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WEIGHT AND BALANCE

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SECTION 6

WEIGHT AND BALANCE

6.1 GENERAL

In order to achieve the performance and flight characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position within the approved operating range (envelope). Although the airplane offers a tremendous flexibility of loading, it cannot be flown with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must ensure 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 tend 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 airplane, however, will perform as intended. Before the airplane is delivered, a basic empty weight and C.G. location is computed (basic empty weight consists of the standard empty weight of the airplane plus the optional equipment). Using the basic empty 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 empty weight and C.G. location are recorded in the Aircraft Log Book, or the Weight and Balance Data Form (Figure 6-5) and the Weight and Balance Record (Figure 6-7). 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 empty weight and C.G. position and to write these in the Aircraft Log Book and the Weight and Balance Record. 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 overloading.

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

6.3 AIRPLANE WEIGHING PROCEDURE

At the time of delivery, Piper Aircraft Corporation provides each airplane with the basic empty weight and center of gravity location. This data is supplied by Figure 6-5.

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

(a) Preparation

- (1) Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.
- (2) Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.
- (3) 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. Then add the unusable fuel (4.0 gallons total, 2.0 gallons each wing).

CAUTION

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

- (4) Fill with oil to full capacity.
- (5) 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.
- (6) Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

(b) Leveling

- (1) With airplane on scales, block main gear oleo pistons in the fully extended position.
- (2) Level airplane (refer to Figure 6-3) deflating nose wheel tire, to center bubble on level.

(c) Weighing - Airplane Basic Empty Weight

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

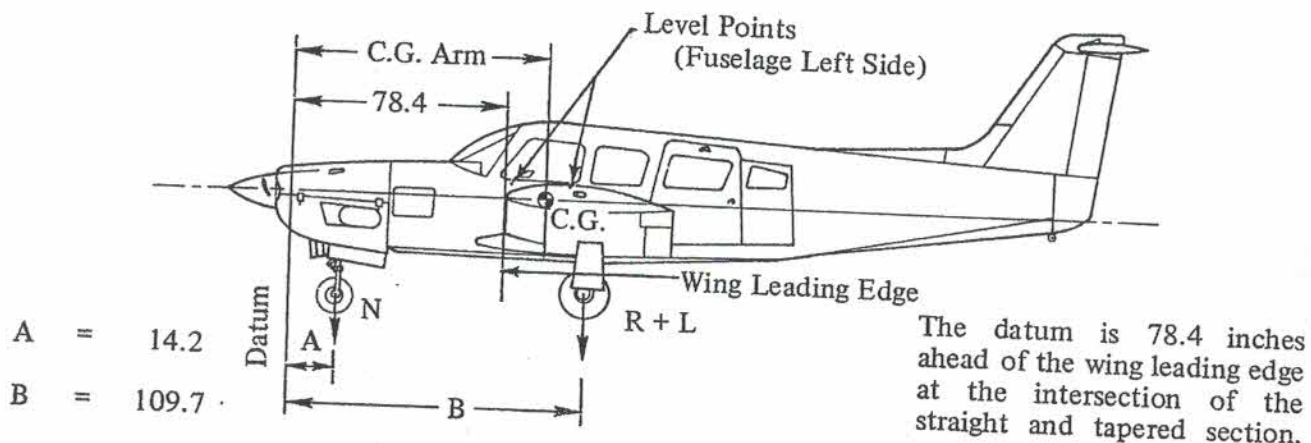
Scale Position and Symbol	Scale Reading	Tare	Net Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Basic Empty Weight, as Weighed (T)			

WEIGHING FORM

Figure 6-1

(d) Basic Empty Weight Center of Gravity

- (1) The following geometry applies to the PA-32RT-300 airplane when it is level. Refer to Leveling paragraph 6.3 (b).



LEVELING DIAGRAM

Figure 6-3

- (2) The basic empty weight center of gravity (as weighed including optional equipment, full oil and unusable fuel) can be determined by the following formula:

$$\text{C.G. Arm} = \frac{N(A) + (R + L)(B)}{T} \text{ inches}$$

Where: $T = N + R + L$

6.5 WEIGHT AND BALANCE DATA AND RECORD

The Basic Empty Weight, Center of Gravity Location and Useful Load listed in Figure 6-5 are for the airplane as delivered from the factory. These figures apply only to the specific airplane serial number and registration number shown.

The basic empty weight of the airplane as delivered from the factory has been entered in the Weight and Balance Record (Figure 6-7). This form is provided to present the current status of the airplane basic empty weight and a complete history of previous modifications. Any change to the permanently installed equipment or modification which affects weight or moment must be entered in the Weight and Balance Record.

MODEL PA-32RT-300 LANCE II

Airplane Serial Number _____

Registration Number _____

Date _____

AIRPLANE BASIC EMPTY WEIGHT

Item	Weight (Lbs)	x	C. G. Arm (Inches Aft of Datum)	=	Moment (In-Lbs)
Standard Empty Weight* Actual Computed					
Optional Equipment					
Basic Empty Weight					

*The standard empty weight includes full oil capacity and 4.0 gallons of unusable fuel.

AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION

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

(3600 lbs) - (lbs) = lbs.

THIS BASIC 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.

WEIGHT AND BALANCE DATA FORM

Figure 6-5

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REPORT: VB-890
6-7

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WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

[illegible]

WEIGHT AND BALANCE RECORD (cont)

Figure 6-7 (cont)

6.7 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

- Add the weight of all items to be loaded to the basic empty weight.
- Use the Loading Graph (Figure 6-13) to determine the moment of all items to be carried in the airplane.
- Add the moment of all items to be loaded to the basic empty weight moment.
- Divide the total moment by the total weight to determine the C.G. location.
- By using the figures of item (a) and item (d) (above), locate a point on the C.G. range and weight graph (Figure 6-15). If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight			
Pilot and Front Passenger	340.0	85.5	29070
Passengers (Center Seats) (Forward Facing)		118.1	
Passengers (Center Seats) (Aft Facing) (Optional)		119.1	
Passengers (Rear Seats)	340.0	157.6	53584
Passenger (Jump Seat) (Optional)		118.1	
Fuel (94 Gallon Maximum)		93.6	
Baggage (Forward) (100 Lb. Limit)		42.0	
Baggage (Aft) (100 Lb. Limit)		178.7	
Moment due to Retraction of Landing Gear			819
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.

