

STEM from Home

Things That Fly

Isn't it absolutely fascinating to watch a massive aeroplane smoothly take off into the sky, a glider flying effortlessly, or a helicopter lifting off from a helipad?

So how do these things fly? Let's explore the concept of aerodynamics to understand this better. Aerodynamics is the way air moves around things. Anything that moves through air reacts to aerodynamics. A rocket blasting off the launch pad and a kite in the sky both react to aerodynamics.

In this STEM Pack we will explore an important aspect of aerodynamics: The Four Forces of Flight which help planes, rockets etc fly:

Drag: The air resistance that tends to slow the forward movement of an airplane.

Gravity/Weight: The force that pulls all objects towards the earth. To fly, an aircraft needs something to push it in the opposite direction from gravity. The weight of an object controls how strong the push has to be. A kite needs a lot less upward push than a jumbo jet does.

Lift: The upward force that is created by the movement of air above and below a wing. Air flows faster above the wing and slower below the wing, creating a difference in pressure that tends to keep an airplane flying.

Thrust: The force or push that moves a plane forward through the air. Thrust is created by a propeller or a jet engine

In this STEM Pack you will create a 3D design of a rocket using Blender software; test out the Four Forces of Flight through a fun paper plane activity and finally design a helicopter to demonstrate the principles of Drag, Gravity, Lift and Thrust.

Main Activity: Things That Fly - Rockets!

Introduction

Create a model of a rocket using Blender.

Getting Started

[Click on this link to access the online resource](#) and begin your project.

What You Will Learn

Using Blender to create 3D Design

What You Will Need

Hardware

- A desktop or laptop computer capable of running the Blender software
- An internet connection

Software

[Blender](#) (v2.8 or newer)



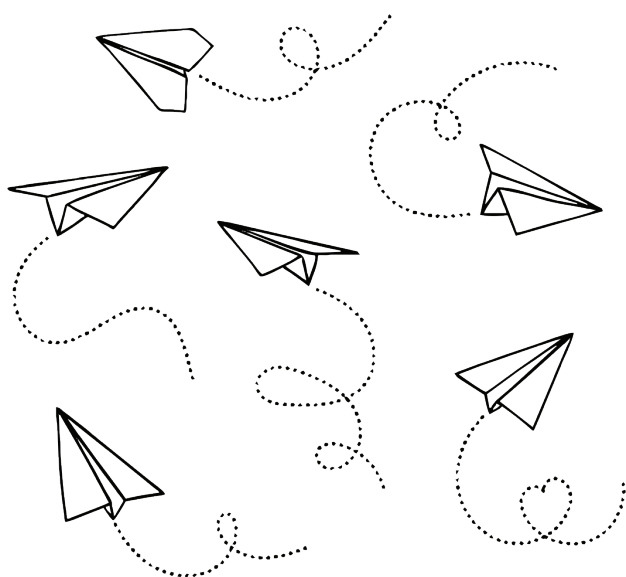
Bonus Activities

Activity 1: Fly!

Introduction

We have all made paper planes though not always successfully! Some float and fly easily, while others refuse to take off any distance. The key to making your airplane fly is the right design and understanding the role of the Four Forces of Flight.

In this aerodynamics activity, you will change the basic design of a paper plane and see how this affects its flight. Specifically, you will increase how much drag the plane experiences and see if this changes how far the paper plane flies.



What You Will Learn

How the four forces of flight allow a plane to fly

What You Will Need

- Paper (3 sheets)
- Metric Ruler
- Masking tape (1 roll). Alternatively, if you are testing this project outdoors, you can use any object as a marker.
- Tape measure
- Scissors
- Observation Sheet

Getting Started

[Access the activity guidelines here.](#)

Challenge Activity: Safe Landings!

A parachute is an umbrella-shaped device of light fabric. When released from a height, due to the resistance of air, a drag force acts on the parachute to slow down its motion. Without air resistance, or drag, the parachute would continue to increase speed until it hits the ground.

The larger the object, the greater its air resistance. Parachutes use a large canopy to increase air resistance. This gives a slow fall and a soft landing.

Imagine you are 10,000 feet above the ground, and you are strapping up for your first sky dive.

Your parachute will be your ticket to a safe landing.

Parachutes demonstrate the concepts of Drag, Thrust Weight and Lift well.

Check Out the Following Links as Pre-Work Reading:

A history of parachutes, plus good pictures: <http://www.parachutehistory.com/>

Explanation of free fall and air resistance with diagrams (Newton's second law): <http://www.physicsclassroom.com/class/newtlaws/Lesson-3/Free-Fall-and-Air-Resistance>

Explanation of forces on a falling object with air resistance: <https://www.grc.nasa.gov/WWW/K-12/airplane/falling.html>



Your Challenge

You have to transport some important fragile material safely. Your challenge is to design a parachute which will demonstrate the concept of Drag.

Your parachute should also be able to carry a small amount of weight (1 raw egg) and land safely without damaging the fragile material.

Create multiple options and test your parachute designs to see which material, size allows you to safely carry and land the material.

Upload a video of the successful landing plus photographs of your final parachute design by uploading a presentation. Your final submission can be presented digitally using Docs or Presentation software.