

# Design Challenge: Zip Line Planes


Brought to you by the Kohl's Design It! Lab



## Introduction

A zip line is a cable that starts at a high point and ends at a low point. Design and build a plane, then send it zipping across the room!

## Materials

- Recycled Materials for building the plane
-  We recommend materials like cardboard and paper towel rolls for the plane
- Thin tube or small hook, such as:
  - A straw, paper clip, or small roll of paper
  - This will attach the top of your plane to the zip line with a string
- 4 feet of string (or more)
- Scissors
- Tape or glue
- Markers

## Before You Start

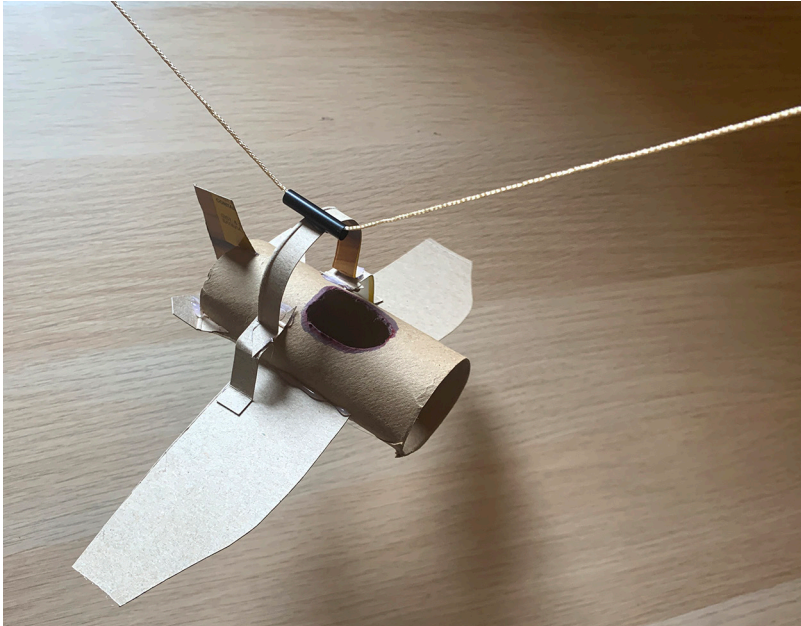
- 1 Draw the design of your glider/plane. Think about:
  - What size glider or airplane will you create?
  - How will you design the wings, tail, and body of the plane?
    - The shape of the wing can change how the plane cuts through the air.
  - How will your plane glide down the zip line?

- 2 Identify where you can set up a zip line. This will need at least 4 feet of string between two objects. Be sure that the line is about two feet higher on one end than the other.
  - a. For example, tying a string to the back of a chair down to a shoe on the ground would work.

## Directions

- 1 Build the glider/plane.
  - a. Start by building the body of your plane. Use a durable material to make the base of the plane.
  - b. Create the wings. Wings generate lift to hold the plane in the air.
  - c. Build a tail. The tail is located at the back of the plane and helps the plane turn and fly stable.
- 2 Add a thin tube or hook to the top of the plane.
  - a. Think about the balance of the plane as you attach this piece. Your plane will need to hang from this piece on the zip line. What will happen to the balance of the plane if this piece is more toward the front or back?
- 3 Pull the string through the thin tube or hook at the top of the plane. Then, set up the zipline in the location you identified.
  - a. Run at least 4 feet of string between two objects. Be sure that the line is about two feet higher on one end than the other.
- 4 To test the glider, pull the plane up to the higher end of the zipline. Let it go and watch it fly!

## Design Challenge: Zip Line Planes Continued



### What's Happening?

Many factors can impact the speed of the glider in this activity. The **slope**, or angle formed by how close together the start and end points are, affects the speed of the object. The higher the slope, the faster the glider will fly. The lower the slope, the slower it will move.

The **friction** between the plane and the string may also impact the speed. Friction is the resistance, or difficulty, an object has when trying to move over another. Smoother surfaces may have less friction. In this experiment, using a smooth string or fishing line may help the glider move faster.

How easily air can move over an object is called its **aerodynamics**. The shape, texture, and design of both the body of your plane and its wings can affect its aerodynamics. The force of air against an object is called **drag**. Airplane designers place models of a design into wind tunnels to measure and observe how air moves over their design. Planes that have a low drag are more aerodynamic.

### Take it Further

- Friction between the hook or tube and the string slows the plane down. How can you reduce friction on the zip line?
- Try adding weight to different areas of your plane. What happens? Change the design of your plane if you need to.

Submit photos of your Zip Line to  
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for a chance to have your design  
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