

RV Weight and Balance

Author: Greg Hale ---- [ghale5224 \(at\) AOL \(dot\) com](mailto:ghale5224@AOL.com)

Rev. Date: Tuesday, November 18, 2011



The RV weight and balance program was designed for the Van's RV aircraft. The program includes a simple performance section for determining fuel required for a specific trip. The program uses this data to determine the center of gravity (CG) of the aircraft for takeoff and landing. The program uses the aircraft owner's supplied information. This manual should explain the operation of the program. The program was originally written for the RV10, but has now been expanded to include other RV aircraft. The example shown in this manual will reference the RV10. Except for the airplane displays, the procedure is the same for all aircraft.

SETUP:

Load Profile Performance Setup

Aircraft -> <- Select Aircraft

Empty Aircraft Weight

Weight: Arm: Moment:

Max Gross Weight =

Max Baggage Weight =

Max Fuel Load = gals

Flight Parameters

	Fuel Burn gph	True Airspeed kts	Time minutes
Cruise			
Descent			
Reserve			

Climb FPM (average)

Descent FPM (average)

Save Setup Data

Click arrow to select aircraft type.

All fields should be filled out

When you first start up the program, the setup screen will display. The first thing you need to do is select the aircraft you will be using from the drop "Select Aircraft" list.

Enter the empty weight, arm (*the moment will be calculated for you*) of your aircraft in the Empty Aircraft Weight frame. In this frame you should also enter the Max Gross Weight and Max Baggage Weight you will use for your aircraft. Some aircraft may have extended range tanks and contain more fuel than the factory aircraft. In the Max Fuel Load box, enter the maximum fuel your aircraft will carry. All data points must be filled out.

The Performance tab of the program will use the following values.

In the Flight Parameters section, enter the fuel burn in gallons per hour, true airspeed in knots, and time in minutes (colons are not required) for the various segments of flight. These values can be updated if your aircraft is different than what you initially entered. The Climb and Descent should be entered in feet per minute.

Click the **Save Setup Data** button to save the setup data. Once you have entered the data required on the Setup tab, you can proceed with the use of the program.

