TABLE OF CONTENTS

SECTION 6

WEIGHT AND BALANCE

SECTION 6

WEIGHT AND BALANCE

6.1 GENERAL

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 operating range (envelope). Although the airplane offers 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 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 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, it is weighed, and 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 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 improper loading.

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.

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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 (2.0 gallons total, 1.0 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 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.

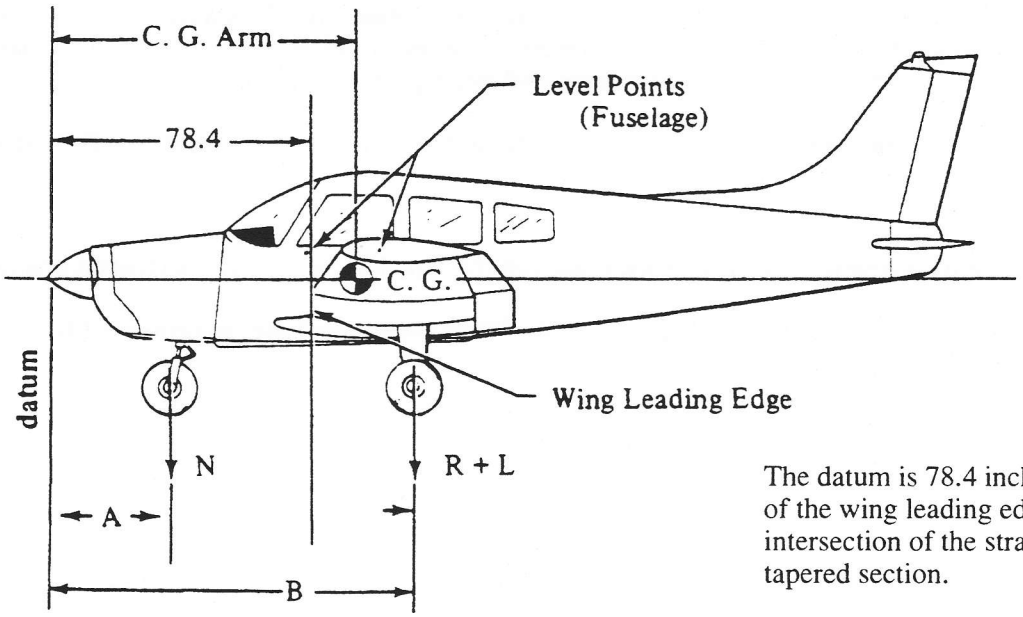
Scale Position and Symbol	Scale Reading	Tare	Net Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Basic Empty Weight, as Weighed (T)	—	—	

WEIGHING FORM

Figure 6-1

(d) Basic Empty Weight Center of Gravity

(1) The following geometry applies to the PA-28-161 airplane when it is level. Refer to Leveling paragraph 6.3 (b).



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

A = 30.9

B = 109.7

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:

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

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-28-161 CHEROKEE WARRIOR 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 2.0 gallons of unusable fuel.

AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION

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

Normal Category: (2325 lbs) - (lbs) = lbs.

Utility Category: (2020 lbs) - (lbs) = lbs.

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

WEIGHT AND BALANCE DATA FORM

Figure 6-5

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PA-28-161			Serial Number	Registration Number						Page Number	
Date	Item No.		Description of Article or Modification	Weight Change						Running Basic Empty Weight	
				Added (+)			Removed (-)				
	In	Out		Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Moment /100
			As Delivered								

WEIGHT AND BALANCE RECORD

Figure 6-7

PA-28-161		Serial Number		Registration Number		Page Number																											
Date	Item No.		Description of Article or Modification	Weight Change																								Running Basic Empty Weight	
	In	Out		Added (+)			Removed (-)																					Wt. (Lb.)	Moment /100
				Wt. (Lb.)	Arm (In.)	Moment /100	Wt. (Lb.)	Arm (In.)	Moment /100																								
			As Delivered																														

WEIGHT AND BALANCE RECORD (cont)

Figure 6-7 (cont)

6.7 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

(a) Add the weight of all items to be loaded to the basic empty weight.

(b) Use the Loading Graph (Figure 6-13) to determine the moment of all items to be carried in the airplane.

(c) Add the moment of all items to be loaded to the basic empty weight moment.

(d) Divide the total moment by the total weight to determine the C.G. location.

(e) 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	80.5	27370
Passengers (Rear Seats)*	340.0	118.1	40154
Fuel (48 Gallon Maximum)		95.0	
Baggage* (200 Lbs. Maximum)		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.

SAMPLE LOADING PROBLEM (NORMAL CATEGORY)

