WEIGHT AND BALANCE

FOR

CHEROKEE ARCHER

APPLICABLE TO SERIAL NUMBERS 28-7405001 THROUGH 28-7505259

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS REPORT TO APPLICABLE AIRCRAFT. THIS REPORT REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED BELOW WHEN APPROVED BY PIPER AIRCRAFT CORPORATION. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-28-180

AIRCRAFT SERIAL NO. _____ REGISTRATION NO._____

WEIGHT AND BALANCE, REPORT NUMBER VB-547 REVISION_____

PIPER AIRCRAFT CORPORATION
APPROVAL SIGNATURE AND STAMP_____

ISSUED: MAY 14, 1973
REVISED: NOVEMBER 21, 1975

REPORT: VB-547
MODEL: PA-28-180

WEIGHT AND BALANCE

WEIGHT AND BALANCE LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	Approved Date
1	5-11	Revised Propeller Weight and Moment: Revised Spinner Weight, Arm and Moment.	Nov. 6, 1973
	5-13	Added Arm and Moment and Removed Dwg. No. for Nose Wheel.	
	5-14	Revised Voltage Regulator and Battery Weights and Moments.	
	5-16	Revised Toe Brakes Weight and Moment.	
	5-18	Revised Battery Weights and Moment.	
	5-23	Revised Selector Panel and Marker Beacon Weights, Arms and Moments.	
	5-25	Revised Microphones Weights, Arms and Moments.	
	5-26	Revised Main and Nose Wheel Fairings Weights, Arms and Moments; Revised Left and Right Vert. Adj. Front Seats Weights, Arms and Moments; Added Overhead Vent System and revised Weight and Moment for Ground Vent Blower; Revised Overhead Vent System Weight, Arm and Moment.	
	5-27	Added Corrosive Resistant Kit.	
2	Title	Added PAC Approval Form. (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	May 30, 1974
3	5-12	Added Oil Filters; added footnote.	June 17, 1974
	5-14	Added Annunciator Lights and footnote.	
	5-16	Revised Inertia Safety Belts Weights, Moment and Part No.	
	5-17	Added Oil Filter - Lycoming, Vacuum Pump - Airborne, Low Vacuum Regulator Light, and Vacuum Regulator- Airborne #2H3-19; revised Weight and Moment of Vacuum Regulator - Airborne #133A4; added footnotes.	
	5-20	Added Encoding Altimeter and footnote.	
	5-21	Added AutoControl IIIB and footnotes.	
	5-22	Revised King VHF Transceivers and added footnotes.	

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	Approved Date
3 (cont)	5-23	Added footnote.	
	5-24	Revised UGR-2 Glide Slope; added footnote.	
	5-25	Revised Narco Transponder and King Audio Panel.	R. Hamlin
	5-25a	Added Page.	
	5-25b	Added Page.	
	5-26	Revised Inertia Safety Belts Part No.; added Assist Strap (79455)	
4	5-5	Revised equations.	
	5-12	Added O-360-A4M engine.	
	5-15	Revised Engine Clusters dash nos.	
	5-22	Revised King KNI-520 VOR/ILS Indicators' weights and moments.	
	5-27	Added Overhead Vent System (76304-9); added Overhead Vent System with Ground Vent. Blower (76304-10).	C. E. Rinkel Jan. 20, 1975
5	Title	Added Applicable Serial Nos.	
	5-12	Removed Ser. Nos. from Engine - Lycoming Model O-360-A4A and Engine - Lycoming Model O-360-A4M; deleted Chrysler alternator.	
	5-18	Revised Rotating Beacon; revised Dwg. No. of Piper Pitch Trim; added footnote.	
	5-26	Added 79591-0 (Left) Vert. Adj. Front Seats; added 79591-1 (Right) Vert. Adj. Front Seats; relocated Overhead Vent Systems (2) to page 5-27.	
	5-27	Added Overhead Vent Systems (2) relocated from page 5-26; added 79337-18 Headrest (Front); added 79337-18 Headrest (Rear); added Stainless Steel Control Cables; relocated Exterior Finish to page 5-28.	C. E. Rinkel
	5-28	Added Exterior Finish from page 5-27.	Nov. 21, 1975
6	5-1	Revised introduction.	Hal Fletcher March 26, 1979