SAMPLE LOADING PROBLEM (NORMAL CATEGORY)

Figure 6-9

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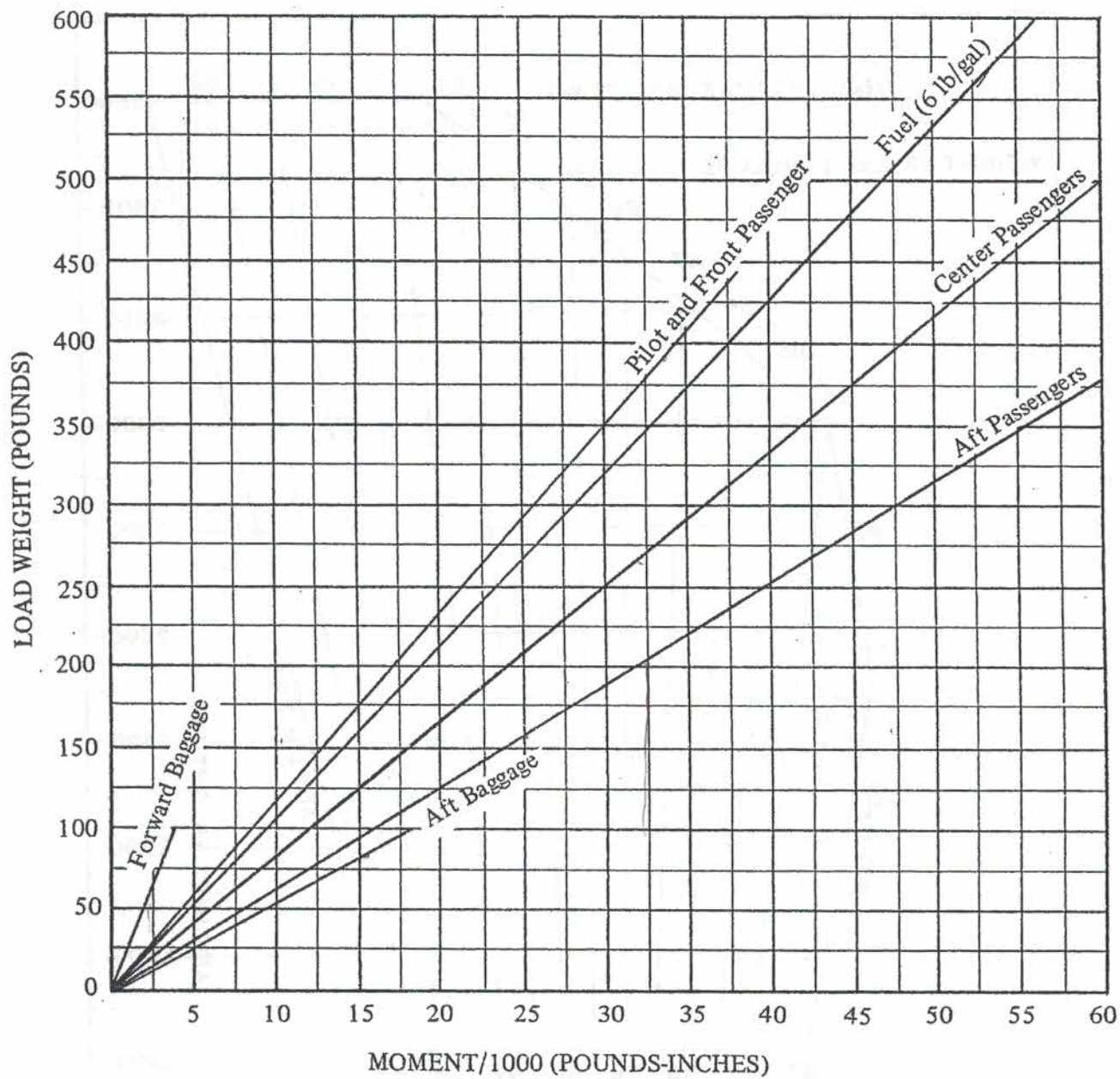
PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight			
Pilot and Front Passenger		85.5	
Passengers (Center Seats) (Forward Facing)		118.1	
Passengers (Center Seats) (Aft Facing) (Optional)		119.1	
Passengers (Rear Seats)		157.6	
Passenger (Jump Seat) (Optional)		118.1	
Fuel (94 Gallon Maximum)		93.6	
Baggage (Forward) (100 Lb. Limit)		42.0	
Baggage (Aft) (100 Lb. Limit)		178.7	
Moment due to Retraction of Landing Gear			819
Total Loaded Airplane			

Totals must be within approved weight and C.G. limits. It is the responsibility of the airplane owner and the pilot to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Weight and Balance Data Form (Figure 6-5). If the airplane has been altered, refer to the Weight and Balance Record for this information.

