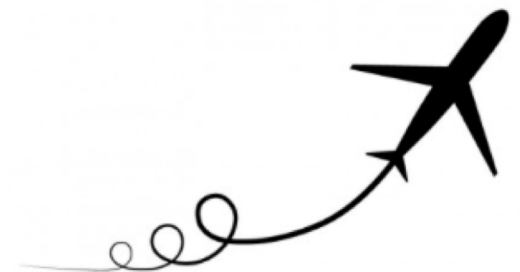
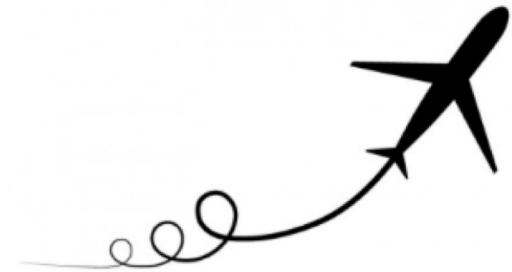
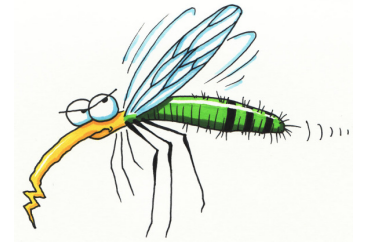
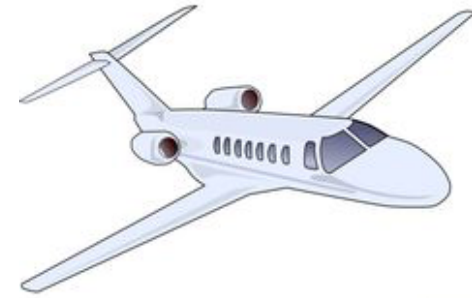


# FLIGHT

GRADE 6 SCIENCE

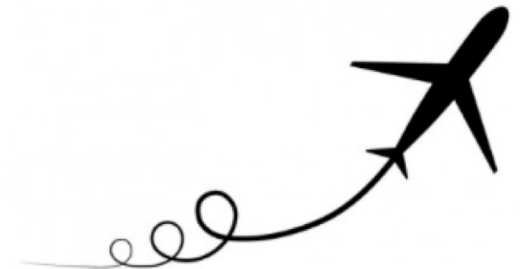
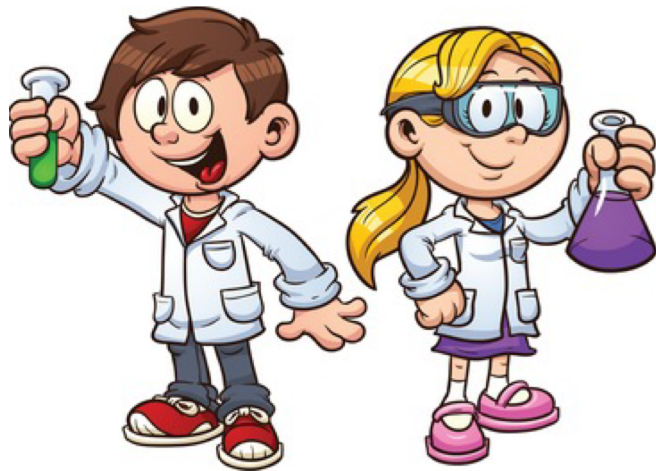


# WHAT ARE SOME THINGS THAT CAN FLY?



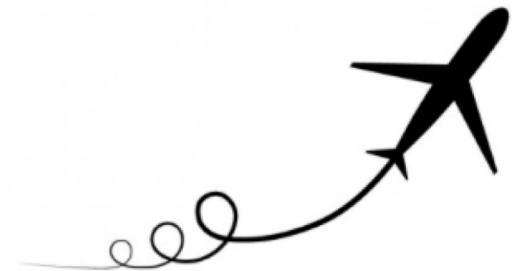
# LEARNING GOALS

- At the end of the unit, students will be able to :
  - explain the properties of air that make flight possible
  - describe how flying structures are designed to take advantage of the properties of air
  - Recognize the environmental and societal impacts of flight



# SUCCESS CRITERIA

- I can identify and define the properties of air
  - I can use proper scientific procedures when conducting experiments to demonstrate the characteristics of air
  - I can identify the four forces which operate to allow flight
  - I can identify the three movements of flight
- I can demonstrate an understanding of the environmental and societal impacts of flight



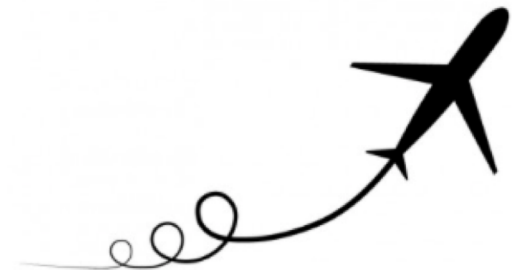
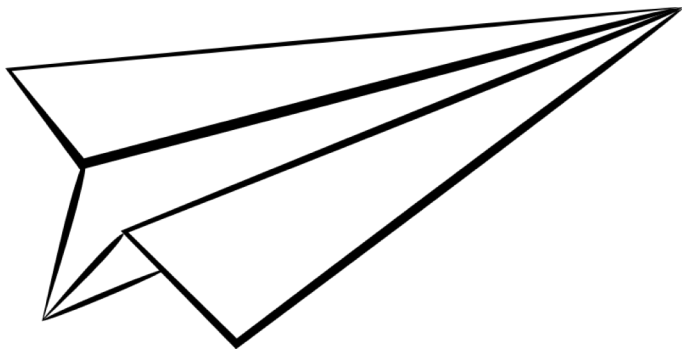


# LESSON 1:

If you want to understand flight, first you must understand...

## THE PROPERTIES OF AIR

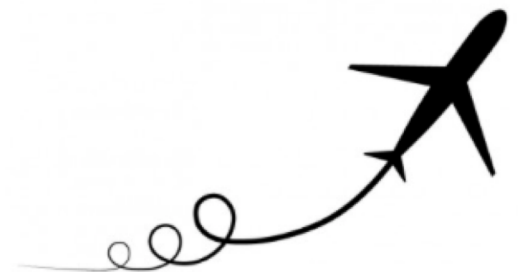
Flight can only occur when the **design of the structure you want to fly takes advantage of these properties of air!**



# PROPERTIES OF AIR

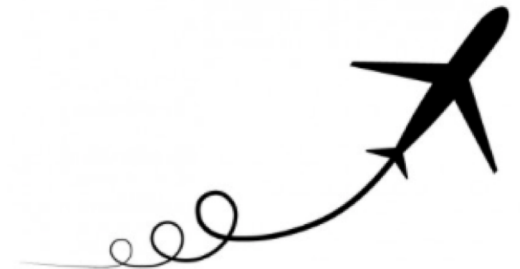


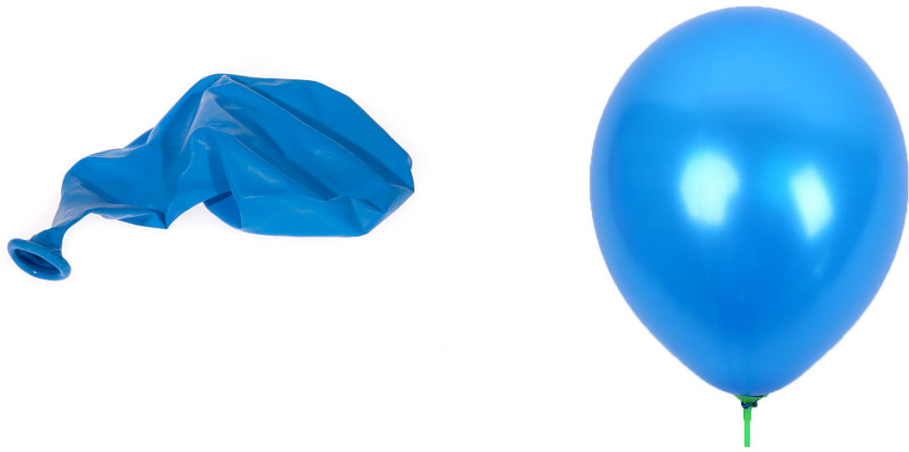
1. Air takes up space
2. Air has mass
3. Air expands
4. Air can exert a force
5. Air insulates



