

# BALANCE

Center of Gravity – It is important that the aviation mechanic understand the following discussion. In simple language the center of gravity (usually written c.g.) of an object is the point around which it balances.

The horizontal c.g. is the balancing point along a horizontal axis and may be represented by vertical line passing through this point. Thus, in Figure 1 the c.g. along the horizontal axis X – X (or any other horizontal line) is represented by a vertical line Z – Z. If a hole were bored through the object anywhere on the line Z – Z and the object supported on a pin run through the hole, it would remain in the horizontal position shown unless disturbed by an outside force.

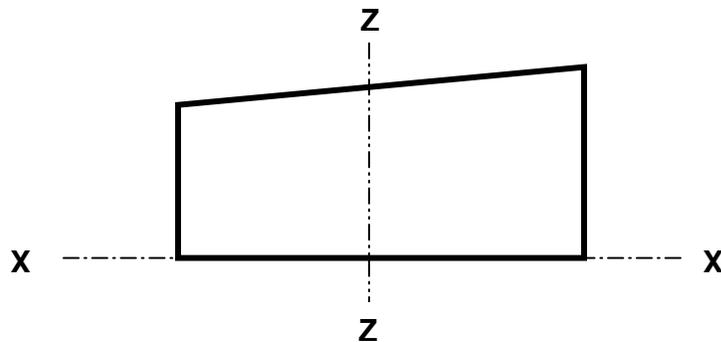


Figure 1.

The vertical c.g. is the balancing point along a vertical axis and may be represented by a horizontal line passing through that point. In Figure 2, the c.g. along the vertical axis Z – Z (or any other vertical line) is represented by the line A – A. In other words, if the object were stood up on its end, it would be in balance if supported anywhere along the line A – A.

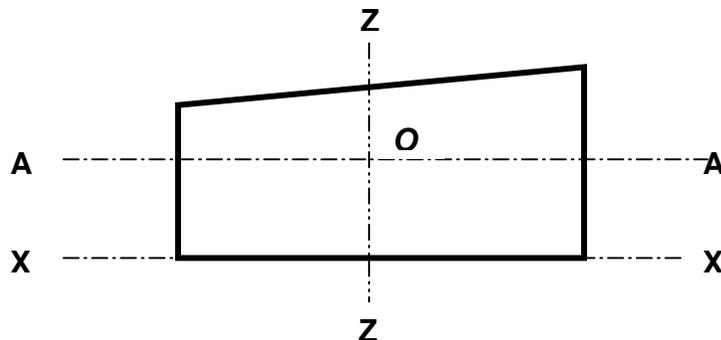


Figure 2.

Now, since the object balances horizontally anywhere along the vertical axis  $Z - Z$ , and balances vertically anywhere along the axis  $A - A$ , obviously, if it is supported on a pin passed through the intersection of these axes at point  $O$ , it will balance in both directions. In other words, when supported in the manner, it may be rotated into any position, as for example, that shown in Figure 3, and will remain in that position until acted upon again by an outside force.

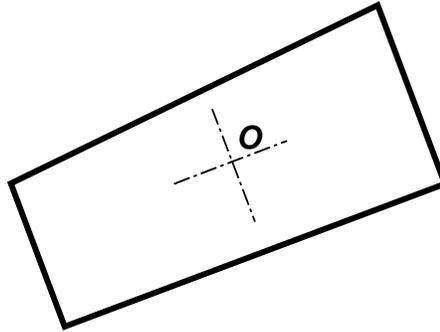


Figure 3.

One other axis must be considered, namely the transverse or  $Y - Y$  axis shown in Figure 4. Since airplanes are usually symmetrical about the centerline, there is seldom any occasion to be concerned about the transverse c.g. In Figure 4 the object has been turned  $90^\circ$  so that the small end is shown. The  $A - A$  axis is, of course, simply a point in this view and is at the intersection. The c.g. along any horizontal axis, as  $y - y$ , will be on the line  $Z - Z$ , as before, and the c.g. along the vertical axis  $Z - Z$  will be on the line  $Y - Y$ . The intersections of  $Y - Y$  and  $Z - Z$  locate the c.g. in ALL directions. Thus the c.g. about any axis, passing through the object in any direction is common at the intersection of all three axes as shown by  $O$ .

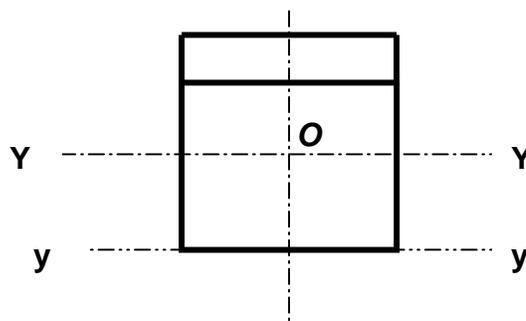


Figure 4.