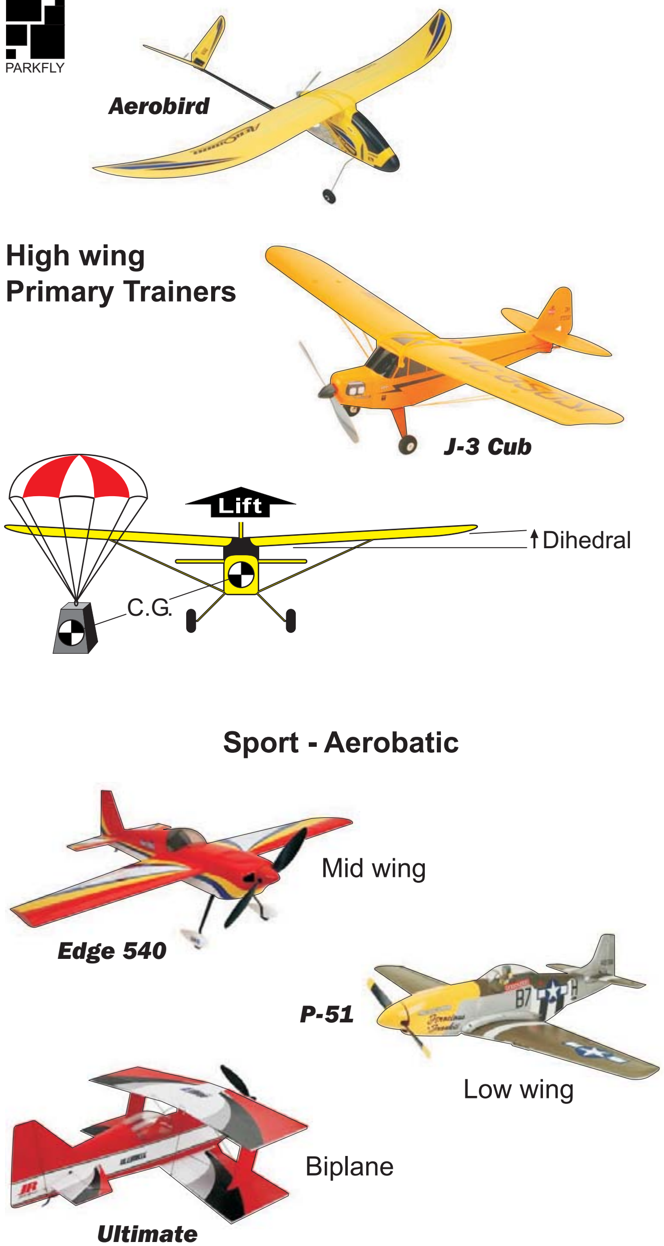
DAS PARKFLY

Section 1:
<u>Basic Ground School</u>

Airplane Considerations and Flight Characteristics

Balance

Airplane Considerations: Wing Location



Like good driving skills, good flying habits universally apply to most types of airplanes, regardless of size. The primary advantages of flying larger airplanes are improved visibility and fewer deviations caused by wind. Smaller models are more effected by wind (compare a leaf to a 747), but are easier to fly in a small area.

As a rule, how quickly an airplane responds to control inputs is a function of how fast and how far the control surfaces deflect—regardless of whether the plane is small, large, high or low performance.

After setting up the control surface deflections per the recommendations of the manufacturer, how a model flies (and thus the skills required to fly it) is primarily determined by the shape of the wing, the wing's location on the fuselage, and balance.

You probably already understand that the purpose of a wing on an airplane is to generate the "lift" required to support a plane's weight. Placing the wing high on top of the fuselage places the lift support above the plane's center of weight or C.G. (center of gravity), resulting in a more stable "parachute" effect. Meaning, when disturbed, a high wing plane will try to right itself. A high wing is therefore easier to fly and better suited for primary flight training. Wing dihedral (angling the wing tips up) enhances stability by raising the wing further above the plane's C.G..