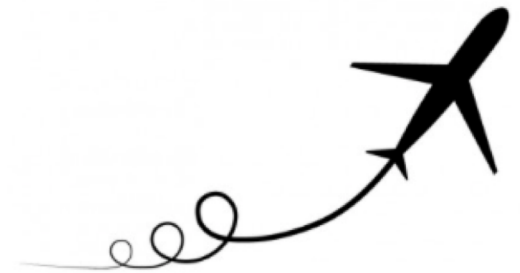


**DOES AIR TAKE UP SPACE?**



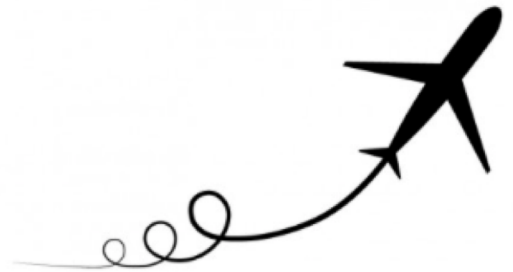


**DOES AIR HAVE MASS?**



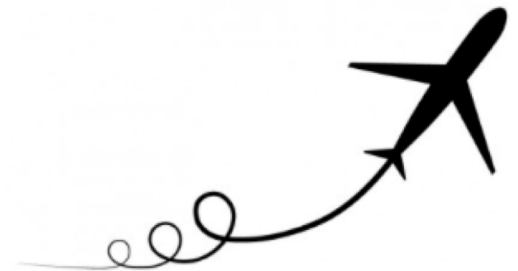


**DOES AIR EXPAND?**





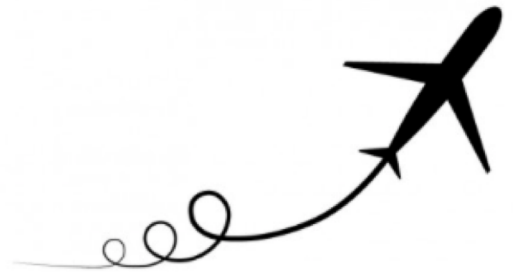
**CAN AIR EXERT A FORCE?**





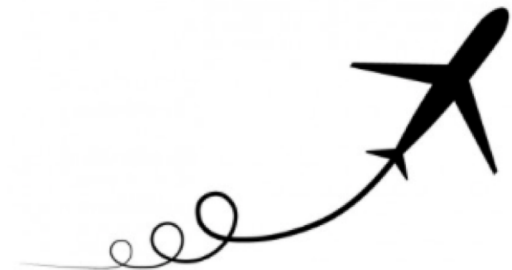


**CAN AIR INSULATE?**

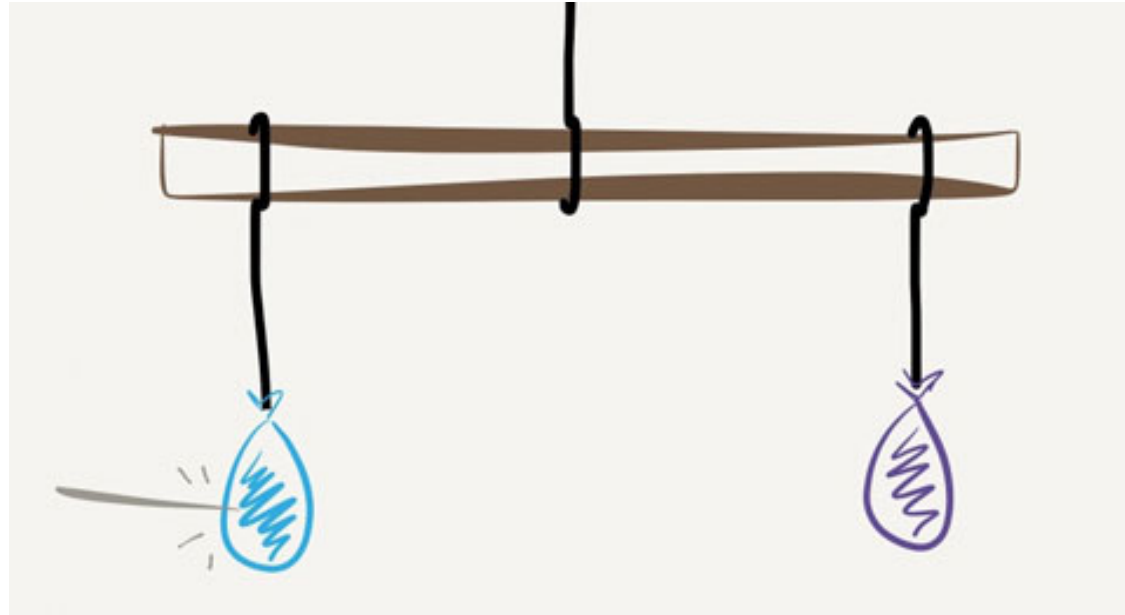


# AIR PRESSURE

- 1. Air has weight
- 2. Because air has weight, it pushes on things
- 3. This is called **Air Pressure**

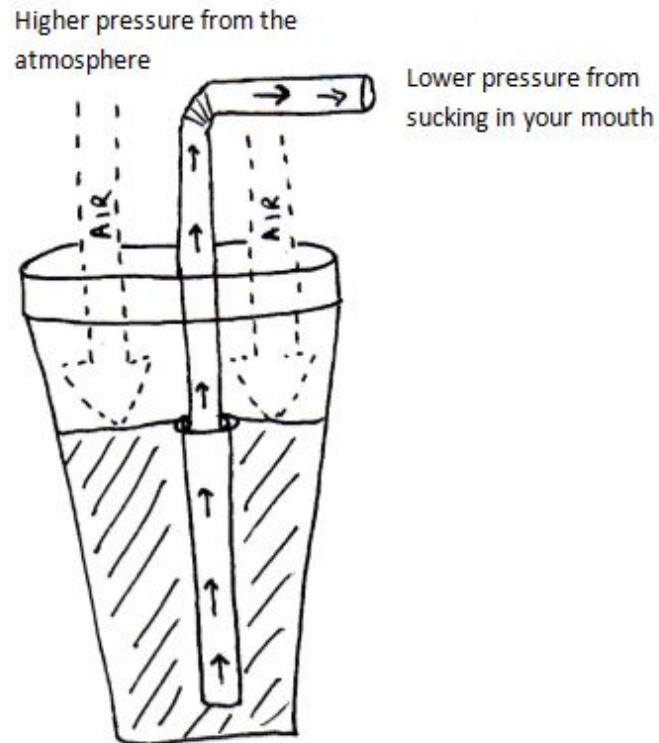


# DOES AIR HAVE MASS?



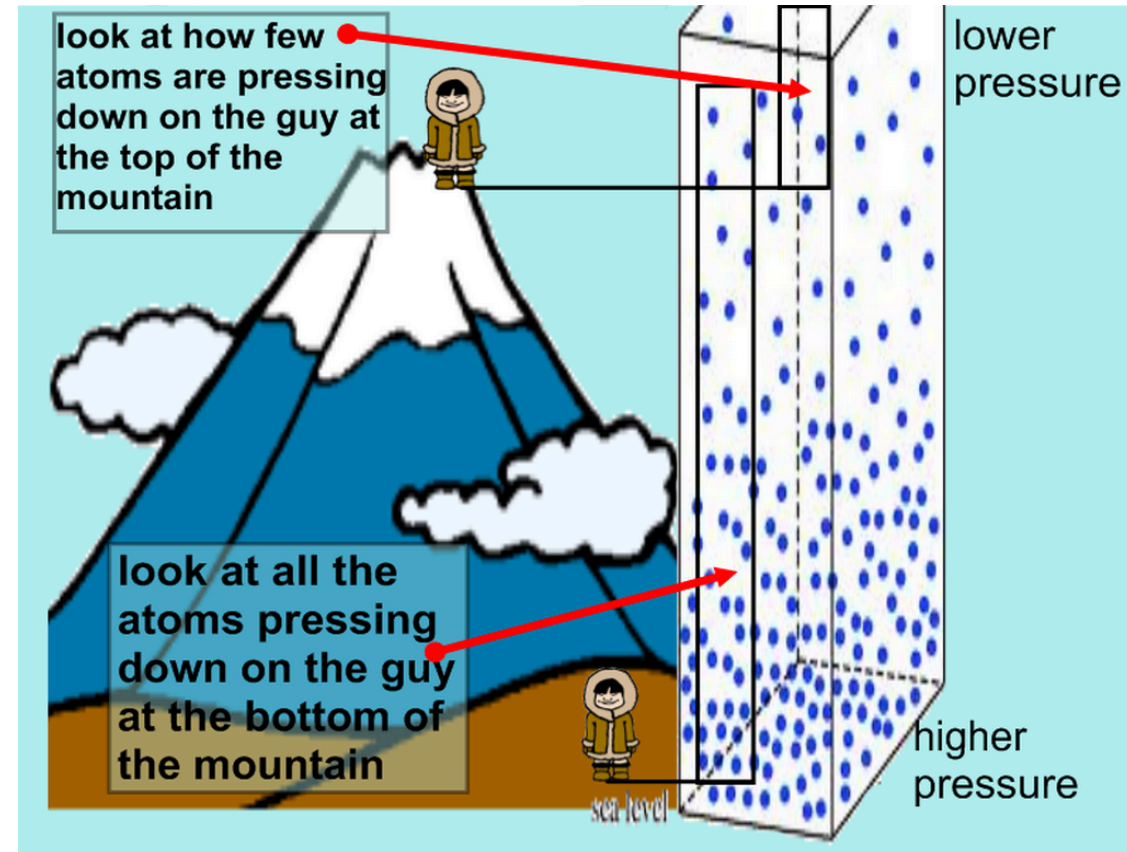
# AIR PRESSURE

- Guess what? There is air pressing on us right this moment!
- Air Pressure- What is it? <https://www.youtube.com/watch?v=axbFo-wsp4g>



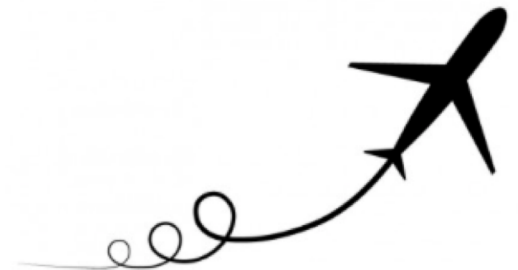
# AIR GETS THINNER AT HIGHER ALTITUDE

- Air is more tightly packed the lower you get (called sea level)
- Air becomes less tightly packed as you move away from sea level
- This makes it harder to breath on top of a mountain



# QUICK RECAP

- What are the 5 properties of air?
- What are some examples for each?
- What is air pressure?
- Why is it harder to breath on top of a mountain?
- Does air have mass? How do you know?

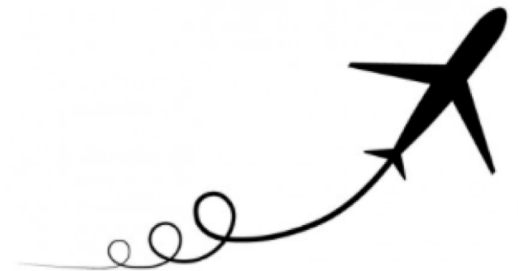




# LESSON 2:

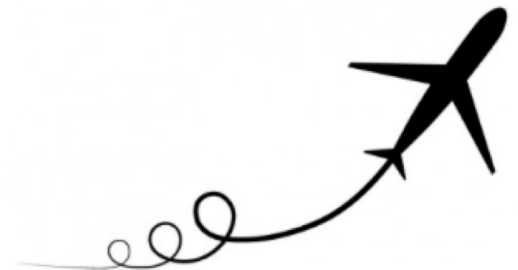
Next, you must learn the..

