

WEIGHT AND BALANCE

FOR

CHEROKEE WARRIOR

ISSUED: MAY 14, 1973
REVISED: OCTOBER 21, 1977

REPORT: VB-535
MODEL: PA-28-151







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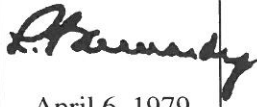

WEIGHT AND BALANCE LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	Approved Date
1	5-8	Revised Arm and Moment values and Fuel capacity for Sample Loading Problem.	<i>V. Tennant</i> Aug. 30, 1973
2	5-10 5-17 5-27	Revised C.G. Range and Weight Chart. Added Vacuum Pump (79399-0). Revised Ground Ventilating Blower.	<i>om</i> Jan. 25, 1974
3	Title	Added PAC Approval Form. (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	May 31, 1974
4	5-5, 5-7 5-12 5-13 5-14 5-16 5-17 5-18 5-19 5-20 5-21 5-22 5-23 5-24 5-25 5-25a 5-25b	Revised Unusable Fuel Moment (graph). Revised Engine Driven Fuel Pump and Prestolite Starter Cert. Basis; added Chrysler Alternator; added Oil Filters and footnote. Revised Landing Gear Cert. Basis. Revised Battery Weight, Arm and Moment; added Annunciator Lights and footnote. Revised Inertia Safety Belts Weights, Moment and part no. Added Lycoming LW13743, Champion (H-48110) Oil Filter; revised Vacuum Regulator Weight and Moment; revised Prestolite Starter Cert. Basis; added Low Vacuum Annunciator Lights, Airborne Vacuum Regulator and footnotes. Revised Battery Weight, Arm and Moment. Revised Red Strobe Light Cert. Basis. Added Encoding Altimeter and footnote. Revised AutoControl III; added AutoControl IIIB and footnotes. Revised King VHF Transceivers; added footnote. Added footnote. Revised UGR-2A Glide Slope; added footnote Revised Narco Marker Beacon and King Audio Panel; added footnote Added Page. Added Page.	<i>om</i>

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	Approved Date
4 (cont)	5-26	Revised Inertia Safety Belts part no.; revised Main Wheel Fairings and Adjustable Front Seats Weight, Arm and Moment; added Assist Strap.	 June 14, 1974
	5-27	Added Corrosive Resistant Kit	
5	5-15	Revised Engine Cluster Dwg. No	 Jan. 17, 1975
	5-26	Revised Fire Extinguisher Weight and Moment; deleted Baggage Tie Down Straps	
	5-27	Added Overhead Vent Systems (76304-9 and 76304-10)	
6	5-15	Revised Airspeed Indicator info; added footnotes.	 July 14, 1975
	5-18	Revised Rotating Beacon; revised Piper Pitch Trim Dwg. No.; added 67496-3 and footnote.	
	5-20	Revised Tru-Speed Indicator info.; added Engine Hour Meter; added footnotes.	
	5-21	Revised AutoFlite II, AutoControl IIIB and Omni Coupler Cert. Basis; added footnotes.	
	5-26	Added 79591-0 (Left) Vert. Adj. Front Seats; added 79591-1 (Right) Vert. Adj. Front Seat.	
	5-27	Added Stainless Steel Control Cables; relocated Exterior Finish to page 5-28.	
	5-28	Added Exterior Finish from page 5-27.	
7	5-20	Revised Clock.	 Dec. 1, 1975
	5-25	Revised Automatic Locator Transmitter	
	5-25a	Added King KN61 and KN65A DME's.	
8	5-25	Added Automatic Locator Transmitter; moved info to page 5-25a.	 July 20, 1976
	5-25a	Added info from page 5-25.	
9	Title	Added Applicable Serial Numbers (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	 Oct. 21, 1977

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	Approved Date
10	5-1 5-3 5-4	Revised Weight and Balance info. Added Caution; relocated para. 2. b. to pg. 5-4. Added para. 2. b. from pg. 5-3.	 April 6, 1979
11	5-12	Added Oil Cooler alternate vendor info.	 Nov. 10, 1988