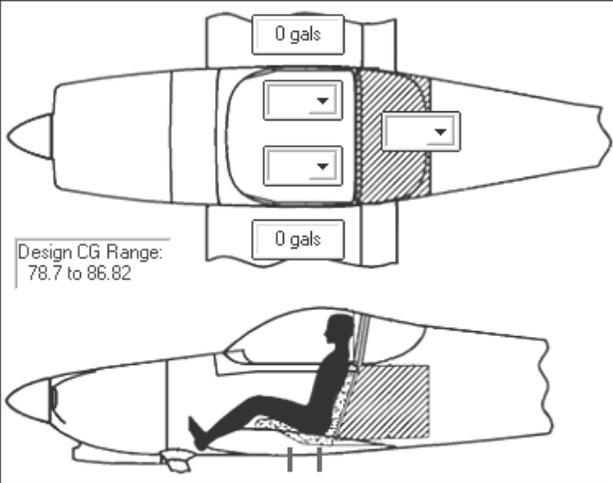
Sample Setup Screen for the RV7

Load Profile	Performance	Setup																																											
Aircraft -> RV7 ▼																																													
<p>Empty Aircraft Weight</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Weight:</td> <td style="width: 33%;">Arm:</td> <td style="width: 33%;">Moment:</td> </tr> <tr> <td style="border: 1px solid black; text-align: center;">1095</td> <td style="border: 1px solid black; text-align: center;">80.2</td> <td style="border: 1px solid black; text-align: center;">87819</td> </tr> <tr> <td colspan="3" style="text-align: center;">Max Gross Weight = <input style="width: 50px;" type="text" value="1800"/></td> </tr> <tr> <td colspan="3" style="text-align: center;">Max Baggage Weight = <input style="width: 50px;" type="text" value="100"/></td> </tr> <tr> <td colspan="3" style="text-align: center;">Max Fuel Load = <input style="width: 50px;" type="text" value="42"/> gals</td> </tr> </table>	Weight:	Arm:	Moment:	1095	80.2	87819	Max Gross Weight = <input style="width: 50px;" type="text" value="1800"/>			Max Baggage Weight = <input style="width: 50px;" type="text" value="100"/>			Max Fuel Load = <input style="width: 50px;" type="text" value="42"/> gals			<p>Flight Parameters</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Mode</th> <th style="width: 20%;">Fuel Burn gph</th> <th style="width: 20%;">TAS - kts</th> <th style="width: 20%;">Time minutes</th> </tr> </thead> <tbody> <tr> <td>Taxi</td> <td style="border: 1px solid black; text-align: center;">2</td> <td style="text-align: center;">-----</td> <td style="border: 1px solid black; text-align: center;">15</td> </tr> <tr> <td>Climb</td> <td style="border: 1px solid black; text-align: center;">16</td> <td style="border: 1px solid black; text-align: center;">120</td> <td style="text-align: center;">-----</td> </tr> <tr> <td>Cruise</td> <td style="border: 1px solid black; text-align: center;">12</td> <td style="border: 1px solid black; text-align: center;">165</td> <td style="text-align: center;">-----</td> </tr> <tr> <td>Descent</td> <td style="border: 1px solid black; text-align: center;">12</td> <td style="border: 1px solid black; text-align: center;">175</td> <td style="text-align: center;">-----</td> </tr> <tr> <td>Reserve</td> <td style="text-align: center;">-----</td> <td style="text-align: center;">-----</td> <td style="border: 1px solid black; text-align: center;">30</td> </tr> </tbody> </table> <table style="width: 100%;"> <tr> <td style="width: 70%;">Climb FPM (average)</td> <td style="border: 1px solid black; text-align: center;">800</td> </tr> <tr> <td>Descent FPM (average)</td> <td style="border: 1px solid black; text-align: center;">1000</td> </tr> </table>	Mode	Fuel Burn gph	TAS - kts	Time minutes	Taxi	2	-----	15	Climb	16	120	-----	Cruise	12	165	-----	Descent	12	175	-----	Reserve	-----	-----	30	Climb FPM (average)	800	Descent FPM (average)	1000	<div style="border: 2px solid orange; padding: 5px; display: inline-block; margin-bottom: 10px;"> All fields should be filled out </div> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Save Setup Data </div>
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The program version is shown in the center of the title bar of the program. This date/time corresponds with the data/time shown on the web page's program update screen. If this date/time does not match the date/time on the web site update page, you will want to get the latest update to keep your program current.

RV9 WEIGHT AND BALANCE
VERSION: 10/2/2011 11:09:39 PM

Projects Active Project = NEW

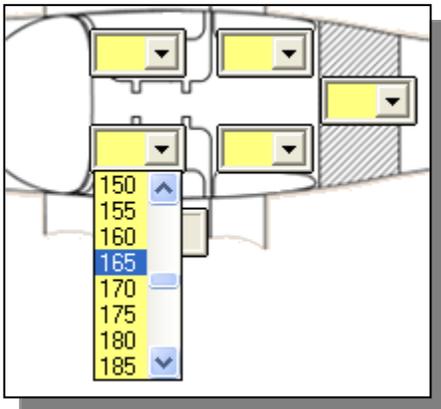
Load Profile	Performance	Setup																
 <p>Design CG Range: 78.7 to 86.82</p>	<p>Loading Summary</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"><u>Cabin Loading</u></th> <th style="width: 40%;"><u>Weight</u></th> </tr> </thead> <tbody> <tr> <td>Pilot</td> <td style="text-align: right;"> </td> </tr> <tr> <td>Pax Seat</td> <td style="text-align: right;"> </td> </tr> <tr> <td>Baggage</td> <td style="text-align: right;"> </td> </tr> <tr> <td>Fuel Gals <input style="width: 50px;" type="text"/></td> <td style="text-align: right;"> </td> </tr> <tr> <td>Total Payload</td> <td style="text-align: right;"> </td> </tr> <tr> <td>+ Empty Weight</td> <td style="text-align: right;"> 1156</td> </tr> <tr> <td>Total Takeoff Weight</td> <td style="text-align: right;"> </td> </tr> </tbody> </table>	<u>Cabin Loading</u>	<u>Weight</u>	Pilot		Pax Seat		Baggage		Fuel Gals <input style="width: 50px;" type="text"/>		Total Payload		+ Empty Weight	1156	Total Takeoff Weight		 <p style="font-size: small; text-align: center;">author: Greg Hale - ghale5224@aol.com</p> <div style="text-align: center; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-right: 10px;"> Calculator </div> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-right: 10px;"> Display Summary </div> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Close </div> </div>
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+ Empty Weight	1156																	
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LOAD PROFILE:

To begin you should enter the loading of the aircraft. Select the **Load Profile** tab.

