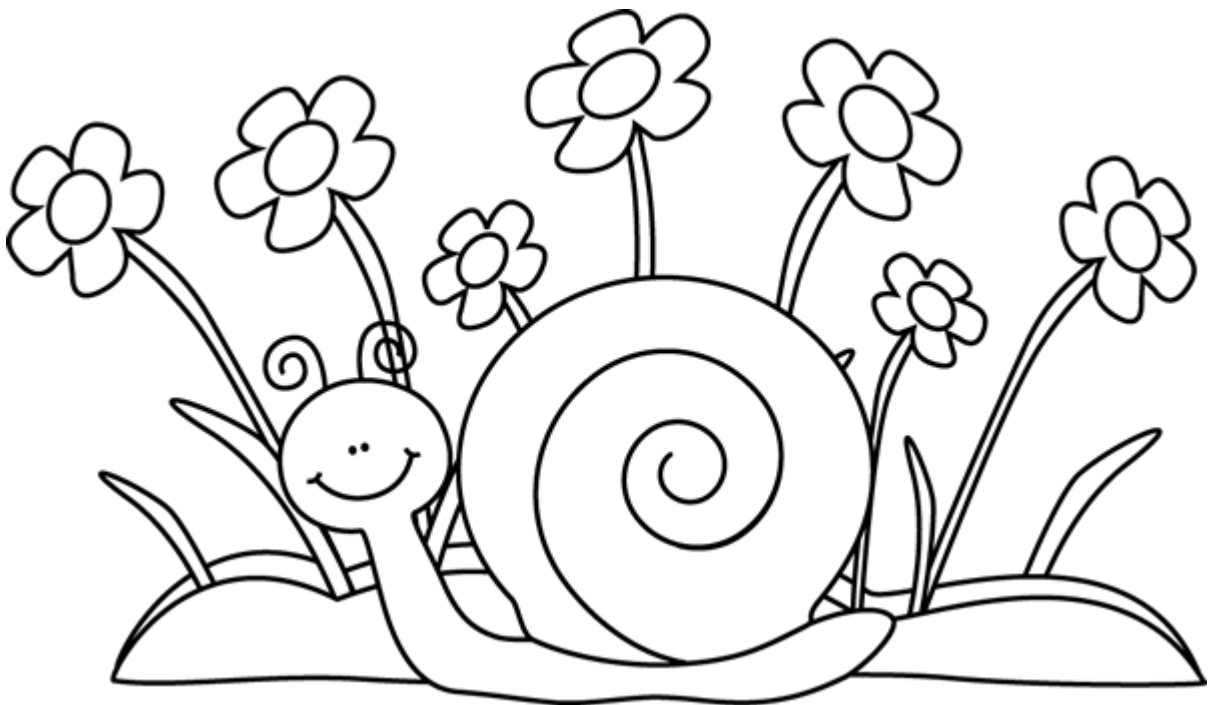


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Nature Journal



Journal Page: Flight

Read about how birds, insects, and bats fly on the following pages then

Take a Walk!

See if you can observe any animals flying. How are they the same? How are they different?



People learned to design airplanes after watching birds and other animals fly.

Use the templates to make a hawk, falcon, and dragonfly airplane. Try them out!

Make some observations about the flights of your paper airplanes.

Did they fly the same?

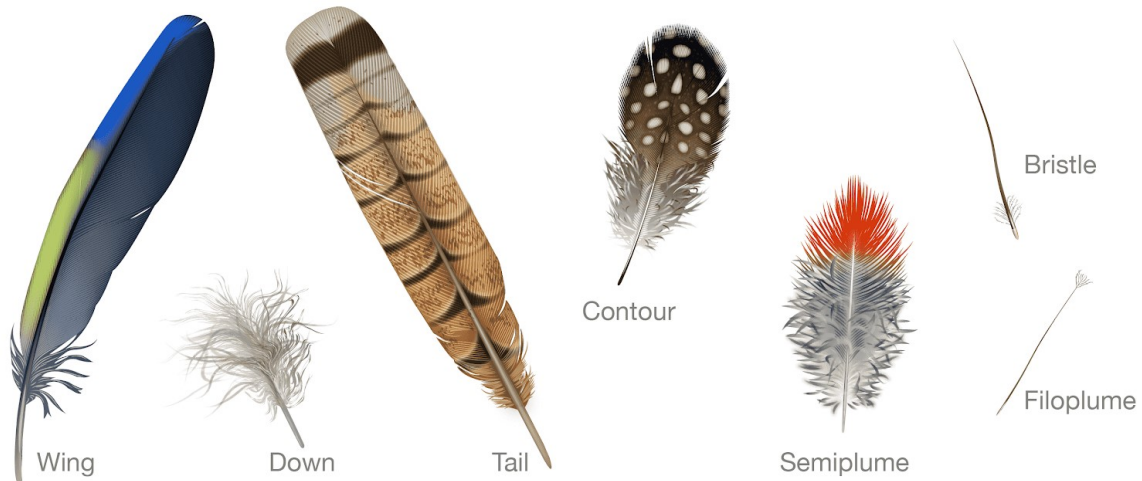
Which went the farthest?

