Make a Straw Plane

Activity Overview

In this activity, you will build an airplane that has ailerons, elevators and a rudder, which will help you better control your plane. You can then adjust these and see how the flight of your plane is changed based on these adjustments. If you need to learn more about ailerons, elevators and rudders, see the Background Information at the end of this activity.

Time: 45 minutes

Materials

- One straw (nonflexible straw—if needed, you can cut off the flexible end)
- One piece of cardstock or other thick paper (8.5" x 11")
- Four-six paperclips
- Clear tape
- Scissors

Steps

1. Measure, mark and cut two sections from your piece of paper.
   First, measure and cut a 10 inch x 5 inch (25.4 x 12.7 cm) piece of card stock (or other stiff paper) for your aileron, or wing. Second, measure and cut an 8 inch x 1.5 inch (20.3 x 3.8 cm) piece out of the cardstock for the tail assembly. See Figure 1.
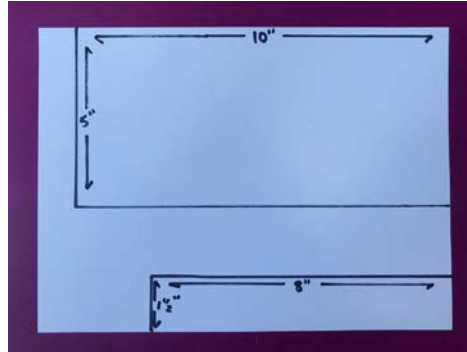

Figure 1. Mark the paper before cutting

2. Airfoil instructions: Fold the first section in half to make an airfoil, or wing, about 2.5 inches (6.4 cm) wide. Do not crease. See Figure 2.

3. Using 10 inches (25.4 cm) of clear tape, tape the two edges together to form an airfoil. (It will look like a raindrop when on its side.) You do not have to use one 10-inch long piece of tape; you can use several smaller pieces. You may have to work on this a little to get an airfoil that is not too fat but also not creased.
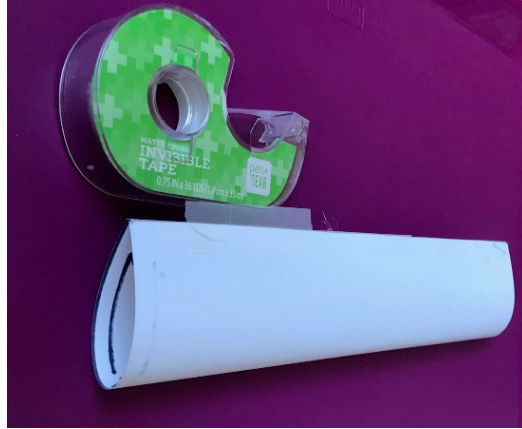
Figure 2. Airfoil shape

4. Make a 1/2-inch (1.3-cm) cut into the taped edge of the wing at about 2 inches (5 cm) in, on both ends, to form ailerons. See Figure 3.
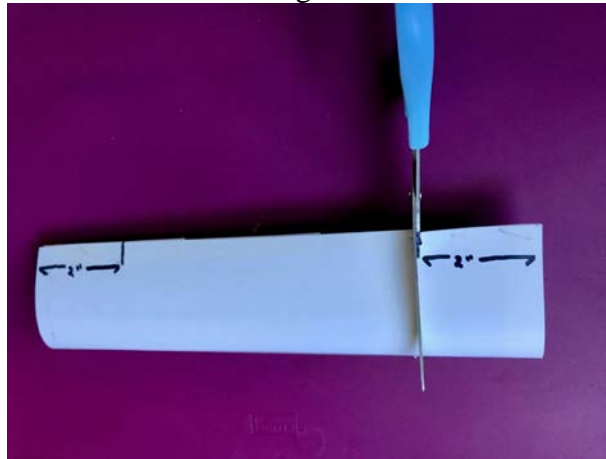

Figure 3. Make a ½-inch long cut about 2 inches from the end

5. While holding the top and bottom of the aileron together, tape both ends of each aileron shut. See Figure 4. Set the aileron aside for now.

Figure 4. Tape both ends of each aileron

6. Tail assembly: Take your second section of paper, and fold in the middle to make a tight crease. See Figure 5.
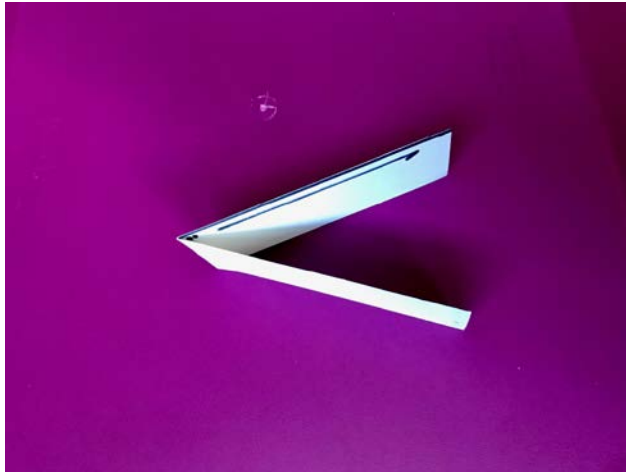
Figure 5. Fold in the middle

