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STEAM STOP: FLIGHT PLANES & COPTERS

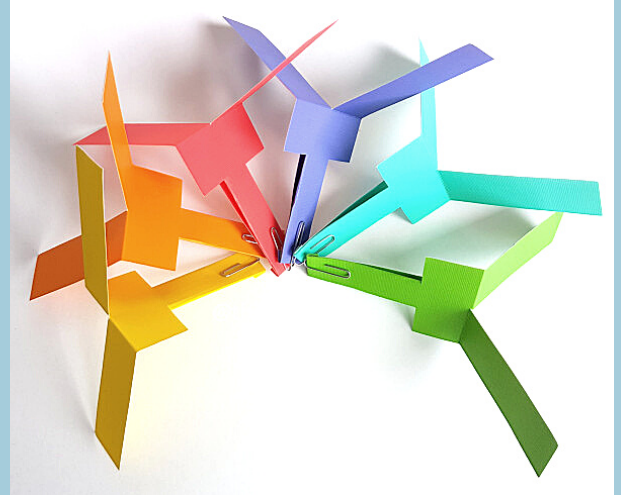
HELICOPTER

SUPPLIES

- 1 piece of paper or cardstock
- 1 paperclip
- Scissors

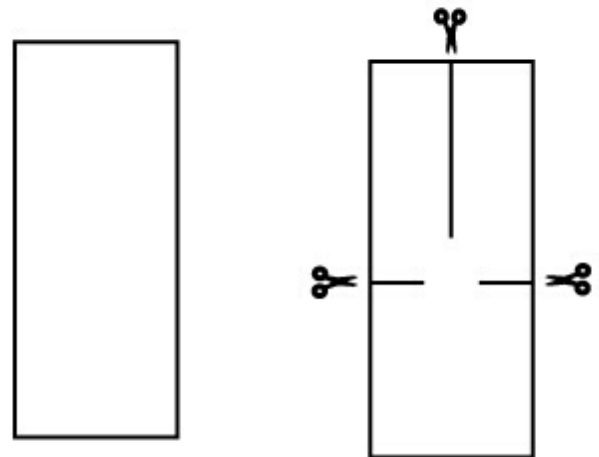
OPTIONAL

- crayons, markers, Washi tape for decorating

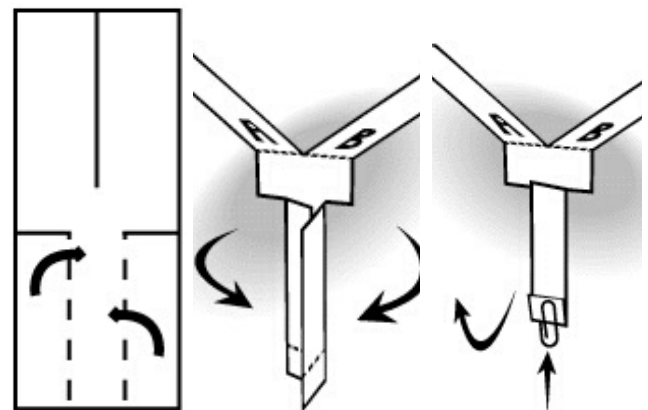


STEP 1: cut out a rectangle

STEP 2: cut the paper in half lengthwise, stopping about halfway across the paper. Then, make a perpendicular cut about 1/3 of the way through the paper approximately an inch above where the lengthwise cut ends. Repeat on the other side of the paper, making a symmetrical cut.



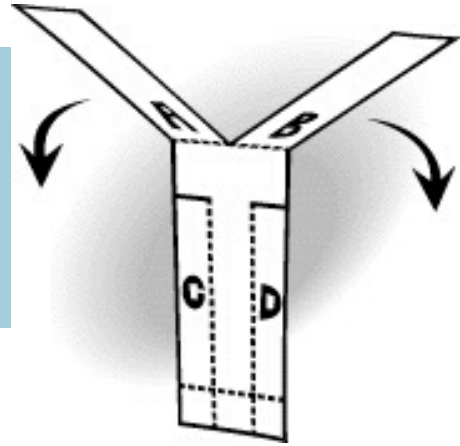
STEP 3: lay the paper so that the uncut end is facing toward you, then fold one of the flaps made by the short cuts over (inward). Repeat with the flap on the other side, folding this flap over the previous one. Fold the resulting piece up approximately 1/3 of the way. Paperclip it closed.