Did any surprise you?

Journal Page: Flight

Birds!

Feather Facts: Birds are the only animals with feathers! Feathers are light but strong. Different types of feathers do different things. Some help keep birds warm, some help birds communicate, and some make flight possible. Wing and tail feathers are often called flight feathers and are used while flying. Contour (body) feathers help a bird stay smooth and streamlined. Watch a bird fly and see if you can see the different kind of feathers.



Feather types illustration by Andrew Leach

The SHAPE of wings helps determine their function in flight!

Soaring

Birds with large wide wings spend a lot of time soaring, like this red-tailed hawk.



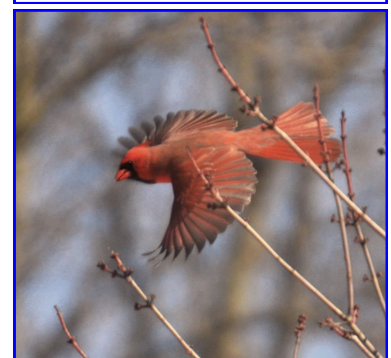
Speed

Birds with triangular wings tend to be fast. Like the Peregrine Falcon, the fastest animal on earth!



Short Bursts

Birds with short curved wings like songbirds tend to have a flapping flight with short bursts of speed.



Journal Page: Flight

Bats, Bees, and Dragonflies! Oh My!

Bats are the only mammals that can truly fly. Their wings have a membrane instead of feathers like birds. Like birds, their wing shape differs and is linked to what they eat. Some bats eat fruit, some eat insects (Ohio bats), some eat fish, some eat nectar, and a few even eat blood!



Fun Fact: Dragonfly wings beat up to 30 flaps per second! A dragonfly can beat her wings up to 1,800 times per minute.!!

Insects are the only group of invertebrates that have wings and fly. Many insects can hover, or stay in one spot in the air, by beating their wings rapidly. Bees have two wings on each side of their body, which are held together with comb-like teeth called hamuli. Read more here <https://askbiologist.asu.edu/>



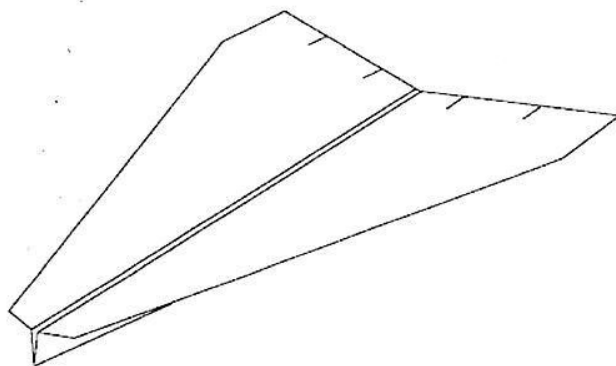
Dragonflies have flight muscles attached directly to their four wings. They can fly forwards, sideways, and backwards! Dragonflies angle their bodies upward, like a helicopter, when they fly backward.



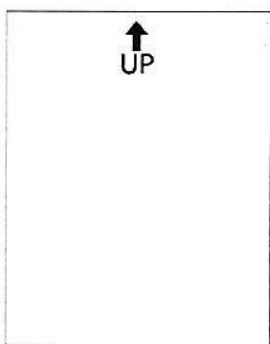
**** Definition****

An invertebrate is an organism without a backbone (spine)

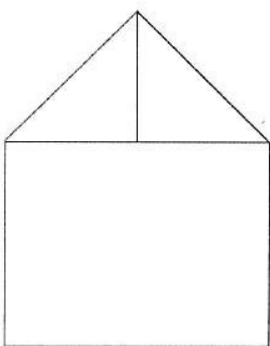
Falcon



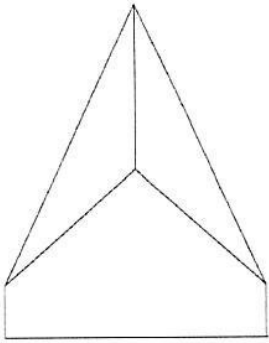
This plane is easy to fold and flies straight and smooth. Add a small amount of up elevator for long level flights.