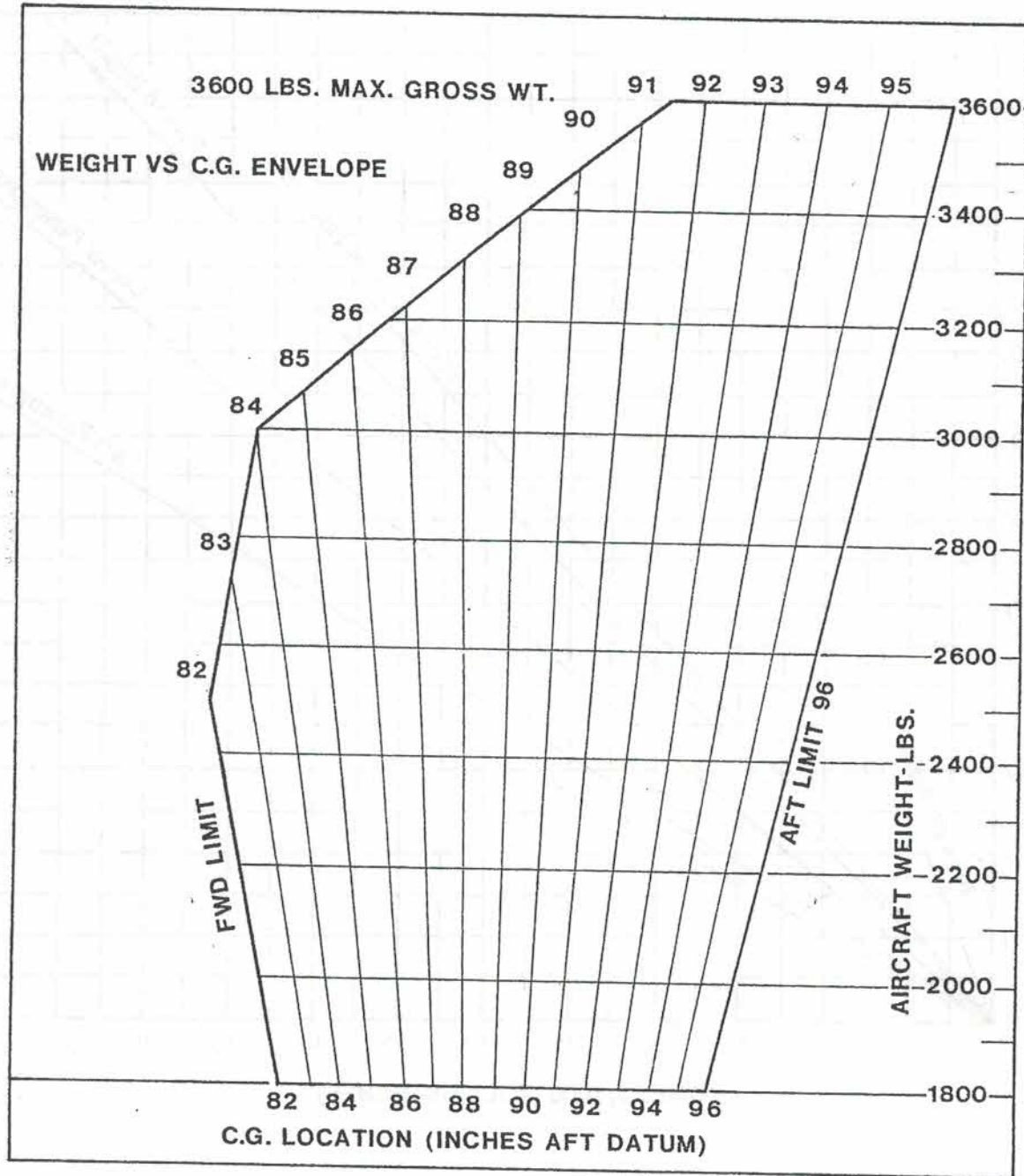
WEIGHT AND BALANCE LOADING FORM

Figure 6-11



LOADING GRAPH

Figure 6-13



Moment change due to retracting landing gear = +819 IN.-LBS.

C.G. RANGE AND WEIGHT

Figure 6-15

6.9 INSTRUCTIONS FOR USING THE WEIGHT AND BALANCE PLOTTER

This plotter is provided to enable the pilot quickly and conveniently to:

- (a) Determine the total weight and C.G. position.
- (b) Decide how to change his load if his first loading is not within the allowable envelope.

Heat can warp or ruin the plotter if it is left in the sunlight. Replacement plotters may be purchased from Piper dealers and distributors.

When the airplane is delivered, the basic weight and basic C.G. will be recorded on the computer. These should be changed any time the basic weight or C.G. location is changed.

The plotter enables the user to add weights and corresponding moments graphically. The effect of adding or disposing of useful load can easily be seen. The plotter does not cover the situation where cargo is loaded in locations other than on the seats or in the baggage compartments.

Brief instructions are given on the plotter itself. To use it, first plot a point on the grid to locate the basic weight and C.G. location. This can be put on more or less permanently because it will not change until the airplane is modified. Next, position the zero weight end of any one of the loading slots over this point. Using a pencil, draw a line along the slot to the weight which will be carried in that location. Then position the zero weight end of the next slot over the end of this line and draw another line representing the weight which will be located in this second position. When all the loads have been drawn in this manner, the final end of the segmented line locates the total load and the C.G. position of the airplane for takeoff. If this point is not within the allowable envelope it will be necessary to remove fuel, baggage, or passengers and/or to rearrange baggage and passengers to get the final point to fall within the envelope.

Fuel burn-off and gear movement do not significantly affect the center of gravity.

SAMPLE PROBLEM

A sample problem will demonstrate the use of the weight and balance plotter.

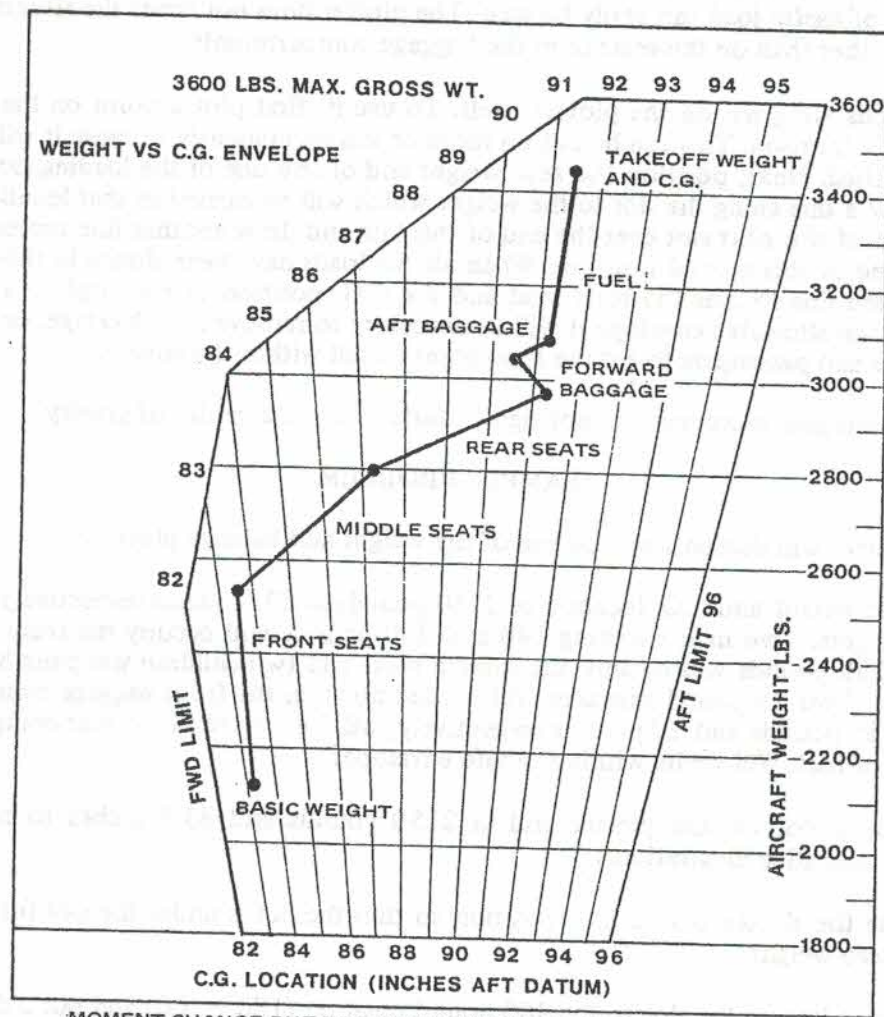
Assume a basic weight and C.G. location of 2150 pounds at 83.5 inches respectively. We wish to carry a pilot and 5 passengers. Two men weighing 180 and 200 pounds will occupy the front seats, two women weighing 115 and 135 pounds will occupy the middle seats and two children weighing 80 and 100 pounds will ride in the rear. Two 25 pound suitcases will be tied down in the front baggage compartment and two suitcases weighing 25 pounds and 20 pounds respectively, will be carried in the rear compartment. We wish to carry 60 gallons of fuel. Will we be within the safe envelope?

