

A STEM in the Park Take Home Activity

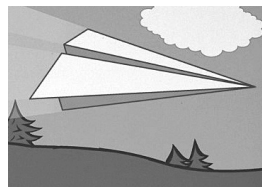
STEM in the PARK

Science, Technology, Engineering, and Mathematics

The Science of the Paper Airplane

What You Need

- Stack of copy paper – this is for our basic airplane, and we will go through lots of it
- Construction paper – this is for one of the variables, so we will only need ~15 sheets
- Heavier paper – this is also for one of the variables, so again need ~15 sheets
- Paper Clips
- Tape Measure



What To Do

1. Fold an 8 1/2 X 11 sheet of paper down the middle of the 11" dimension.
2. Next fold the upper two corners in at a 45 degree angle. Be careful here to line these up, and do not let the flaps cross the middle of the paper. Use the middle fold as a guide.
3. Fold each side, again using the middle as a guide. The two sides should be even.
4. Fold in half along the fold that you made in step 1. Now fold the wing down to the bottom of the plane. (Note. The nose of the plane should NOT be folded down as in the picture for the control airplane.)

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Learn...

How does plane weight affect flight? In every object there is a center of gravity – a neutral point where all of the mass is balanced. If an airplane has a center of gravity ahead of the neutral point, then this plane is stable. If this center of gravity is behind the neutral point then it becomes unstable causing nose-dives and spins.

What really is stability? A stable airplane tends to oscillate up and down a few times, but converge on a steady flight. A plane that is unstable will either pitch up into a stall, or nose-dive, but won't settle out anywhere in-between. As a plane becomes more and more stable, it wants to fly faster and faster. The classic designs rely on the small inherent "up elevator" effect (positive zero lift pitching moment) resulting from the swept wing, and possibly the airfoil shape.

Does material matter? The low strength of paper does not allow the use of high aspect ratio wings. With a thicker material or paper, it is easier to make planes with high aspect ratio wings which makes them better flyers.

Investigate...

- To vary the weight of your airplane, fold the nose over varying lengths to make a shorter body after step 3. Stability = does it wobble, nose dive, do loopy-loops?
- To vary the stability of your plane, create winglets by folding the ends of the wings up or down after step 3.

	Length of Flight	Stability
Control Plane		
Size of Fold 1 =		
Size of Fold 2 =		

- Vary the material that your plane is made out of.

	Length of Flight	Stability
Control Plane		
Size of Fold 1 =		
Size of Fold 2 =		

- Add paper clips to different areas of the plane to experiment with weight distribution.

	Length of Flight	Stability
Control Plane		
Location of paper clip 1 =		
Location of paper clip 2 =		

This activity comes from the Wood County Historical Center and Museum.



Visit their website at www.woodcountyhistory.org