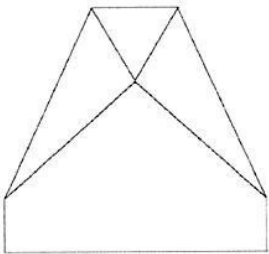
Orient the template with the “UP” arrow at the top of the page. Then, flip the paper over onto its backside, so that you cannot see any of the fold lines.



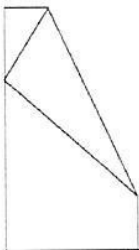
Pull the top right corner down toward you until fold line 1 is visible and crease along the dotted line. Repeat with the top left corner.



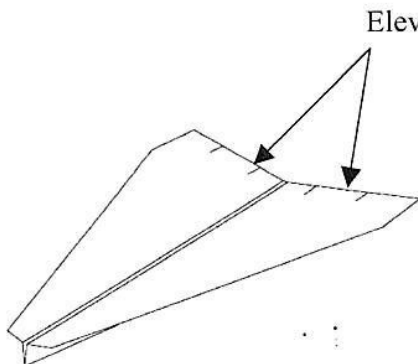
Fold the right side over again and crease along fold line 2. Repeat with the left side.



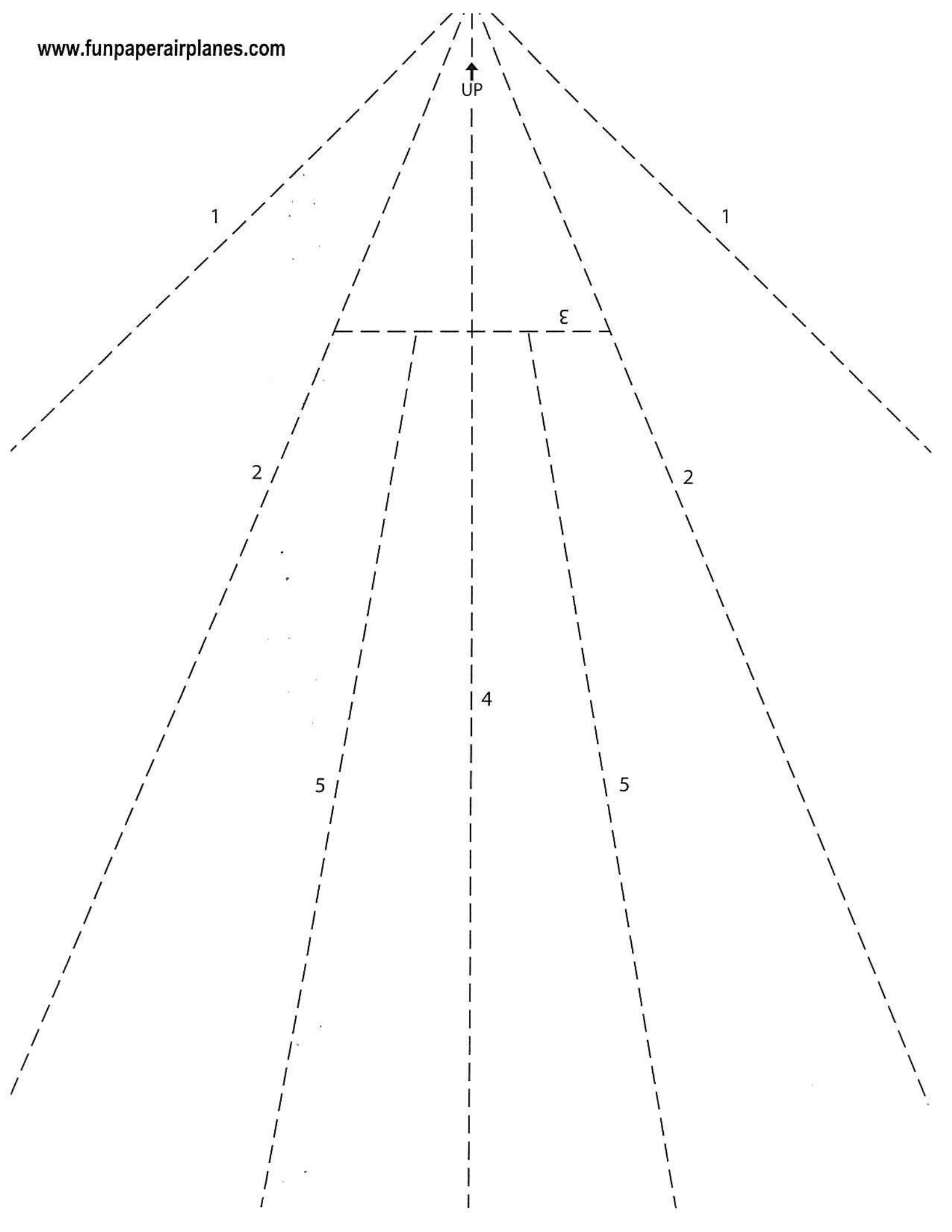
Fold the tip down toward you and crease along fold line 3.