Figure 6-9

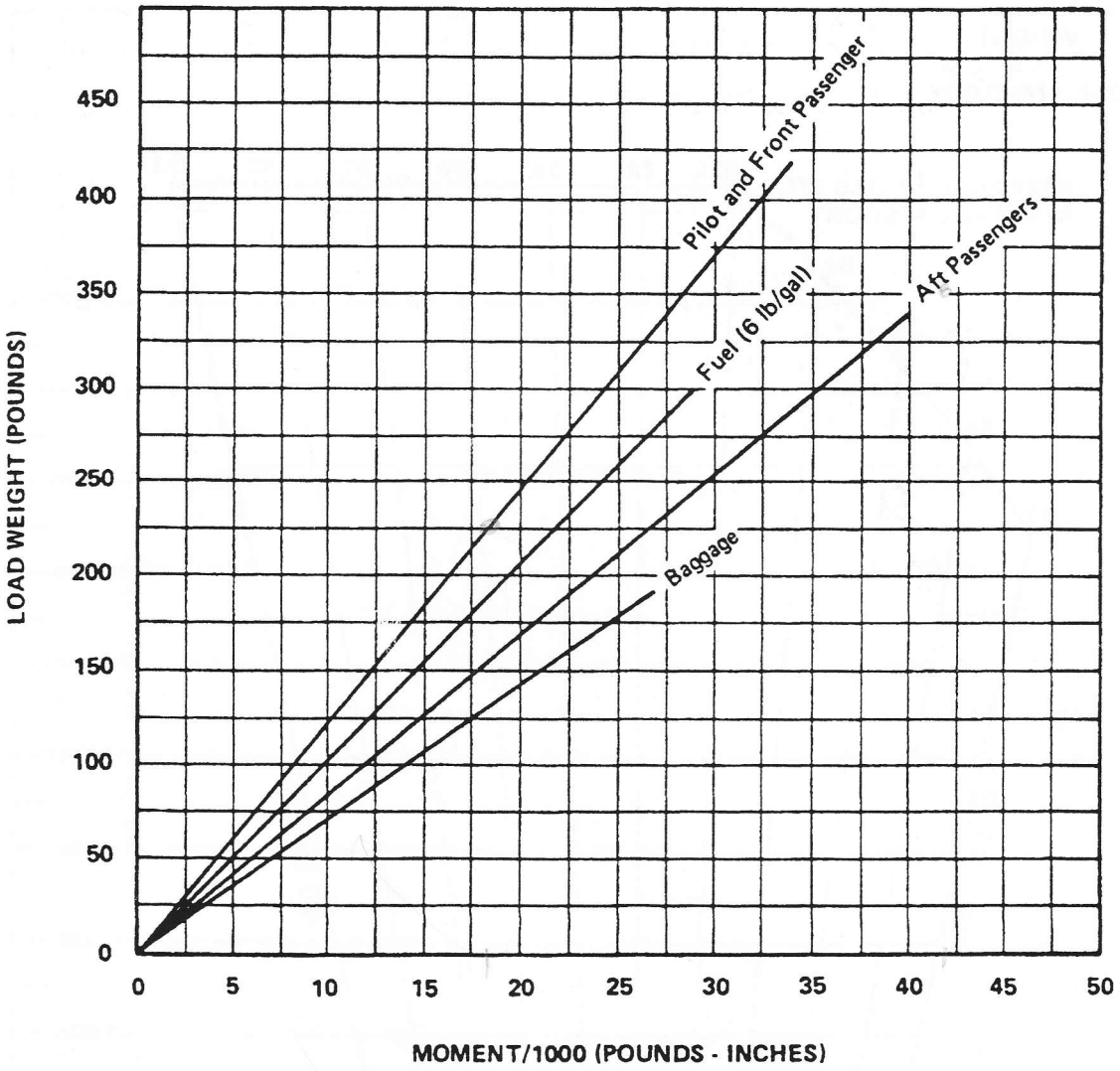
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight			
Pilot and Front Passenger		80.5	
Passenger (Rear Seats)*		118.1	
Fuel (48 Gallon Maximum)		95.0	
Baggage* (200 Lbs. Maximum)		142.8	
Total Loaded Airplane			

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.

