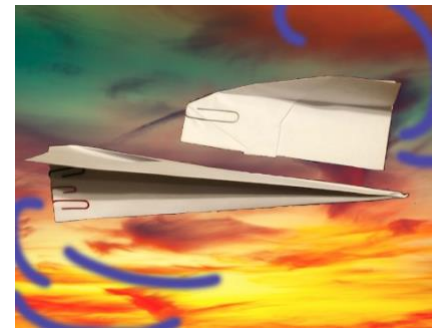


# DIY Air Force Activities: Folding into Flight

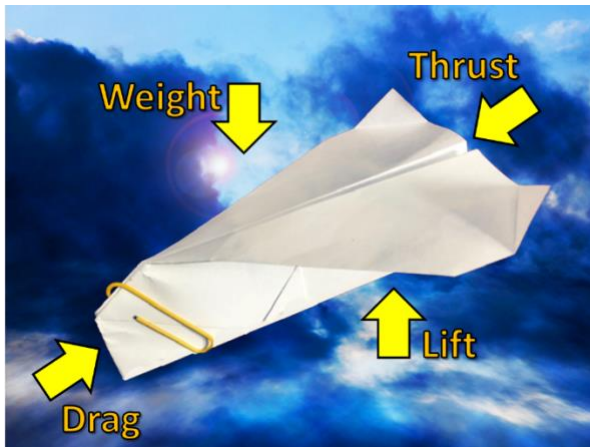


## Materials:

- printer paper
- paper clips
- pen or pencil to record time, distance, and observations

\*You can expand this activity using a tape measure and stop watch.

## Forces of Flight



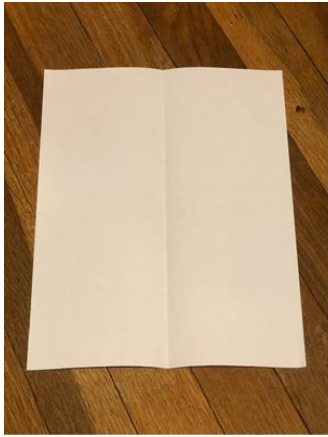
Have you ever flown in an airplane, or watched them streak across the sky and wondered how they stay up? Airplanes come in many different shapes and sizes, serving a variety of different purposes, but all are subject to the same forces of flight. The four main forces on an airplane are lift, weight, thrust, and drag. These forces work in opposition to make the airplane fly! Lift is the force that holds the plane in the air, and is created by differences in air pressure as that air moves over the wings. Weight is a force caused by gravity acting on the mass of the plane, and works in opposition to the lift. Lift must be greater than weight for the plane to fly. Thrust is the force that moves the plane in the direction of the motion. It can be created by an engine or propeller; for our paper planes your arm will provide the thrust! Thrust helps create lift. Finally we have drag. Drag is the force that works in opposition to thrust and is the result of friction from the air. Thrust must be greater than drag for flight to occur.

The shape of an airplane is one element that determines how well it flies. Different styles of wings and body types will alter the way it performs, as these factors affect the forces of flight. Broader wings might produce more lift, but may create more drag. Folding the wing tips up or down will also alter how the plane moves through the air. Follow the instructions on the back to build two different paper airplanes. Note their differences and observe how each plane flies. Then use your paper clips to add weight to the front or back. How does this change your results? Does the plane fly better or worse? What other changes can you make? Using what you learn can you design a better plane?

## Air Force Associations:

The Aerospace Systems Directorate at the Air Force Research Labs at WPAFB in Dayton, Ohio is constantly developing new flight technologies. Researchers here have access to rocket testing facilities, supersonic wind tunnels, and flight simulation labs! Their work includes research on alternative fuels, unmanned and hypersonic vehicles as well as collision avoidance and aircraft energy optimization.

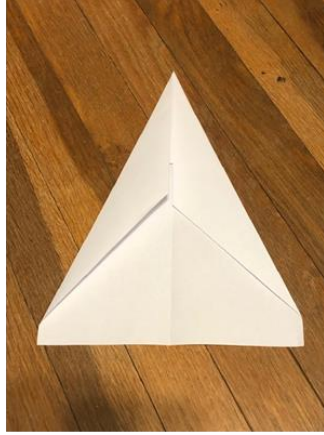
**Step 1:**



**Step 2:**



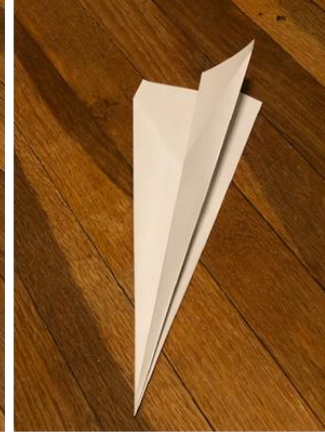
**Step 3:**



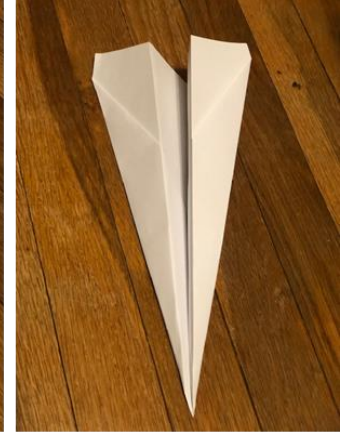
**Step 4:**



**Step 5:**

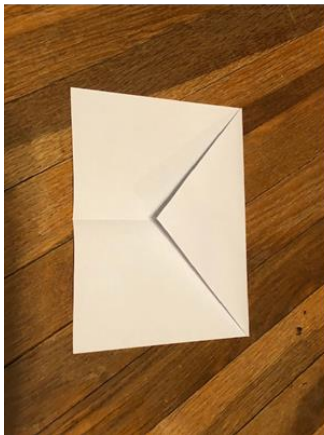


**Step 6:**

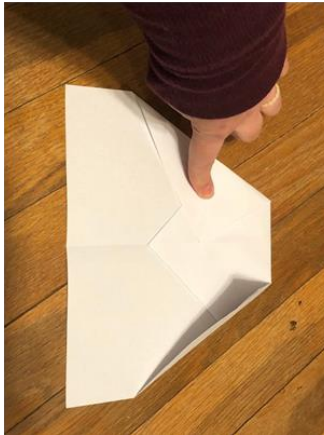


**\*\*\*Step 1 and 2 are the same for both planes!**

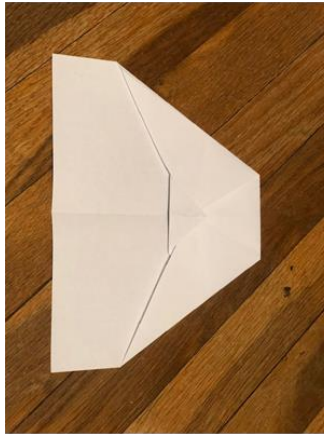
**Step 3:**



**Step 4:**



**Step 5:**



**Step 6:**



**Step 7:**



**Step 8:**



For more fun:

Add extra folds to the wing tips. Can you make a plane that does tricks? Can you make one that does flips, spins or dips? What other changes could alter this behavior?

Use the stop watch and measuring tape to record time of flight and distance and see how your modifications alter the results. Can you make a plane that flies further? How about one that stays in the air longer?

For more airplane ideas visit: <https://www.foldnfly.com/#/1-1-1-1-1-1-1-1-2>

For more fun exploration into flight, check out our WOW! lessons on the subject.