- (1) Place a dot on the plotter grid at 2150 pounds and 83.5 inches to represent the basic airplane. (See illustration.)
- (2) Slide the slotted plastic into position so that the dot is under the slot for the forward seats, at zero weight.
- (3) Draw a line up the slot to the 380 pound position ($180 + 200$) and put a dot.
- (4) Move the slotted plastic again to get the zero end of the middle seat slot over this dot.
- (5) Draw a line up this slot to the 250 pound position ($115 + 135$) and place the 3rd dot.

- (6) Continue moving the plastic and plotting points to account for weight in the rear seats (80 + 100), forward baggage compartment (50), rear baggage compartment (45), and fuel tanks (360).
- (7) As can be seen from the illustration, the final dot shows the total weight to be 3440 pounds with the C.G. at 91.6. This is well within the envelope.
- (8) There will be room for more fuel.

As fuel is burned off, the weight and C.G. will follow down the fuel line and stay within the envelope for landing.

SAMPLE PROBLEM



MOMENT CHANGE DUE TO RETRACTING LANDING GEAR = 819 IN.-LBS.

6.11 EQUIPMENT LIST

The following is a list of equipment which may be installed in the PA-32RT-300. It consists of those items used for defining the configuration of an airplane when the basic empty weight is established at the time of delivery. Only those standard items which are alternate standard items and those required to be listed by the certificating authority (FAA) are presented. Items marked with an "X" are those items which were installed on the airplane described below as delivered by the manufacturer.

Where the letter "A," "B," or "C" precedes an item, "A" denotes an item which is required equipment that must be installed in the aircraft, "B" denotes an item which is required equipment that must be installed in the aircraft unless replaced by an optional equivalent item; "C" denotes an optional item which replaces a required item of standard equipment. Where no letter precedes an item, that item is not required equipment.

Unless otherwise indicated, the installation certification basis for the equipment included in this list is the aircraft's approved type design.

PIPER AIRCRAFT CORPORATION

PA-32RT-300 LANCE II

SERIAL NO. _____ REGISTRATION NO. _____ DATE: _____

(a) Propeller and Propeller Accessories

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
1	A	Propeller, Hartzell HC-C2YK-1 () F/F8475D-4 Cert. Basis - TC P920		51.0	-12.1	-618
3		Spinner Piper Dwg. 99374-0		4.8	-13.2	-63
5	A	Propeller Governor Piper Dwg. 66634-8 (Hartzell F-4-11 ()) Cert. Basis - TC P920		4.5	-3.1	-14

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(b) Engine and Engine Accessories, Fuel and Oil Systems

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
7 A	Engine Lycoming Model IO-540-K1G5D Cert. Basis - TC 1E4	_____	468.8	11.25	5274
9 A	Engine Driven Fuel Pump Lycoming P/N 75247 Cert Basis - TC 1E4	_____	*1.7	27.6	47
11 A	Electric Fuel Pump Airborne P/N 1B5-6	_____	3.0	112.6	338
13 A	Fuel Valve Piper Dwg. 69735-5 (Airborne P/N 1-H65-5)	_____	2.4	110.8	266
15 A	Oil Coolers (2), Piper Dwg. 16599-0 (Harrison P/N C-8529245)	_____	4.2	22.5	94
17 A	Air Filter Fram P/N CA-161PL	_____	1.0	16.0	16
19 B	Alternator Piper Dwg. 99945-0 a. Chrysler P/N 3656624 b. Chrysler P/N 4111810	_____ _____	*12.7 13.5	-2.5 -2.5	-32 -34
21 A	Starter Lycoming P/N 76211 (Prestolite P/N MZ 4206) Cert. Basis - TC 1E4	_____	*18.0	0.7	13
23 A	Oil Filter Lycoming P/N 63459 Cert. Basis - TC 1E4	_____	*1.6	43.5	70

*Included in basic engine dry weight.

(c) Landing Gear and Brakes

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
31 B	Two Main Wheel-Assemblies, a. Cleveland Aircraft Products Wheel Assy. No. 40-90 Brake Assy. No. 30-65, Cert. Basis - TSO C26a b. 6.00-6 Type III 8 Ply Rating Tires with Reg. Tubes Cert. Basis - TSO C62		32.9	109.8	3612
33 B	Nose Wheel Assembly a. Cleveland Aircraft Products Wheel Assy. No. 40-77 Cert. Basis - TSO C26a b. McCauley Industrial Corp. Wheel Assy. No. D-30500 Cert. Basis - TSO C26b c. 5.00-5 Type III 6 Ply Rating Tire with Reg. Tube Cert. Basis - TSO C62	— —	2.6 3.6 6.1	14.3 14.3 14.3	37 51 88

(d) Electrical Equipment

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft. Datum	Moment (Lb-In.)
41 A	Voltage Regulator Piper Dwg. 68804-3		0.5	19.4	10
43 B	Battery Rebat S-25		21.9	42.4	929
45 A	Starter Relay Piper Dwg. 99130-2 (Rebat P/N 111-111)		1.0	32.4	33
47 A	Over Voltage Relay Piper PS50034-1 (Prestolite (Wico Div.) P/N X16799)		0.5	23.0	12