# PRINCIPLES OF FLIGHT



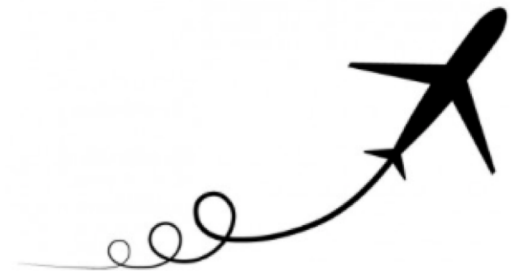
# FORCE

- A force is a push or a pull that causes an object to **move** or **change direction**.
- There are 4 forces that act upon things that fly:
  - THRUST
  - DRAG
  - LIFT
  - WEIGHT



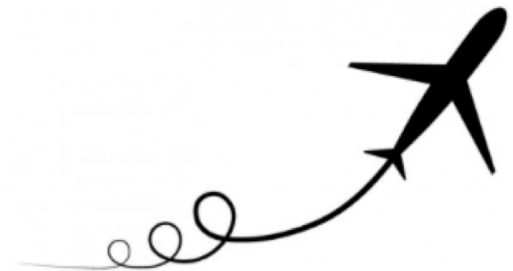
# THRUST

- Thrust is produced by an engine
- Thrust is the force that **propels** a flying machine in a direction of motion (forward)



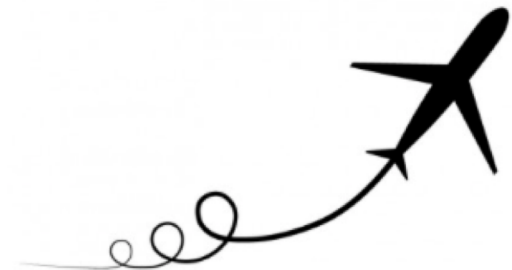
# DRAG

- Drag is caused by **friction** and differences in air pressure
- Drag is the force that acts opposite to the direction of motion (backward)



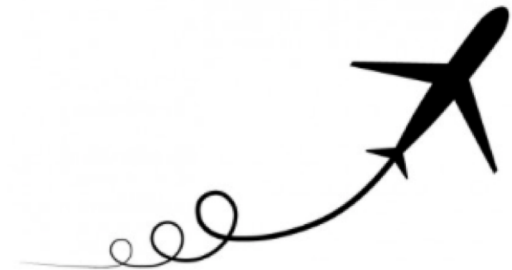
# LIFT

- Lift is created by differences in air pressure
- Lift is the force that acts at a right angle to the direction of motion through the air (upward)



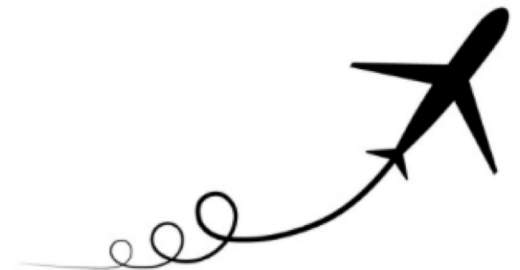
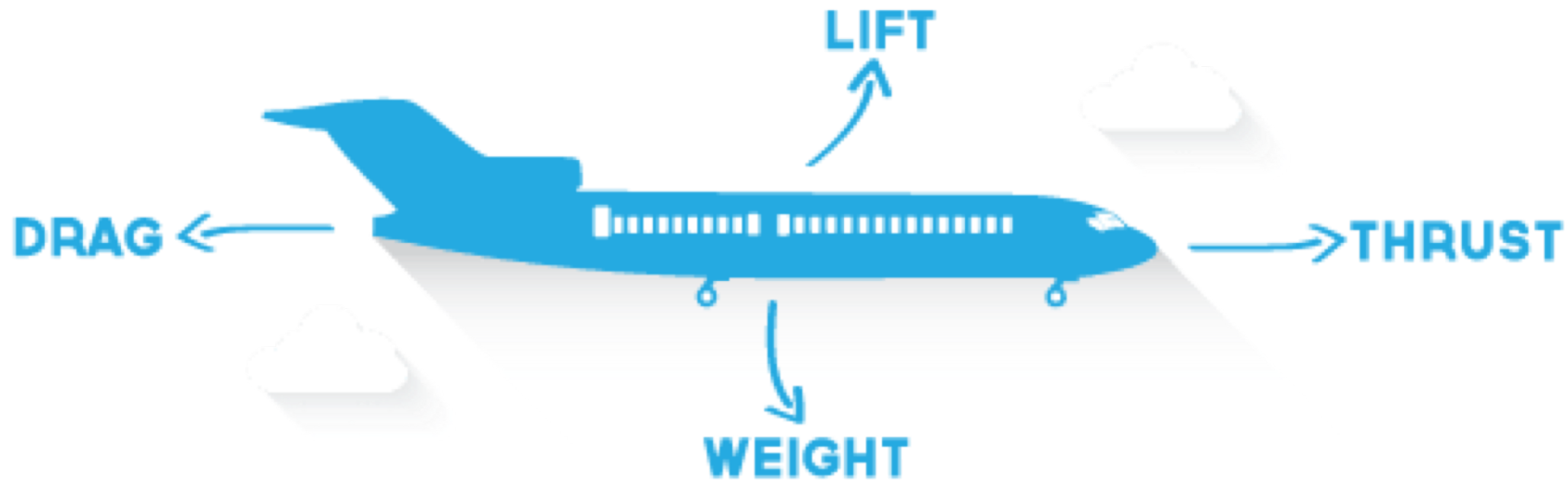
# WEIGHT

- Weight acts in a downward direction toward the centre of the Earth
- Weight is the force of **gravity**



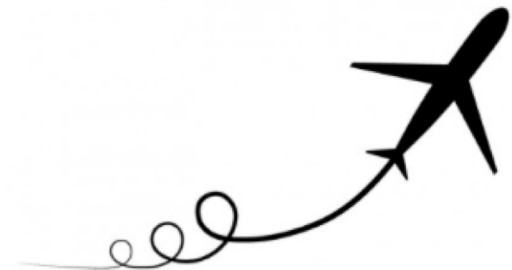


# THE 4 FORCES THAT ALLOW FLIGHT



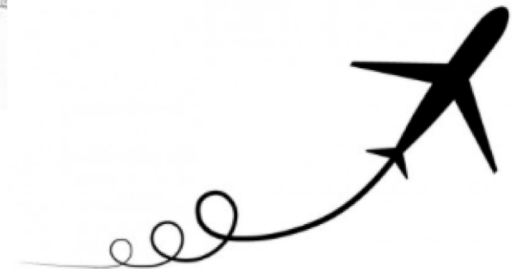
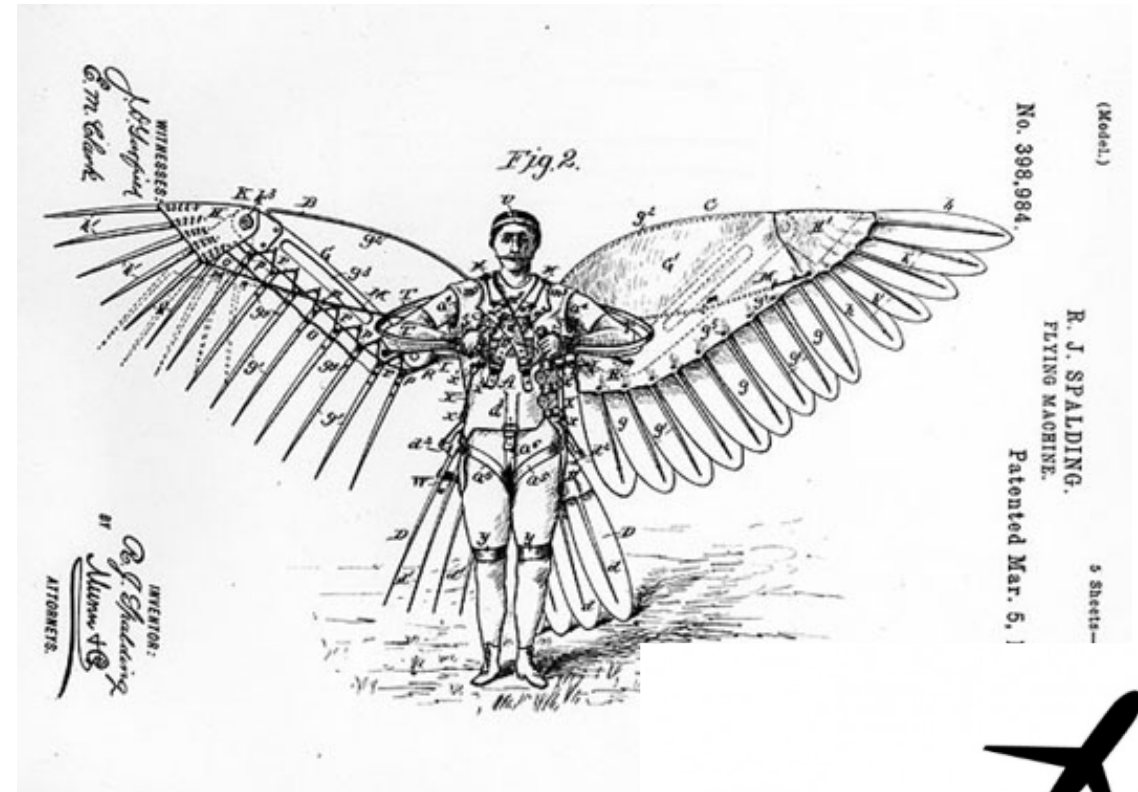
# DO THESE FORCES ONLY APPLY TO PLANES?

