

## How a Plane is Controlled – Extension Activity

Cars go only left or right, but planes must be steered up or down as well. A plane has parts on its wings and tail called **control surfaces**. These can be demonstrated by using folded paper gliders and balsa gliders. Begin with an experiment to illustrate how a plane is controlled.

### Equipment

- Folded paper glider (use a 9" x 6" piece of paper)
- Paper clip

Follow the steps below to construct this basic paper airplane. The paper clip can be placed on the body of the airplane in order to give it extra weight. Experiment with the glider, moving the clip up or back as needed to obtain proper balance.

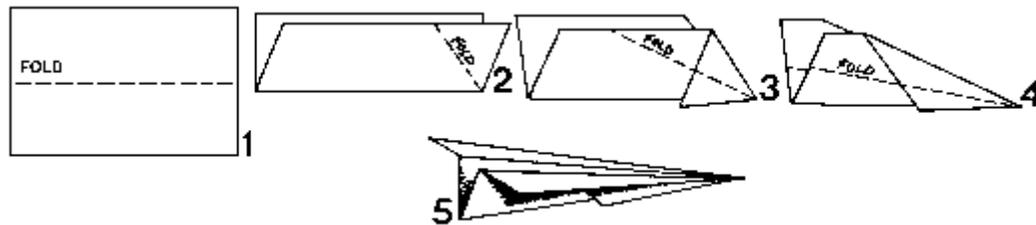


Figure 1. Steps for making a paper airplane.  
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Experiment further by changing the size of the wings. This can be done by changing how far the fold in step 4 is brought down.

### Control Surfaces

Real planes have segments called *ailerons* inserted in the wings and segments called *rudders* and *elevators* inserted respectively in the *vertical fin* and *horizontal stabilizer* (see Figure 2). The pilot controls their position from the airplane cockpit. When the pilot moves them into the air stream, they cause the plane to react to air pressure. The pilot uses them to go right or left and also up and down.

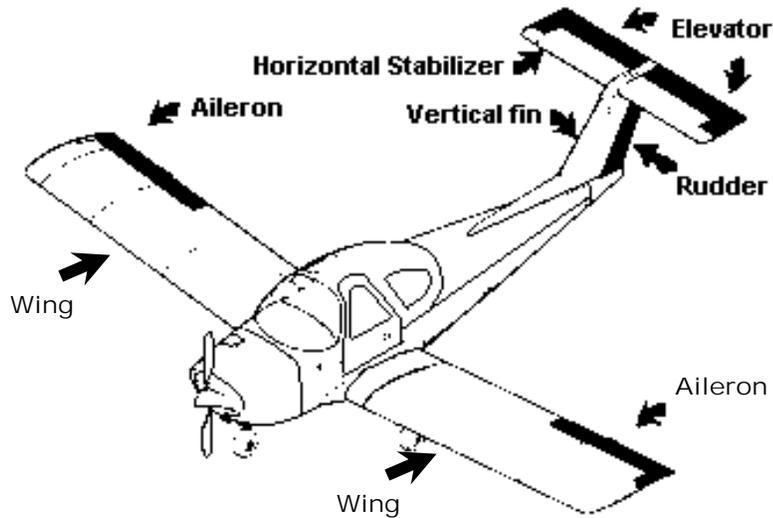


Figure 2. The control surfaces of an airplane  
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### Up and down

Fold the back edges of the paper glider up, as in Figure 3. When you throw the glider, the tail should go down and the nose should point up. It may take some practice to get the controls set so the glider does what you want it to do.

To make the plane climb, the pilot moves the controls so that the elevators tilt up in the same way that you folded the back edges of the glider. The air hitting the elevators pushes the tail of the plane down, tilting the nose upward, so that the plane can climb.

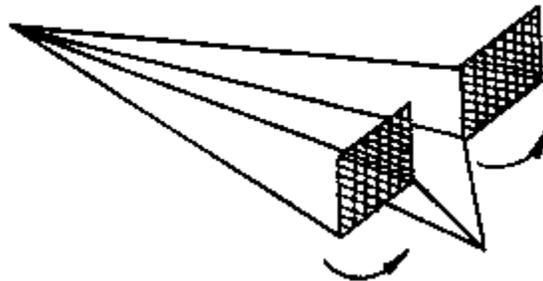


Figure 3. Folding the back edges of the airplane up should make the plane climb.  
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Fold the back edges of the glider down (see Figure 4). When you throw the glider, the tail should go up and the nose should go down. This same thing happens when the pilot tilts the elevators downward.

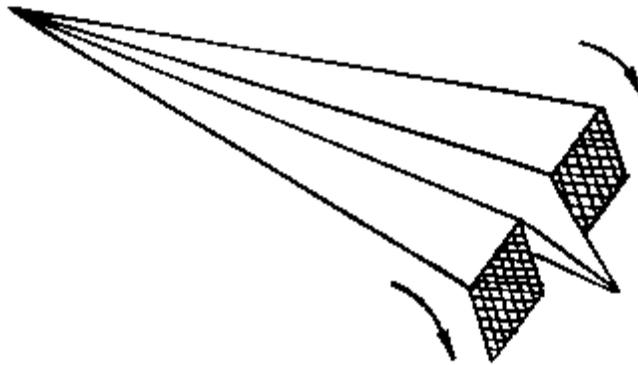


Figure 4. Folding the back edges down should make the plane's nose tilt down and tail to go up.

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### Right and left

Turn the vertical fin on the glider a little to the right; the glider will fly toward the right. The pilot moves the rudder to the right for a right turn, but must also bank (lean) the plane for the turn, the same as you would do if you were turning on a bicycle. (You would lean to the right for a right turn.) The pilot tilts the plane to one side by using the ailerons. This is done by tilting one up and the other one down.

To tilt the plane to the left, the pilot tilts the right aileron down so the right wing is pushed up. The left aileron is tilted up so the left wing will be pushed down. You can do the same thing with a paper glider (see Figure 5).

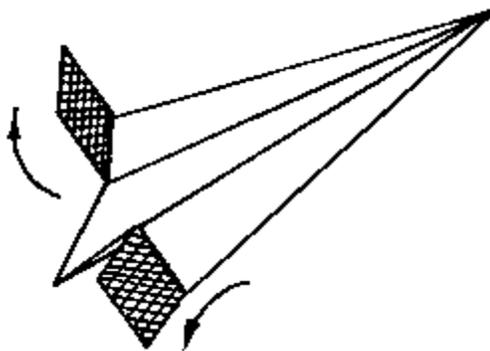


Figure 5. Folding one back edge of the plane up and the other down will cause the plane to turn in the direction of the edge that is turned up.

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For a left turn, the pilot reverses the process described above.