Weight Shift & %MAC Worksheet

This worksheet has two parts: at the left is the weight shift function and at the %MAC function.

Clear	Set all variables to a invalid state keeping the current value. If it is touched again, clears all values to 0.		
Weight Shift		**%MAC**	
Wt	Total weight of the aircraft.	**CG**	Center of gravity Arm of the air-craft..
ΔCG	Change in the center of gravity arm	**MAC**	Mean aerodynamic chop length.
ΔArm	Change in the arm of the weight to shift.	**LMAC**	Leading edge arm of the MAC.
ΔWt	Weight to shift to new location.	**%MAC**	Percentage of MAC.

The **Weight Shift** function computes the   amount of weight that must shift to move the CG by a desired amount. Also, can be used to find the change in CG or Arm from adding or removing weight.

The **%MAC** function calculates the %MAC given the CG, the length of the mean aerodynamic chord (MAC), and the leading edge of the mean aerodynamic chord (LMAC).

NOTE: Always verify the physical units
To change the units of a variable, tap over the unit symbol and select the right one from the pop-up menu. To change the whole units in the worksheet select "Set Metric Units" or "Set US Units" from the **[UNITS▶]** button.

All the following examples use US units. So please select "Set US Units" from the **[UNITS▶]** menu in the Navigation Bar.

Example 1:

Find weight of the item that must shift to move the CG in 1 IN if the total weight is 7,500 LBS and the distance weight is shifted is 120 IN.
Solution:

Keystrokes	Description
[Clear]	Clears all variables to start a new calculation and Leg-1 selected.
type 7500 **[Wt]**	Stores 7,500 LB in the aircraft weight, **Wt**
type 1 **[ΔCG]**	Stores 1 IN of change in the center of gravity, **ΔCG**
type 120 **[ΔArm]**	Stores 120 IN change in the arm to shift the weight, **ΔArm** and automatically show the calculations weight to shift: **ΔWt = 62.5 LB**

Example 2:

Determine the CG in percent of MAC if MAC extends from 860.2 to 1040.9 inches and the center of gravity is at 910.2 inches.
Solution:

Keystrokes	Description
type 860.2 **[LMAC]**	Stores 860.2 IN in the left edge of MAC, **LMAC**
[+ / -] [+] type 1040.9 **[MAC]**	Stores 180.7 IN in mean aerodynamic chor, **MAC**
type 910.2 **[CG]**	Stores 910.2 IN in center of gravity arm, **CG** and automatically calculates: **%MAC = 27.7 %**

<u>Appendix : Equations Used</u>

The equations that this worksheet calculates are:

Weight Shift:

a) Center of Gravity Change, **ΔCG**:
$$\Delta CG = \Delta Wt \cdot \Delta Arm\ /\ Wt$$

b) Item Weight Arm Change, **ΔArm**:
$$\Delta Arm = Wt \cdot \Delta CG\ /\ \Delta Wt$$

c) Item Weight to shift, **ΔWt**:
$$\Delta Wt = Wt \cdot \Delta CG\ /\ \Delta Arm$$

%Mach:

a) Mean Aerodynamic Chor:
$$MAC = (\ CG - LMAC\ ) \cdot 100\ /\ \%MAC$$

b) Center of Gravity Arm:
$$CG = MAC \cdot \%MAC\ /\ 100 + LMAC$$

c) Left Edge of MAC Arm:
$$LMAC = CG\ -\ MAC \cdot \%MAC\ /\ 100$$

d) Center of Gravity Percent of MAC:
$$\%MAC = 100 \cdot (\ CG - LMAC\ )\ /\ MAC$$