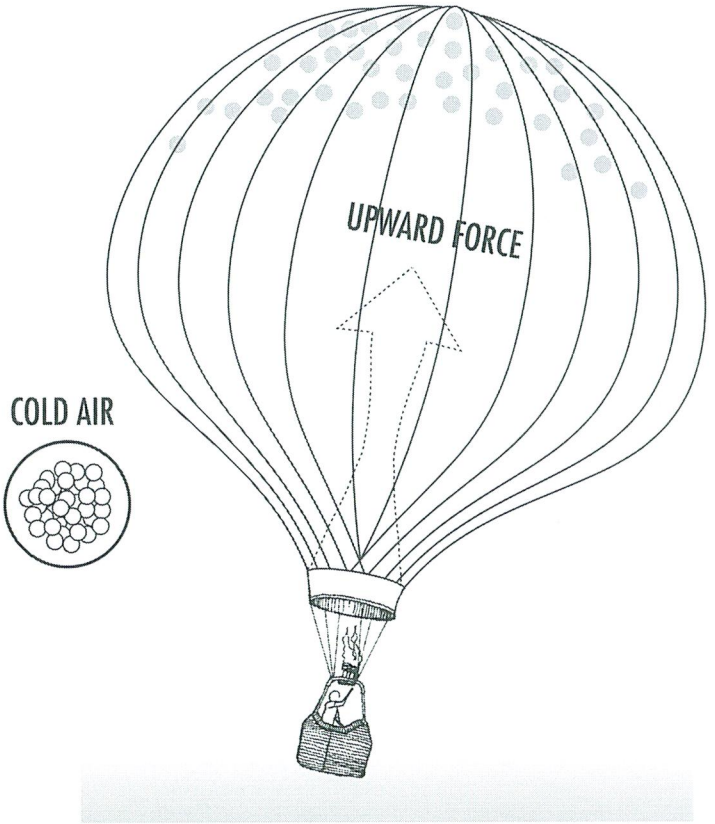
Name: _____ **Master#4**

Date: _____

LIGHTER THAN AIR - 1

Hot Air Expands -
Heat makes air molecules become more active and farther apart

Hot Air Rises -
Hot air rises because it is less dense and therefore lighter than cold air.



It is possible for balloons to rise because they have gas inside them that is less dense and therefore lighter than the air around them. The density difference creates <u>lift</u> and lets the balloon float in the air. Early balloons used hydrogen gas which is very light, but highly flammable which made it dangerous. Today some balloons use helium which is heavier but safer. Other balloons use hot air which is both safe and cheap. Propane gas burners, mounted under the balloon, heat the air. To keep the balloons aloft, a blast from the burners is given every thirty seconds.

Name: _____ **Master#5**

Date: _____

LIGHTER THAN AIR - 2

Draw and label a diagram of a hot air balloon.

Explain how you could control the flight of your balloon (rising and falling).

_____

_____

_____

_____

_____

_____

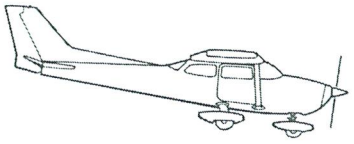
Name: _____ **Master#7a**

Date: _____

THREE BASIC MOVEMENTS OF AN AIRPLANE

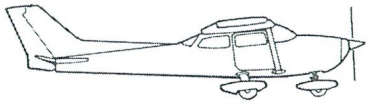
The three basic movements of an airplane are pitch, roll and yaw. In *Picture B* the airplane is level. When you change the pitch of an airplane its nose is pushed either up or down (see *Picture A and C*).

A.



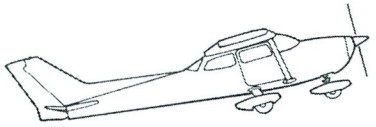
Downward pitch

B.



Level pitch

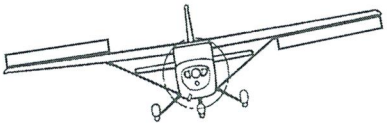
C.



Upward pitch

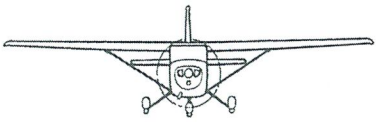
In *Picture E* the airplane is level. When you change the roll of the airplane the wings would dip either on the left side (left bank, *Picture D*) or on the right side (right bank, *Picture F*).

D.



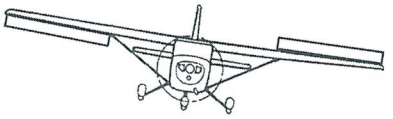
Right bank

E.