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HELICOPTER (CONTINUED)

Step 4: fold the two long pieces at the top in opposite directions at 90 degree angles to the body of the helicopter (the paperclipped piece).



Give it a try! Hold onto the paperclipped piece and throw the helicopter like you would throw a paper airplane, aiming upward. You can also simply drop the helicopter from a tall height.

ROTATION: WHY DOES IT SPIN?

When the helicopter falls, air pushes up against the blades, bending them up just a little. When air pushes upward on the slanted blade, some of that thrust becomes a sideways, or horizontal, push. The two blades each get the same push in opposite directions. These two opposing forces work together to cause the spin.



EXPERIMENT & OBSERVE

Does changing the size of the helicopter affect how it flies? What happens if you only make the blades longer or shorter?

Which way does the helicopter spin (clockwise or counterclockwise)?
Can you change the helicopter to make it spin in the opposite direction?

References

Exploratorium. (1997). *Roto-copter*. Retrieved May 23, 2020 from https://www.exploratorium.edu/science_explorer/roto-copter.html

Kelley, Vale Farrar. (2005). *BD's paper helicopter*. Retrieved May 23, 2020 from <http://browndog.com/helicop.html>

Thislittlegoose. (1997, August 28). *Paper Helicopters*. This Little Goose. Retrieved May 23, 2020 from <https://thislittlegoose.wordpress.com/2017/08/28/paper-helicopters/>



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STEAM STOP: FLIGHT PLANES & COPTERS

HOOP GLIDER

SUPPLIES

- 1 straight straw, plastic or paper
- 3X5 index card or other stiff paper
- Tape
- Scissors



STEP 1: cut the index card or paper into three 5" x 1" strips.

STEP 2: tape two of the strips together at the ends. You now have one 5-inch strip and one 10 inch strip.

STEP 3: create a circle by taping the ends of the 10 inch strip together, overlapping the ends about 1/2 inch. Repeat this step, taping the ends of the 5 inch strip together to create a smaller circle.

STEP 4: use a piece of tape to secure the end of the straw inside the large circle. Repeat the step with the small circle, securing it to the opposite end of the straw so that the circles are parallel.

Try it out! Hold the straw and throw it like you would a paper airplane.

EXPERIMENT & OBSERVE

Does the placement of the circles on the body (straw) affect flight?

What happens if you add another circle?

Do the circles have to be lined up in order for the plane to fly well?

How does the length of the body (straw) affect flight?



References

Science Bob. (n.d.). The incredible hoop glider. Retrieved May 23, 2020 from <https://sciencebob.com/the-incredible-hoop-glider/>

Stoegbauer, Kim. (n.d.). How to make straw and paper airplanes. DIY Network. Retrieved May 23, 2020 from <https://www.diynetwork.com/how-to/make-and-decorate/crafts/how-to-make-straw-and-paper-airplanes>

STEAM STOP: FLIGHT PLANES & COPTERS

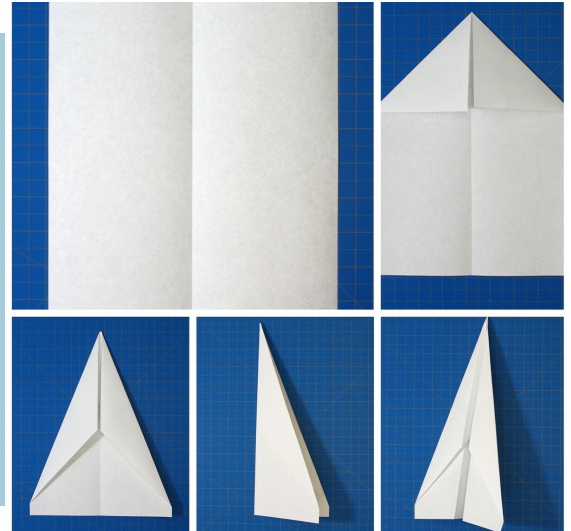
THE DART

SUPPLIES

- 1 piece of paper (8 1/2 x 11 inches)