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

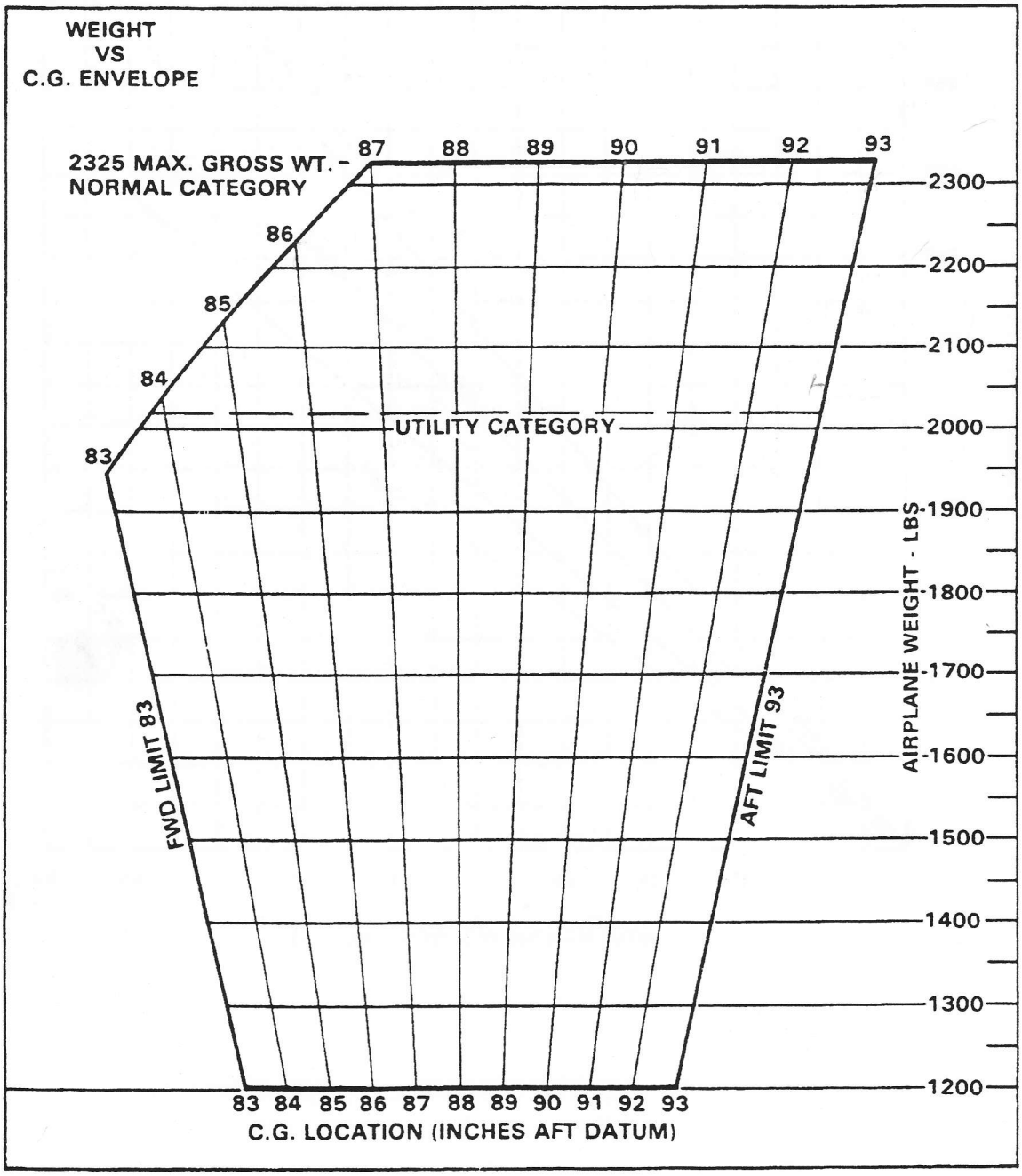
WEIGHT AND BALANCE LOADING FORM

Figure 6-11



LOADING GRAPH

Figure 6-13



C. G. RANGE AND WEIGHT

Figure 6-15

6.8 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.

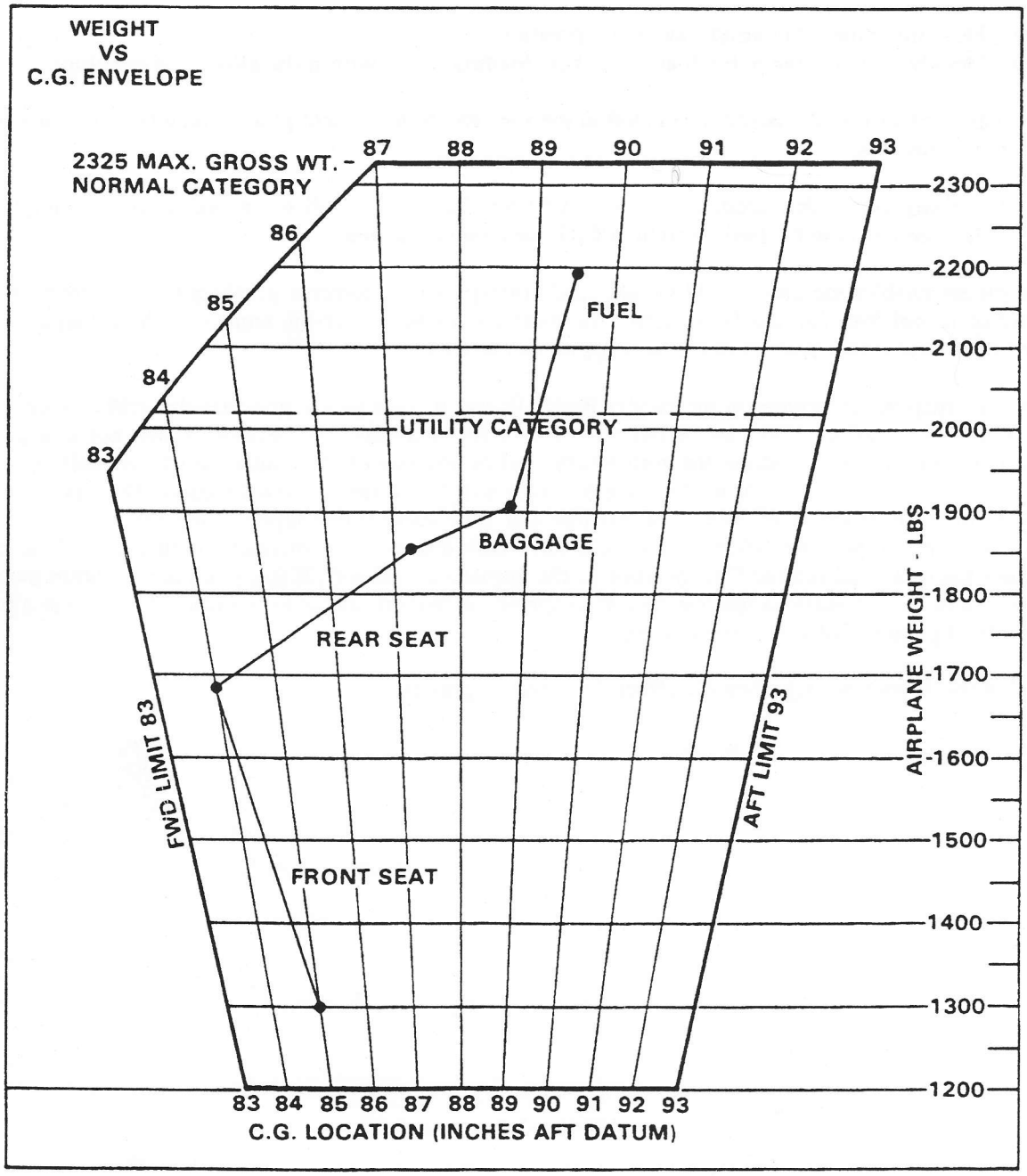
Heat can warp or ruin the plotter if it is left in the sunlight. Replacement plotters may be purchased from Piper dealers and distributors.