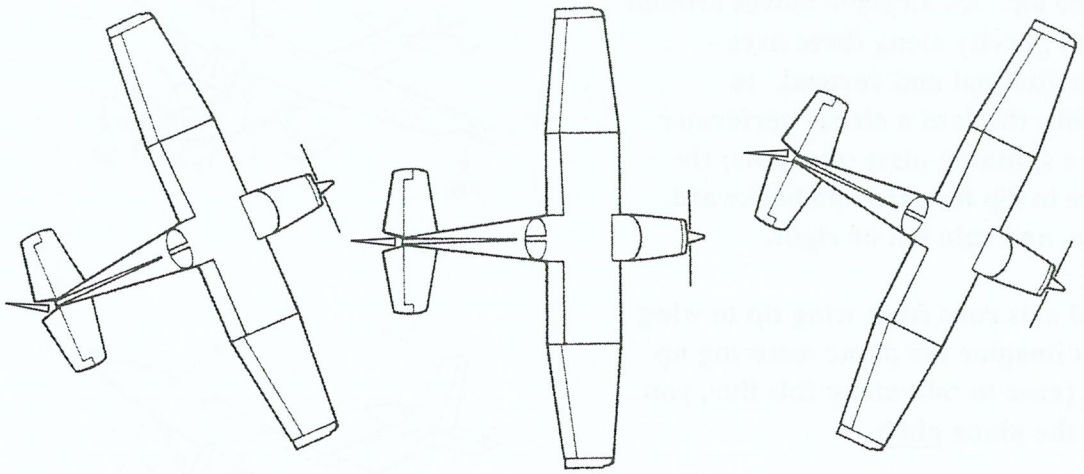
Level flight

F.



Left bank

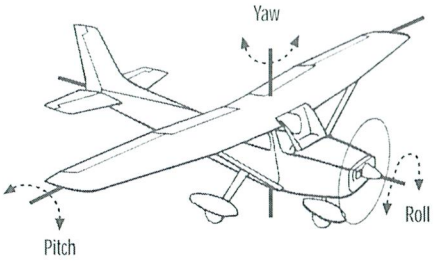
In *Picture H* the airplane is level. When you change the yaw of the airplane, the nose is made to turn to the left (Left yaw, *Picture G*) or to the right (Right yaw, *Picture I*).



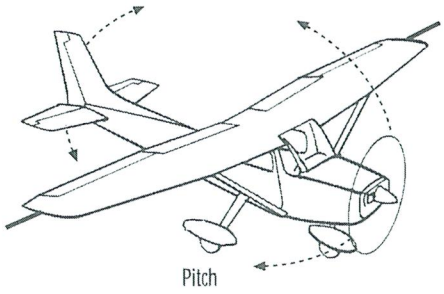
Left yaw Level flight Right yaw

Three Basic Movements of an Airplane (cont.d)

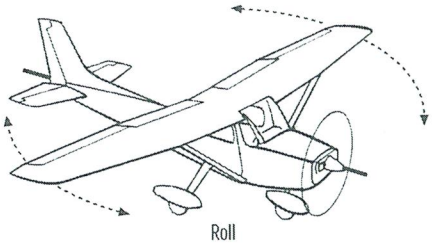
The pilot of an airplane must keep the movements of the plane *adjusted* to keep it stable in the air. An airplane moves around its center of gravity along three axes - lateral, longitudinal and vertical. to visualize this, think of a circus performer balancing a spinning plate on a pole; the plate is free to dip forward and backward, side to side, and spin left or right.



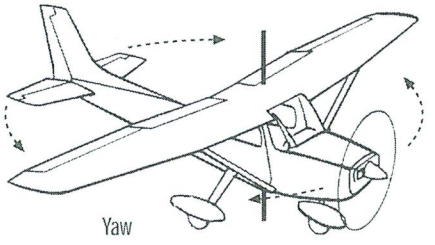
The lateral axis runs from wing tip to wing tip. If you imagine the plane teetering up and down (nose to tail) along this line, you would see the plane <u>pitch</u>.



The longitudinal axis runs from the nose to the tail of the plane. If you imagine the plane rocking from side to side (wing tip up or down) along this line, you would see the plane <u>roll</u>.