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(e) Instruments

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
51 B	Altimeter Piper PS50008-2-2 (United Instruments UI5934-P or UI5934P-1) Cert. Basis - TSO C10b		1.1	65.9	73
53 B	Airspeed Indicator Piper PS50049-39S-2 (United Instruments 8025-B.280) Cert. Basis - TSO C2b		0.6	66.8	40
55 A	Manifold & Fuel Flow Indicator Cert. Basis - TSO C45 & C47 a. Piper PS50031-7 (United Instruments 6082-H.56 or 6331-H.56) b. Piper PS50031-16 (United Instruments 6331-H.95)		1.2	66.2	80
57 A	Compass Piper Dwg. 67462-6 (Airpath P/N C-2200-L4-B) Cert. Basis - TSO C7c		0.9	64.9	59
59 A	Tachometer Piper Dwg. 62177-2 (AC 6411622) or Piper Dwg. 62177-3 (Stewart Warner 551-WE(N))		0.7	66.2	47
61 A	Left Engine Cluster Piper Dwg. 95241-20		0.8	67.4	54
63 A	Right Engine Cluster Piper Dwg. 95211-19 or -28		0.8	67.4	54

(f) Hydraulic Equipment

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
71 A	Handbrake Master Cylinder Cleveland Aircraft Products No. 10-22		0.6	60.9	37
73 A	Toe Brake Cylinders				
	a. Cleveland Aircraft Products No. 10-27	_____	0.7	55.1	39
	b. Gar-Kenyon Instruments 17000	_____	0.4	55.1	22
75 A	Landing Gear Hydraulic Pump Piper Dwg. 96671-2 (Prestolite HYC-5005)		9.0	46.6	420
77 A	Main Gear Hydraulic Cylinders (2), Piper Dwg. 96860-0 Synco Devices SFA 232-3)		2.2	108.0	238
79 A	Nose Gear Hydraulic Cylinder Piper Dwg. 35797-2 (Gar Kenyon 94951)		2.0	41.8	84

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(g) Cabin Interior

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
85 A	Left Front Seat Piper Dwg. 79337-19		15.5	93.0	1442
87	Right Front Seat Piper Dwg. 79337-20		15.5	93.0	1442
89	Left Middle Seat Piper Dwg. 96827-24		13.5	124.1	1676
91	Right Middle Seat Piper Dwg. 96827-25		13.5	124.1	1676
93	Left Rear Seat Piper Dwg. 79479-2		14.5	155.7	2258
95	Right Rear Seat Piper Dwg. 79479-3		14.5	155.7	2258
97 A	Front Seat Belts (2) Piper PS50039-4-2A (American Safety Eqpt. Corp. 449965 Black) Cert. Basis - TSO C22f		1.8	86.9	156
99 A	Center Seat Belts (2) Piper PS50039-4-3A (American Safety Eqpt. Corp. 500577 Black) Cert. Basis - TSO C22f		1.6	123.0	197
101 A	Aft Seat Belts (2) Piper PS50039-4-4A (American Safety Equip. Corp. 500576 Black) Cert. Basis - TSO C22f		1.6	163.0	261

(g) Cabin Interior (Cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
103 A	Shoulder Harness (2) (Front Seats Only) Piper PS50039-4-21 (Pacific Scientific 1 107447-05 Black)		1.4	120.1	169
105 A	Baggage Straps Piper Dwg. 66804-0 and 66805-0		1.3	177.0	230
107	Tow Bar Piper Dwg. 69975-2		2.3	193.9	446

(h) Engine and Engine Accessories, Fuel and Oil Systems
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
111	Vacuum Pump				
	a. Piper Dwg. 26749-3 (Airborne P/N 200CC)	_____	3.6	27.4	99
	b. Piper Dwg. 79399-0 (Airborne P/N 211cc)	_____	1.8	27.4	50
	c. Piper Dwg. 36535-2 (Edo-Aire P/N 1U128A)	_____	2.2	27.4	60
113	Exhaust Gas Temperature Gage Installation Piper Dwg. 69185-3, Alcor Indicator P/N 202A-7A or P/N 202B-7A Probe Model "A" Lead Assembly 90.00	_____	0.7	69.4	49

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(i) **Propeller and Propeller Accessories**
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
-------------	------	-------------------	--------------------	------------------------	--------------------

(j) **Landing Gear and Brakes**
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
-------------	------	-------------------	--------------------	------------------------	--------------------

121 C Heavy Duty Group No. 1

a. Cleveland Aircraft Products
40-120 Wheel Assy. (2),
30-83 Brake Assy. (2),
Cert. Basis - TSO C26a
Goodrich 6.00 x 6 Ribbed
Type III 8 Ply Rating Tire
with Tube (2)

Cert. Basis - TSO C62

b. Goodrich 5.00 x 5 Ribbed
Type III 6 Ply Rating Tire
with Tube

Cert. Basis - TSO C62

_____ *1.5 109.8 165

_____ (Same as Standard Equipment)

*Weight and moment difference between standard and optional equipment.

(k) Electrical Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
131	Instrument Panel Lights Instl. Piper Dwg. 38004-4	_____	0.3	67.8	20
133	Instrument Light (2), Grimes 15-0083-7	_____	0.2	99.0	20
135	Reading Lights (4) Grimes P/N 10-0644-1	_____	0.6	133.3	80
137	Courtesy Light Installation Piper Dwg. 37874-2	_____	0.4	125.2	50
139	Forward Baggage Light Piper Dwg. 68697-3	_____	0.2	43.5	9
141	Landing Light Piper PS10008-4509 G.E. Model 4509	_____	0.5	-2.6	-1
143	Navigation Lights (Wing) (2) Grimes Model A1285 (Red and Green)	_____	0.4	106.6	43
145	Navigation Light (Rear) (2) Grimes Model A2064 (White)	_____	0.4	304.5	122
147	Anti-Collision Lights (Wing Tip) (Whelen) Piper Dwg. 38221-10 Cert. Basis - STC SA615EA	_____	6.3	186.5	1175
149	Heated Pitot Installation Piper Dwg. 67477-0	_____	0.4	100.0	40
151	Piper Pitch Trim Piper Dwg. 69378-2	_____	4.7	183.2	861
153 C	Battery 12v 35 A.H. Rebat R35	_____	*6.5	42.4	276

*Weight and moment difference between standard and optional equipment.

