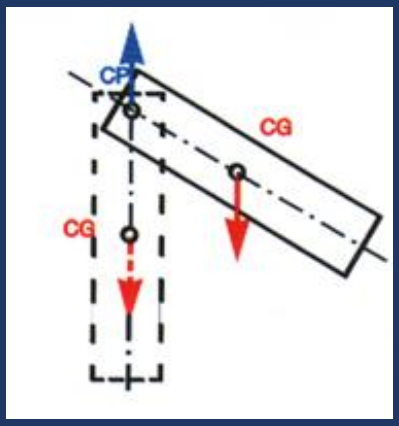
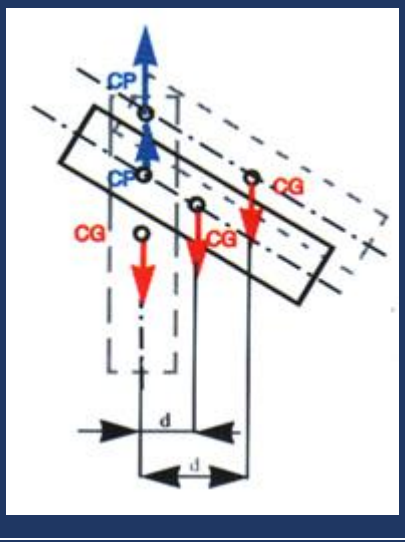
STABILITY AND MANEUVERABILITY OF THE AIRPLANE



Stability itself is defined as a body's tendency to return to its original state of equilibrium on its own, after a force is exerted upon it. When a body is unstable, it will tend to move away from its original position, when a force is applied.



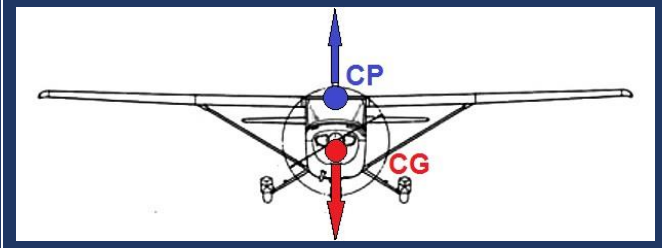
In the case of pendulum, we may notice that if its hanging point is above the center of gravity, a pendulum will be stable. If we try to displace it, it will resist displacement and it will re-stabilize in its original position. This tendency, or stability, is stronger as the hanging point is higher above the center of gravity, as in that case, the center of gravity accompanied with a hanging point present a greater moment of resistance.

Consequence: When the "hanging point" of the body is higher above its center of gravity, it is also more difficult to steer it (to displace the body from its state of equilibrium to the same angle), thus the body is also less maneuverable.

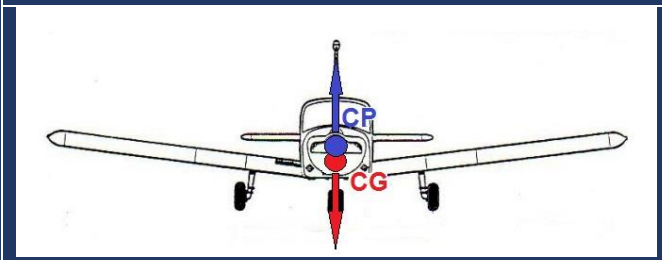
This concept also applies to the construction of the airplanes, just, here, a "hanging point" is a center of pressure "CP". **The relation of CP (center of pressure) and CG (center of gravity) define the overall airplane stability.** …and this rule applies for stability around each of the 3 airplane axes: longitudinal, lateral and vertical.

Speaking of longitudinal and lateral stability, if the CP is higher above the CG (for directional, and additional factor for longitudinal - when the CP is further behind the CG) the airplane is more stable and less maneuverable (and vice versa). This is why, in order to make the same maneuver, a more stable airplane needs to deflect its control surfaces more than a less stable airplane. Or, for the same amount of deflection off the control surfaces, a less stable airplane is able to make sharper maneuver.

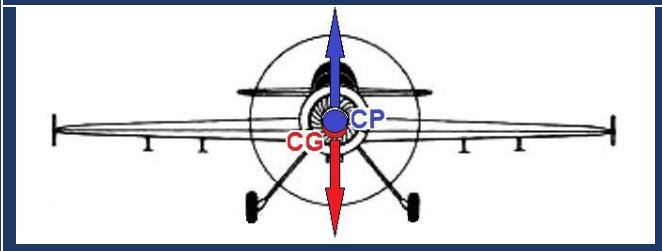
LATERAL STABILITY



High wing – very stable and not very maneuverable

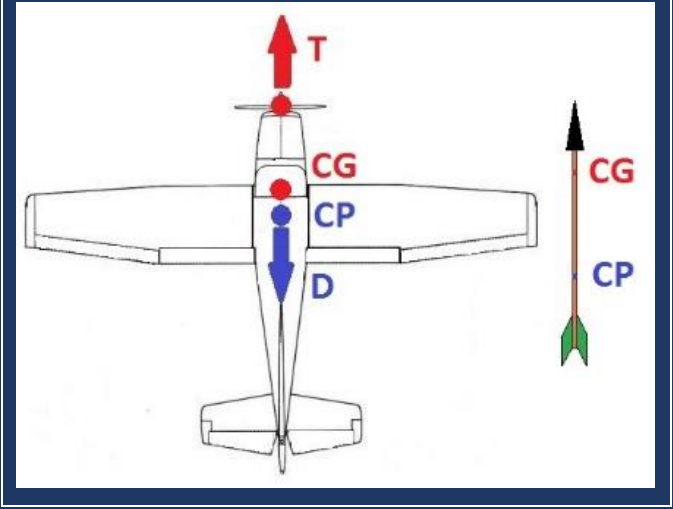


Low wing – less stable and more maneuverable

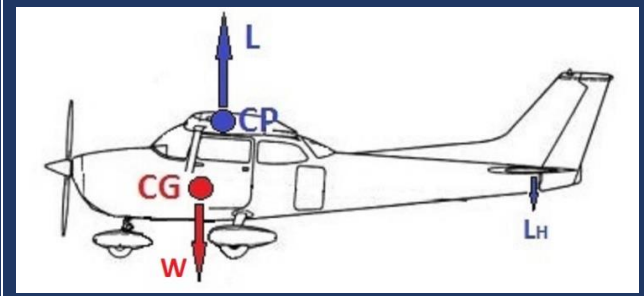


Aerobatic – almost unstable and very maneuverable

DIRECTIONAL STABILITY



LONGITUDINAL STABILITY



high wing – very stable and not very maneuverable