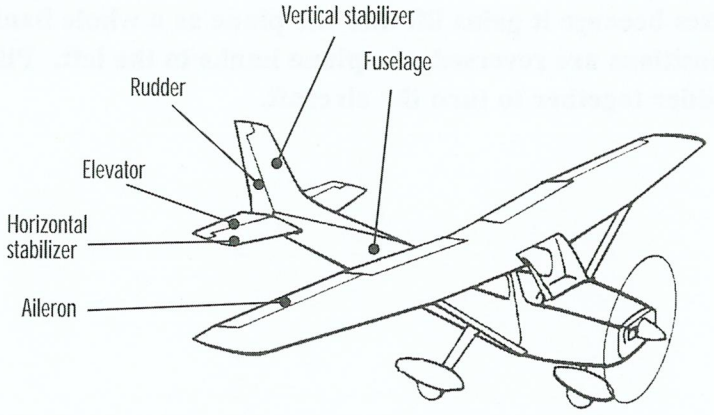


The vertical axis runs from the top to the bottom of the fuselage. If you imagine the nose of the plane swinging left or right along this line, you would see <u>yaw</u>.



Three Basic Movements of an Airplane (cont.)

With all these different movements happening at the same time, how can a pilot control the flight of the aircraft?



The diagram above shows the main control surfaces of a fixed-wing aircraft.

The aircraft's body, called the fuselage, functions as a holding place for both passengers and cargo. Structurally, it also anchors the wings at a certain angle to insure lift. The other control surfaces, the horizontal stabilizers and the vertical stabilizers, are also attached to the fuselage.

On the tail of the aircraft is a set of miniature wings called the horizontal stabilizers. They keep the airplane flying forward on an even flight path. In the horizontal stabilizer is a set of flaps called the elevators which the pilot uses to control the pitch of the plane. When the elevators are raised, it increases the drag above the tail. This slower moving air over the tail results in higher pressure above the tail; this pushes the tail down, resulting in the nose going up. To lower the nose, the pilot would lower the elevators. The elevators can also be used to lower air speed because they cause drag.

The upright fin located at the tail of the plane is called the vertical stabilizer. Found in the vertical stabilizer is a flap called the rudder which allows the pilot to change direction from left to right. If the rudder is turned to the left, the nose of the flyer yaws left. Conversely, if the rudder is turned to the right, the nose yaws right. This occurs because air pushes against the rudder, swinging it to the left. The nose turns right.

Ailerons are flaps located on the back edge of the wings. They are used to control roll, which helps the plane to turn. To turn, a plane must bank, or tip, a little on its side, much in the same way as a cyclist leans when turning a corner. When an aileron is raised, drag is created and this slows the air moving over the upper surface of the wing, thereby increasing pressure. The result is less lift to the wing. If the aileron is lowered, the air speed over the top of the wing is faster relative to the speed under the wing. The pressure on top of the wing decreases which makes the lift greater. What happens if the right aileron is raised and the left one lowered? The right wing drops because it loses lift and the left one raises because it gains lift and the plane as a whole banks to the right. When the aileron positions are reversed, the plane banks to the left. Pilots use both the ailerons and the rudder together to turn the aircraft.

Name:_____ **Master#8**

Date: _____

Designing Controls for Your Flyer

A)

How is your glider designed to overcome air resistance?_____

_____

How does the leading edge of an airplane wing overcome air resistance_____

_____

B.)

Describe the flight of your flyer with the addition of *elevators*. What was the position of the nose during flight?_____

_____

C.)

How did you make the flyer more stable?_____

_____

Explain how this worked._____

_____

_____

_____

D.)

How does a pilot use the rudder to turn the plane to the right?_____

_____

Explain how this works._____

_____

_____

Name: _____ **Master#11**

Date: _____

THE HELIOSTRAW

To make a heliostraw:

1. *Cut a piece of manila tag 2 cm x 21 cm.*

2. *Locate the center of the piece of cardboard by drawing a diagonal line from each of the corners. see diagram.*