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 does not significantly affect the center of gravity.



SAMPLE PROBLEM

SAMPLE PROBLEM

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

Assume a basic weight and C.G. location of 1300 pounds at 85.00 inches respectively. We wish to carry a pilot and 3 passengers. Two men weighing 180 and 200 pounds will occupy the front seats, and two children weighting 80 and 100 pounds will ride in the rear. Two suitcases weighing 25 pounds and 20 pounds respectively, will be carried in the rear compartment. We wish to carry 48 gallons of fuel. Will we be within the safe envelope?

(a) Place a dot on the plotter grid at 1300 pounds and 85.00 inches to represent the basic airplane. (See illustration.)
(b) Slide the slotted plastic into position so that the dot is under the slot for the forward seats, at zero weight.
(c) Draw a line up the slot to the 380 pound position (180 + 200) and put a dot.
(d) Continue moving the plastic and plotting points to account for weight in the rear seats (80 + 100), baggage compartment (45), and fuel tanks (288).
(e) As can be seen from the illustration, the final dot shows the total weight to be 2193 pounds with the C.G. at 89.44. This is well within the envelope.

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

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6.9 EQUIPMENT LIST

The following is a list of equipment which may be installed in the PA-28-161. It consists of those items used for defining the configuration of an airplane when the basic empty weight is established at the time of licensing. 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 when licensed 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-28-161 WARRIOR 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, Sensenich 74DM6-0-60 Cert. Basis - TC P886		32.4	3.8	123
3		Spinner Dome and Bulkhead Piper Dwg. 35323 or 36850		2.9	3.8	11
4		Spinner Dome and Bulkhead Piper Dwg. 87325		3.3	3.8	13

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(b) Engine and Engine Accessories

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
5	A	Engine				
		a. Lycoming Model 0-320-D2A	_____	272.0	21.3	5794
		b. Lycoming Model 0-320-D3G	_____	268.0	21.3	5708
		Cert. Basis - TC 274				
7	B	Alternator 60 Amp				
		a. Prestolite No. ALY6422				
		Piper Dwg. 99981-0	_____	10.5	14.0	147
		b. Chrysler 3656624				
		Piper Dwg. 99945-0	_____	12.4	14.0	174
		c. Chrysler 4111810				
		Piper Dwg. 99945-3	_____	13.5	14.0	189
9	A	Engine Driven Fuel Pump				
		Lycoming Dwg. 75246				
		Cert. Basis - TC E274		1.7	36.3	62
10	A	Electric Fuel Pump				
		Bendix P/N 478360		1.8	36.8	66
11	A	Fuel Valve				
		Piper Dwg. 66945 or Allen				
		Aircraft Prod. Inc. No. 6S122	_____	0.4	61.9	25
12	A	Oil Coolers				
		Piper Dwg. 18622				
		Harrison No. C8526250		1.9	41.3	78
13	A	Air Filter				
		Piper Dwg. 35477		0.9	29.5	27
14	A	Starter				
		Prestolite MZ4218				
		Cert. Basis - TC E274		*17.0	14.5	247
15	A	Oil Filter				
		LW-13743 (Champion No.				
		CH48110) or Lyc. No. 75528				
		(AC No. OF5578770)				
		Cert. Basis - TC E274		**2.5	35.3	89

*Included in engine weight.
**Includes adapter.

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(c) Landing Gear and Brakes

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
16	A	Two Main Wheel Assemblies a. Cleveland Aircraft Products Wheel Assy. No. 40-86 Brake Assy. No. 30-55 Cert. Basis - TSO C26a b. 6.00-6 Type III 4 Ply Rating Tires with Regular Tubes Cert. Basis - TSO C62	_____	32.3	109.6	3540
17	A	Nose Wheel Assembly a. Cleveland Aircraft Products Wheel Assy. No. 40-77A Cert. Basis - TSO C26a	_____	2.6	30.8	80
		b. McCauley Industrial Corp. Wheel Assy. No. D-30500 Cert. Basis - TSO C26b	_____	3.6	30.8	111
		c. 5.00-5 Type III 4 Ply Rating Tire with Regular Tube Cert. Basis - TSO C62	_____	5.8	30.8	179
18	A	Hand Brake Master Cylinder Piper Dwg. 65842 (Cleveland Aircraft Products P/N 10-22)	_____	0.6	60.9	37
19	A	Toe Brake Cylinders a. Cleveland Aircraft Products No 10-27	_____	0.7	53.0	37
		b. Gar-Kenyon Instrument No 17000	_____	0.4	53.0	21

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(d) Electrical Equipment

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
20	A	Voltage Regulator Piper Dwg. 68804-3		0.9	51.9	47
21	B	Battery Piper Dwg. 35544 (Rebat S-25)	_____	21.9	114.9	2516
22	A	Starter Relay Piper Dwg. 99130-2 RBM Controls P/N 111-111		1.0	45.8	46
23	A	Overvoltage Relay Piper Dwg. 35544 (Wico X16799)		0.5	55.4	28
24	A	Stall Warning Device Piper Dwg. 35544 (Safe Flight P/N C52207-4)		0.2	80.2	16
25	A	Stall Warning Horn Piper Dwg. 35544 (Safe Flight P/N 35214)	_____	0.2	58.8	12