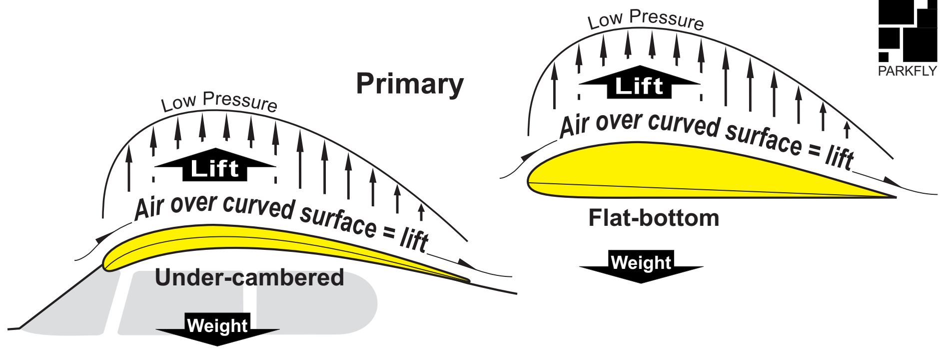
Mid wing, low wing, and most biplanes with little or no dihedral place the wing(s) nearer to the plane's C.G., thus promoting "neutral" flight characteristics, i.e., the plane's tendency to stay in the attitude (position) the pilot puts it in. These planes tend to be more maneuverable and willing to do whatever the pilot tells them to do. Therefore, pilots must also more accurately control these types of airplanes. They don't necessarily require any special flying skills, but there's less margin for error. Thus, these planes would be appropriate only after a pilot has developed good control skills and is looking for greater maneuverability.

KPTR: While a high wing will lessen the result of pilot error, a mid or low wing tends to do what it's told, right or wrong.

Airplane Considerations: Wing Airfoil

Together with proper balance, a wing's airfoil shape has the greatest influence on how the plane will fly and what it is capable of:

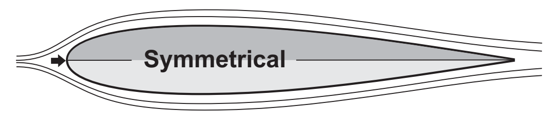
When only the top surface of the wing features the convex curvature that generates upward lift (the low pressure *vacuum* on top of the wing) the plane is able to maintain level flight at slower speeds and perform slower landings. While capable of aerobatics, the partiality of these airfoils to upright flight tends to limit aerobatic performance.



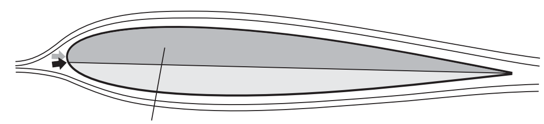
A semi or fully-symmetrical wing provides "neutral" flight characteristics. Meaning, these planes maneuver just about as well upside down as right side up. They tend to do whatever the pilot asks, and when correctly balanced, provide a "flying on rails" feel. A symmetrical wing typically necessitates higher speeds to maintain level flight and when landing, and is therefore appropriate for pilots who have become comfortable landing a trainer and seek more speed and performance.

Sport - Aerobatic

Featuring more curvature on top than bottom, a semi-sym. wing generates more low pressure on top = lift

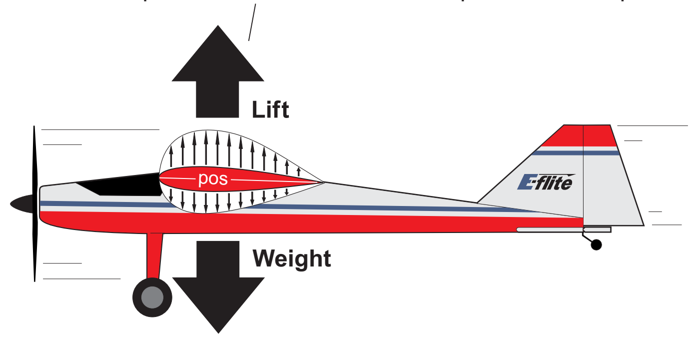


At zero angle, a fully-sym. wing generates equal amounts of low pressure top and bottom = no lift



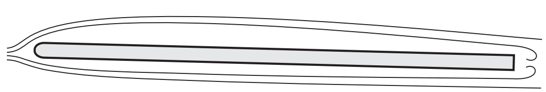
A slightly positive angle results in more curvature on top than bottom and more low pressure on top = lift

Side note: If you're wondering how a symmetrical wing generates lift to support the plane's weight, a symmetrical wing is flown at a slightly positive angle relative to the flight path. In that position, the point at which the air divides over and under the wing moves lower on the leading edge. The air traveling over the top thus travels over a greater curve than the air underneath, and thus more low pressure is generated on top.



Many "foamie" park flyers feature simple "flat-plate" airfoils to save weight. Flat-plate airfoil foamies tend to be unstable. That is, they usually don't stay in one position very long, and therefore would not be a good choice for a low-time pilot. However, their instability can also make them exciting 3D (stunt) performers in the hands of skilled pilots.