- NO!
- These 4 forces are what allow flight of objects or animals



# WE ARE NOT BUILT TO FLY

- We cannot fly like birds
- Thanks to their light weight, great strength, and complex biological design, birds and other flying creatures can use their wings to create both lift and thrust



# IN ORDER TO FLY:

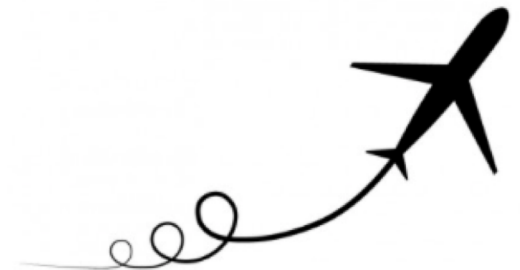
- We need to overcome our own weight, the force of gravity
- To overcome gravity, we need to create the upward force of lift
- To create lift, we need to generate thrust for a forward motion
- To keep moving, we need to overcome the resistance of air, a force called drag

- But using only our muscles, we can't get off the ground very high or for very long
- So, we have created machines to do what we cannot



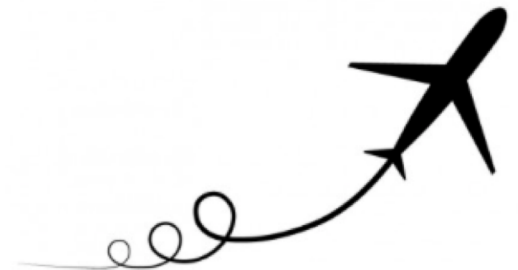
# BILL NYE

- <https://www.youtube.com/watch?v=F0m1vCx5EHE>



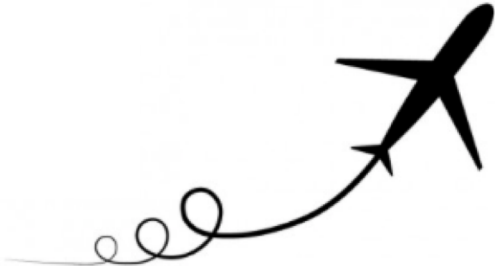
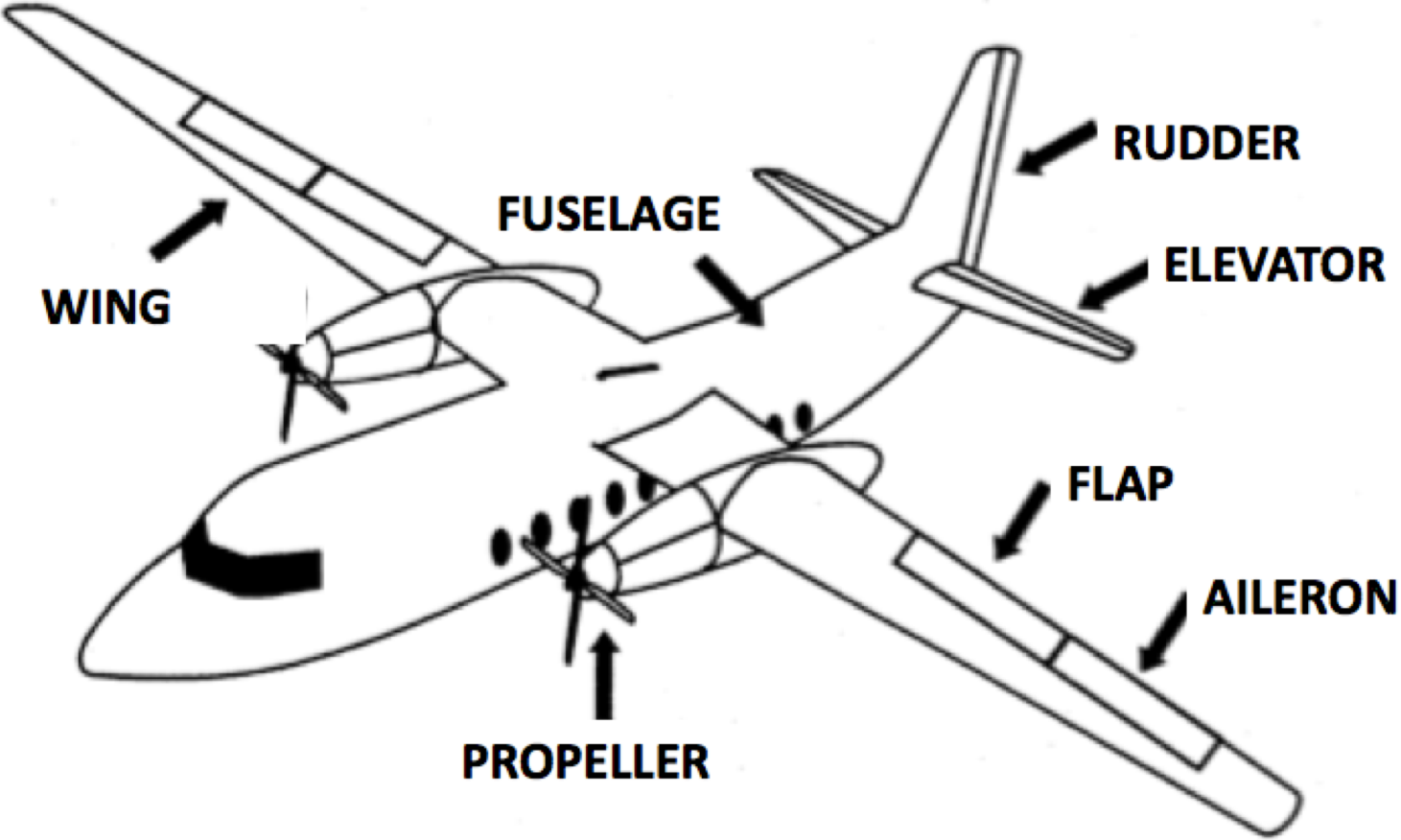
# QUICK RECAP

- What are the 5 properties of air?
- What are some examples for each?
- What is air pressure?
- What is a force?
- What are the 4 principles of flight?



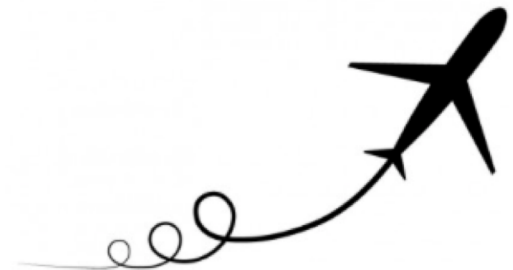
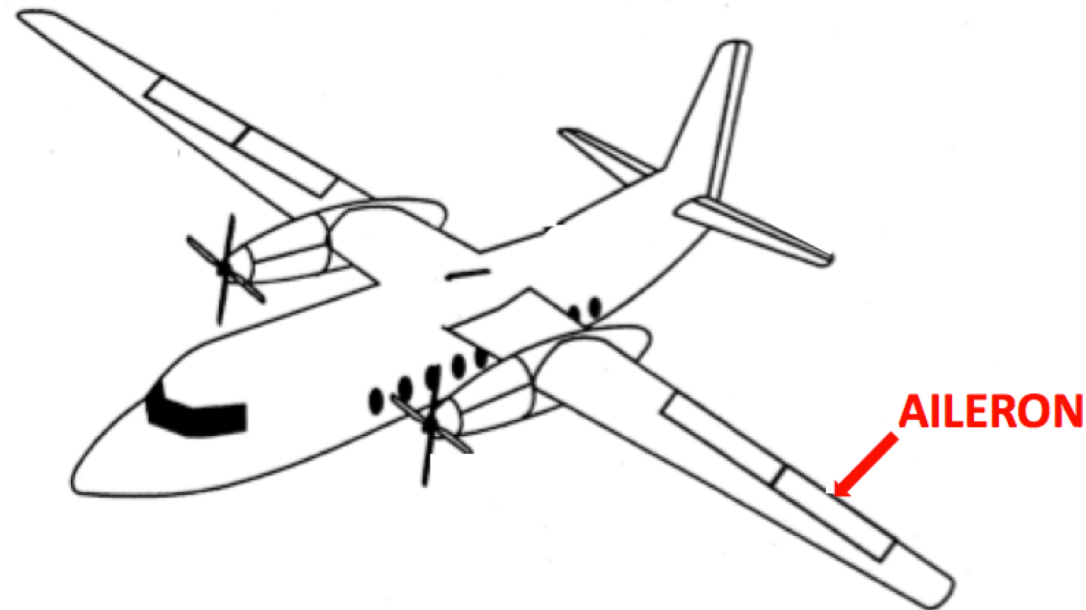


# PARTS OF A PLANE



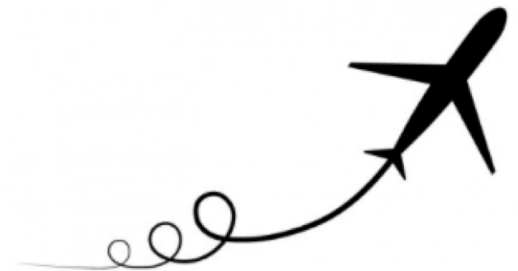
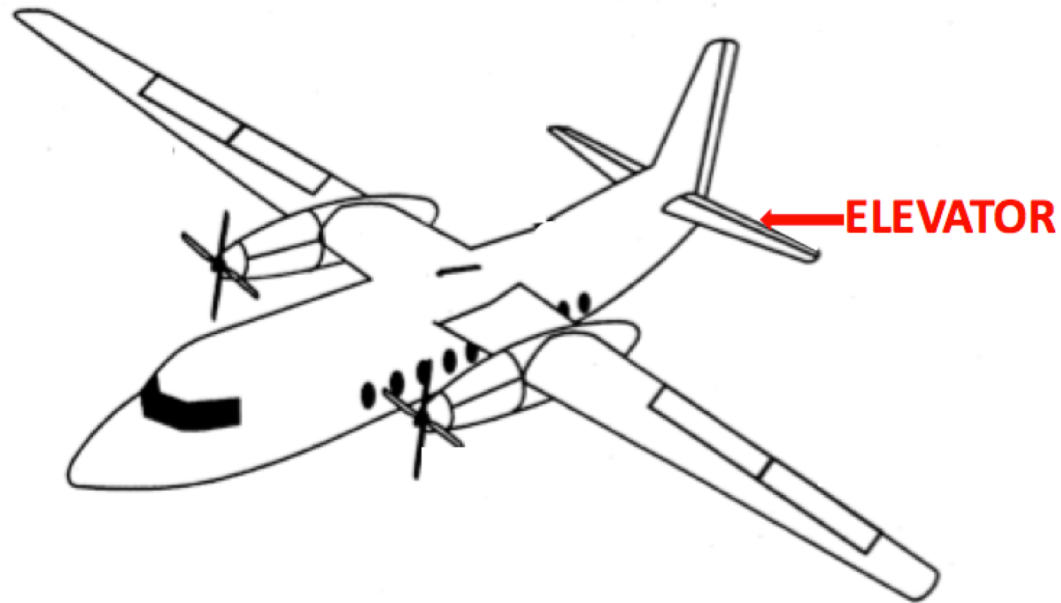
# AILERONS