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(e) Instruments

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
26	B	Altimeter Piper PS50008-2 or -3 Cert. Basis - TSO C10b	_____	1.1	60.9	67
27	B	Airspeed Indicator Piper PS50049-41S Cert. Basis - TSO C2b	_____	0.6	61.8	37
28	A	Compass Piper Dwg. 67462 Cert. Basis - TSO C7c		0.9	59.9	54
29	A	Tachometer Piper Dwg. 62177-3		0.7	61.2	43
30	A	Engine Cluster Piper Dwg. 95241-17		0.8	62.4	50

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(f) Miscellaneous

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
33	A	Front Seat Belts (2) Piper PS50039-4-2A American Safety Eqpt. Corp. 500576 Davis Acft. Prod. Inc. FDC-5900-120-5 (Black) Cert. Basis - TSO C22f		1.8	84.0	151
35	A	Aft Seat Belts (2) Piper PS50039-4-3 American Safety Eqpt. Corp. 449968 Davis Acft. Prod. Inc. FDC-5900-120-2 (Black) Cert. Basis - TSO C22f		1.6	123.0	197
36	B	Left Front Seat Piper Dwg. 79337-21	_____	15.5	84.0	1302
37	B	Right Front Seat Piper Dwg. 79337-2	_____	15.5	84.0	1302
38		Rear Seat Piper Dwg. 35131		27.0	124.1	3351
39	A	a. Shoulder Harness (2) Front Seats Only) Piper PS50039-4-20 Pacific Scientific P/N 110747-13	_____	1.4	119.5	167
	B	b. Shoulder Harness-Fixed (Front) (2) Piper Dwg. PS50039-4-23 American Safety Eqpt. Corp. 501385-407 Davis Acft. Prod. Inc. FDC-7275-16-4 (Black)	_____	1.1	119.5	131
40	A	Baggage Straps Piper Dwg. 66804 and 66805		1.3	142.8	186

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(g) Engine and Engine Accessories
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
45	Primer System Piper Dwg. 35327-0	_____	1.2	50.0	60
47	Carburetor Ice Detector Piper Dwg. 39684-2	_____	0.5	59.7	30

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(h) Propeller and Propeller Accessories (Optional Equipment)

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

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(i) Landing Gear and Brakes
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
63	Nose Wheel Fairing Piper Dwg. 35513	_____	3.8	29.8	113
65	Main Wheel Fairings Piper Dwg. 65237	_____	7.6	113.6	863
67	Nose Wheel Fairing Piper Dwg. 37896-2	_____	10.3	36.3	374
69	Main Wheel Fairings Piper Dwg. 37885-2, -3	_____	20.6	113.6	2340
71	Nose Wheel Fairing Piper Dwg. 37896-2	_____	3.5	36.3	127
73	Main Wheel Fairings Piper Dwg. 79893-2, -3	_____	17.0	113.6	1931

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(j) Electrical Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
79	Instrument Panel Lights Piper Dwg. 35544	_____	0.3	62.8	19
81	Instrument Light (2), Grimes 15-0083-7 or Whelen A300-W-14	_____	0.1	99.0	10
83	Cabin Light Piper Dwg. 95229	_____	0.3	99.0	30
85	Landing Light G.E. Model 4509	_____	0.5	13.1	7
87	Navigation Lights (2) Grimes Model A1285 (Red and Green)	_____	0.4	106.6	43
88	Navigation Light (Rear) (1) Grimes Model A2064 (White)	_____	0.2	281.0	56
89	Navigation Lights (Wing) (2) Red/White & Green/White Whelen Model A675	_____	0.5	106.6	53
90	Navigation Lights (Wing) (2) Red White & Green White with White Strobe (Wing) Whelen Model A600 Fin Strobe (A-470)	_____ _____	5.8 1.1	157.9 216.0	916 238
91	Navigation Lights (Wing) (2) Red White & Green White with Red Strobe (Wing) Fin Strobe (A-470)	_____ _____	5.8 1.1	157.9 216.0	916 238
92	Rotating Beacon Whelen Eng. Co. WRMI-12 Piper Dwg. 63892 or 63518	_____	1.5	263.4	395
93	Anti-Collision Light (Fin only) Piper Dwg. 99033-2 Includes power supply	_____	3.1	210.3	652

(j) Electrical Equipment
(Optional Equipment) (cont)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
94		Anti-Collision Lights (Wing tips only) Cert. Basis - STC SA800 EA	_____	5.7	157.9	900
95		Anti-Collision Lights (Fin and Wing Tips) Piper Dwg. 99033-10	_____	6.1	172.8	1054
97		Heated Pitot Head Piper Dwg. 35493-2	_____	0.4	100.0	40
99		Piper Pitch Trim. Piper Dwg. 67496-3	_____	4.3	155.3	668
101	C	Battery 12V 35 A.H. Rebat R35 (Wt. 27.2 lbs.)	_____	*5.3	114.9	609
103		Auxiliary Power Receptacle Piper Dwg. 35298	_____	2.7	178.5	482
105		External Power Cable Piper Dwg. 62355-11	_____	4.6	142.8	657
107		Lighter, #200462, 12 Volt Universal	_____	0.2	62.9	13

*Weight and moment difference between standard and optional equipment.

