Fabulous Foam Flyer F-3

Day 2: Aerodynamics

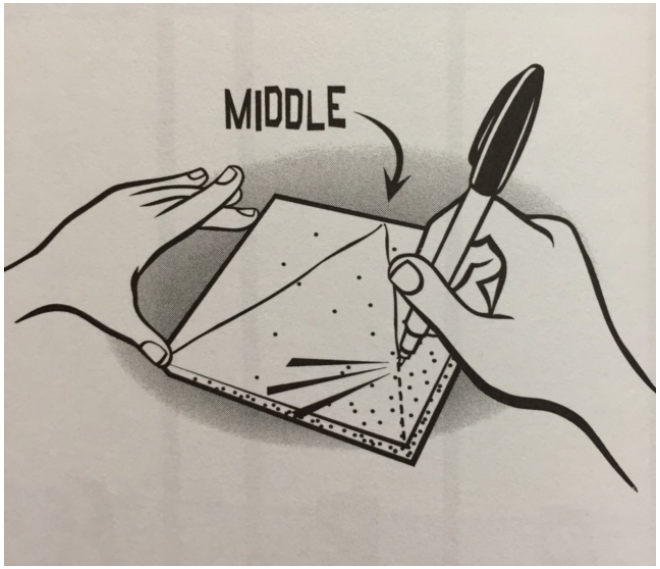
What Do I Need?

- Styrofoam trays from your supermarket (at least one per student plus extras for additional trials)
- Marker
- Ruler
- Scissors
- Clear tape
- Paper clips

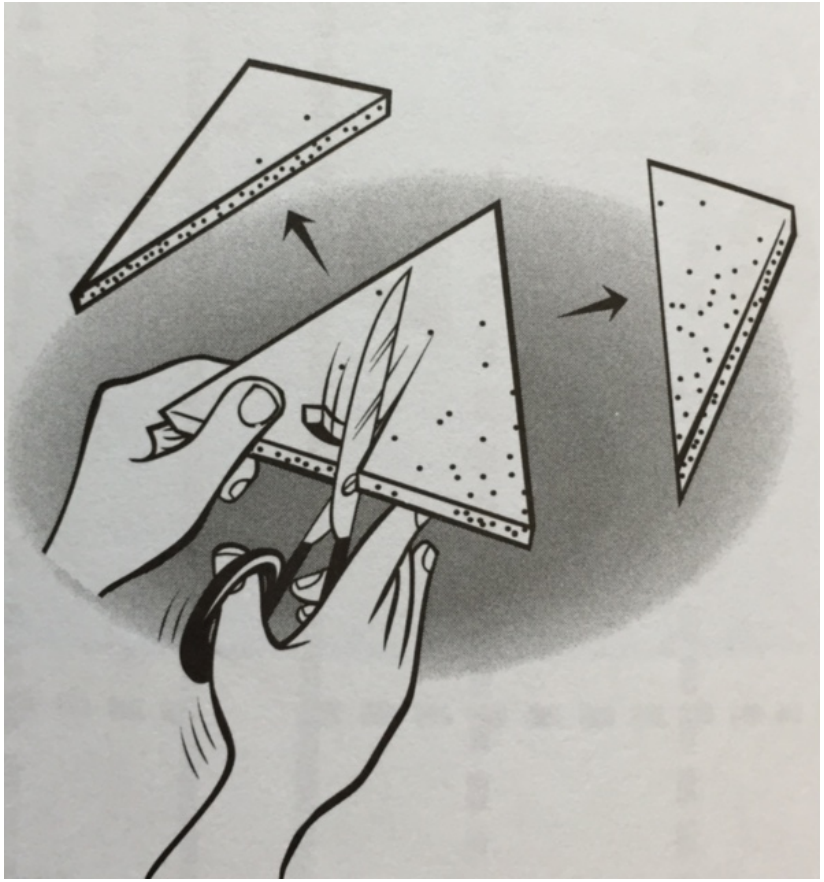
Instructions:

1. On the flat part of the tray, measure and draw a 4 or 5 inch square. Cut out the square.

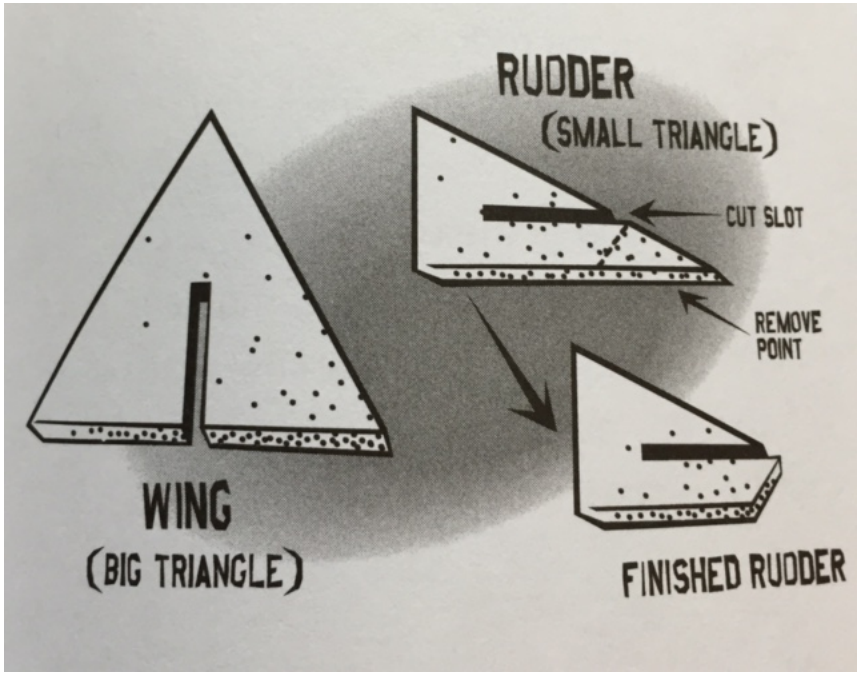
2. Measure to the middle of one side of the square and make a dot there. Draw lines from the dot to each of the opposite corners to make a triangle. Cut along the lines you drew. You'll have one big triangle and two little ones.

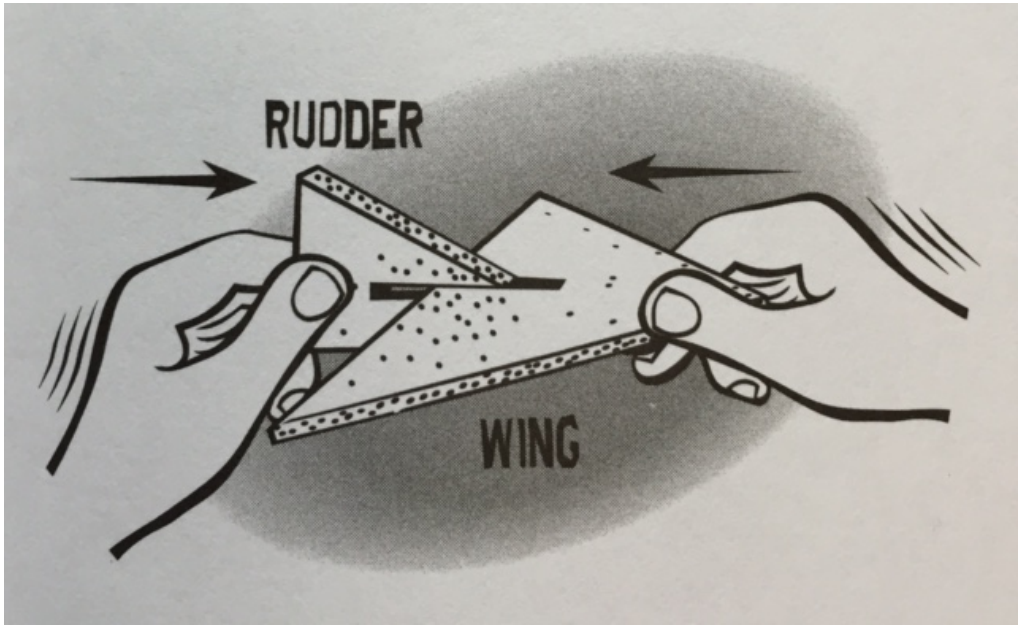


3. The big triangle is the wing. Measure to the middle of the bottom of the wing and make a dot. Cut a slot from this dot to the center of the wing and pop the little strip of the foam out. How big is your piece of foam? That's how wide the slot should be.



4. One of the little triangles is the rudder. Cut a slot in it that's the same size as the slot in the big triangle. Cut off the pointy end so that it looks like the picture. (Keep the other little triangle as a spare.)