Cabin Loading	Weight
Pilot	<input type="text"/>
Front Seat - Right	<input type="text"/>
Back Seat - Left	<input type="text"/>
Back Seat - Right	<input type="text"/>
Baggage	<input type="text"/>
Fuel Gals	<input type="text"/>
Total Payload	<input type="text"/>
+ Empty Weight	1615
Total Takeoff Weight	<input type="text"/>

To enter weights on the aircraft, click on the appropriate arrow for the seat position and select the weight from the list. You can also type in a weight in the yellow box.



In this example we are selecting 165 pounds for the pilot seat. If you want to be accurate on the weight and the pilot weighed 167 pounds, you can type this value in the yellow box.

The baggage weights are entered the same way. The max baggage weight will be limited to the weight you specified on the setup screen.

Fuel loading, is entered by selecting the gallon amount on the Fuel Gals combo box in the **Loading Summary** frame. The fuel load will display on the Loading Diagram divided equally for each wing. During the use of the Performance tab, the program will alert you to the fuel calculated for the trip if the amount specified in the "Fuel Gals" combo box is less. You will be prompted to allow the program to change the amount shown in the combo box.

During the submission of data to the Load Profile tab, you will be prompted with various messages related to the current weights entered. These are advisory messages only.



Total weights selected will display on the **Loading Summary** frame. Takeoff weight will be calculated and the CG (green bar) on the loading diagram will move to show the center of gravity of the aircraft before takeoff. By changing and rearranging weights in the aircraft, you can instantly see the new CG location. The CG value will be displayed in the lower right corner of the loading diagram.

Cabin Loading	Weight
Pilot	165
Front Seat - Right	125
Back Seat - Left	130
Back Seat - Right	110
Baggage	50
Fuel Gals	360
Total Payload	940
+ Empty Weight	1615
Total Takeoff Weight	2555

PERFORMANCE:

The weight and balance program contains an added bonus to compute your CG during takeoff and your CG during landing. The **Performance** tab is divided into 2 tabs -- **Flight Data** and **Weight/Balance for Flight**.

Mode	Time	Fuel (gals)	Miles
Taxi	00:15	2	-----
Climb	00:08	2	17
Cruise	01:36	21	312
Descent	00:07	2	21
Alternate	00:44	10	125
Reserve	00:45	10	-----
Total for Flight *	01:51	47	350

Total flight time does not include taxi or reserve/alternate time. Alternate time and fuel are based on cruise parameters.

The performance data displayed is only as accurate as the information you entered on the Setup tab. After you have flown your airplane, you can update the information on the Setup tab.

FLIGHT DATA:

Enter information about your flight.

Flight Conditions

Airport Elevations

Departure Airport (feet)

Destination Airport (feet)

Mileage

To Destination

Destination to Alternate

Use IFR Reserve Fuel

Cruise Conditions

Cruise Altitude

Headwind(-) Tailwind(+)

Wind Speed (kts)

Information required:

- **Departure Airport Elevation** - The altitude of the departure airport.
- **Destination Airport Elevation** - The altitude of the destination airport.
- **Mileage to Destination** - The nautical miles from the departure airport to the destination airport.
- **Mileage To Alternate** - The nautical miles from the destination airport to the alternate airport if you require an alternate.
- **Use IFR Reserve Fuel** - Check this box if you wish to use the IFR reserve fuel values -- (45 minutes). An unchecked box will use VFR reserve fuel of 30 minutes or the value entered on the Setup screen.
- **Cruise Altitude** - The altitude you want to cruise at.
- **Headwind** - If you know the winds at the cruise altitude, select a minus (-) for headwind or plus (+) for tailwind.
- **Wind Speed** - The wind speed in knots at the cruise altitude.

The example above has an airplane flying from Tulsa Riverside airport to Memphis Intl. Airport at an altitude of 7000 ft. Tulsa's elevation is 650 ft. The elevation for Memphis is 300 ft. The mileage Tulsa to Memphis is 350 NM. There is a tailwind of 25 kts at the cruise altitude. An alternate airport has been added with a distance of 125 NM from the Memphis airport.

If an IFR alternate distance is specified, the reserve time will automatically change to 45 minutes. Leaving the Alternate distance value at zero, the program will use the reserve value you entered on the Setup screen. VFR reserve fuel can be used by unchecking "Use IFR Reserve Fuel".

After entering the flight condition's data, click the [Compute] button to calculate the time, fuel needed and weight and balance for the trip.