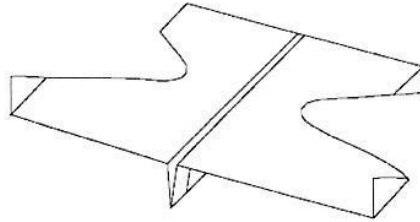
Now, flip the paper over. Then, fold the left side over onto the right side and crease along fold line 4 so that the outside edges of the wings line up.



Fold the wings down along fold lines 5. Partially open the folds you just created so that the wings stick out straight. Cut two slits, one inch apart, along the back edge of each wing for elevator adjustments. Add wing dihedral by tilting the wings up slightly away from the fuselage. The wings will have a slight "V" shape when viewed from the front. Read the Introduction for more information about dihedral. Now you are ready to fly!



Dragonfly



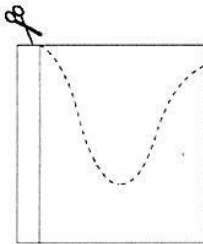
This unusual plane gets its name from its two sets of nearly symmetrical wings that resemble a dragonfly when viewed from the top. This plane is very aerobatic, and will tend to loop if thrown hard outdoors.



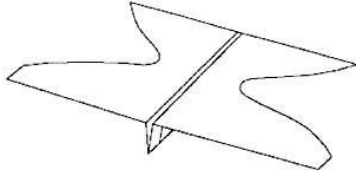
Begin by folding toward you along the first fold line. Continue folding this strip over itself until you reach the stop line. Make firm creases with each fold.



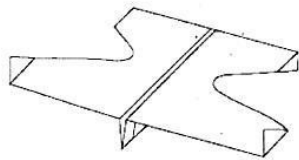
After you reach the stop line, flip your paper over and fold it in half fold line 2, so that the two flat sides of the paper are touching.



Cut along cut line 3 while keeping the paper folded tightly together to ensure that both wings match perfectly.



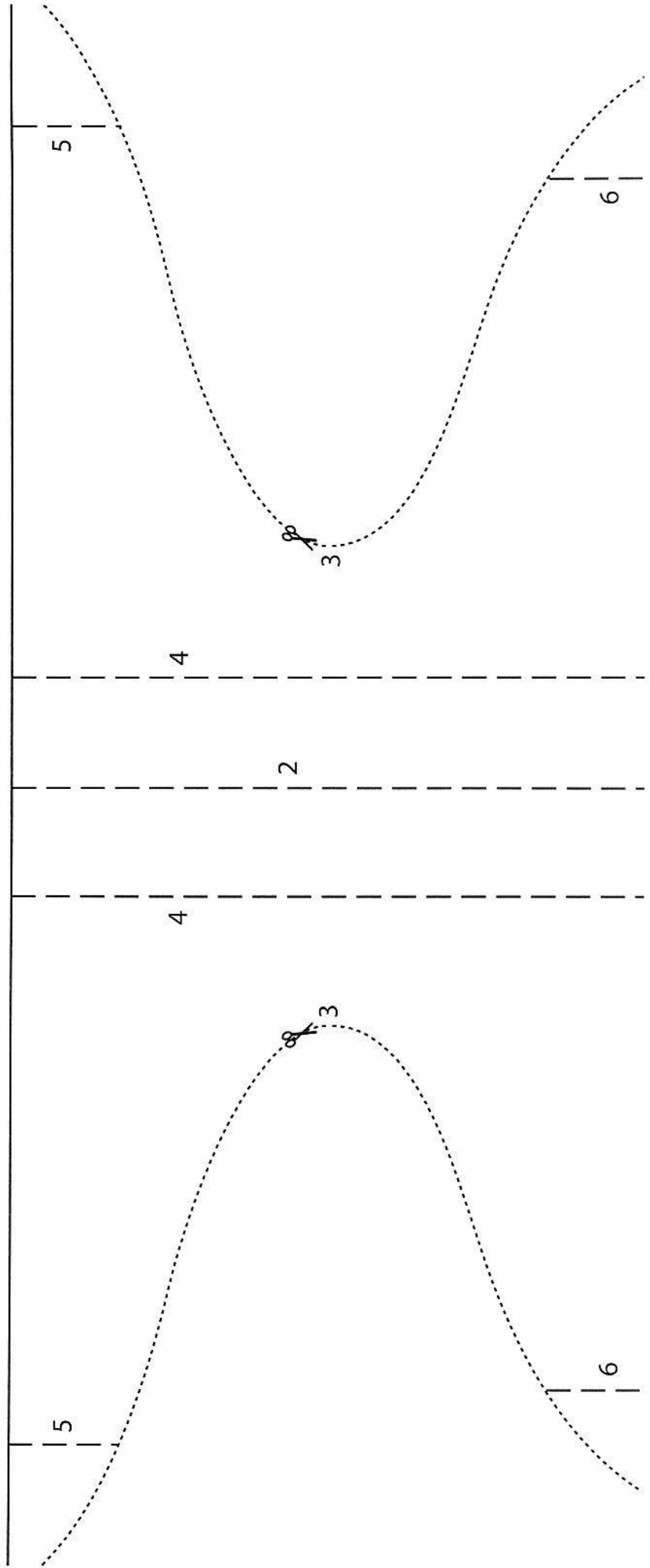
Fold the wings down along fold lines 4.



