Bird Wing Types

By Kyla Younger

Birds play a huge role in the Earth's environments. Birds are essential to populations across the globe, as prey, predators, or detritivores. One thing that makes birds so amazing is their ability to fly, which come from their wings. Seeing as there are species of birds from around the globe, not all of these wings will be the same. There are different types of wings and flight patterns that birds commonly use, tailored to the needs of that species.

Wing shape is essential to life in the air. Different wing shapes correspond to different advantages; some with more speed, maneuverability, or low energy use. These advantages are measured in two ways: wing loading and aspect ratio. Wing loading is the total mass of the bird divided by the area of its wing; or more simply, the faster a bird flies, the more lift can be produced by each unit of wing area. A wing's aspect ratio is the square of the wingspan divided by the wing area, or the ratio of the wingspan to the mean of its chord. Because of how heavily these two attributes weigh on wings, most bird wings are either a high speed wing, elliptical wing, soaring wing, or high aspect ratio wing.

High speed wings are designed to help the bird reach a temporary high speed. These wings have heavy wing loading and tend to be flat, pointed and short. These wings reduce drag and turbulence by blending into the body with a large trailing end. The wing's aspect ratio is quite high, or, in other words, the wings are long and narrow. When beat very quickly, these wings produce high speeds, but with a great energetic expense. These wings are commonly found on falcons, ducks, hummingbirds, swifts, swallows, and auks. Falcons use these wings to dive a great speeds, up to 389 km per hour, pursuing their prey. High speed wings are also used by auks to dive underwater for their prey, their aerodynamic wing shape allowing them to swim quickly after fish.

Elliptical wings are tailored to tight maneuvers and quick movements. These wings are rounded and short, with a slight asymmetrical curve. The primary feathers are quite short, as longer feathers would be damaged in the close-growing habitats of these birds. Elliptical wings also have a slotted alula (or thumb-wing) that gives the bird extra lift during flight. Birds usually combine these wings with fast flapping to gain enough speed for proper maneuverability. These wings are found on sparrows, some types of hawk, pheasants, partridges, and robins. Using these wings, the house sparrow can manage the same aerodynamics as a WWII Spitfire in a much smaller space.

Soaring wings (or soaring wings with deep slots) are designed for taking off and landing in confined spaces and low-speed soaring. These wings have a high aspect ratio, the shorter wings making takeoff easier. Slots between the primary feathers at the ends of the wings increase lift, decrease drag, and capture the energy of the airflow. These wings are commonly found on birds of prey and other large bird species, such as vultures, eagles, pelicans, and storks.

High aspect ratio wings are suited to soaring for long distances without using a lot of energy. These wings have low wing loading and a high aspect ratio, with wings that are far longer that they are wide. These are usually used in gliding, soaring flight, such as is found in seabirds, or flight alike to almost hovering, found in kestrels and turns. Although they're great for gliding, birds with these wings require a long taxi to get properly airborne; the wings are too long and heavy for the bird to takeoff normally. High aspect ratio wings are so great for soaring because they take advantage of the winds and air currents created by the ocean and the variation between wind speeds at different altitudes. These wings are also used by diving birds, to whom low speed flying is essential.

Along with different types of wings, birds have also developed different types of flight to aid them in their natural habitats, such as gliding flight, flapping flight, and bounding flight. Gliding flight is where a bird doesn't propel itself forward; instead the upward aerodynamic force around the bird is equal to its weight. Gliding birds use the energy of air currents or rising thermals to stay aloft instead of the energy provided by flapping. Flapping flight, on the other hand, the bird's wings provide the thrust needed to stay airborne. These wing beats also act to counteract the bird's weight, as well as increasing the bird's speed. Flapping flight is composed of two stages: the downstroke and the upstroke. The downstroke provides the majority of the thrust needed for flight, with the upstroke preparing the wing for another downstroke. During the upstroke, the bird's wings are folded slightly inward to reduce expended energy from drag, with each flap having the potential to change a bird's speed and direction. Bounding flight is where a smaller bird propels itself in shorter, faster bursts of speed spread out at even intervals. Between bursts of flapping, the bird's wings are folded close to its body, creating little lift and with ballistic trajectory. This type of flight decreases the amount of energy used for flight as little drag is created during the ballistic part of flight.

Birds are magnificent animals, with many amazing abilities outside the reach of even humans. They've evolved many specialized traits to make their species successful and to allow them to thrive in environments across the globe.