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	Approved Date
7	5-1 5-3 5-7	Revised text info. Revised text info. Revised Weight and Balance Data.	Ward Evans March 16, 1984

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 flexibility in 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 licensed, 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 licensing, 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.

   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.

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

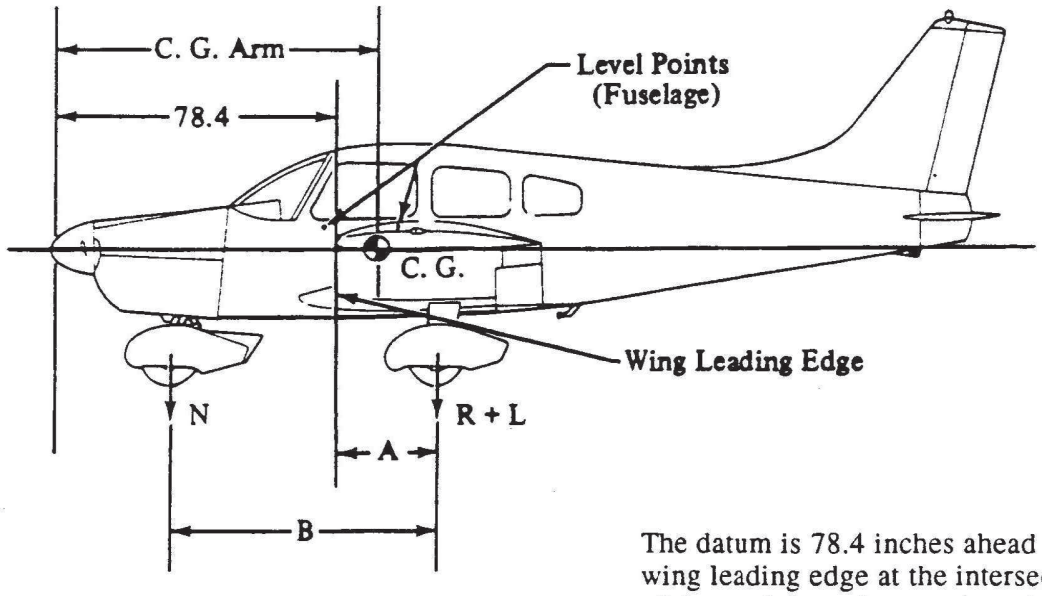
3. WEIGHING - AIRPLANE EMPTY WEIGHT

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-28-180 airplane when airplane is level (See Item 2).



A =

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

B =

b. Obtain measurement "A" by measuring from a plumb bob dropped from one wing leading edge, at the intersection of the straight and 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 (13-1/3 pints)	+10.0	103.0	+1030
Licensed Empty Weight			

WEIGHT AND BALANCE DATA

MODEL PA-28-180 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 (13-1/3 pints)	10.0	103.0	1030
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:	(2450 lbs)	-	(	lbs)	=	lbs
Utility Category:	(1950 lbs)	-	(	lbs)	=	lbs

THIS LICENSED EMPTY WEIGHT. C.G. AND USEFUL LOAD FOR THE AIRPLANE AS LICENSED AT 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)