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(k) Electrical Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
155	Auxiliary Power Receptacle, Piper Dwg. 38014-2	_____	2.6	48.4	126
157	External Power Cable, Piper Dwg. 62355-2	_____	4.3	42.0	181
159	Lighter Casco P/N 200462	_____	0.2	67.9	14

(I) Instruments
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
167	Attitude Gyro				
	a. Piper Dwg. 99002-3 (Edo-Aire P/N 5000B-9)	_____	1.9	64.4	122
	b. Piper Dwg. 99002-8 (Aeritalia S.P.A. P/N 36101P)	_____	2.2	64.4	142
	Cert. Basis - TSO C4c				
169	Directional Gyro				
	a. Piper Dwg. 99003-3 (Edo-Aire P/N 4000B-9)	_____	2.4	64.7	156
	b. Piper Dwg. 99003-4 (Aviation Inst. Mfg. Corp. P/N 200-5)	_____	2.8	64.7	181
	c. Piper Dwg. 99003-7 (Aeritalia S.P.A. P/N 31101P)	_____	1.9	64.7	123
	Cert. Basis - TSO C5c				
171	Horizontal Situation Indicator (HSI) Mitchell P/N NSD-360A Cert. Basis - TSO C6c, C9c, C52c	_____	4.6	64.9	299
173 C	Tru-Speed Indicator Piper PS50049-39T-2 United Instruments P/N 81 25-B.281 Cert. Basis - TSO C2b	_____	(Same as standard equipment)		

SECTION 6
WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(I) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
175 C	Altimeter Piper PS50008-3-2 (United Instruments P/N UI5934-PM or P/N UI5934-PM-1) or Piper PS50008-4-2 (United Instruments P/N UI5934-PA or P/N UI5934-PA-1) or Piper PS50008-5-2 (United Instruments) P/N 5934-PAM-1) Cert. Basis - TSO C10b	_____	(Same as standard equipment)		
177 C	Encoding Altimeter Piper PS50008-6-2 (United Instruments P/N UI5035P-P23) or Piper PS50008-7-2 (United Instruments P/N UI5035PM-P24) Cert. Basis - TSO C10b and C88	_____	*0.7	65.3	46
179	Altitude Reporter (Narco AR-500) Piper Dwg. 69875-3 Cert. Basis - TSO C88	_____	1.0	56.2	57
180	Altitude Digitizer (United Instruments P/N 5125-P3) Cert. Basis - TSO C88	_____	1.0	56.2	56
181	Rate of Climb a. Piper Dwg. 99010-3 (Standard Precision Co. P/N SP-1403 (1) - PIP)	_____	0.5	67.2	34
	b. Piper Dwg. 99010-5 (United Instruments P/N UI-7000) Cert. Basis - TSO C8b	_____	0.7	65.9	47

*Weight and moment difference between standard and optional equipment.

(I) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
183	Alternate Static Source Installation Piper Dwg. 67479-2	_____	0.4	66.0	26
185	Turn and Slip Indicator				
	a. Piper PS50030-2-2 (R. C. Allen P/N A2475-2)	_____	2.9	64.7	188
	b. Piper PS50030-2-3 (Electric Gyro Corp. P/N1234T100-5(P)	_____	1.1	64.7	72
	c. Piper PS50030-2-4 (Electric Gyro Corp. P/N 1234T100-(TY)	_____	1.1	64.7	72
	Cert. Basis - TSO C3b				
187	Turn Coordinator				
	a. Piper PS50030-3-2 (R. C. Allen P/N RCA 80A-9)	_____	2.9	64.7	188
	b. Piper PS50030-3-3 (Electric Gyro Corp. 1394T100-3(5Y)	_____	1.1	64.7	72
	c. Piper PS50030-3-4 (Brittain (AIM) P/N600-009-900)	_____	2.1	64.7	136
	d. Piper PS50030-3-5 (Electric Gyro Corp. 1394T100-3(5PE)	_____	1.1	64.7	72
	Cert. Basis - TSO C3b				
189	MK 10 Radar Altimeter Piper Dwg. 37693-8	_____	5.4	181.3	979
191	Engine Hour Meter Piper Dwg. 69889-2	_____	0.3	66.2	20

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WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(I) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
193	Clock Piper Dwg. 69920-3 or Piper Dwg. 99478-0 (Wakman P/N AN5743-L2 or (Aircraft Instruments and Dev. Inc. 16-100)	_____	0.4	67.4	27
195	Outside Air Temperature Gauge Piper Dwg. 79316-0 (Dresser Industries P/N NHM-70)	_____	0.2	77.6	16
197	Gyro Suction Gauge Piper Dwg. 99480-0 (Airborne P/N 1G10-1) or (AN Std. P/N AN577-11)	_____	0.5	67.2	34
199	Vacuum Regulator Airborne P/N 2H3-19	_____	0.6	53.2	32
201	Vacuum Filter Piper Dwg. 66673-0 (Airborne P/N 1J7-1)	_____	0.3	53.5	16

(m) Autopilots
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
211	Auto Flite II Cert. Basis - STC SA-3054 SW-D	_____	6.6	92.8	613
213	Auto Control IIIB	_____	7.4	88.5	655
	a. Directional Gyro 52D54	_____	3.1	64.0	199
	b. Omni Coupler IC-388	_____	0.9	64.3	58
	Cert. Basis - STC SA-3053 SW-D				
215	AltiMatic IIIC	_____	23.0	126.6	2912
	a. Directional Gyro 52D54	_____	3.1	64.9	202
	b. Omni Coupler IC-388	_____	0.9	64.3	58
	c. G/S Coupler IC-493	_____	1.5	56.7	85
	Cert. Basis - STC SA-3253 SW-D				
217	King KFC 200 Flight Control System with KI-256 Flight Director and 3 In. Gyros Cert. Basis - STC SA1430CE	_____	50.4	149.9	7555
219	King KFC 200 Flight Control System with KG-258 Attitude Horizon Indicator and 3 In. Gyros Cert. Basis - STC SA1430CE	_____	50.4	149.9	7555

SECTION 6
WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(n) Radio Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
221	Collins VHF-250 or VHF-251 Comm Transceiver				
	a. Single	_____	4.0	61.9	248
	b. Dual	_____	8.1	61.9	502
	Cert. Basis - TSO C37b, C38b				
223	Collins VIR-350 or VIR-351 Nav Receiver				
	a. Single	_____	3.9	62.4	243
	b. Dual	_____	7.9	62.4	493
	Cert. Basis - TSO C40a, C36c				
225	Collins IND-350 VOR/LOC Indicator				
	a. Single	_____	1.0	65.2	65
	b. Dual	_____	2.0	65.2	130
	Cert. Basis - TSO C40a, C36c				
227	Collins IND-351 VOR/LOC/ GS Indicator				
	Cert. Basis - TSO C40a, C36c	_____	1.3	65.2	85
229	Collins GLS-350 Glide Slope Receiver				
	Cert. Basis - TSO C34c	_____	2.0	199.7	399
230	Collins DCE 400 Distance Computing Equipment				
	Cert. Basis - TSO C40a	_____	2.1	63.9	134
231	Collins RCR-650 ADF Receiver and Antenna and IND-650 Indicator				
	Cert. Basis - TSO C41c	_____	7.7	122.1	941
233	Collins AMR-350 Audio/Marker Panel				
	Cert. Basis - TSO C35d, C50b	_____	*3.3	123.9	409

*Weight includes marker antenna and cable.