(k) Instruments
(Optional Equipment)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
113		Vacuum System Installation				
		a. With Airborne Model 211cc Pump	_____	4.5	39.1	176
		b. With Edo-Aire Model 1U128A Pump	_____	4.9	39.1	192
115		Attitude Gyro, Piper Dwg. 99002-2, -3, 4 or -8 Cert. Basis - TSO C4c	_____	2.2	59.4	131
117		Directional Gyro, Piper Dwg. 99003-2, -3, -4 or -7 Cert. Basis - TSO C5c	_____	2.6	59.7	155
119	C	Tru-Speed Indicator Piper PS50049-41T Cert. Basis - TSO C2b	_____	(same as standard equipment)		
121	C	Encoding Altimeter Piper PS50008-6 or -7 Cert. Basis - TSO C10b, C88	_____	*0.9	60.3	54
122		Altitude Digitizer (United Instruments P/N 5125-P3) Cert. Basis - TSO C88	_____	1.0	51.5	52
123		Vertical Speed Piper Dwg. 99010-2, -4 or -5 Cert. Basis - TSO C8b	_____	1.0	60.9	61
125		Alternate Static Source Piper Dwg. 35493	_____	0.4	61.0	24
127		Turn and Slip Indicator Piper PS50030-2 or -3 Cert. Basis - TSO C3b	_____	2.6	59.7	155

*Weight and moment difference between standard and optional equipment.

(k) Instruments
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
129	Engine Hour Meter Piper Dwg. 69889-0	_____	0.3	61.2	18
131	Clock	_____	0.4	62.4	25
132	Control Wheel Digital Clock Piper Dwg. 87347-3	_____	0.3	71.9	22
133	Air Temperature Gauge Piper Dwg. 99479-0 or -2	_____	0.2	72.6	15

(l) Autopilots
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
141	AutoFlite II Piper Dwg. 99447 Cert. Basis - STC SA3066SW-D	_____	5.6	91.8	514
143	AutoControl IIIB	_____	9.6	77.6	745
	a. Omni Coupler 1C-388 Piper Dwg. 79221 Cert. Basis - STC SA3065SW-D	_____	1.0	59.3	59
145	AutoPilot - Century 21 Piper Dwg. 39726 Cert. Basis - STC SA3352SW	_____	12.0	69.0	828

(m) Radio Equipment
(Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
151	Bendix AS-2015A-7 or -9 Audio Panel	_____	1.0	66.4	66
152	Bendix CN2013-1 Com/Nav Cert. Basis - TSO C34c, C35d, C36c, C37b, C38b, C40a	_____	7.5	61.4	461
153	Bendix CN2013-2 Com/Nav w/G.S. Receiver Cert. Basis - TSO C34c, C35d, C36c, C37b, C38b, C40a	_____	8.2	61.4	504
154	Bendix CN 2013-4 Com/Nav w/G.S. Receiver and M.B. Receiver	_____	8.5	61.4	522
155	Bendix ADF 2070 Cert. Basis - TSO C41c, C2a	_____	6.0*	105.0	630
156	Bendix TR2060 Transponder Cert. Basis - TSO C74c	_____	2.8*	63.6	178
157	Bendix CN2011 Dual Com/Nav Cert. Basis - TSO C34c, C35d C36c, C37b, C40a	_____	16.8	66.8	1122
158	Bendix IN2014B Indicator a. Single b Dual Cert. Basis - TSO C34c, C 36c, C40a, C66c	_____ _____	1.9 3.8	63.4 63.4	121 241
159	Bendix DME 2030 Cert. Basis - TSO C66a	_____	10.3*	185.0	1906

*Weight includes antenna and cable

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
161	Collins VHF-250 or VHF-251 Comm Transceiver				
	a. Single	_____	4.0	56.9	228
	b. Dual	_____	8.1	56.9	461
	Cert. Basis - TSO C37b, C38b				
162	Collins VIR-350 or VIR-351 Nav Receiver				
	a. Single	_____	3.9	57.4	224
	b. Dual	_____	7.9	57.4	453
	Cert. Basis - TSO C40a, C36c				
163	Collins IND-350 ( ) VOR/LOC Indicator				
	a. Single	_____	1.0	60.2	60
	b. Dual	_____	2.0	60.2	120
	Cert. Basis - TSO C40a, C36c				
164	Collins IND-351 ( ) VOR/LOC/GS Indicator				
	Cert. Basis - TSO C40a, C36c	_____	1.3	60.2	78
165	Collins GLS-350 Glide Slope Receiver				
	Cert. Basis - TSO C34c	_____	2.0	183.4	367
167	Collins DCE 400 Distance Computing Equipment				
	Cert. Basis - TSO C40a	_____	2.1	58.9	124
168	Collins RCR-650 ADF Receiver and Antenna and IND-650 Indicator				
	Cert. Basis - TSO C41c	_____	6.6	104.8	692
169	Collins RCR-650A ADF Receiver and Antenna and IND-650A Indicator				
	Cert. Basis - TSO C41c	_____	7.3	100.3	733

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
170	Collins AMR-350 Audio/Marker Panel Cert. Basis - TSO C35d, C50b	_____	*3.3	110.0	363
171	Collins DME-451 W/Ind. 451 450 Cert. Basis - TSO C66a	_____	8.0	174.9	1399
172	Collins TDR-950 Transponder Cert. Basis - TSO C74c	_____	**2.8	62.9	176
173	King KN 53 Nav/Receiver	_____	2.8	63.8	179
177	King KX 170 ( ) VHF Comm/Nav				
	a. Transceiver, Single	_____	7.5	56.6	425
	b. Transceiver, Dual	_____	15.0	56.6	849
174	King KN 53 Nav Receiver W GS Receiver				
	a. Single	_____	3.1	63.8	198
	b. Dual	_____	6.2	63.8	396
175	King KX 155 VHF Nav/Comm Transceiver				
	a. With Audio Amplifier	_____	5.0	58.1	291
	b. With Glide Slope Receiver	_____	5.3	58.1	308
	c. Without Glide Slope Receiver	_____	4.8	58.1	279
	Cert. Basis - TSO C37b, C38b, C40a, C36a				
176	King KX 165 VHF Nav/ Comm Transceiver				
	a. With Glide Slope Receiver	_____	5.7	58.0	331
	b. Without Glide Slope Receiver	_____	5.1	58.1	296
	Cert. Basis - TSO C37b, C38b C40a, C36a				

*Weight includes antenna and cable.
**Weight includes antenna.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
178	King KX 175 ( ) VHF				
	a. Transceiver	_____	9.4	56.6	532
	b. King KN 72 VOR/LOC Converter	_____	1.3	183.6	239
	c. King KN 73 Glide Slope Receiver	_____	3.2	184.3	590
	d. KN 75 Glide Slope Receiver	_____	1.6	184.3	295
	e. King KN 77 VOR/LOC Converter	_____	3.6	183.6	661
	f. King KI-204 VOR/ILS Indicator	_____	1.7	60.5	103
	g. King KNI-520 VOR/ILS Indicator	_____	1.7	60.5	103
	Cert. Basis - TSO C36c, C37b, C38b, C40a				
179	King KX 175 ( ) VHF				
	a. Transceiver (2nd)	_____	8.6	56.6	487
	b. King KN 72 VOR/LOC Converter	_____	1.3	183.6	239
	c. King KN 77 VOR/LOC Converter	_____	4.2	183.6	771
	d. King KI-203 VOR/ILS Indicator	_____	1.6	60.5	97
	e. King KNI 520 VOR/ILS Indicator	_____	1.7	60.5	103
	Cert. Basis - TSO C36c, C37b, C38b, C40a				
180	King KY 196E Transceiver with RB 125 Power Booster				
	a. Single	_____	5.7	77.0	439
	b. Dual	_____	11.4	77.0	878
	Cert. Basis - TSO C37b, C38b				
181	King KY 197 Transceiver				
	a. Single	_____	4.2	58.7	246
	b. Dual	_____	8.4	58.7	492
	Cert. Basis - TSO C37B, C38B				
182	King KI 201 ( ) VOR/LOC Ind.				
	a. Single	_____	2.5	59.6	149
	b. Dual	_____	5.0	59.9	300
183	King KI 202 VOR/LOC Indicator				
	Cert. Basis - TSO C40a, C36c	_____	1.3	60.9	79

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
184	King KI 206 VOR/LOC Indicator Cert. Basis - TSO C40a, C36c	_____	1.3	60.9	79
185	King KI 208 VOR LOC Indicator				
	a. Single	_____	1.0	59.6	60
	b. Dual	_____	2.0	59.9	120
	Cert. Basis - TSO C34c, C36c, C40a				
186	King KI 209 VOR LOC GS Ind. Cert. Basis - TSO C34c C36c, c40a	_____	1.2	59.9	72
187	King KI 213 VOR LOC GS Ind.	_____	2.5	60.4	151
188	King KI 214 ( ) VOR LOC GS Ind.	_____	3.3	59.9	198
189	King KN 74 R-Nav	_____	4.7	56.6	266
191	King KN 61 DME	_____	12.5	179.0	2237
192	King KN 62A DME	_____	3.3	58.3	193
193	King KN 65A DME Cert. Basis - TSO C66a	_____	13.0	174.9	2274
194	King KRA-10 Radio Altimeter	_____	4.3	162.6	699
195	King KR 85 Digital ADF	_____	8.6	85.2	733
	a. Audio Amplifier Cert. Basis - TSO C41b	_____	0.8	51.0	41
196	King KR 85 ADF with KA 42B Loop and Sense Antenna	_____	9.5	85.2	809
	a. Audio Amplifier Cert. Basis - TSO C41b	_____	0.8	51.0	41
197	King KR 86 ADF				
	a. First	_____	6.7	91.6	614
	b. Second	_____	9.7	107.0	1038
	c. Audio Amplifier	_____	0.8	51.0	41

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
198	King KR 86 ADF with KA 42B Loop and Sense Antenna				
	a. First	_____	7.6	91.6	696
	b. Second	_____	10.6	107.0	1134
	c. Audio Amplifier	_____	0.8	51.0	41
199	King KR 87 ADF Receiver and Indicator	_____	4.0	59.0	236
	a. KA 44 Antenna	_____	2.8	147.4	413
	b. KA 44B Antenna	_____	3.6	150.6	542
	c. Audio Amplifier	_____	0.8	51.0	41
	Cert. Basis - TSO C41c				
200	King KMA 20 ( ) Audio Panel				
	Cert. Basis - TSO C35c, C50b	_____	*3.7	70.8	262
201	King KMA-24 Audio Panel	_____	1.7	65.3	111
	Cert. Basis - TSO C35d, C50b				
203	King KT 76 ( )/78 ( ) Transponder				
	Cert. Basis - TSO C74b	_____	*3.1	58.1	180
204	Narco Comm 10A VHF Transceiver	_____	3.9	57.4	224
205	Narco Comm 11A VHF Transceiver				
	a. Single	_____	3.6	57.4	207
	b. Dual	_____	7.1	57.4	408
207	Narco Comm 11B VHF Transceiver				
	a. Single	_____	3.9	57 4	224
	b. Dual	_____	7.8	57.4	448

