

Fun with Building Paper Airplanes

PURPOSE:

1. To understand the forces acting on an airplane in the sky.
2. To look into how an airplane is designed to fly despite the forces acting against it.

OPENING LESSON

- Planes are awesome... and super heavy. Almost 90,000 pounds, to be exact! How does it even manage to stay up in the air?
- Weight isn't the only force acting on a plane while it's up in the air — there are 4 of them:
 - a. Weight
 - b. Drag
 - c. Lift
 - d. Thrust
- The weight of the plane, caused by gravity, pulls the plane toward the earth, while drag, caused by head-on wind, slows the plane down. **These are the forces that planes have to overcome in order to get up in the air.**



- Engineers must design planes so that the drag force is really small (in other words, so that the plane is *arrow dynamic*) and the lift force — an upward force that “fights” against gravity — is really big.
- Even though planes ultimately need thrust — or the propulsion force supplied by a motor — to stay up indefinitely, lift alone can keep a body gliding through the air for a good chunk of time. Think of a hang glider!
- In today's lesson, we'll be making planes to see lift forces in action and learn how much of a difference the design of an airplane can make!

MATERIALS

- Printer paper
- Index Cards
- Scissors
- Tape
- Straws

PROCEDURE

1. Down below there are instructions to make four different types of airplanes.
2. Show how to make each type.
3. Test throw each one to see which travels the farthest.

CLOSING LESSON: Ask the kids and discuss some of the questions below...

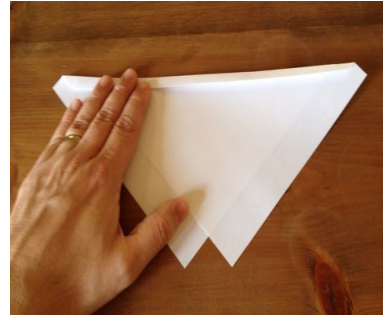
1. Which design worked the best?
2. Why do you think some designs worked better than others?
3. What were important factors when building the planes?
4. What were important factors when launching the planes?

DESIGN 1 (Materials: Printer Paper, Tape)

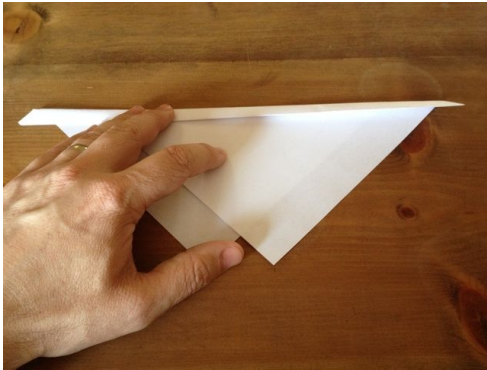
1. Fold the top right corner of the paper toward the bottom left corner. Create a 45 degree angle and make sure to allow the tail to be offset by about 1 inch.



2. Fold the folded edge of the paper over again about 3/8".



3. Fold it over 2 more times.



4. Bring the two ends together to make a loop (tab into slot) and tape to hold them together



5. Grip the tail with 2 or 3 fingers. Use a similar motion that you'd use to throw darts. And then release by fully extending your arm. A *gentle* throw should be enough to get the plane sailing — think of a light “push” rather than an overhand throw.

DESIGN 2 (Materials: Index Cards, Straw, Scissors, Tape)

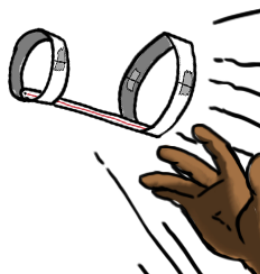
1. Cut the index card into three equal strips that measure 1 inch by 5 inches.
2. Take 2 of the strips of paper and tape them together into a hoop as shown. Be sure to overlap the pieces about half an inch so that they keep a nice round shape once taped.
3. Use the last strip of paper to make a smaller hoop, overlapping the edges a bit like before.



4. Tape the paper loops to the ends of the straw as shown below. (notice that the straw is lined up on the inside of the loops)



5. Hold the straw in the middle with the hoops on top and throw it in the air similar to how you might throw a dart angled slightly up. As with Design 1, a *gentle* throw should be enough to keep the plane up in the air.



DESIGN 3

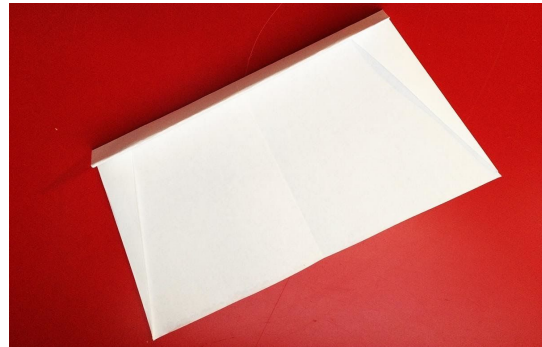
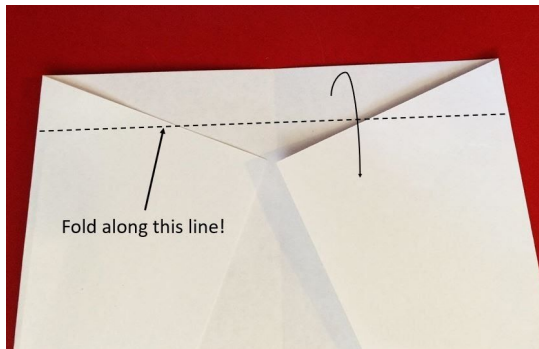
Step 1: Fold an 8x11 sheet of paper in half, “hot dog style.” Unfold the paper so that a crease runs down the middle of the sheet.



