inhand AVIATION
A Division of INFOequipt,Inc.

Weight&Balance Users Manual

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v1 May 2003

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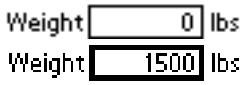
The AirCalc System

Applications displaying the **AIRCALC SYSTEM** logo, contain common user interface elements that make it easy and intuitive to operate programs within the system. **AIRCALC SYSTEM** applications also make use of common aircraft data. For instance, an aircraft defined using the AircraftEditor can be used with *E6B*, *Weight&Balance* and *FlightPlanning* programs from **inhand Aviation**.

The following user interface elements are common within the **AIRCALC SYSTEM.**

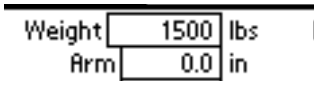
Input Boxes: All numeric values are entered and displayed in input boxes. An input box typically has three parts: 1) *label* in the example shown, the label is the word *Weight*. 2) *input box* is the rectangle where values are displayed and entered. 3) *units labels* are optional. A *units label* is commonly found to the right of the input box but can also appear at the top of a column of input boxes. An input box has two states. In the example, the top input box is in a *ready* state. This means the box can be targeted for input. In the example, the bottom input box has been targeted for input. Tapping within the bounds of the rectangle will target the box. The target input box has a thicker border (as shown). There is only one target input box at a time.



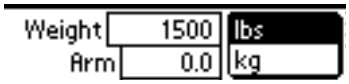
The targeted input box receives digits from the **Onscreen Keypad** (See below). You can also use Graffiti, the virtual keyboard (from the Edit menu) or any built in device keyboard.

Onscreen Keypad: Any screen that contains input boxes will also display a keypad for entering numeric data into the boxes. The target input box receives the keystrokes from the keypad. Besides digits 0 through 9 and decimal point, the keypad contains a change sign, backspace and enter key. The change sign key is used to change a values sign from + to - or - to +. This key is also used to change latitude values from E to W and longitude values from N to S (and vice versa). The backspace key is used to delete the last digit entered. After keying in a value, use the enter key to set the value.

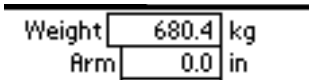
Point-Of-Use Unit Conversion: If an input box offers a units label, this signifies the input box value can be converted to other units. To see what units are available, tap directly on the units label. A list will popup showing the available units. Tap the units you wish to use. The value will be automatically converted to those units. In the example, the top image shows the *Weight* input box value is currently in *lbs* (pounds). Tapping directly on the *lbs* label displays a list offering *lbs* and *k*g (kilograms).



The weight input box displays 1500 pounds.



To see what units are available, tap directly on the *lbs* label. Here, we are offered *lbs* and *kg*.



After tapping *kg*, the 1500 pounds has been converted to 680.4 kilograms.

Range Errors: Each input box has a minimum and maximum range of values that can be entered. Should you exceed this valid range, a warning dialog will appear displaying the legal value range. After clicking OK, a safe value will be automatically be entered. A valid number can then be reentered.

Menus: **AIRCALC SYSTEM** applications make use of the PalmOS™ menu system. To use the menus, tap the menu button located to the left of the Graffitti™ text input area.

Common Aircraft Data: The *AircraftEditor* is used to create and edit aircraft. Aircraft are used by other **AIRCALC SYSTEM** applications such as *E6B, Weight&Balance* and *FlightPlanner.*

Aircraft are automatically backed up to your desktop computer hard disk when you HotSync™. If you are interested in finding these files inside the Palm directory on your hard disk, they are named AC1000.PDB, AC1001.PDB, AC1002.PDB, etc. for each aircraft you have defined.

Support For Removable Media: If your PalmOS™ device supports removable media (such as cards or sticks), you can store data (aircraft, flights, routes, etc.) to either the devices internal memory (handheld) or cards/sticks (removable). **AIRCALC SYSTEM** applications that store or retrieve data will offer the ability to select a storage type from their respective data browsers.

Overview

Flight Phases

In order to more accurately represent how fuel is burned throughout a flight, *Weight&Balance* uses the concept of flight phases. Flight phases are also used on the Other Stations screen, whereby a load can by specified to exist only during certain phases. Here are the flight phases and their definition:

Ramp: The ramp phase refers to the loaded aircraft prior to engine start.

Takeoff: The takeoff phase refers to the aircraft at the point of takeoff. This phase assumes that the aircraft has burned an amount of fuel for start, taxi and run-up (S.T.R.) For larger (or turbine) aircraft, this phase can also be considered to be the point the aircraft reaches top of initial climb. In this case, the amount of fuel burned should include start, taxi, run-up and initial climb.

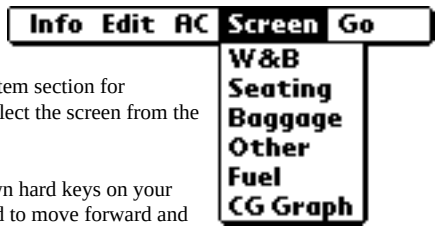
Landing: The landing phase refers to the aircraft at the point it has landed and consumed fuel enroute.

Fuel Exh: The fuel exhaustion phase is included in order to compare the aircraft's loaded zero-fuel weight with its maximum zero-fuel weight. When this phase is selected no fuel value will be displayed.

Program Navigation

Weight&Balance provides a number of ways in which to move from screen to screen.

Menus: From the menu bar, choose the Screen menu. See The AirCalc System section for activating the menu bar. Select the screen from the list.



Hard Key: The up and down hard keys on your Palm OS device can be used to move forward and backward amongst the screens. The order of the screens follow the Screen menu.

To W&B Button: Most screens feature a "To W&B" button that will take you directly to the W&B screen.

Aircraft Browser

Edit: Tapping this button will transfer to *AircraftEditor*.

Select: Makes the selected aircraft active for w&b computations.

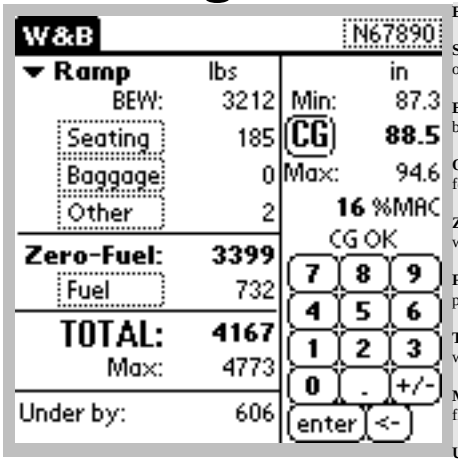
Cancel: If you have an aircraft selected, and don't wish to change that aircraft, tap this button to return to the last screen.

Weight&Balance requires an aircraft be selected before any calculations can be performed. To create an aircraft, use *AircraftEditor*.

From the list, tap on the aircraft you wish to compute weights and center of gravity. Tap the Select button.

Tapping the **Edit** button will transfer to *AircraftEditor* so that aircraft information can be adjusted or changed.

Weight & Balance



BEW: Basic Empty Weight.

Seating: Total weight of all seat occupants.

Baggage: Total weight of all baggage compartments.

Other: Total weight of other loads for selected flight phase.

Zero-Fuel: Total Zero-Fuel weight.

Fuel: Weight of fuel for this flight phase.

Total: Sum of Zero-Fuel and Fuel weight.

Max: Maximum weight for this flight phase.

Under By: Max less Total

The Weight&Balance screen is divided into two parts. The left part of the screen is concerned with calculating the loaded weight of the aircraft. The right part of the screen displays calculated center of gravity information and MAC (mean aerodynamic chord).

Weight

BEW: Basic Empty Weight cannot be changed on this screen. To set or change this value, refer to the *inhand AVIATION AircraftEditor* User Manual.

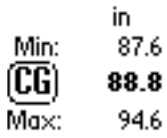
Seating: This value is the sum of all weights entered on the Seating screen. Tap the **seating selector** to jump to the Seating screen.

Baggage: The baggage value is the sum of all weights entered on the Baggage screen. Tap the **baggage selector** to jump to the Baggage screen.

Other: The other value is the sum of all weights entered on the Other screen for the selected flight phase. Tap the **other selector** to jump to the Other screen.

Fuel: The fuel value displays the fuel weight for the selected flight phase. Tap the **fuel selector** to jump to the Fuel screen. This value is reduced by the amount of unusable fuel.

Balance

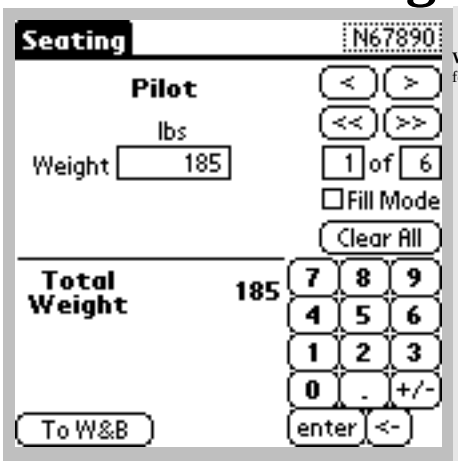


Center of Gravity: Three values are calculated for CG based on the computed weight of the aircraft. The **Min** and **Max** CG values show the range of the CG at the current aircraft weight. The **CG** value is the actual center of gravity of the loaded aircraft. Press the **CG** button to go to the CG Graph screen.

CG Indicator: The CG indicator displays a quick status of CG: CG OK

%MAC: If MAC and LEMAC were specified for the aircraft, the percentage MAC will be displayed. **16** %MAC

Seating



Weight: Enter occupant weight for this seat.

Seat weights can be entered individually or through the use of Fill Mode.

To enter individual seat weights, use the navigation controls to select a seat and then enter the weight.

< > Use these buttons to move forward and back by 1 seat.

<< >> Use these buttons to move forward and back by 10 seats.

1 of 6 Index display shows what seat is currently displayed.*

☐ Fill Mode Check box to activate fill mode.

Clear All This button zero's all seats.

1 to 6
☑ Fill Mode
Fill

When Fill Mode is active the seat navigation buttons are no longer visible. The index display changes to input boxes in order to accept from and to seat numbers. This is also indicated by the word "of" changing to the word "to".

To use Fill Mode, enter the range of seats in the boxes. The weight entered in the Weight input box will be stored in all seats when the Fill button is tapped.

* You can select a seat directly by entering its number in the index box.

Baggage

Arm: Enter baggage arm to center of baggage load (or compartment).

Weight: Enter weight of all baggage at this arm.

Total: This is the total weight of all baggage in all compartments.

M.A.C.W: Maximum Allowable Combined Weight of all compartments.

Status: This will show **"Under By"** or **"Over By"** the MACW amount.

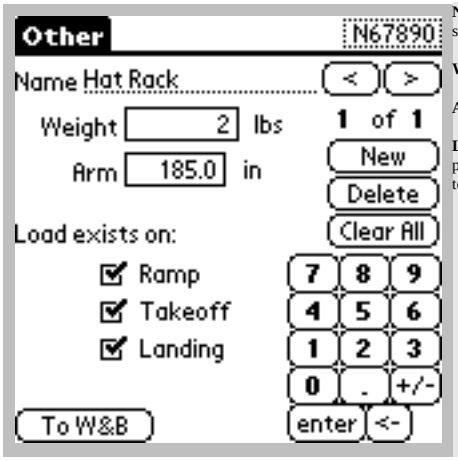
Enter the weight of baggage for each baggage compartment along with the arm (station). When you click in either the Arm input box, a message will appear detailing the station range of the compartment. When you target the Weight input box, a message will appear with maximum weight information for this compartment.

< > Use these buttons to move to the previous or next compartment.

1 of 2 The index display lets you know what compartment is currently targeted.

Clear All Clear All will zero all baggage compartment weights.

Other Stations



Name: Enter a name for this station.

Weight: Enter weight of this load.

Arm: Enter station arm.

Load Exists On: Check the flight phase this load should be applied to.

The Other Stations screen will allow the entry of stations that do not fit as either seats, baggage compartments or fuel. A station can be named.

The load for a station can be specified to exist in a combination of three flight phases - Ramp, Takeoff and Landing. For an explanation of flight phases, see the Overview.