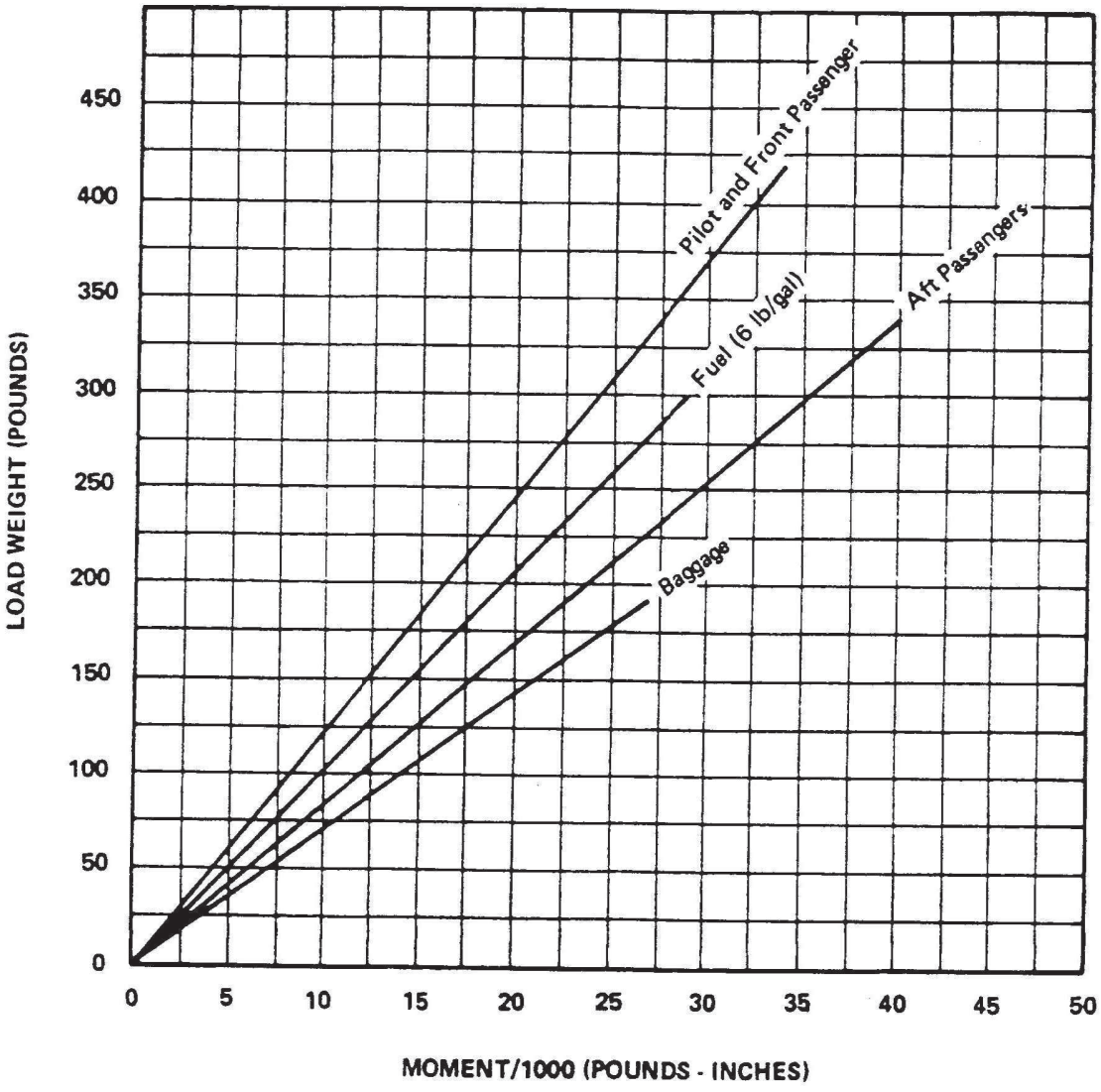
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Licensed Empty Weight			
Oil (8 quarts)	15	27.5	413
Pilot and Front Passenger	340	80.5	27370
Passengers, Aft* (Rear Seat)	340	118.1	40154
Fuel (48 Gal. Maximum)		95.0	
Baggage*		142.8	
Total Loaded Airplane			

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