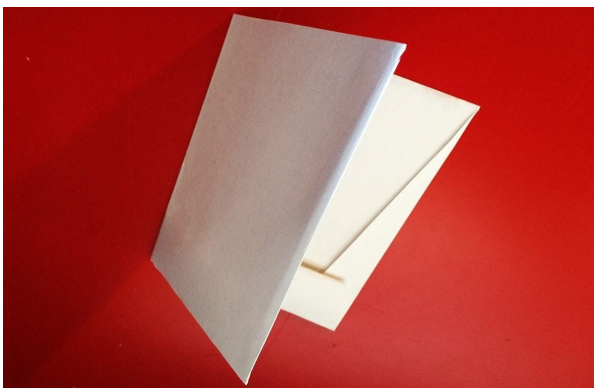
Step 2: Fold the two top corners of the sheet down toward the vertical crease, around an inch below the top edge of the sheet.



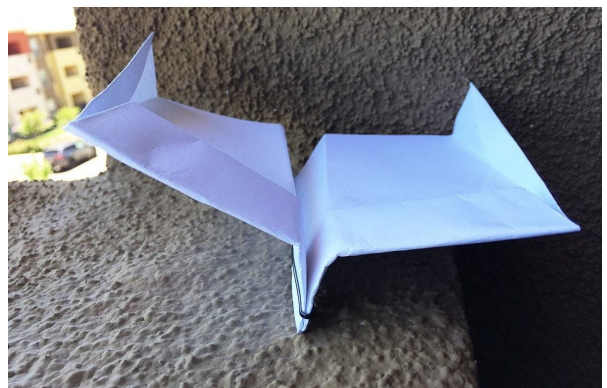
Step 3: Fold an inch-thick section at the top of the sheet across the dotted line (as labelled below). Repeat the fold about 8 times.



Step 4: Fold the sheet in half to make the two wings of the plane.

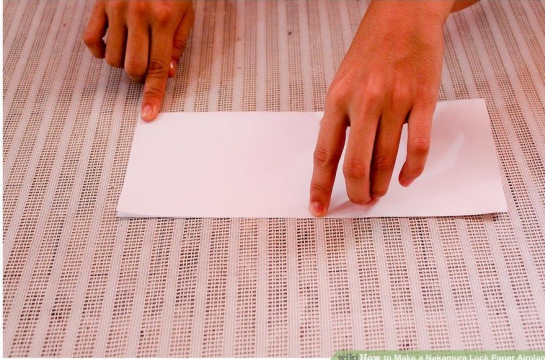


Step 5: Make a small “pinch” in the center of the sheet to make the nose of the plane.



DESIGN 4

Step 1: Fold a sheet of printer paper in half, “hot dog style.” Unfold the paper so that a crease runs down the middle of the sheet.



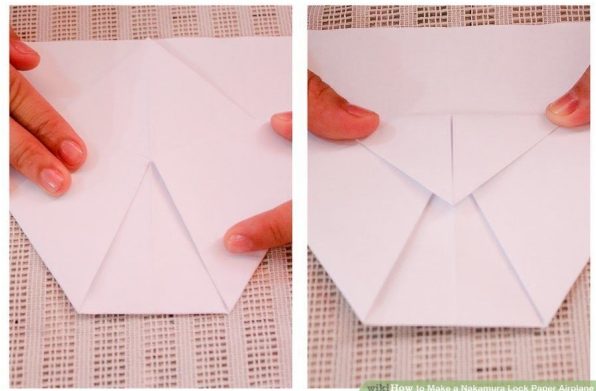
Step 2: Fold the top two corners in toward the center of the page and match the edges with the crease.



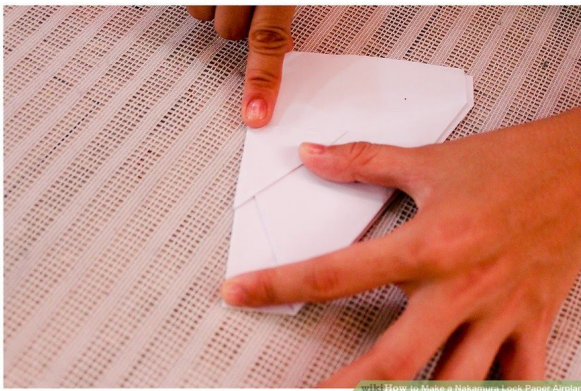
Step 3: Fold the top corner over so that it touches the bottom edge of the page.



Step 4: Fold the top corners toward a middle point in the sheet and fold the bottom of the triangle over the corners that you just folded.



Step 5: Fold the sheet in half to make the two wings of the plane.



Step 6: Fold the wings down, matching the top edges up with the bottom edge of the body.