WEIGHT AND BALANCE

In order to achieve the performance and flying characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position within the approved envelope. The aircraft offers a tremendous flexibility of loading. However, you cannot fill the airplane, with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must insure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as a properly loaded one. The heavier the airplane is loaded, the less climb performance it will have.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, it may be difficult to rotate for takeoff or landing. If the C.G. is too far aft, the airplane may rotate prematurely on takeoff or try to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded aircraft, however, will perform as intended. Before the airplane is delivered, it is weighed, and a basic weight and C.G. location is computed. (Basic weight consists of the empty weight of the aircraft plus the unusable fuel and full oil capacity.) Using the basic weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

The basic weight and C.G. location for a particular airplane are recorded in the weight and balance section of the Airplane Flight Manual. The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new basic weight and basic C.G. position and to write these in the aircraft log book. The owner should make sure that it is done.

A weight and balance calculation is necessary in determining how much fuel or baggage can be boarded so as to keep within allowable limits. Check calculations prior to adding fuel to insure against improper loading.

The following pages are forms used in weighing an airplane in production and in computing basic weight, basic C.G. position, and useful load. Note that the useful load includes fuel, oil, baggage, cargo and passengers. Following this is the method for computing takeoff weight and C.G.

WEIGHT AND BALANCE DATA

WEIGHING PROCEDURE

At the time of delivery, Piper Aircraft Corporation provides each airplane with the licensed empty weight and center of gravity location. This data is on Page 5-7.

The removal or addition of an excessive amount of equipment or excessive airplane modifications can affect the licensed empty weight and empty weight center of gravity. The following is a weighing procedure to determine this licensed empty weight and center of gravity location:

1. PREPARATION

- a. Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.
- b. Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.
- c. Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops.

CAUTION

Whenever the fuel system is completely drained and fuel is replenished it will be necessary to run the engine for a minimum of 3 minutes at 1000 RPM on each tank to insure no air exists in the fuel supply lines.

- d. Drain all oil from the engine, by means of the oil drain, with the airplane in ground attitude. This will leave the undrainable oil still in the system. Engine oil temperature should be in the normal operating range before draining.
- e. Place pilot and copilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.
- f. Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

2. LEVELING

- a. With airplane on scales, block main gear oleo pistons in the fully extended position.

CHEROKEE WARRIOR

- b. Level airplane (see diagram) deflating nose wheel tire, to center bubble on level.

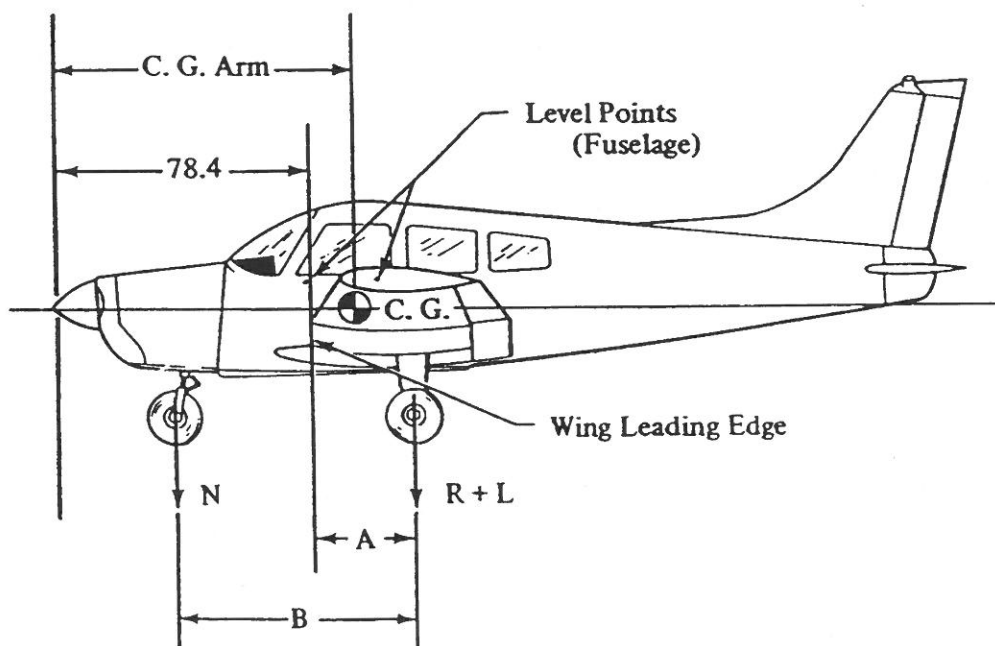
3. WEIGHING - AIRPLANE EMPTY WEIGHT

- a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

Scale Position and Symbol	Scale Reading	Tare	Net Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Airplane Empty Weight, as Weighed (T)			

4. EMPTY WEIGHT CENTER OF GRAVITY

- a. The following geometry applies to the PA-28-151 airplane when airplane is level (See Item 2).



The datum is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.

A =

B =

- b. Obtain measurement "A" by measuring from a plumb bob dropped from one wing leading edge, at the intersection of the straight and inboard tapered section, horizontally and parallel to the airplane centerline, to the main wheel centerline.
- c. Obtain measurement "B" by measuring the distance from the main wheel centerline, horizontally and parallel to the airplane centerline, to each side of the nose wheel axle. Then average the measurements.
- d. The empty weight center of gravity (as weighed including optional equipment and undrainable oil) can be determined by the following formula:

$$\text{C.G. Arm} = 78.4 + A - \frac{B(N)}{T}$$

$$\text{C. G. Arm} = 78.4 + (\quad) - \frac{(\quad)(\quad)}{(\quad)} = \quad \text{inches}$$

5. LICENSED EMPTY WEIGHT AND EMPTY WEIGHT CENTER OF GRAVITY

	Weight	Arm	Moment
Empty Weight (as weighed)			
Unusable Fuel (2.0 gal.)	12 lb	103.0	1236
Licensed Empty Weight			

WEIGHT AND BALANCE DATA

MODEL PA-28-151 CHEROKEE

Airplane Serial Number _____

Registration Number _____

Date _____

AIRPLANE EMPTY WEIGHT

Item		Weight (Lbs)	x	C. G. Arm (Inches Aft of Datum)	=	Moment (In-Lbs)
*Empty Weight	Actual Computed					
Unusable Fuel (2 gal.)		12		103		1236
Standard Empty Weight						
Optional Equipment						
Licensed Empty Weight						

*Empty weight is defined as dry empty weight (including paint and hydraulic fluid) plus 1.8 lbs undrainable engine oil.

AIRPLANE USEFUL LOAD

(Gross Weight) - (Licensed Empty Weight) = Useful Load

Normal category: (2325 lbs) - (lbs) = lbs

Utility category: (1950 lbs) - (lbs) = lbs

THIS LICENSED EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS DELIVERED FROM THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

C. G. RANGE AND WEIGHT INSTRUCTIONS

1. Add the weight of all items to be loaded to the licensed empty weight.
2. Use the loading graph to determine the moment of all items to be carried in the airplane.
3. Add the moment of all items to be loaded to the licensed empty weight moment.
4. Divide the total moment by the total weight to determine the C.G. location.
5. By using the figures of Item 1 and Item 4, locate a point on the C.G. range and weight graph. If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

SAMPLE LOADING PROBLEM (Normal Category)

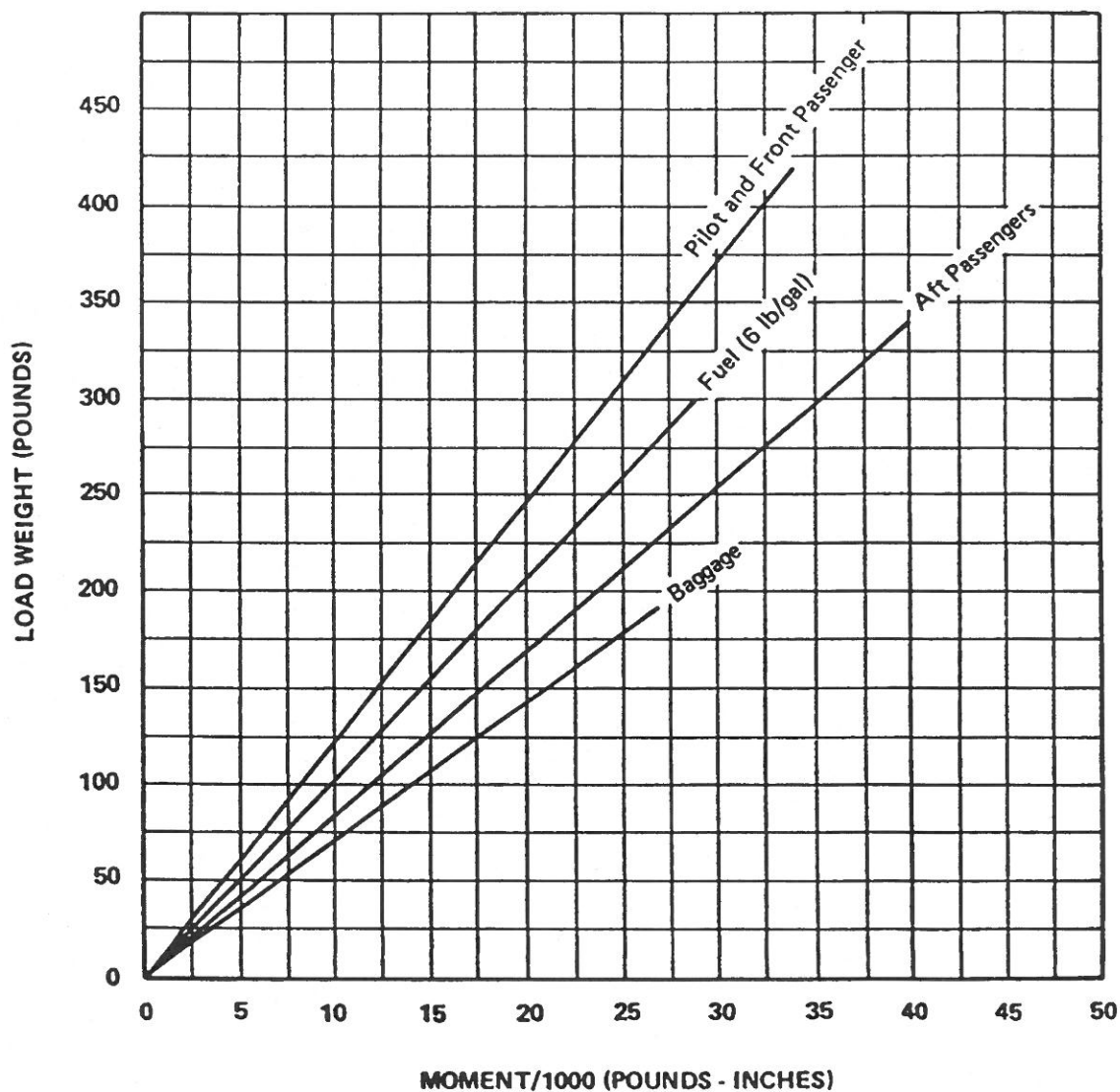
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Licensed Empty Weight			
Oil (8 quarts)	15	27.5	413
Pilot and Front Passenger	340	80.5	27370
Passengers, Aft* (Rear Seat)	340	118.1	40154
Fuel (48 Gal. Maximum)		95.0	
Baggage*		142.8	
Total Loaded Airplane			

The center of gravity (C.G.) of this sample loading problem is at _____ inches aft of the datum line. Locate this point () on the C.G. range and weight graph. Since this point falls within the weight-C.G. envelope, this loading meets the weight and balance requirements.

IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.

*Utility Category Operation - No baggage or aft passengers allowed.

LOADING GRAPH



C. G. RANGE AND WEIGHT

