



CESSNA 150 W&B

Typically, for any W&B on an aircraft you'd check the POH under the Weight and Balance section for the arms of each station. You'd get a diagram of where the seats, baggage area and fuel tank arms are relative to the reference datum .

In the 150, it's an older POH so you have to do a little reverse engineering...

You're given a SAMPLE problem with the WEIGHT (lbs) and MOMENT (lb-in/1,000)

Usually, we display MOMENT in its entirety, such as 54,300 lb-in. In the sample, they simplify the number by dividing the MOMENT by 1,000 and getting a smaller number. (e.g. 54,300 would simply be 54.3).

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb. -ins. /1000)	Weight (lbs.)	Moment (lb. -ins. /1000)
1. Licensed Empty Weight (Sample Airplane) . . .	1038	34.1		
2. Oil (6 qts. - Full oil may be assumed for all flights)	11	-0.1	11	-0.1
3. Fuel (Standard - 22.5 gal at 6 lbs./gallon). . .	135	5.7		
Fuel (Long Range - 35 gal. at 6 lbs./gallon). .				
4. Pilot and Passenger.	340	13.3		
5. Baggage - Area 1 (or children on child's seat)	76	4.9		
6. Baggage - Area 2.	0	0.0		
7. TOTAL WEIGHT AND MOMENT	1600	57.9		
8. Locate this point (1600 at 57.9) on the center of gravity moment envelope, and since this point falls within the envelope, the loading is acceptable.				



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We've got the WEIGHTS and MOMENTS for the sample problem, now we need to find the ARMS of each station (oil, fuel, pilot/passenger, baggage area 1, etc.)

Let's rearrange the simple equation: Weight x Arm = Moment

For example, to find the ARM of the pilot/passenger seats....

Weight= 340lbs

Moment=13.3 (13,300 lb-in)

$W \times A = M$... so $M/W=A$

$13,300\text{lb-in}/340\text{lb} = \mathbf{39.1\text{ in}}$

The arm for the pilot/passenger seats is 39.1 inches. Keep in mind, the seats do move slightly back and forward. 39 inches is likely the average.

Repeat this step for the Oil, Fuel (standard), Baggage Area 1 and 2, and you'll have the arms for each station. Oil's Arm will be NEGATIVE since it is FORWARD of the datum.

Then, refer to the Weight and Balance sheet located inside the aircraft for the appropriate Empty Weight, Empty Weight CG and Empty Weight Moment.

****Remember that UNUSEABLE FUEL is included in the plane's empty weight, so the fuel provided in the sample problem is based on the USEABLE FUEL amount.**

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See W&B sheet
-9, but inc. in BEW
42 in
N/A
39 in
64.5 in
N/A



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Useful terms:

- **Standard Empty Weight:**
 - This is the weight of the aircraft including the airframe, engines, and permanently installed equipment like fixed ballast, unusable fuel, and full engine oil.
- **Licensed Empty Weight:**
 - This term, sometimes used instead of standard empty weight, includes all the elements of standard empty weight, but may not include full engine oil, only undrainable oil.
- **Basic Empty Weight:**
 - This is the standard empty weight plus the weight of any optional or special equipment installed.
- **Useful Load:**
 - This is the difference between the maximum takeoff weight and the basic empty weight, and it includes the weight of the crew, passengers, baggage, usable fuel, and drainable oil.

Additional Information:

Most modern general aviation aircraft are certificated under **14 CFR Part 23 – AIRWORTHINESS STANDARDS: NORMAL CATEGORY AIRPLANES.**

CAR Part 3 is the *previous* version of 14 CFR Part 23 (Airworthiness), but is still applicable when determining continued airworthiness of most aircraft manufactured before 1980.

The important take away is that CAR 3 was the certification standards that the aircraft had to meet at the time of certification. CAR 3 was replaced by 14 CFR Part 23. Once an aircraft is certified and has an Airworthiness Certificate, a new set of airworthiness standards typically will not supplant it. So Part 23 does not apply to a CAR 3 plane.

This is significant because our particular Cessna 150 was certificated in 1969, which means we fall under CAR (Civil Air Regulations) Part 3, vs 14 CFR (Code of Federal Regulations) Part 21. The empty weight **does not include full oil** in the W&B of CAR Part 3 aircraft.