(n) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
235	Collins TDR-950 Transponder Cert. Basis - TSO C74c	_____	*2.8	62.4	175

*Weight includes antenna and cable.

SECTION 6
WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(n) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
241	King KX 170 () (VHF Comm/Nav)				
	Transceiver, Single	_____	7.3	61.6	450
	Transceiver, Dual	_____	15.0	61.6	924
243	King KX 175 () VHF				
	a. Transceiver,	_____	11.4	61.6	703
	b. King KN 72 VOR/LOC Converter,	_____	1.3	214.8	279
	c. King KN 73 Glide Slope Receiver,	_____	2.0	214.8	430
	d. King KN 75 Glide Slope Receiver,	_____	1.6	214.8	344
	e. King KN 77 VOR/LOC Converter,	_____	2.8	214.8	601
	f. King KI-204 VOR/ILS Indicator,	_____	1.7	65.5	111
	g. King KNI-520 VOR/ILS Indicator	_____	1.7	65.5	111
	Cert. Basis - TSO C3bc, C37b, C38b, C40a				
245	King KX 175 () VHF				
	a. Transceiver (2nd),	_____	10.0	61.6	616
	b. King KN 72 VOR/LOC Converter,	_____	1.3	214.8	279
	c. King KN 77 VOR/LOC Converter,	_____	2.8	214.8	601
	d. King KI-203 VOR/LOC Indicator,	_____	1.6	65.5	105
	e. King KNI-520 VOR/ILS Indicator	_____	1.7	65.5	111
	Cert. Basis - TSO C36c, C37b, C38b, C40a				
247	King KI-201 () VOR/LOC Indicator				
	a. Single	_____	2.4	64.9	156
	b. Dual	_____	5.0	64.9	325

(n) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
248	King KI-208 VOR/LOC Indicator				
	a. Single	_____	1.0	64.9	65
	b. Dual	_____	2.0	64.9	130
	Cert. Basis - TSO C34c, C36c, C40a				
249	King KI-209 VOR/LOC/GS Indicator	_____	1.2	64.9	78
	Cert. Basis - TSO C34c, C36c, C40a				
250	King KI-213 VOR/LOC/GS Indicator	_____	2.5	64.9	162
251	King KI-214 () VOR/LOC/GS Indicator	_____	2.9	64.9	189
253	King KN 74 R-Nav	_____	4.7	61.3	288
254	King KI-206 R-Nav Indicator	_____	1.3	61.6	80
	Cert. Basis - TSO C34c, C36c, C40a				
255	King KN 61 DME	_____	13.3	189.5	2520
257	King KN 65 () DME	_____	13.8	185.4	2559
	Cert. Basis - TSO C66a				
259	King KR 85 Digital ADF	_____	8.6	96.6	831
	a. Audio Amplifier	_____	0.8	54.1	43
	Cert. Basis - TSO C41b				
261	King KR 86 ADF				
	a. First	_____	6.7	104.8	702
	b. Second	_____	9.7	108.9	1057
	c. Audio Amplifier	_____	0.8	54.1	43
263	King KMA 20 () Audio Panel				
	Cert. Basis - TSO C35c, C50b	_____	*3.7	74.9	277

*Weight includes antenna and cable.

SECTION 6
WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(n) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
265	King KT 76 ()/78() Transponder Cert. Basis - TSO C74b	_____	*3.1	63.1	196
277	Narco Comm 111 VHF Transceiver a. Single b. Dual Cert. Basis - TSO C37b, C38b	_____ _____ _____	4.0 8.0	62.4 62.4	250 500
279	Narco Comm 120 VHF Transceiver a. Single b. Dual Cert. Basis - TSO C37b, C38b	_____ _____	4.8 8.6	61.9 62.4	297 537
281	Narco Nav 121 VHF Receiver a. Single b. Dual Cert. Basis - TSO C36c, C40c, C66a	_____ _____	3.1 6.2	63.5 63.4	197 393
283	Narco Nav 122 VHF Receiver a. Single b. Dual Cert. Basis - TSO C35d, C36c, C40c, C66a	_____ _____	**5.3 **8.8	105.7 87.5	560 770
285	Narco Nav 122A VHF Receiver a. Single b. Dual Cert. Basis - TSO C34c, C35d, C36c, C40c, C66a	_____ _____	**5.4 **9.0	104.6 86.8	565 781
287	Narco Nav 124A VHF Receiver a. Single b. Dual Cert. Basis - TSO C35d, C36c, C40a, C66a	_____ _____	**6.4 **11.1	100.3 84.2	642 935

*Weight includes antenna and cable.

**Weight includes marker antenna and cable.

(n) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
289	Narco Nav 124R VHF Receiver Cert. Basis - TSO C36c, C40a, C66a	_____	4.4	62.4	275
291	Narco ID 124 VOR/LOC/GS Indicator	_____	1.2	65.5	79
	a. Single	_____	2.4	65.5	157
	b. Dual	_____			
	Cert. Basis - TSO C34c, C35d, C36c, C40c				
293	Narco UGR-2A Glide Slope	_____	3.8	185.5	705
	a. Single	_____	8.2	185.2	1519
	b. Dual	_____			
	Cert. Basis - TSO C34b				
295	Narco CP-135 Audio Selector Panel	_____	2.2	76.2	168
	Cert. Basis - TSO C50b				
297	Narco CP-135M Audio Selector Panel	_____	*3.9	132.6	517
	Cert. Basis - TSO C50b, C35d				
299	Narco CLC-60A R-Nav	_____	11.5	133.9	1540
	a. Narco SA-11 Adapter	_____	0.8	213.4	171
301	Narco DME-190 TSO	_____	**5.9	65.9	389
	Cert. Basis - TSO C66a				
303	Narco DME-195 Receiver and Indicator	_____	**10.4	170.5	1774
	Cert. Basis - TSO C66a				
305	Narco ADF-141	_____	6.4	94.3	604
	a. Single	_____	***17.9	109.9	1967
	b. Dual	_____			
	Cert. Basis - TSO C41c				

*Weight includes marker antenna and cable.