- These are small surfaces located at the ends of the wings
- If they are angled in opposite directions to each other (i.e. the left aileron is lowered and the right aileron is raised), the plane will roll in the direction of the raised aileron



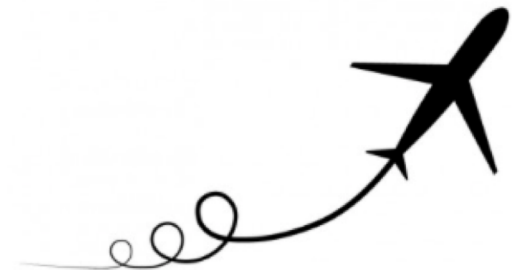
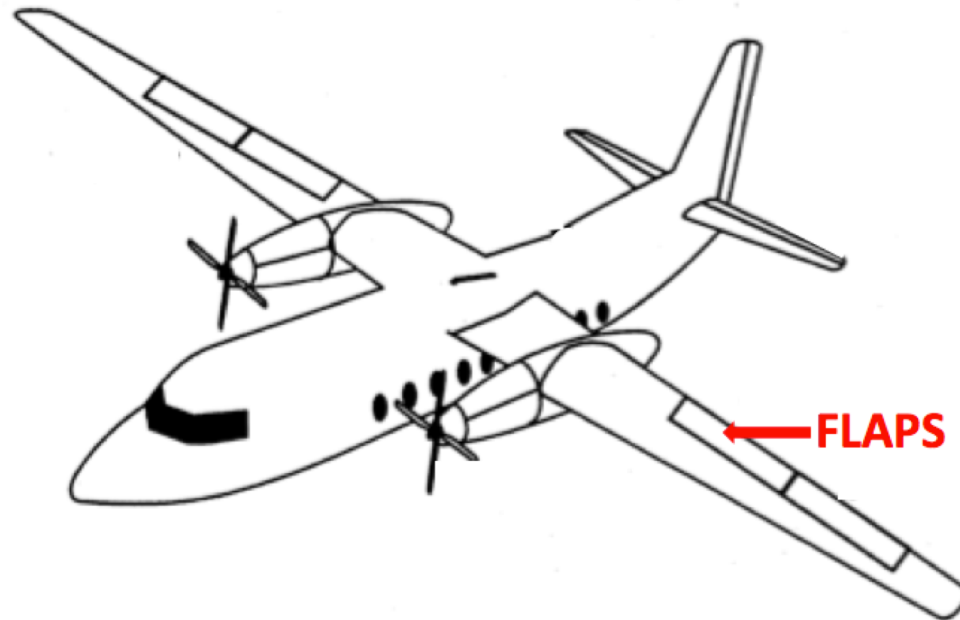
# ELEVATOR

- The elevator can be controlled in an up and down motion
- When angled up, the nose of the plane rises
- When the elevator is lowered, the nose drops



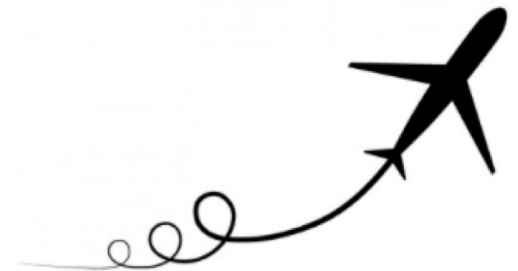
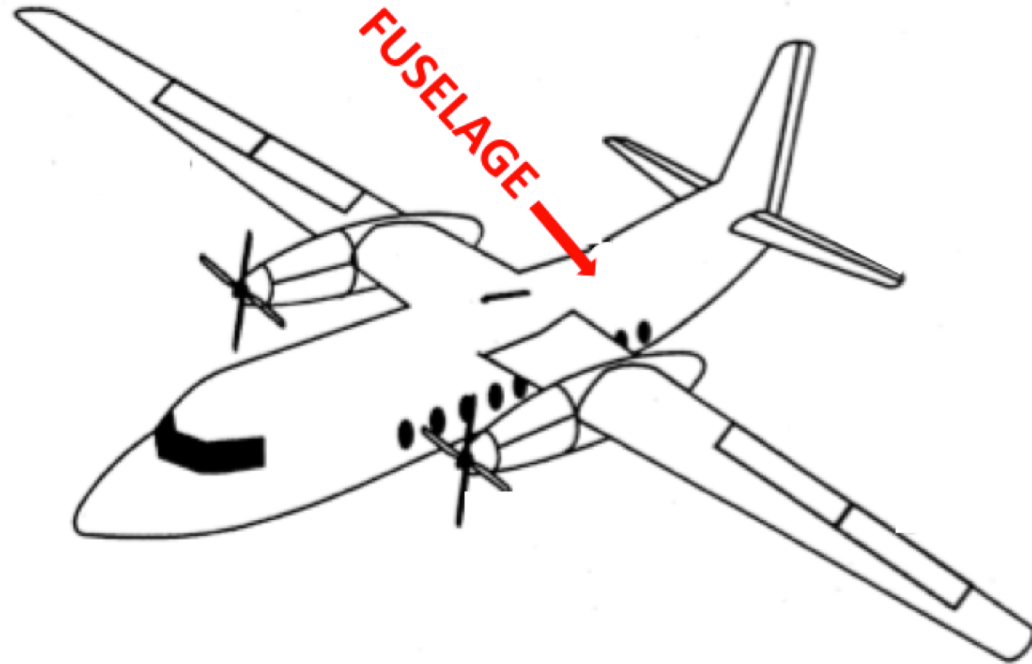
# FLAPS

- Flaps are surfaces on the wings which can be raised or lowered to create additional lift or drag
- They are used mainly during landing and takeoff



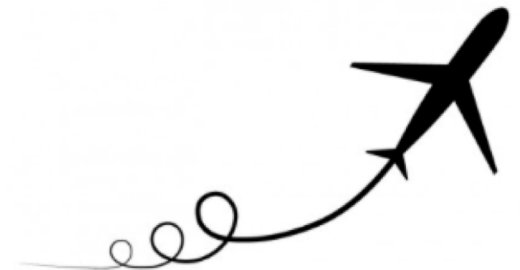
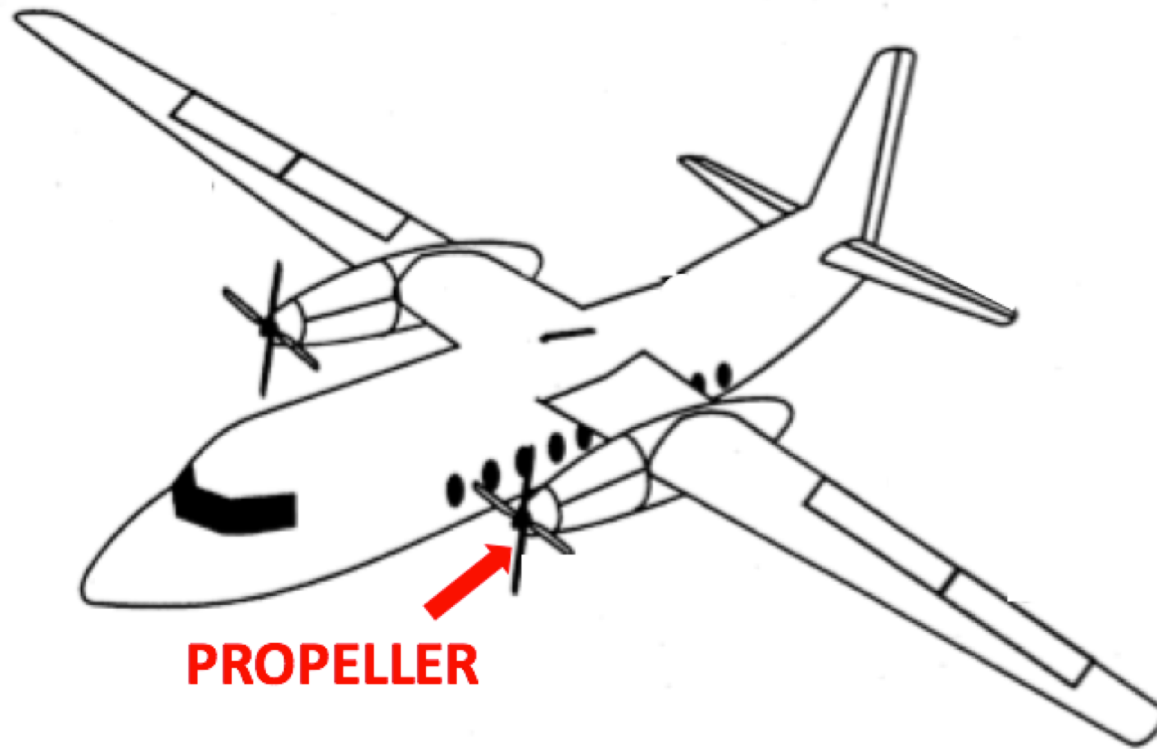
# FUSELAGE

- The fuselage is the main body of the airplane
- It can be used to carry cargo or passengers



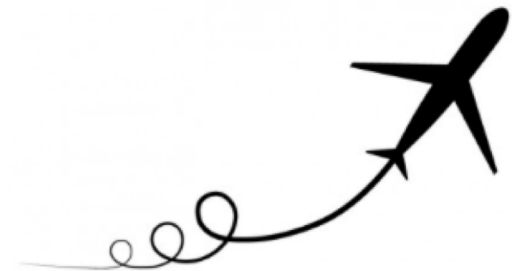
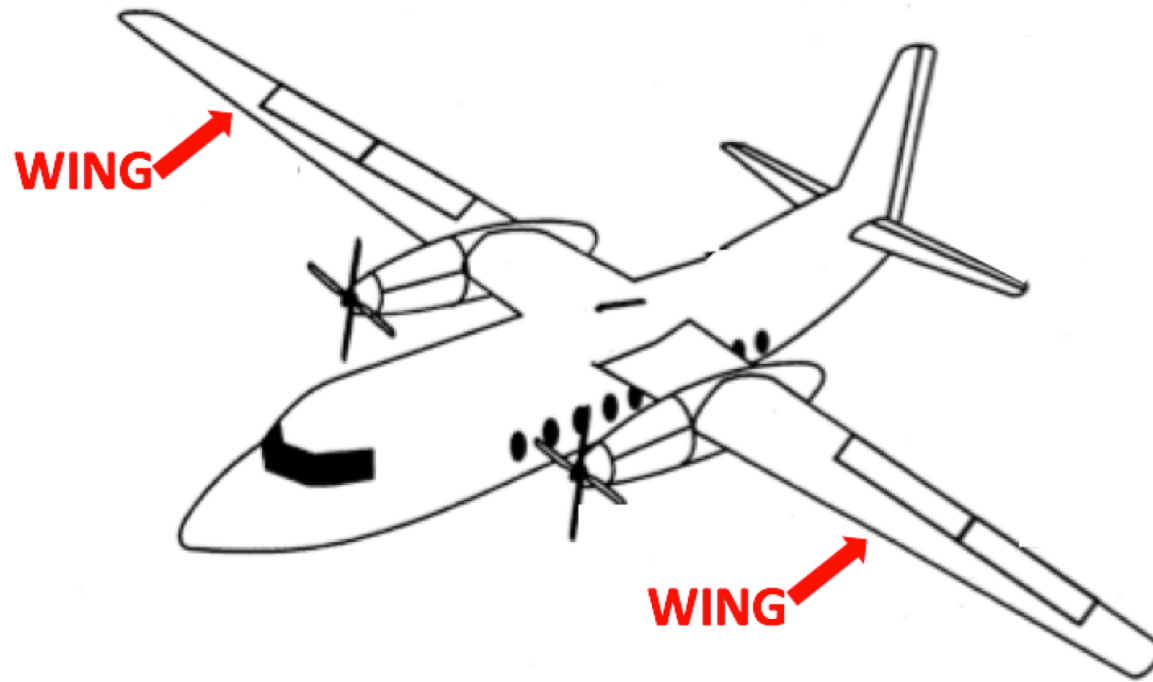
# PROPELLER

- The propeller creates the forward thrust to increase lift



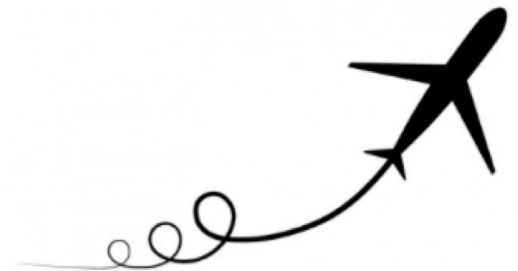
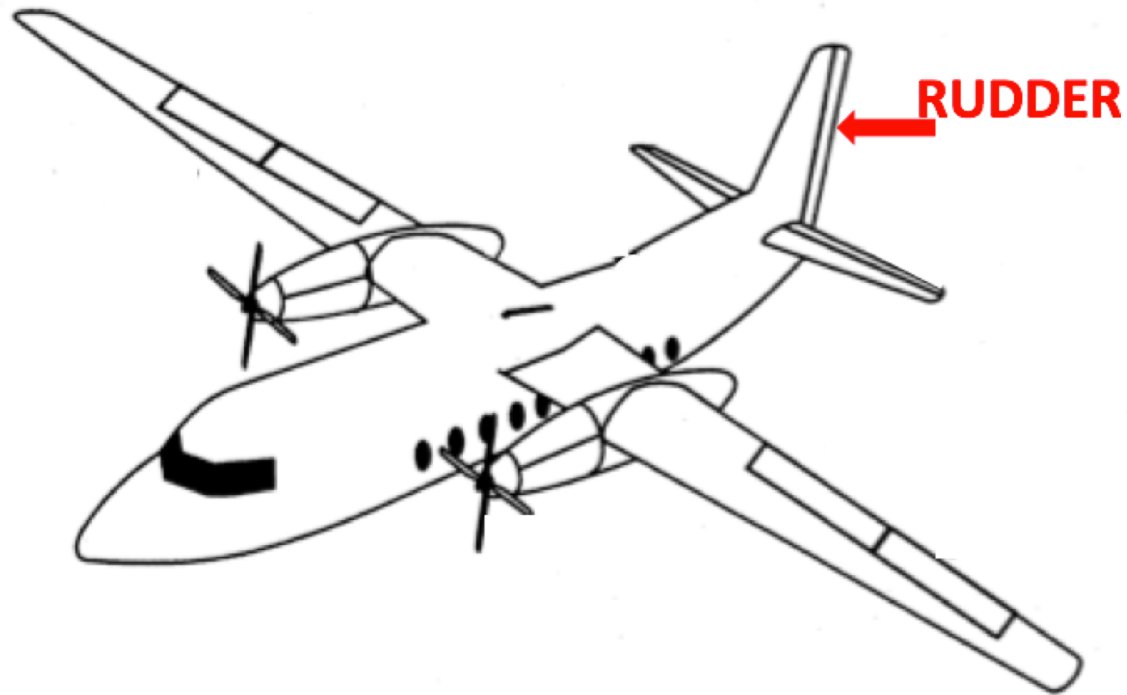
# WINGS

- The wings permit lift to occur which allows the plane to fly



# RUDDER

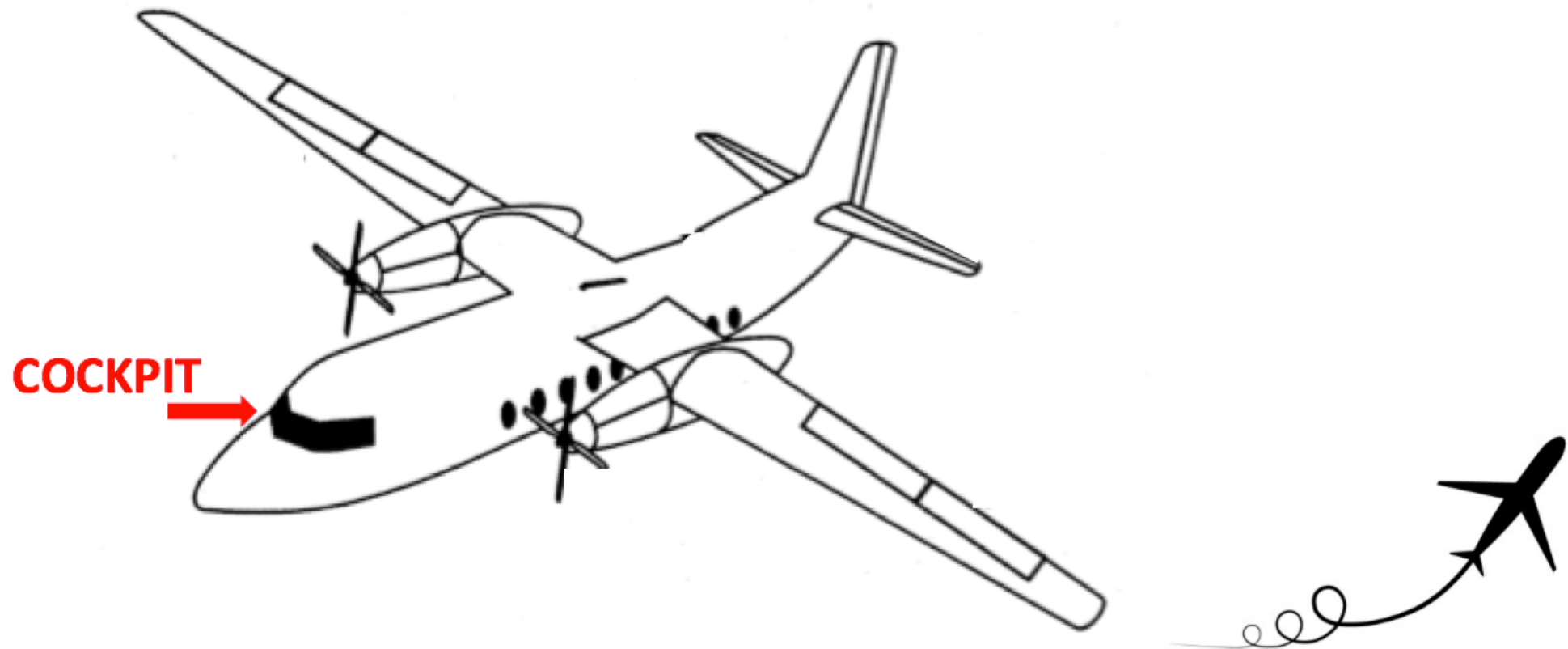
- The rudder is a flap which can be moved right or left
- The nose of the plane will move in the direction of the turned rudder





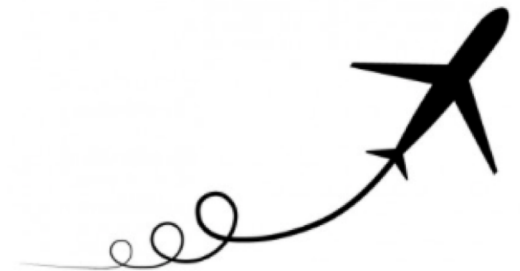
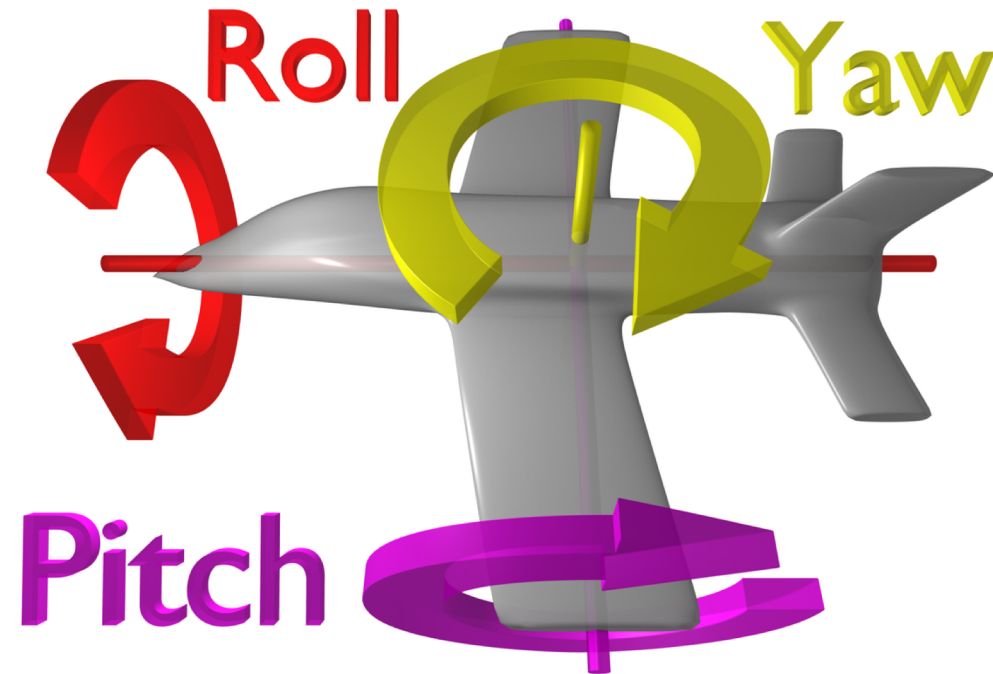
# COCKPIT

- The cockpit is where the pilot and co-pilot operate the controls that fly the plane



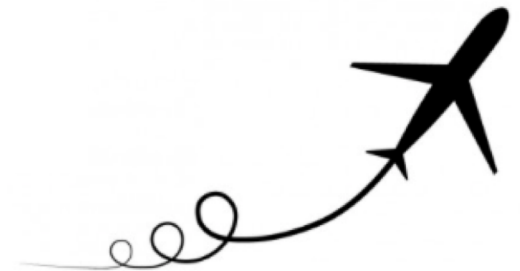
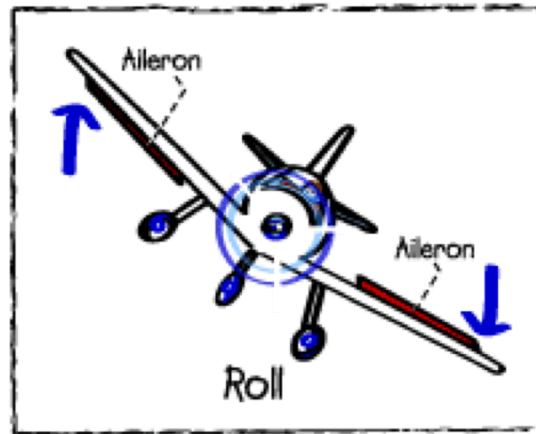
# THREE BASIC MOVEMENTS OF A PLANE

- Roll
- Yaw
- Pitch



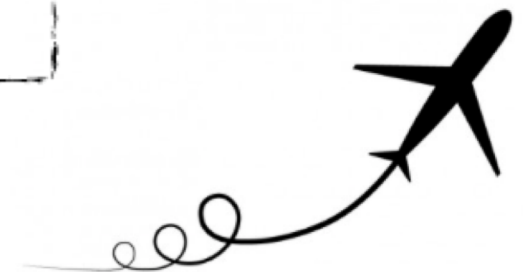
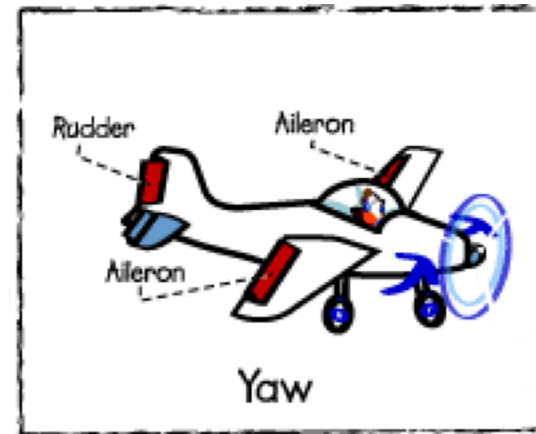
# ROLL

- Roll motion is an up and down movement of the wings, which is controlled by the ailerons. The ailerons work in opposition. When the right aileron goes up, the left aileron goes down.



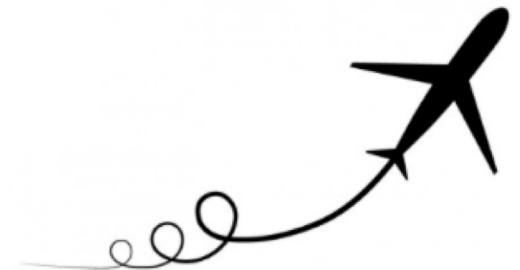
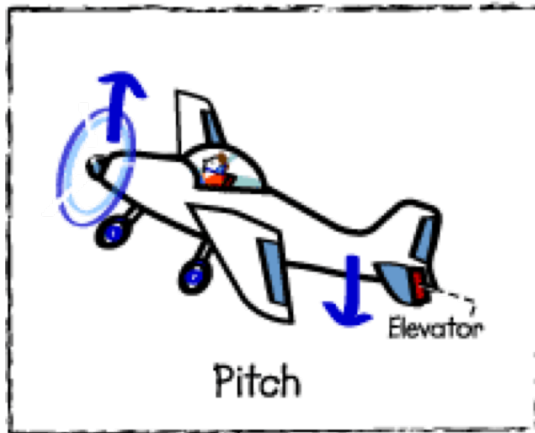
# YAW

- Yaw motion is a side-to-side movement of the nose of the aircraft, which is controlled by the rudder. The rudder can be moved left or right.

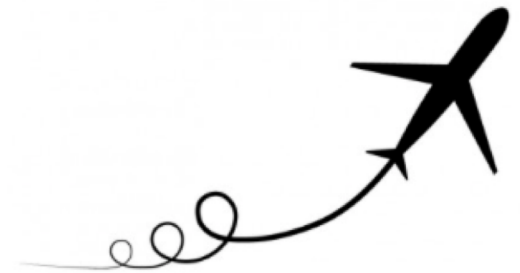
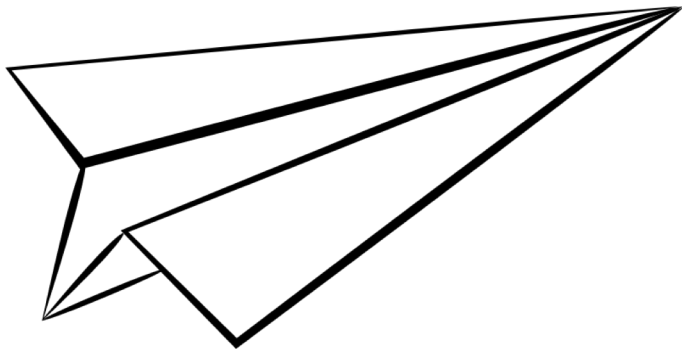


# PITCH

- Pitch motion is an up and down movement of the nose of the aircraft, which is controlled by the elevators. The elevators work in pairs. When the right elevator goes up, the left elevator goes down.

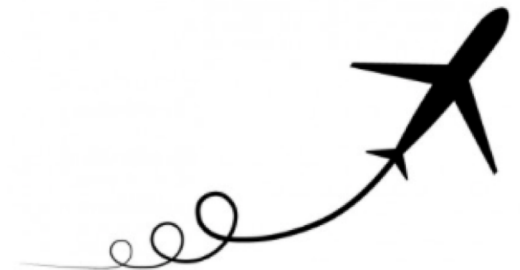
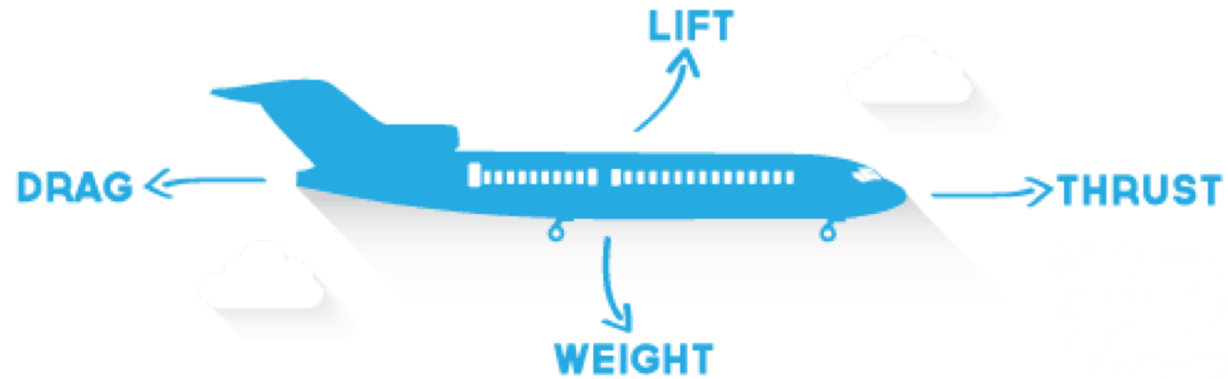


# **LESSON 5: TESTING PAPER AIRPLANES**



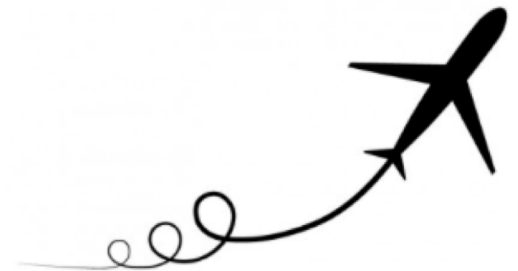
# CONNECTION TO WHAT WE HAVE LEARNT

- In order for flight to occur, the object in flight must take advantage of the 5 principles of air
- The object in flight will also have 4 forces acting upon it



