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CHARACTERISTIC OF WING DESIGN

CHORD OR CHORD LENGTH

In aeronautics, Chord is a term that refers to an imaginary line joining the trailing edge and the center of curvature of the leading edge of a cross-section of an airfoil.

The wing, horizontal stabilizer, vertical stabilizer and propeller of an aircraft are all based on airfoil sections, and the term chord or chord length is also used to describe their width. The chord is determined by examining and measuring the distance between leading and trailing edges in the direction of airflow. If the wing is a rectangular platform, rather than tapered or swept, then the chord is the width of the wing measured in the direction of airflow.

Most modern wing designs vary in chord over the span, growing narrower toward the outer tip. The lift generated on the wider, inner portion, or wing root, will be greater than the outer narrower portion of the wing span. The ratio of the length, or span, of a wing to its chord is known as the aspect ratio. An important indicator of the lift-induced drag the wing will create. This means that planes with higher aspect ratio, long skinny wings, will have less induced drag. This is why gliders have long wings that reduce drag.

BIPLANE DESIGN

The Orville and Wilbur Wright Brothers were dedicated inventors with ambition and patients as they developed bicycle design that has not changed much in the past 100 years. Their desire to build a wing that would fly or glide required over 200 experiments with miniature wing concepts in a makeshift six-foot wind tunnel before they finally in July 1900, began their manned gliding experiments at a place called Kill Devil Hills, four miles from Kitty Hawk, North Carolina.



Early airplane designers worked on both monoplane and biplane concepts in development of design based on technology available. Their efforts centered on making wings capable of withstanding the required loads. Considering the technology of the day, the biplane could be made lighter for a given strength requirement, and was the common choice. Most aircraft built between 1914 and 1925 were biplanes using the same box kite design concept as the Wright Flier designs.





Early monoplanes and biplanes were externally braced with struts and bracing wires adding to unwanted aerodynamic drag. Biplanes can usually lift up to 20 percent more than can a similar sized monoplane with similar wingspan. Biplanes have a shorter wingspan than a similar monoplane and the struts and wire bracing form a box glider configuration that provides a light but strong wing structure. Some biplanes were built with one wing positioned forward of the other to increase lift and reduce drag but will distort the benefits of the box glider concept designed for strength.

MONOPLANE DESIGN



A few monoplanes were built before 1912 that were designed with external wing supports but did not reach popularity or practical structural qualities until 1915 when designs incorporated internal structures connecting the wing as a structural part of the fuselage.

By the late 1930s the monoplane became the most common form of fixed wing aircraft. The types vary according to how the wing is attached to the fuselage.



A **low wing** design places the lower surface of the wing level with the bottom of the fuselage. A **mid-wing** places the wing mid-way on the fuselage. A **shoulder wing** is placed above the center on the fuselage. A **high wing** design places the wing with the wings upper surface level or above the fuselage. The **parasol wing** design places the wing above the fuselage and is not connected directly but will have struts and wires for attachment to the fuselage,