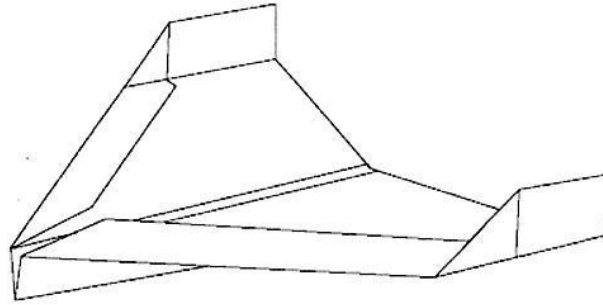
Fold the front winglets up along fold lines 5 and the back winglets down along fold lines 6. Add wing dihedral by tilting the wings up slightly away from the fuselage. The wings will have a slight "V" shape when viewed from the front. You are ready to fly!

MAKE FIRST FOLD ON THIS LINE 1

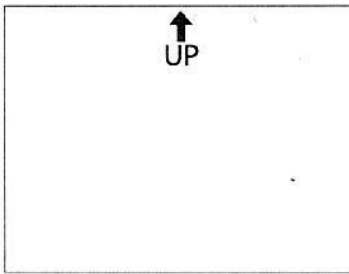
STOP FOLDING WHEN YOU REACH THIS LINE



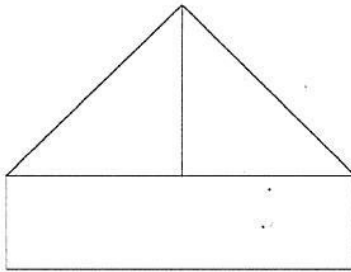
Red-Tailed Hawk



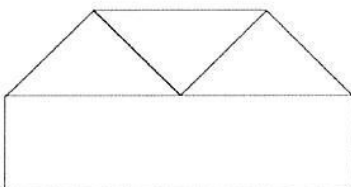
This plane produces tremendous lift at low speed, giving it a very low glide slope. It is an excellent indoor flier and will coast across the room on slow, smooth glides.



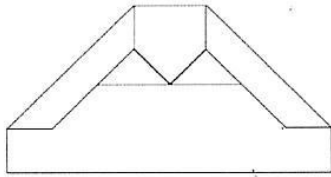
Orient the template so that the “UP” arrow is at the top of the page. Then flip the paper over so that none of the fold lines are showing.



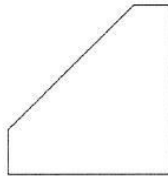
Fold the top left corner down toward you until fold line 1 becomes visible. Crease along the dotted line and repeat with the top right corner.



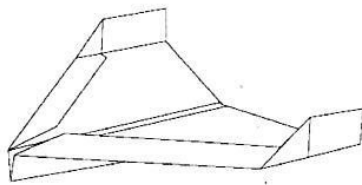
Fold the nose down until fold line 2 becomes visible and crease along the dotted line.



Fold the outside wing edges in and crease along fold lines 3.



Fold the right half of the plane over the left half and crease along fold line 4 so that the outside edges of the wings line up.



Fold the wings down along fold lines 5 and the winglets up along fold lines 6. Add wing dihedral by tilting the wings up slightly away from the fuselage. The wings will have a slight "V" shape when viewed from the front. Add elevator slits along the back edge of the wings to adjust the flight if necessary. You are ready to fly!