# STEPS FOR SCIENTIFIC PROCEDURE

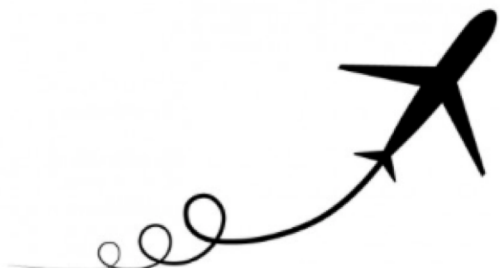
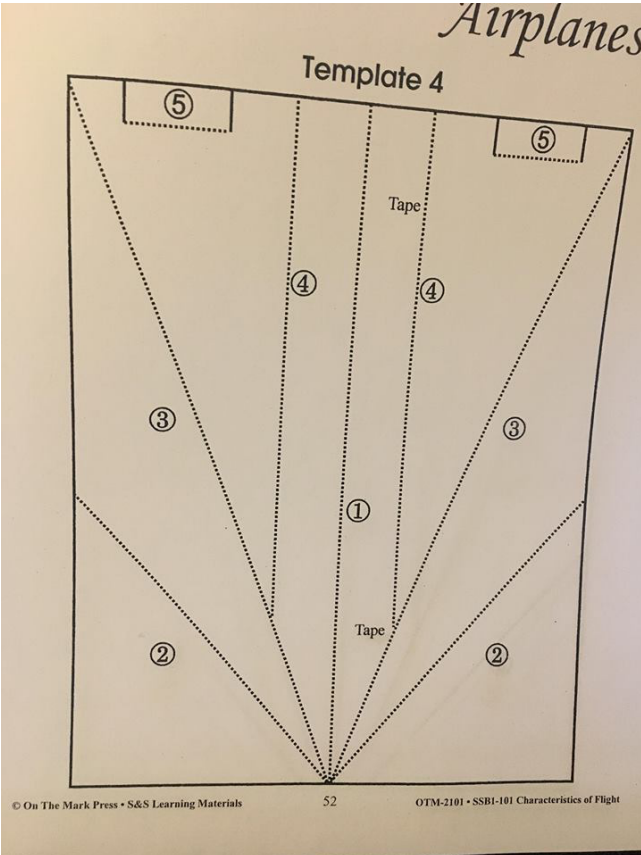
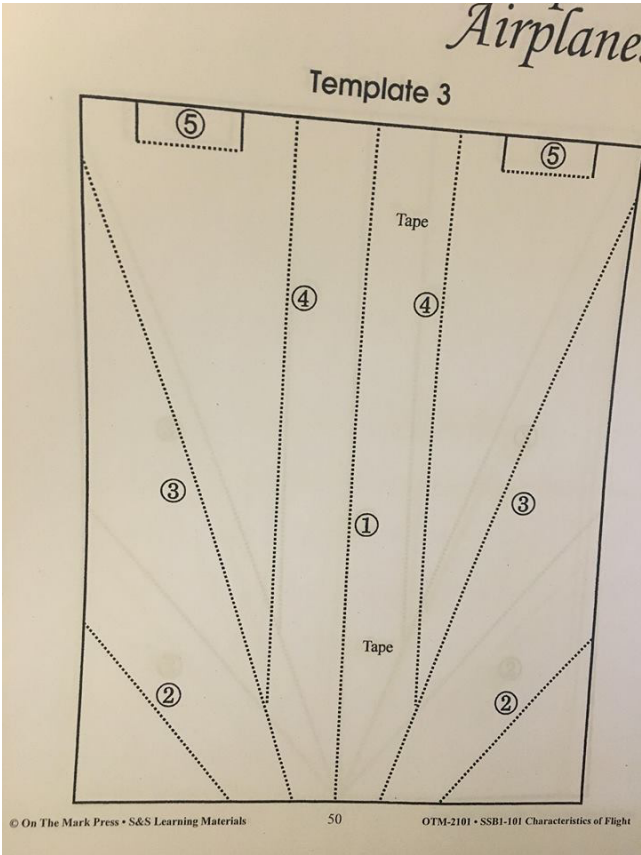
- 1. Question
- 2. Hypothesis
- 3. Materials
- 4. Procedure
- 5. Observation
- 6. Conclusion





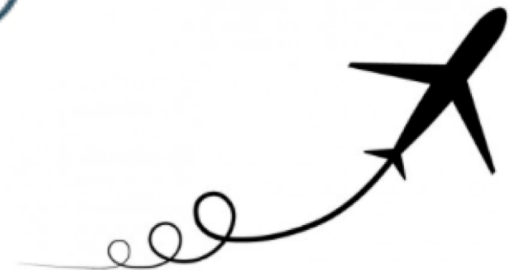
# PLANE DESIGNS

- Today we will be testing out two different paper airplane designs



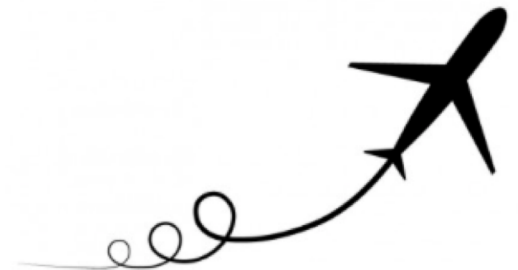
# QUESTION

- An inquiry question to guide the experiment :
- Which paper airplane design will fly further?



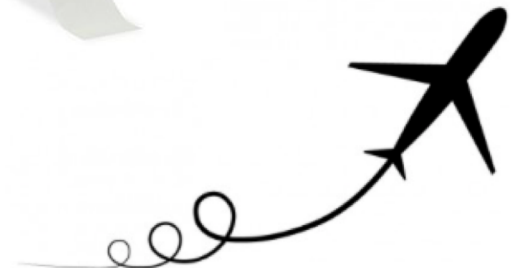
# HYPOTHESIS

- An educated guess :
- I think that plane \_\_\_\_\_ will fly further than plane \_\_\_\_\_ because.....



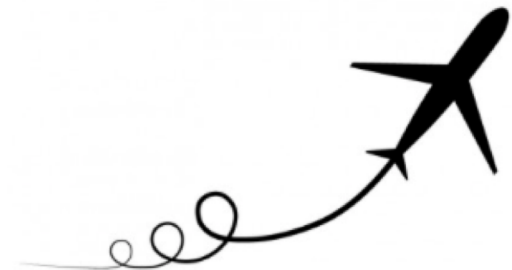
# MATERIALS

- List all the materials you will need for the experiment :
- Paper airplane templates
- Tape
- A tape measure/meter stick
- Markers/pencil crayons



# PROCEDURES

- Write all the steps to conduct the experiment:
- Create two paper airplanes using the templates provided. Use tape when necessary.
- Test both paper airplane planes by throwing them in similar conditions (i.e. same room, same weather conditions, etc.)
- Use a tape measure or meter stick to calculate the distance each paper airplane travels.
- Record the results.



# OBSERVATIONS

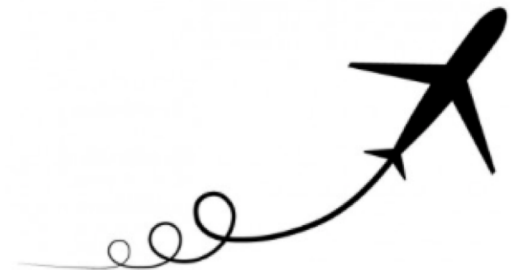
- Write anything you observed during the experiment :
- I noticed that...
- I saw...

Paper Airplane Design #	Distance in _____



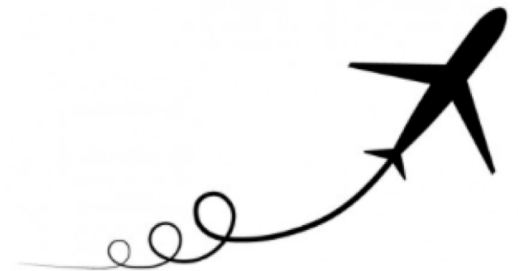
# CONCLUSION

- Write a conclusion based on what happened during the experiment :
- After having tested out both paper airplane designs, I can conclude that paper airplane \_\_\_\_\_ flew further than paper airplane \_\_\_\_\_. This could be because...
- Write your conclusion after having tested both the paper airplane designs



# BE CREATIVE

- Add logos
- Add colours
- Do NOT add anything that will add weight to the paper airplane



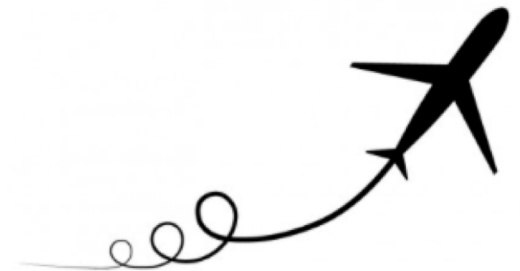


# STEPS FOR FOLDING

- Cut along the solid lines
- Place the paper on a hard flat surface
- Fold the paper in half along the centre 1 line
- Make an inward fold along line 2
- Repeat the same fold along line 3
- Fold outwardly along line 4
- Place a small piece of tape in the centre and press together
- Cut along line 5 and fold up or down to achieve best flight results

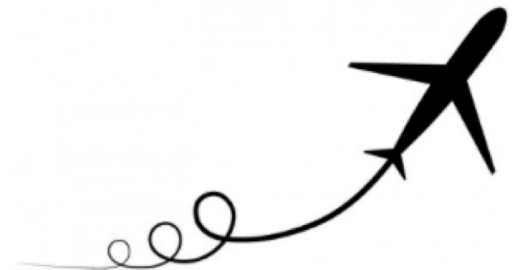


# **LESSON 6: COSTS & BENEFITS OF AVIATION**



# BENEFITS VS. COSTS

- Benefit: an advantage of aviation
- Cost: a consequence of aviation
- Aviation technology has made a very large impact on today's society. It provides jobs, makes importing and exporting goods much faster and easier, and also provides easy access to any destination. But, aviation technology also has some costs (consequences). For example, planes can be very loud and can be expensive to board.
- What are some other benefits and costs you can think of?



# TODAY'S TASK

- We will read about two uses of aviation: crop dusting and air transportation
- After we read the two uses of aviation, sort the information from the reading into the provided chart based on what part of the situation you think is a **benefit to society** and what you think is a **cost/problem for society or the environment**
- You will fill out an exit card on costs and benefits of aviation technology before the end of class today.