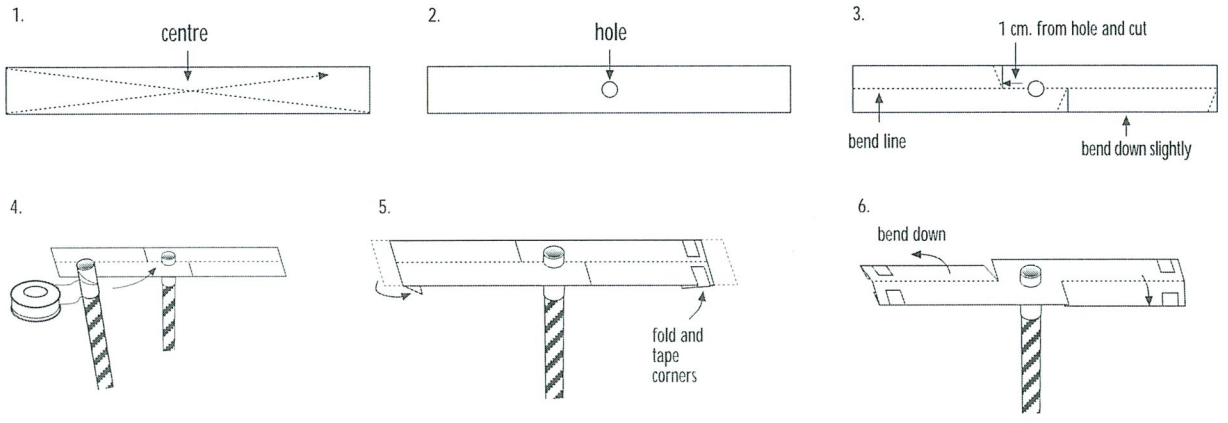
3. *Punch a hole into the middle of the strip of manila tag with a hole punch.*

4. *Make a 1 cm long cut on either side of the straw. This will form the wing.*

5. *Wrap tape around one end of the straw so that the wrapped end is a snug fit when put into the hole in the wing. If the wing wobbles, tape the straw to the wing to hold it firm.*

6. *Fold under the last 1 cm of the wing tips. Tape these folds down. This will add weight to the wing tips and increase momentum as the wings spin.*

7. *From the cuts outward, bend the wings down slightly along the fold line. Do not bend the wings down too far. There should be just a gentle curve. Make sure both wings are bent down the same amount.*



Name: _____ **Master#13**

Date: _____

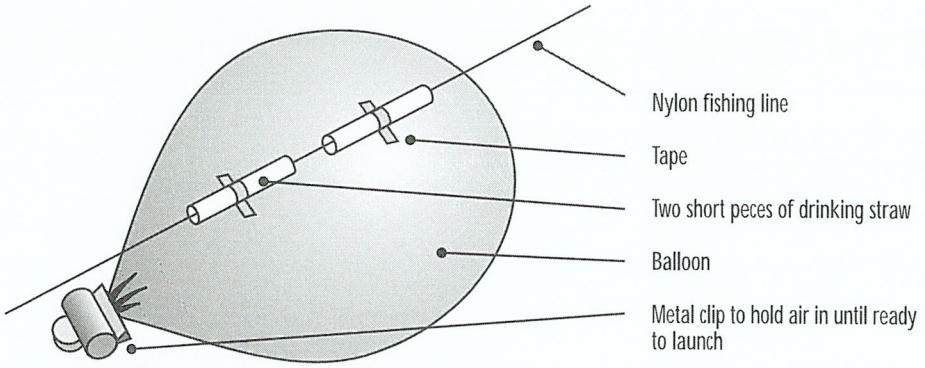
BALLOON ROCKETS

To construct a balloon rocket:

1. *Blow up the balloon.*
2. *Close the neck of the balloon with a metal clip.*
3. *Tape a straw (or two pieces of a straw) along the length of the inflated balloon.*
4. *Tie a length of string or fishing line to a high, sturdy fixture in your classroom .*
5. *Thread the untied end of the string through the straws and position the balloon at one end or the other.*
6. *With your partner holding the line aloft and taut, release the clamp. Try several tests.*
7. *Record your observations below.*

When the balloon rocket was launched it _____

_____



Write a brief description explaining how a jet flies.