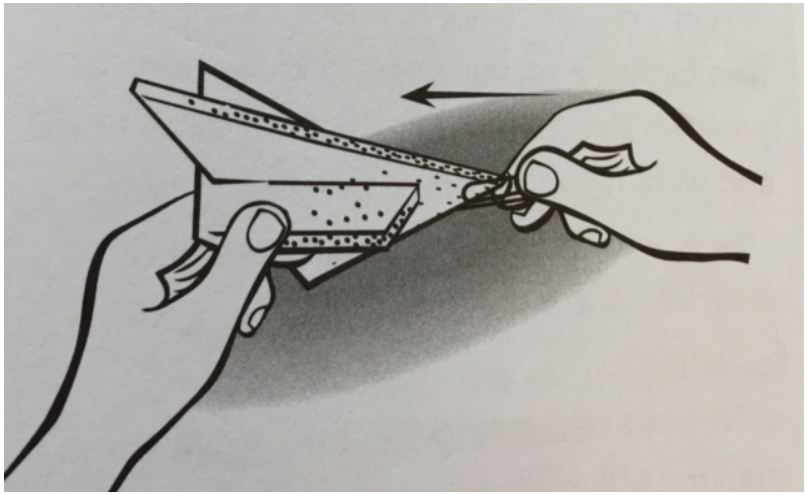




5. Push the rudder onto the wing so the 2 slots fit together. If it feels loose, you can tape the rudder to the wing. The rudder will stick out a little from the back of the wing.

6. Now you can see if it flies. Hold the F-3 by the bottom part of the rudder and throw it forward.

7. If your F-3 just wobbles and falls to the floor, it needs more weight in its nose. (The nose is the front point of the wing.) Push a paper clip onto the nose. Now how does your F-3 fly?



Experiment! Make a F-3 from a tray that has bumps on one side and another F-3 from a tray that has smooth sides. Test each F-3 to discover which one flies better!

Can you Make Your F-3 Fly Better?

Here are some things to try:

- Put more weight (paperclips, pennies, etc.) on the nose.
- Put weight on the back or sides of the wing, or on the rudder.
- Make little rudders from the leftover foam and put them on either side of the big rudder.
- Make a F-3 that's bigger or smaller---Just be sure you start with a square.

Why does the F-3 fly?

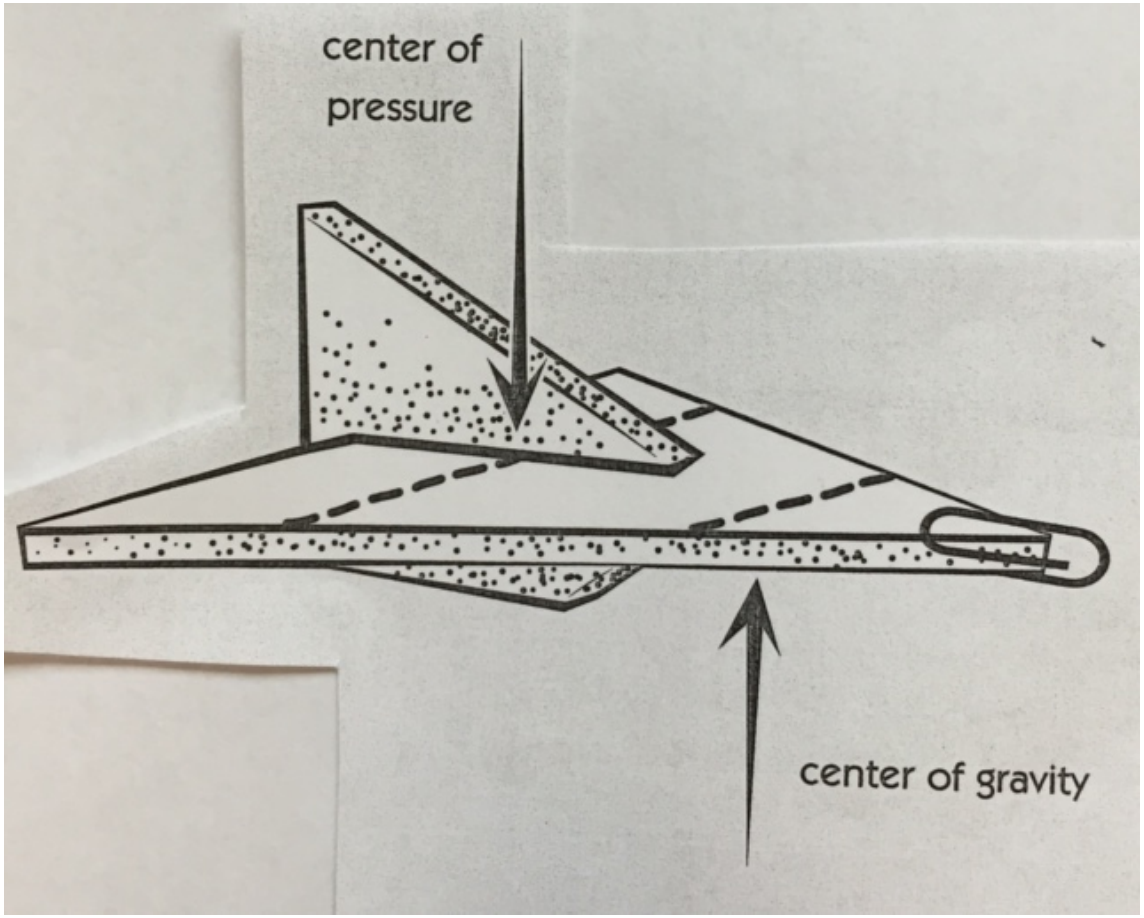
Gravity is pulling the plane down, but at the same time, air helps hold the plane up.