OPTIONAL SUPPLIES

- crayons, markers, pens or pencils for decorating the plane



STEP 1: fold the piece of paper in half lengthwise.

STEP 2: open paper back up and fold the top corners in to the crease, turning the top of the paper into a triangle.

STEP 3: fold the corners at the bottom of the triangle in to the crease.

STEP 4: fold the paper in half lengthwise, so that the folded parts are on the inside. Your plane now has a nose and a body.

STEP 5: lay the plane in front of you, horizontally, so the nose is pointing to the left or to the right. Fold the top edge of the paper down to the bottom of the plane to make a wing. Repeat with the other side.

Try it out! How well does it fly?



How would changing the size of the wings affect flight? Wider wings?
Narrower wings?

Next: have some fun using flaps and folds to control your flight pattern.

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THE DART (CONTINUED)

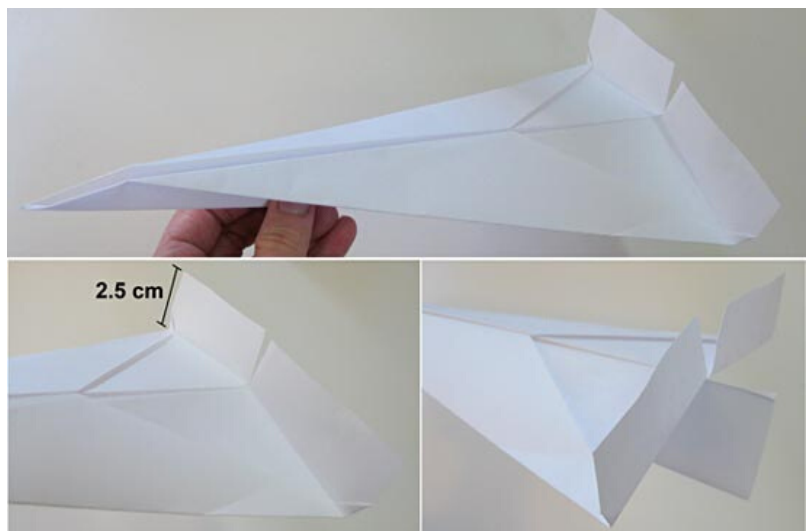
STEP 6: Go to a large open area and make a line on the ground 12 inches long (make the line using a ruler, rocks, sticks, etc). This will be the starting line.

STEP 7: Place your toe on the line and throw the plane. How far does it fly? Throw the plane four more times. Every time you throw it, check to make sure it is still in good condition (that the folds and points are still sharp). When you throw the plane, place your toe on the line and try to throw the same way you did before, including holding it in the same spot.



Did it go about the same distance each time? Why or why not?

STEP 8: Once you have a good idea of about how far your plane typically flies, change the plane to increase how much drag it experiences. To do this, cut slits that are about 2.5 cm (or 1 inch) long right where either wing meets the middle ridge. Fold up the cut section on both wings so that each now has a 2.5 cm-wide section at the end of the wing that is folded up, at about a 90 degree angle from the rest of the wing.



How did adding flaps change the way the plane flies? Why do you think this is?

Did adding flaps create more or less drag?

References

Basic dart. (n.d.). Fold 'n fly. Retrieved May 23, 2020 from <https://www.foldnfly.com/1.html>

Rowland, Teisha. (n.d.). *Paper airplanes why flaps and folds matter.* Science Buddies. Retrieved May 23, 2020 from <https://www.sciencebuddies.org/stem-activities/paper-airplanes-aerodynamics#summary>