_____

_____

_____

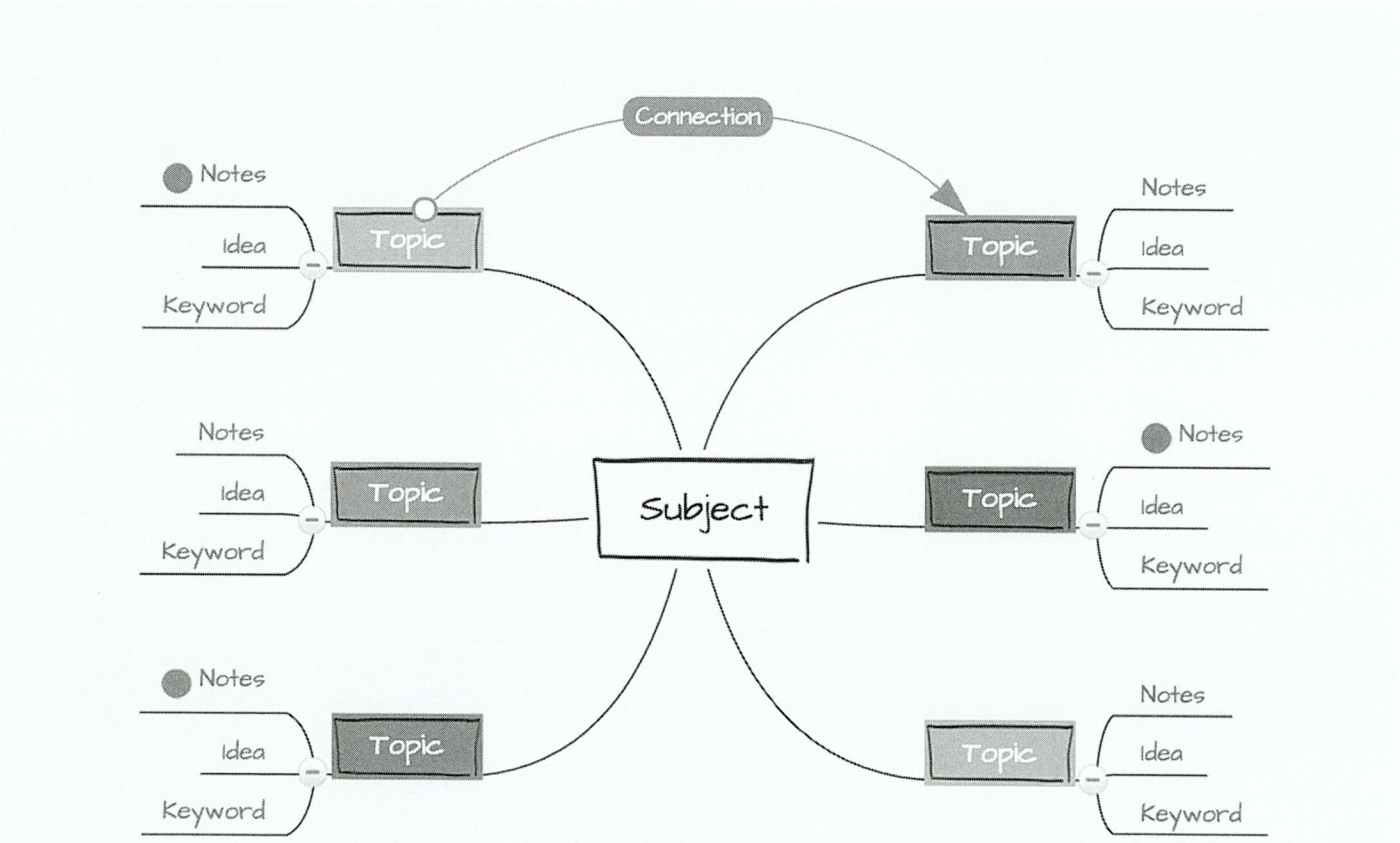
_____

Grade 6A & 6C: Science

Topic B: Flight

Mind Map

➔ **Task:** You use the following information as guideline to create your mind map (*words and illustration*).



Name: _ _ _ _ _ _ _ _ _ _

Date: _ _/_ _/_ _ _ _(dd/mm/yyyy)

Topic B: Flight

Reflection: How Did You Do?

1. List three things you didn't know before this unit started.

2. Describe what you liked best in this unit.

3. Give yourself a pat on the back! What did you do well in this unit?

4. List three questions you still have about *flight*.

Grade 6A & 6C: Science

Topic B: Flight

I can...	4	3	2	1
I can conduct tests of model parachute designs and identify/explain design changes to improve the effectiveness of the design				
I can describe the design of a hot-air balloon and the principles by which its rising and falling are controlled.				
I can conduct tests of glider designs and modify a design so that a glider will go farther, stay up longer or fly in a desired way.				
I can recognize the importance of stability and control to aircraft flight and design, construct and test control surfaces.				
I can apply appropriate vocabulary in referring to control surfaces (pitch, roll/bank and yaw), and major components of an aircraft including wing, fuselage, vertical and horizontal stabilizers, elevators, ailerons, and rudder.				
I can construct and test propellers and other devices for propelling a model aircraft.				
I can identify 4 adaptations which enable birds and insects to fly.				
I can describe how flying animals and aircrafts propel				
I can describe what streamlining means and why it is necessary to overcome drag.				
I can describe difference in design between aircraft and spacecraft and identify reasons for the design differences.				

Please provide some sample evidence: