

Centre of Gravity Adjustment – By Bob Bailey 2015.

Why move the Centre of Gravity (CG)?

If the CG is sufficiently far from where it should be, the model will either fly, but very inefficiently or it won't fly at all! In the former case, the CG is probably too far forward, in the latter, it is probably too far back.

The following discussion is aimed primarily at duration models but it can be applied to a limited extent to scale models. Trimming some of the latter can often be much more difficult than for duration models due primarily to the usually very small tailplane. Consult one of the scale experts for more advice in this case!

CG too far forward

The usual sign of this is a large amount of decalage (difference between wing and tail incidence measured relative to a fuselage datum) when the model is adjusted to fly level. An angle of more than 4 or 5 degrees is probably excessive and indicates that the CG should be moved back.

Symptoms seen in flight are:

When the model stalls, correction will be very quick and several stalls may occur before recovery.

When the power input to the model is increased, it will be very prone to stall on launch or try to loop!

In these cases, move the CG back in increments of 5 to 10% of the wing chord.

CG too far back

The usual symptoms are:

The model will either dive in or stall and dive in, showing that it is unstable. In this case, move the CG forward by at least 20% of the wing chord.

When the model is disturbed nose down from its usual flying attitude it flies at the new attitude for an easily observed period of time before recovering to its original attitude. The model is marginally stable and this can have a substantial effect on duration. The reason for this effect is that the model, when disturbed, spends too much time recovering to its most efficient flying attitude.

If the model is disturbed nose up from its original attitude, it will be very prone to stall and tailslide.

For these scenarios, move the CG forward by at least 10% of the wing chord.

Moving the CG

There are several methods of achieving this:

If the model is carrying ballast then adjust the CG by moving this first.

A lighter prop will move the CG to the rear – and a lighter tailplane and/or tailboom

will move it forwards.

If the wing is mounted on posts you can soak the cement joints to detach from the fuselage (you didn't use cyano did you?) and replace them in a forward position to move the CG back or vice versa.

Cautionary notes.

The maximum forward position of the wing is about $\frac{1}{2}$ the maximum prop. blade chord. The reason is that in unfavourable circumstances (eg. the model stalls and speeds up) the prop can bend and jam under the wing LE.

The maximum rearward position for the posts is governed by the separation between wing and tail being not less than 2 wing chords. This is particularly true for small models. The tailplane can easily be rendered ineffective by the airflow from the wing so that the model can then get into a deep stall condition and will not recover. In this case, ensure that the wing is far enough forward and add ballast to the nose if needed to move the CG to match.

This situation is one of the prime reasons why having a light tailplane is highly advantageous.

Good luck!