Flight Time and Fuel

Mode	Time	Fuel (gals)	Miles
Taxi	<input type="text" value="00:15"/>	<input type="text" value="2"/>	-----
Climb	<input type="text" value="00:08"/>	<input type="text" value="2"/>	<input type="text" value="17"/>
Cruise	<input type="text" value="01:36"/>	<input type="text" value="21"/>	<input type="text" value="312"/>
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Alternate	<input type="text" value="00:44"/>	<input type="text" value="10"/>	<input type="text" value="125"/>
Reserve	<input type="text" value="00:45"/>	<input type="text" value="10"/>	-----
Total for Flight *	<input type="text" value="01:51"/>	<input type="text" value="47"/>	<input type="text" value="350"/>

Total flight time does not include taxi or reserve/alternate time.
Alternate time and fuel are based on cruise parameters.

The total flight time is the time during the flight portion of the trip. It does not include the Reserve or Alternate times.

The total fuel does include all the fuel required for the trip including the Reserve and Alternate fuel.

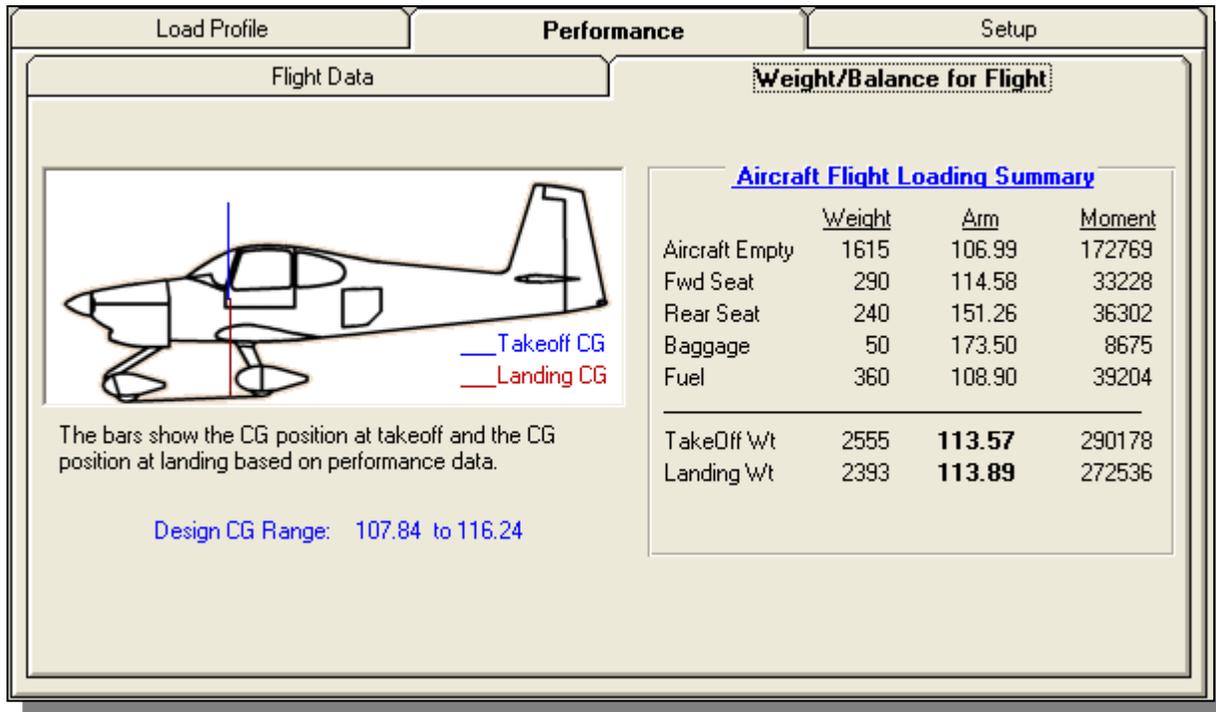
NOTE: If the fuel required is more than the fuel selected on the **Load Summary** frame on the **Load Profile** tab, the fuel load on the **Load Summary** frame will be changed to the computed value. You will be prompted to use this value or leave the current fuel value you entered on the **Load Summary** frame.

The mileage is the distance from takeoff to touchdown. It does not include the Alternate mileage.

Anytime parameters are changed on the **Flight Condition** section or **Load Profile** section, you will need to re-calculate the Flight Time and Fuel by clicking the [Compute] button.

