Finding the Mean Aerodynamic Chord (MAC)

Many kits and plans indicate that the **Center of Gravity** (CG) should be located at a certain point of the **Mean Aerodynamic Chord**. This figure is usually given in percentage, but is sometimes a measurement.

The CG can be measured from any point along the span from the leading edge of the wing if the wing is a constant chord planform.

If the wing is tapered then you must locate the MAC before you can locate the CG.

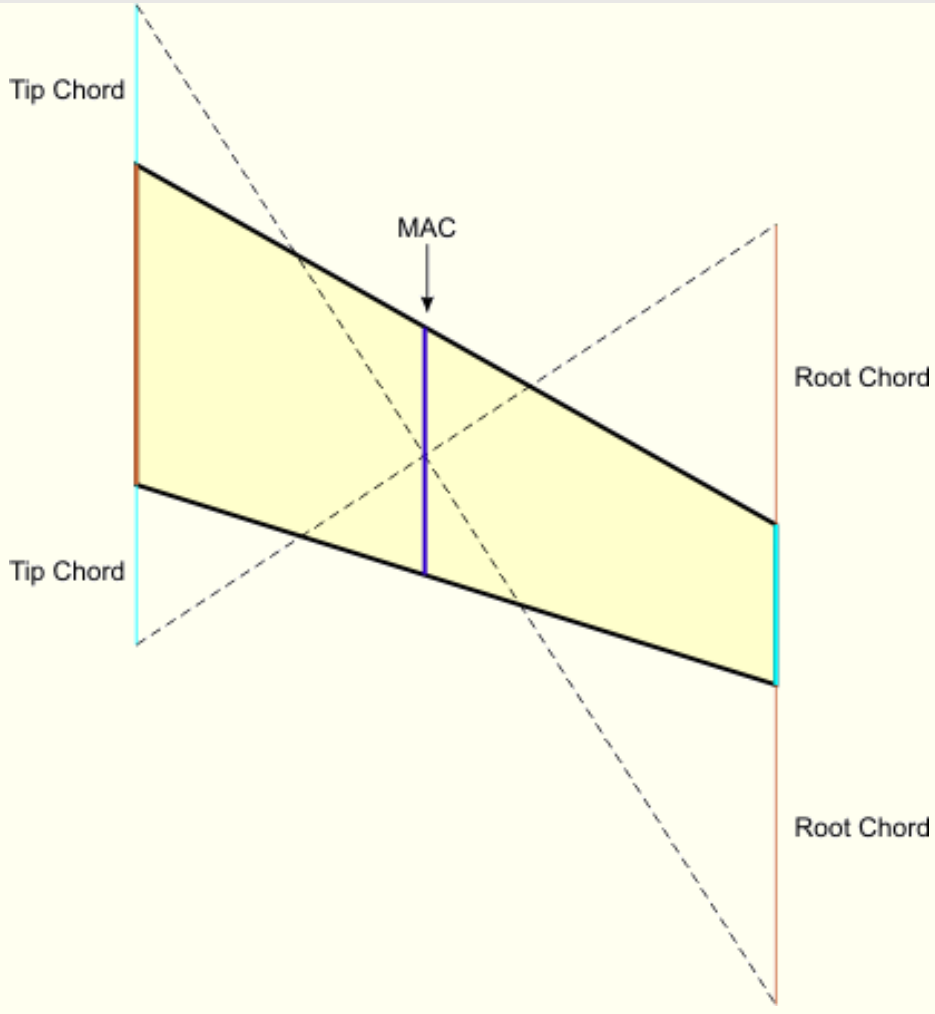
The Mean Aerodynamic Chord is not the average chord.

To Locate the Mean Aerodynamic Chord on a Tapered or Delta Wing

Measure the root and tip chord. Then draw the following lines on the plans:

- At the root of the wing, draw a line parallel to the centerline of the fuselage extending forward from the leading edge and rearward from the trailing edge. Both lines should be the length of the tip chord.
- Do the same thing at the tip but drawing the lines the length of the root chord.
- Connect the ends of the lines so that they create an "X" over the wing panel. Where the two lines intersect is the spanwise location of the Mean Aerodynamic Chord.
- If the plan indicates that the CG should be located at some percentage of the MAC, then measure the MAC and put the CG the given percentage back from the leading edge along the MAC. For example, if the MAC is 10" and the plan indicates the CG should be 25% back from the leading edge, then the CG is 2-1/2" back from the leading edge at the MAC.

This drawing should help you visualize what you need to do:



Note: The lines cross at the spanwise location of the MAC. It is not the fore/aft CG location (unless the CG happens to be located at 50% MAC).

The following formula will give the measurement (chord) of the MAC. It does not give the span wise location of the MAC.

rc = Root Chord
t = Taper Ratio = (Tip Chord ÷ Root Chord)

$MAC = rc \times 2/3 \times ((1 + t + t^2) \div (1 + t))$

Using the drawing above, let's say the root chord is 11" and the tip chord is 6"

$t = 6 \div 11 = .5455$

Now plug t into the formula to find the MAC. Note that the wingspan and sweep do not matter. No matter what the span or how much the wing is swept, the MAC will always be the same length.

$MAC = 11 \times 2/3 \times ((1 + .5455 + .5455^2) \div (1 + .5455))$

$MAC = 22/3 \times (1.8431 \div 1.5455)$

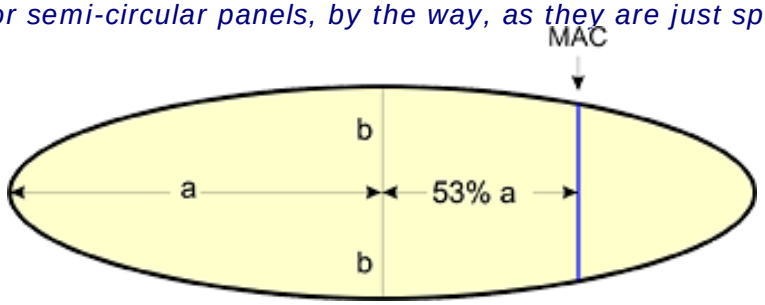
$MAC = 7.3333 \times (1.8431 \div 1.5455)$

MAC = 7.3333 x 1.19254

MAC = 8.7453"

To Locate the Mean Aerodynamic Chord on an Elliptical Wing

"The MAC of an elliptical wing panel is 85% of its root chord, and you will find it 53% of the panel's span from its root chord. The panel Area = 0.785 x span x root chord. is also works for semi-circular panels, by the way, as they are just special ellipses."



a = Wing Span / 2
b = Root Chord / 2