The selection of flight phases can be used to handle cases where a load is dropped in flight. In this case, Ramp and Takeoff would be checked and Landing would be unchecked.

< > Use these button to move to the next or previous station.

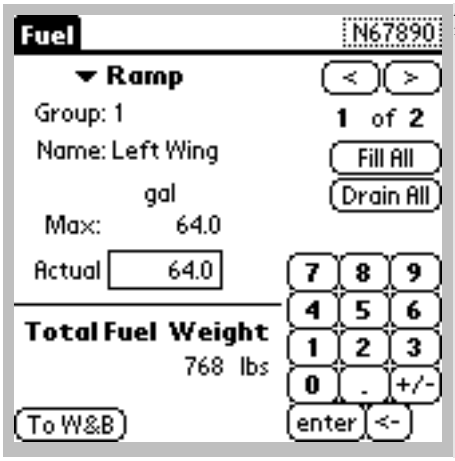
1 of 1 The index display shows what station is currently selected.

New Tap New to add a new station (max of 8).

Delete Delete will remove the current station.

Clear All Clear All will zero all other station weights.

Fuel



Actual: Enter the level of tank fuel in this flight phase.

The Fuel screen is used to specify the amount of fuel in tanks at the selected flight phase. For an explanation of flight phases, see the Overview.

The flight phase selector shows the active flight phase. It is important that fuel is entered for all three phases in order to get accurate CG and weight measurements.

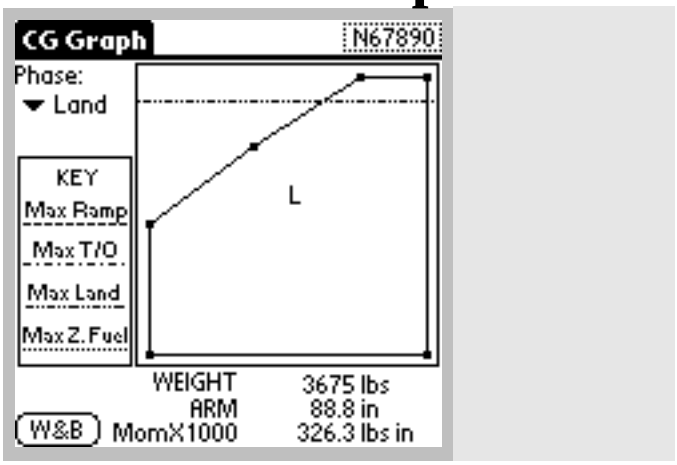
Group is the number to which this tank belongs (as specified when the aircraft was created using *AircraftEditor*)

Name of this tank was specified when the aircraft was created.

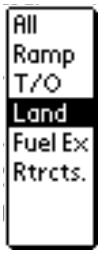
Max: The maximum amount of fuel this tank can hold. (NOTE: This is the actual amount of fuel including unusable fuel.)

Total Fuel Weight: Is the weight of fuel in all tanks.

CG Graph



The CG Graph screen gives a graphical representation of the loaded aircraft center of gravity as it relates to the cg envelope. The graph also depicts the maximum weight for the selected phase.



For example, in the example screen above the letter “L” shows the position of the CG within the envelope. Below the graph, the actual weight, arm and moment are shown.

Use the Phase selector to show a different flight phase or select All to see a composite of all points.

To find the weight and arm of any point on the graph, tap within the envelop. A blinking point will be displayed and the WEIGHT, ARM and MOM fields will be updated.

Glossary

Arm ..... Center of gravity station (used in CG calculation)
Ceiling ..... Altitude at which climb < 100 ft/min.
CG ..... Center of Gravity
IALT ..... Indicated Altitude. Altitude as read from altimeter.
LEMAC ..... Leading Edge MAC distance.
MAC ..... Mean Aerodynamic Chord
MACW ..... Maximum Allowable Combined Weight
Moment ..... Weight X Arm (used in CG calculation)
RF ..... Recovery Factor. Used to correct for temp probe error.
TAS ..... True airspeed.
VVEL ..... Vertical Velocity. Rate of climb or descent.
W&B ..... Weight and Balance
X-Wind ..... Cross Wind component

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