7. Open and then fold either side in half again so that both edges come up to the crease. See Figure 6.
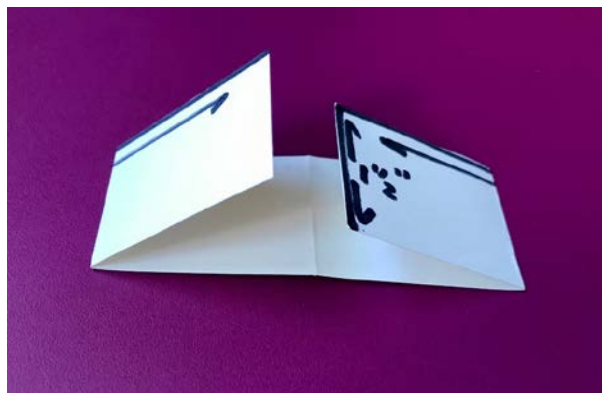
Figure 6. Fold both ends up to the middle

8. Tape the crease in place so that it sticks up. Let the two outer panels lay flat. See Figure 7.
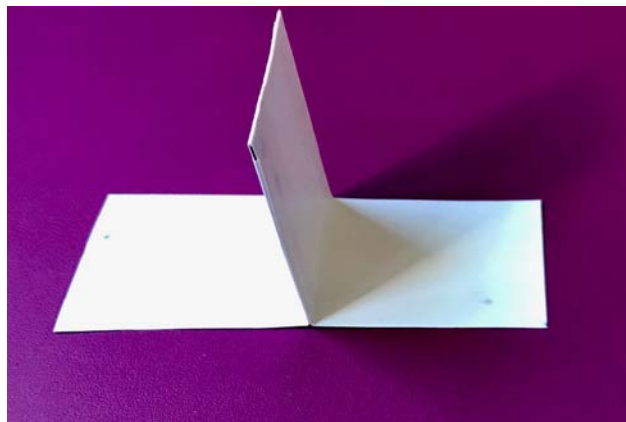
Figure 7. Tape the front and back of vertical stabilizer (the part that sticks up)

9. Cut 0.33 inch (0.8 cm) off the back of the two outer panels. The piece that is sticking out from the vertical stabilizer will be the rudder. See Figure 8.
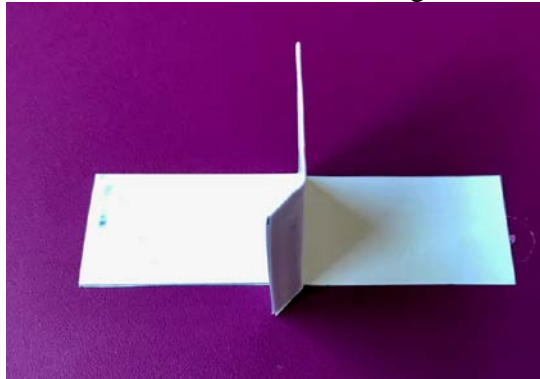

Figure 8. The rudder can bend from side to side

10. Make two 0.33 inch (0.8 cm) cuts into the horizontal stabilizer to form two elevators about 1.5 inches (3.8 cm) long from either end. See Figure 9.
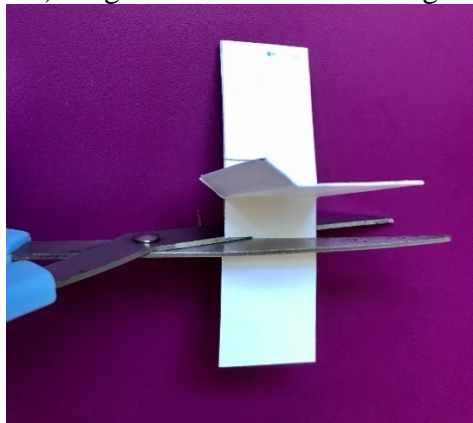

Figure 9. Make 0.33 inch long cuts about 1.5 inches in from each end

11. Wing and Tail Assembly Instructions: Measure the wing to find the center of the wingspan and mark it with a pencil.

12. Tape the straw to the center of the wing so that the leading edge of the wing is about 3.5-4 inches (8.9–10 cm) back from the front of the straw. If you are having difficulty, have someone hold the wing in place on the straw while you affix two or three strips of tape to hold the wing onto the straw firmly. See Figure 10.
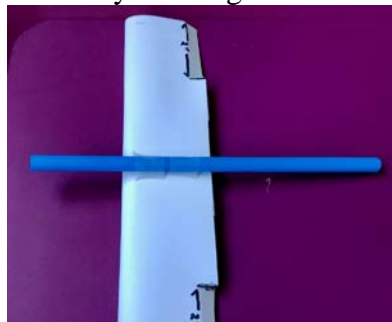