WEIGHT/BALANCE FOR FLIGHT:

The final section of the program is the **Performance Weight and Balance** for the flight. This page will show the Aircraft Flight Loading Summary. The CG for the flight will be displayed for the takeoff condition and the landing condition.



If the CG of the aircraft is not within the designed CG range, the Takeoff and/or Landing CG value will be colored red to alert you of this condition.

TakeOff Wt	2090	107.89	225491
Landing Wt	1748	107.69	188247
CG OUT OF LIMITS			

Miscellaneous Controls

Display Summary

Selecting this button will display a complete summary of the Weight and Balance/Performance data.

Note: The performance screen should be filled out and the weight and balance should be computed before selecting [Display Summary]. The printout will show your aircraft's CG during and takeoff and when you land. It will also show the actual fuel used and the fuel remaining at your destination.

Click the "X" to close this display

CG COMPUTATIONS
X

RV10 WEIGHT AND BALANCE
4/15/2008 10:47:22 AM
Design CG Range: 107.84 to 116.24



LOADING SUMMARY

<u>Cabin Loading</u>	<u>Weight</u>
Pilot	165
Front Seat - Right	125
Back Seat - Left	130
Back Seat - Right	110
Baggage	50
Fuel - 46 gals	276
Total Payload	856
Empty Weight	1615

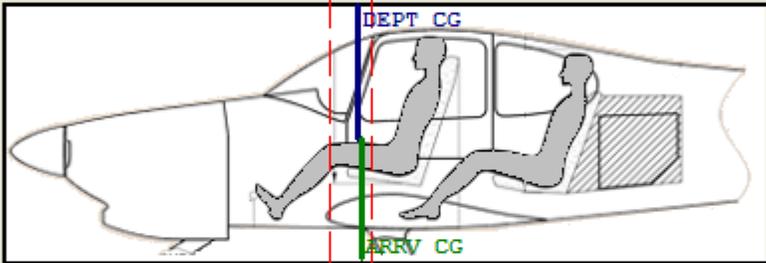
Total Takeoff Weight	2471

FLIGHT LOAD SUMMARY

	<u>Weight</u>	<u>Arm</u>	<u>Moment</u>
Aircraft Empty	1615	106.99	172789
Fwd Seats	290	114.58	33228
Rear Seats	240	151.26	36302
Baggage	50	173.50	8675
Fuel (46 gals)	276	108.90	30056

TakeOff Wt/CG	2471	113.74	281050
Landing Wt/CG	2315	114.07	264062

Fuel Used For Flight = 26 gals



CG Limits -> | |

PERFORMANCE

Assumptions: Distance to Destination = 350nm
CruiseAltitude = 7000FT Wind Component = +25KTS (Tailwind)
Climb = 600fpm/140kts Descent = 800fpm/180kts
Cruise Speed = 170kts Estimated Ground Speed = 195kts

Flight Time and Fuel Required

<u>Mode</u>	<u>Time</u>	<u>Fuel</u>	<u>Miles</u>
Taxi	00:15	1	----
Climb	00:11	3	26
Cruise	01:32	20	300
Descent	00:08	2	24
Alternate	00:44	10	125
Reserve	00:45	10	----

Total For Flight	01:51	46	350

Fuel Remaining At Arrival = 20 gals

Print

Select [Print] to send this display to the printer.

SAVING YOUR PROJECTS

The program allows you keep your projects on file. When you begin the program, the display is blank and the Active Project is called "NEW". This title is shown on the menu bar at the top of the page. The "Active Project" advises you of the project you are working on.



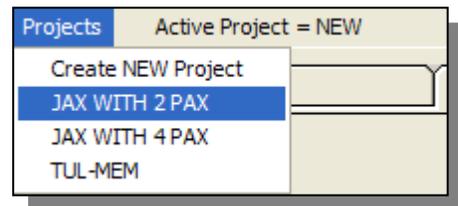
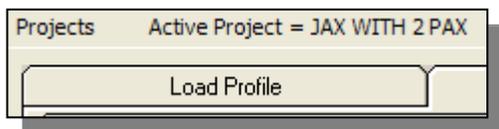
Once you have filled in the required data and the Flight Data has been computed, you can save the displayed project. Select the [**Save Project**] button to save the project. You will be prompted to enter a unique name for this project. The project name shown on the Active Project menu, will automatically be placed in the save project dialog box.



You can change or use the current displayed name. The Active Project menu will be updated to the name of the current project shown.

You can retrieve any saved project by selecting the project name on the **Projects** menu. In this example we are selecting the "JAX WITH 2 PAX" project.