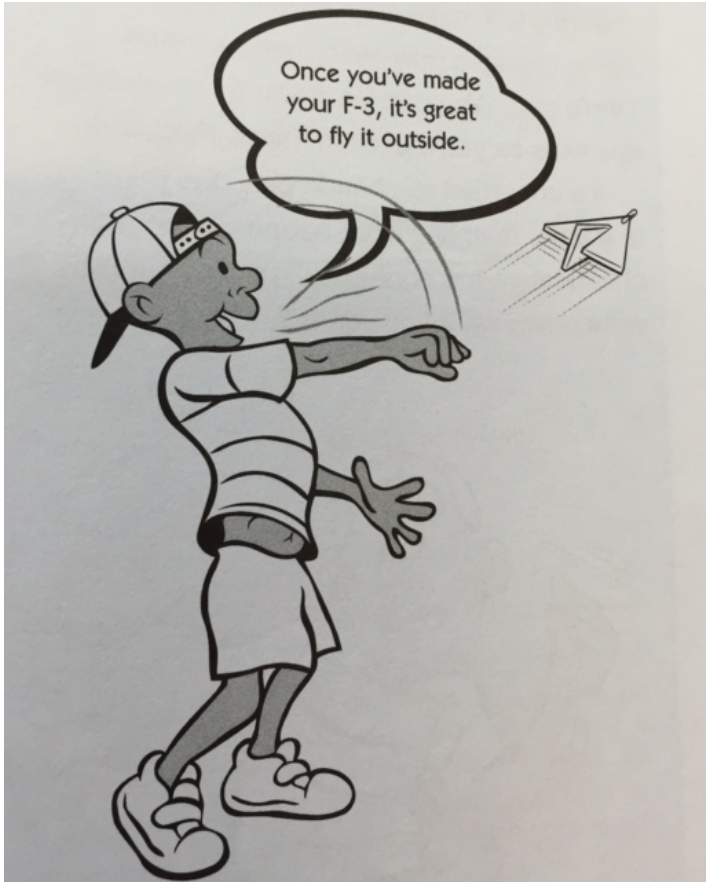
For the plane to fly through the air there must be a balance between the gravity that's pulling the glider down and the air resistance that's helping to hold it up. You need to balance these forces so that the glider moves forward, propelled by the pull of gravity.

Why Does the paperclip help the F-3 fly better?

Adding a paperclip to your plane changes the glider's center of gravity. The center of gravity is the glider's balance point. Put a support under this spot and the plane will balance perfectly.

For a glider to move smoothly through the air, the center of gravity needs to be in front of the center of pressure. Then gravity will pull the front of the glider downward and the air beneath the wings will keep it from falling right to the ground. Instead the glider slides smoothly through the air.


center of
pressure
center of gravity

What Does the Rudder Do?

The plane's rudder, the triangle that's perpendicular to the wing, keeps the glider from sliding through the air sideways. The rudder ensures that the plane's nose is always pointing in the direction that it's flying.