Figure 10. Tape the wing to the straw so the front of the wing is 3 inches back from the end of the straw

13. Firmly tape the tail assembly onto the end of the straw as shown in Figure 11.
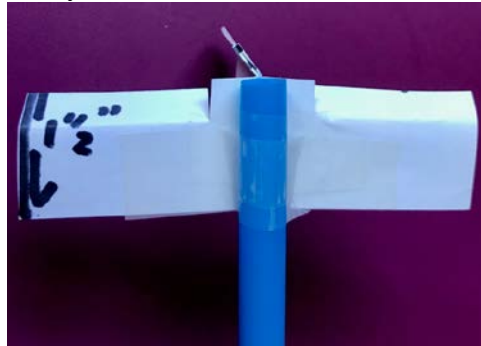

Figure 11. Tape the tail assembly to the back of the straw so the rudder sticks out

14. Weight the end of the nose (front end of the straw) with several paper clips. (Try different amounts to ensure a nose-forward flight. You may need to adjust this as needed.)
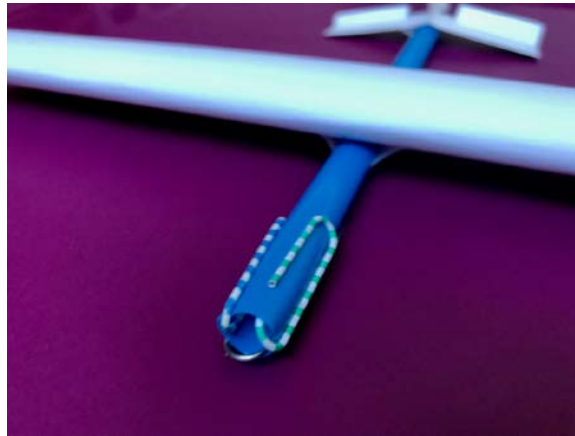

Figure 12. Attach paperclips to the front end of the straw

15. Crease and bend the ailerons, elevators and rudder to see how they affect your plane's flight.
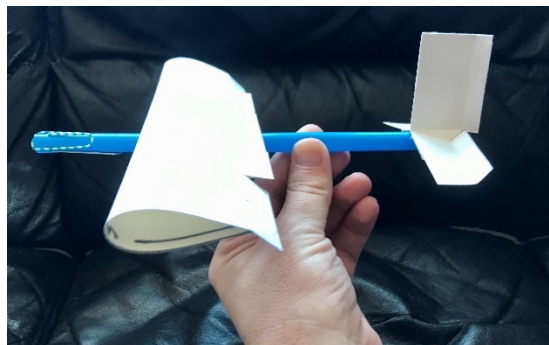

Figure 13. Finished plane

You Might Want to Try:

- Try to make your aircraft fly as straight as possible.
- Can you make the aircraft bank (turn) to the left? To the right?

- Can you make the aircraft do a loop?
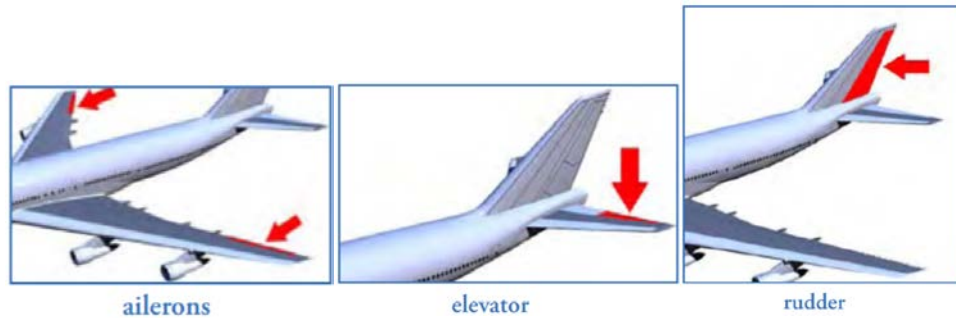
Background Information

Figure 14. Some of the parts of a plane.

Aileron The ailerons are located at the rear of the wing, typically one on each side. They work opposite to each other, meaning that when one is raised, the other is lowered. Their job is to increase the lift on one wing while reducing the lift on the other. By doing this, they roll the aircraft sideways, causing the aircraft to turn. This is the primary method of steering a fixed-wing aircraft.

Elevators As the name implies, the elevator helps elevate the aircraft. It is located on the tail of the aircraft and directs the nose of the aircraft either upwards or downwards (pitch) in order to make the airplane climb and descend.

Rudder The rudder is attached to the vertical stabilizer, located on the tail of the aircraft. It helps to steer the nose of the aircraft left and right; this motion is called yaw. It is not, however, the primary method of steering. Its main purpose is to counteract certain types of drag, or friction, ensuring that the aircraft's tail follows the nose rather than sliding out to the side.