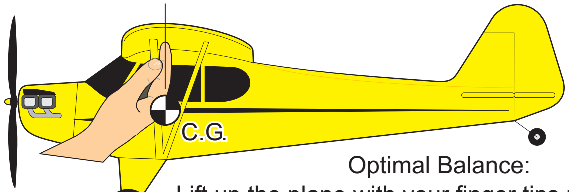
Flat-Plate



KPTR: Under-cambered and flat-bottom wings allow a pilot more time to think, while sym. wings = speed and performance.

DAS PARKFLY

Balance



Optimal Balance:
Lift up the plane with your finger tips positioned at the wing's thickest-highest point. The fuselage should be level or slightly nose down.

C.G. location has a huge impact on how an airplane handles in the air. Note: Whenever the nose of the airplane is pitched up or down, the plane pivots around a point on or near the wing's thickest point. When the C.G. is neither forward nor aft of the wing's thickest-highest point (pivot point) the airplane tends to be the most neutral, i.e., most predictable. In the case of a flat-plate airfoil, apply the general rule of balancing at 30-35% of the wing's chord.

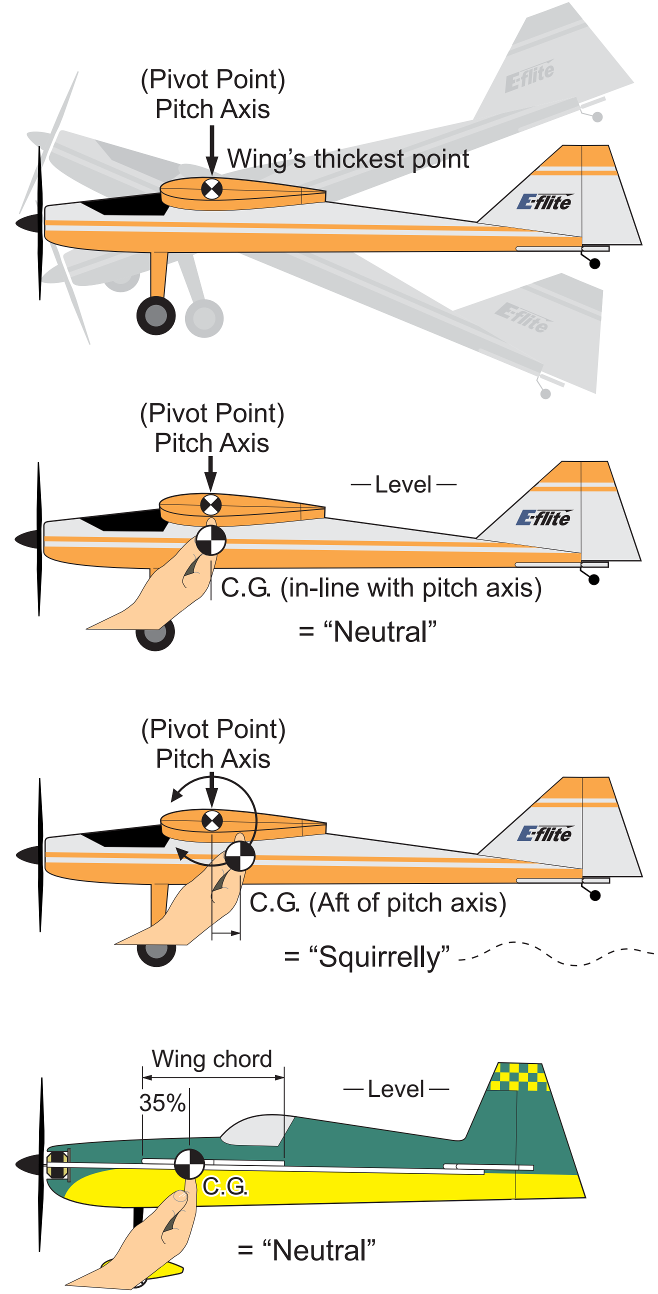
When the C.G. is aft of the wing's pitch axis (pivot point), the plane becomes unstable—similar to shooting an arrow backwards—and would be inclined to swap ends in flight if it were not for the tail and corrective inputs! Therefore, novice pilots especially need to avoid flying tail heavy airplanes!

While a nose heavy airplane won't attempt to swap ends, it will tend to behave noticeably different at different speeds. Since flying involves constant airspeed changes, a neutral C.G. location is best, providing the best overall balance between predictability and maneuverability.

An aft C.G. (tail heavy) makes a plane:
1. Unstable
2. More maneuverable
3. More demanding to fly

A forward C.G. (nose heavy) makes a plane:
1. Stable
2. Less maneuverable
3. Less demanding to fly

Note: When lightness is a concern, repositioning the battery pack is the preferred method to achieve optimal balance.



 KPTR: Neutral pitch stability provides the most predictable performance throughout all maneuvers and airspeeds.