

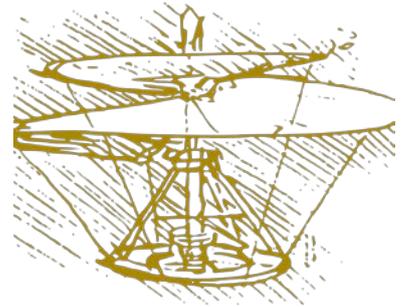
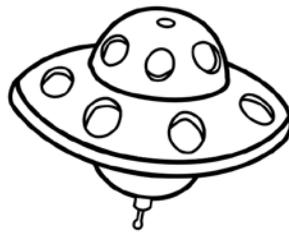


Physics

Activity 26

Does It Fly?

People have been designing flying machines for centuries. In this activity, you will investigate the properties of a flying body that has no wings!

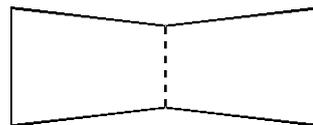
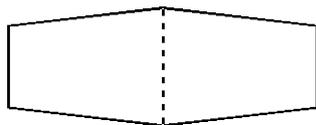


Plan>

1. In a small group (Patrol or Six), list as many flying objects as possible.
2. In a small group (Patrol or Six), discuss your list of flying objects. Do they have similarities? For example, frisbees and aeroplanes fly by having a curved surface move through the air. Can you group your list of flying objects into sub-lists that have a similar method of flying?
3. If anyone plays tennis or table tennis, did they list a spinning ball as a flying object? In a small group (Patrol or Six), discuss how a spinning ball is pushed upwards or downwards as it moves through the air.
4. Read the instructions in the **Do>** section, and discuss how you should remain safe during the activity. You will be using rubber bands to launch objects into flight. How will you keep snapping and flicking rubber bands away from your faces and bare skin?

Do>

5. Obtain two paper cups. Turn one of them upside down. Put the cups together end-to-end.
6. Wrap a piece of tape around the join to stick the two cups together.
7. How many joined the cups bottom-to-bottom? How many joined the cups top-to-top?



8. Join 5 or 6 large rubber bands to form a chain. This is the launcher.
9. In a large area, of at least 10 metres in length, try different methods of using the rubber bands to launch the cups into flight.
10. Try wrapping the rubber bands around the cups so that they spin as well as move through the air.

11. Do some launch methods work better than others?
12. Does having the cups joined bottom-to-bottom work better than being joined top-to-top? Or the other way around? What if you had a cylinder?
13. Can you add fins to your design to make it fly better? Or fly straighter?



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Review>

14. In a small group (Patrol or Six), discuss whether your flying cup model could be used instead of wings for an aeroplane. Would there be any advantages or disadvantages to using the flying cup model instead of wings for an aeroplane.
15. What did you learn from today's activity?
16. Which parts of this activity were good (and why)? How could this activity be improved?



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Physics

Activity 26

Does It Fly?

Materials/equipment

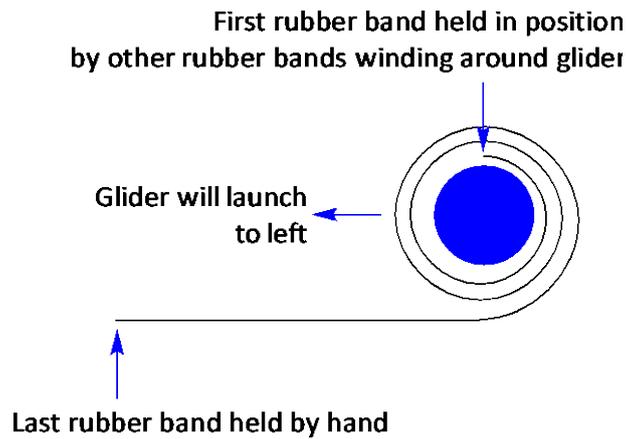
- 2 disposable cups for each Scout
- Sticky tape
- About 5 large rubber bands for each Scout
- Scissors and paper to make fins
- Optional: Cardboard tubes

Different ways of generating lift

An object will only fly if there is an upward force pushing on it. This upward force is called **lift**.

Examples	Mode of action	Principle of flight
<ul style="list-style-type: none"> • Hot air balloons • Helium balloons • Blimps • “Airships” 	The balloon is lighter than air.	Buoyancy. The balloon is lighter than air and floats upwards
<ul style="list-style-type: none"> • Aeroplanes • Birds • Insects 	Wings / air foils.	Air moving faster over top surface than under bottom surface creates lower pressure above top surface.
<ul style="list-style-type: none"> • Backspinning balls • Cup gliders 	Magnus effect. “Back-spin” drags air around ball or glider and deflects air downwards.	Action-reaction forces push the air flow downwards and pushes the flying object upwards.
<ul style="list-style-type: none"> • Rockets 	Exhaust gases rush downwards.	
<ul style="list-style-type: none"> • Kites 	Kite deflects wind downwards.	
<ul style="list-style-type: none"> • Helicopters 	Helicopter blades are a combination of air foils (see above) and a big fan that pushes air downwards.	
<ul style="list-style-type: none"> • Bullets • Darts • Arrows 	Projectiles.	Not true flight as there is no lift. The fast horizontal movement gives the illusion of flying.

Launching the flying cups



How does it work?

The coffee cup glider is launched with backspin. This drags the air around the glider and deflects air downwards. An action-reaction force pushes glider upwards, which is lift.

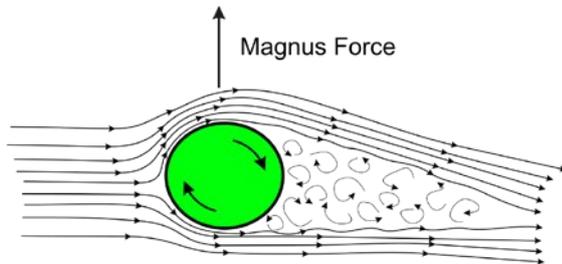


Image from commons.wikimedia.org/wiki/File:Sketch_of_Magnus_effect_with_streamlines_and_turbulent_wake.svg. This image is used and distributed under the Creative Commons Attribution-Share Alike 3.0 Unported license.

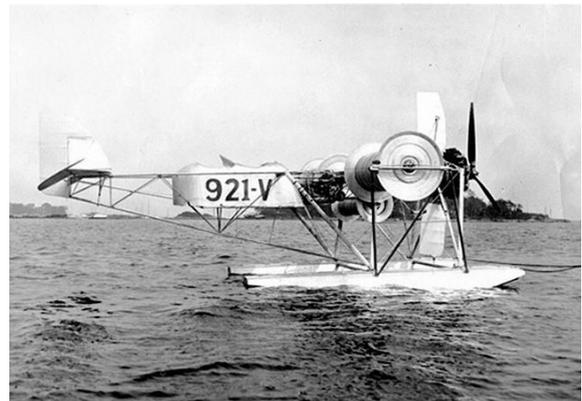


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The Plymouth A-A-2004 was a flying cylinder aircraft. If the cylinder stopped spinning, there would be no lift and the aircraft would crash.

Information sources

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