When the project is loaded, the name of the Active Project will change to this requested project's name.

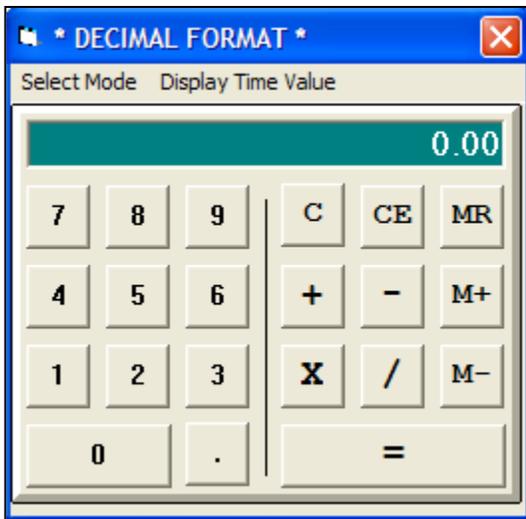


To create a new project, select "**Create NEW Project**" on the Projects menu. All data boxes will be cleared and the Active Project will say NEW.

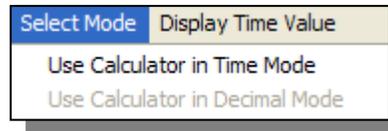
Any saved project can be removed from memory. Selecting the [**Delete Project**] button will remove the displayed project from memory.

Calculator

Displays a calculator that can compute decimal and time values.



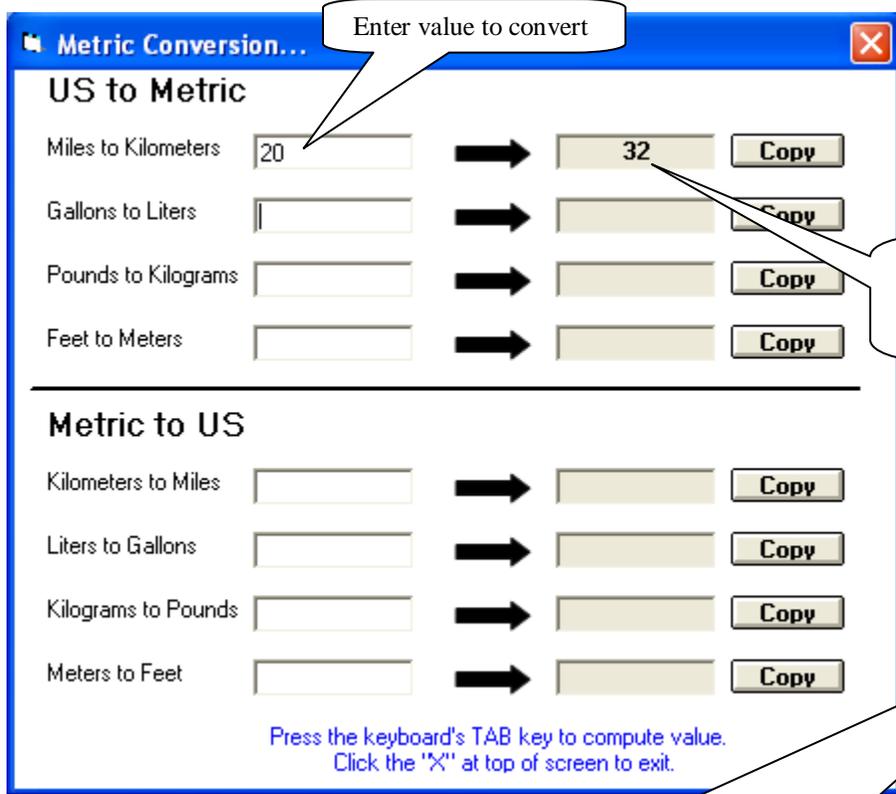
The calculator initially displays in the "Decimal" format. To use the "Time" format, click on the "Select Mode" menu to display the choices.



Click the "X" in the top right corner to close the calculator.

Metric Conversion

This table will let you convert US measurements to Metric or Metric to US. Enter the value you wish to convert in the appropriate box and press your keyboard's [TAB] key to compute the value. Clicking the corresponding [Copy] button will copy the value to the clipboard. Computed values will be rounded up or down to the next whole value.



To Paste the copied value in the weight and balance program, place your mouse arrow over the box to place the value and click the RIGHT mouse button. Select Paste from the displayed menu.