**Weight includes antenna and cable.

***Weight includes dual antenna and cable.

SECTION 6
WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(n) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (lb-In.)
307	Narco AT 150 Transponder Cert. Basis - TSO C74c	_____	*3.0	62.3	187
309	Antenna and Cable				
	a. Nav Receiving	_____	1.3	209.4	273
	b. * 1 VHF Comm	_____	0.6	146.3	88
	c. * 2 VHF Comm	_____	0.9	181.1	163
	d. Glide Slope (Single)	_____	0.9	96.7	87
	e. Glide Slope (Dual)	_____	2.8	180.0	504
	f. Single ADF Sense	_____	0.4	160.0	64
311	Anti Static Antenna and Cable				
	a. * 1 VHF Comm	_____	1.5	162.7	244
	b. * 2 VHF Comm	_____	1.6	192.5	308
	c. Single ADF Sense	_____	0.6	160.0	96
313	Emergency Locator Transmitter (C.C.C. Model CIR-11-2)	_____	1.7	267.2	454
	a. Antenna and Coax	_____	0.2	255.4	51
	b. Shelf and Access Hole	_____	0.5	266.4	133
	Cert. Basis - TSO C91				
314	Emergency Locator Transmitter (Narco Model ELT-10)	_____	3.5	267.2	935
	a. Antenna and Coax	_____	0.3	255.4	77
	b. Shelf and Access Hole	_____	0.5	266.4	133
	Cert. Basis - TSO C91				
315	RCA Radar Piper Dwg. 36885-2	_____	23.0	81.0	1863

*Weight includes antenna and cable.

(n) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
316	Headphone Wm. J. Murdock P/N P-23 300 Ohms with MC162A Cushions or Telex Comm. P/N 61650-03	_____	0.5	69.9	35
317	Microphone				
	a. Telex Acoustics P/N 60837-17 (Model 66C)	_____	0.3	69.9	21
	b. Narco P/N M700B	_____	0.6	74.9	45
	c. Telex Acoustics P/N 62800-04 (Model 100T/NH)	_____	0.3	69.9	21
319	Boom Microphone - Headset Piper Dwg. 37921-3 Telex 5 x 5 Mark II (P/N 62629-00)	_____	0.3	85.5	26
321	Cabin Speaker, Installation Piper Dwg. 69390-7	_____	0.8	97.5	78
323	Radio Shelf, Piper Dwg. 67367-0	_____	2.3	201.8	464

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WEIGHT AND BALANCE

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PA-32RT-300, LANCE II

(o) Miscellaneous
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft. Datum	Moment (Lb-In.)
337	Zinc Chromate Finish Piper Dwg. 79700-2	_____	7.5	113.2	849
339	Stainless Steel Control Cables Piper Dwg. 79700-12	_____	(Same as standard equipment)		
341	Air Conditioner, Piper Dwg. 99750-4	_____	70.4	114.5	8061
343	Ground Ventilating Blower, Piper Dwg. 79273-13	_____	8.6	204.0	1754
345	Assist Step, Piper Dwg. 37846-3	_____	1.5	147.5	221
347	Super Cabin Sound Proofing, Piper Dwg. 79601-7	_____	24.4	107.2	2616
349 C	Adjustable Front Seat (Left), Piper Dwg. 79592-2	_____	*4.6	84.7	390
351	Adjustable Front Seat (Right), Piper Dwg. 79592-3	_____	*4.6	84.1	387
353	Jump Seat (with seat belts), Piper Dwg. 69595-9	_____	9.2	122.3	1125
355	Club Seating (includes oversize headrest center seats) Piper Dwg. 37825-2	_____	*14.2	90.4	1284
357	Inboard Armrest - Aft Piper Dwg. 79479-7	_____	2.6	152.0	395
359	Headrests (2) Front, Piper Dwg. 79337-18	_____	2.0	99.5	199

*Weight and moment difference between standard and optional equipment.

(o) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
361	Headrests (2) Center, Piper Dwg. 79337-18	_____	2.0	132.1	264
363	Headrests (2) Rear, Piper Dwg. 79337-18	_____	2.0	171.5	343
365	Oversize Headrests - Front (2), Piper Dwg. 79764-2	_____	3.2	99.5	318
367	Oversize Headrests - Center (2), (Fwd. Facing Seats Only) Piper Dwg. 79764-2	_____	3.2	132.1	423
369	Oversize Headrests - Aft (2), Piper Dwg. 79764-2	_____	3.2	171.5	549
371	Inertia Safety Belts (Center) (2) Piper PS50039-4-15 (Pacific Scientific P/N 1107319-03 Black) or (Americam Safety Equipt. Co. P/N 500853-403)	_____	1.5	133.9	201
373	Inertia Safety Belts (Rear) (2) Piper PS50039-4-14 (Pacific Scientific P/N 1107319-01 Black) or (American Safety Equipt. Co., P/N 500853-401)	_____	1.6	181.5	290
375	Assist Straps Piper Dwg. 79455-0	_____	0.3	120.0	36
377	Curtain and Rod Installation Piper Dwg. 67955-3	_____	5.2	143.6	747

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WEIGHT AND BALANCE

PIPER AIRCRAFT CORPORATION
PA-32RT-300, LANCE II

(o) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
379	Refreshment Console Piper Dwg. 37825-5	_____	7.0	118.5	830
380	Executive Writing Table Piper Dwg. 36800-2	_____	3.9	185.6	724
381	Luxurious Interior Piper Dwg. 67953-3	_____	*25.0	113.9	2848
383	Fire Extinguisher Installation				
	a. Piper Dwg. 35680-14 (Graviner P/N HA1014-01)	_____	5.6	62.8	352
	b. Piper Dwg. 76167-2 (W. Kiddie P/N 2¾DCK-6)	_____	4.6	71.0	327
385	Clip Installation - Map Piper Dwg. 37907-2	_____	0.1	75.0	8

TOTAL OPTIONAL EQUIPMENT

EXTERIOR FINISH

Base Color _____

Registration No. Color _____

Trim Color _____

Type Finish _____

*Weight and moment difference between standard and optional equipment.