*Weight includes antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
209	Narco Comm 111 VHF Transceiver				
	a. Single	_____	3.0	57.4	172
	b. Dual	_____	6.0	57.4	344
	Cert. Basis - TSO C37b, C38b				
211	Narco Comm IIIB VHF Transceiver				
	a. Single	_____	3.9	57.4	224
	b. Dual	_____	7.8	57.4	448
	Cert. Basis - TSO C37b, C38b				
213	Narco Comm 120 VHF Transceiver				
	a. Single	_____	4.8	56.9	273
	b. Dual	_____	8.6	57.4	494
	Cert. Basis - TSO C37b, C38b				
215	Narco Nav 10 VHF Receiver	_____	1.9	58.6	111
217	Narco Nav 11 VHF Receiver				
	a. Single	_____	2.8	58.6	164
	b. Dual	_____	5.6	58.6	328
219	Narco Nav 12 VHF Receiver	_____	3.4	58.6	199
221	Narco Nav 14 VHF Receiver	_____	2.5	57.4	144
223	Narco Nav 111 Cert. Basis - TSO C36c, C40a, C66a	_____	2.5	58.6	147
225	Narco Nav 112 Receiver Cert. Basis - TSO C36c, C40a, C66c, C34c	_____	3.3	58.6	193
227	Narco Nav 114 VHF Receiver Cert. Basis - TSO C38b, C40a, C36c, C34c, C66a	_____	2.5	57.4	144

*Weight includes marker antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
229	Narco Nav 121 VHF Receiver				
	a. Single	_____	3.1	58.4	181
	b. Dual	_____	6.2	58.4	362
	Cert. Basis - TSO C36c, C40c, C66a				
231	Narco Nav 122 VHF Receiver				
	a. Single	_____	*5.1	99.4	507
	b. Dual	_____	*8.6	82.9	713
	Cert. Basis - TSO C35d, C36c, C40c, C66a				
233	Narco Nav 122A VHF Receiver				
	a. Single	_____	* 5.2	98.5	512
	b. Dual	_____	* 8.8	82.2	723
	Cert. Basis - TSO C34c, C35d, C36c, C40c, C66a				
235	Narco Nav 124A VHF Receiver				
	a. Single	_____	* 6.2	92.3	572
	b. Dual	_____	*10.9	77.2	841
	Cert. Basis - TSO C35d, C36c, C40a, C66a				
237	Narco ID 124 VOR/LOC/GS Indicator				
	a. Single	_____	1.2	60.5	73
	b. Dual	_____	2.4	60.5	145
	Cert. Basis - TSO C34c, C35d, C36c, C40c				
239	Narco UGR-2A Glide Slope				
	a. Single	_____	4.2	154.0	647
	b. Dual	_____	8.4	220.0	1848
	Cert. Basis - TSO C34b				
241	Narco UGR-3 Glide Slope	_____	4.2	154.0	647
243	Narco MBT-12-R, Marker Beacon	_____	3.1	69.1	214
245	Narco CP-125 Audio Selector Panel	_____	2.2	60.2	132

*Weight includes marker antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
247	Narco CP135 Audio Selector Panel Cert. Basis - TSO C50b	_____	2.2	55.0	121
249	Narco CP135M Audio Selector Panel Cert. Basis - TSO C50b, C35d	_____	* 3.7	114.3	423
251	Narco DME-190	_____	** 5.9	61.0	360
253	Narco DME-190 TSO Cert. Basis - TSO C66a	_____	** 5.9	60.9	359
255	Narco DME-195 Receiver and Indicator Cert. Basis - TSO C66a	_____	**13.2	154.5	2039
257	Narco ADF-140 a. Single b. Dual Cert. Basis - TSO C41c	_____ _____	6.0 ***17.9	91.2 107.6	547 1926
259	Narco ADF-141 a. Single b. Dual Cert. Basis - TSO C41c	_____ _____	6.0 ***17.9	91.2 107.6	547 1926
261	Narco AT50A Transponder Cert. Basis - TSO C74b a. Narco AR-500 Altitude Encoder Cert. Basis - TSO C88	_____ _____	** 3.0 1.0	57.3 51.5	172 52
263	Narco AT150 Transponder Cert. Basis - TSO C74c a. Narco AR-500 Altitude Encoder Cert. Basis - TSO C88	_____ _____	** 3.0 1.0	57.3 51.5	172 52

*Weight includes marker antenna and cable.
**Weight includes antenna and cable.
***Weight includes dual antenna and cable.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
273	Antenna and Cable				
	a. Nav Receiving VRP-37 or AV12-PPR	_____	1.6	171.3	274
	b. #1 VHF Comm VTP-17	_____	0.7	125.7	88
	c. #2 VHF Comm VTP-17	_____	0.8	147.5	118
	d. Glide Slope (Single) GS401 or CI 104	_____	0.9	120.0	108
	e. Glide Slope (Dual) GS401 or CI 104	_____	2.8	154.0	431
	f. Single ADF Sense 99841	_____	0.4	150.0	60
	Piper Dwg. 99461				
275	Anti Static Antenna and Cable				
	a. #1 VHF Comm PS50040-18	_____	1.4	144.3	202
	b. #2 VHF Comm PS50040-18	_____	1.5	170.7	256
	c. Single ADF Sense 79160	_____	0.5	147.5	74
276	Marker Beacon Antenna Piper PS50040-15 King KA-23 or Narco VMA-15 or Commant CI-102	Included as part of marker beacon installation			
277	Marker Beacon Antenna Comant CI 102 Piper Dwg. 39737-4	_____	*1.2	175.0	210
278	Emergency Locator Transmitter (C.C.C. Model CIR-11-2)	_____	1.7	236.2	402
	a. Antenna and Coax	_____	0.2	224.4	45
	b. Shelf and Access Hole	_____	0.5	235.4	118
	Cert. Basis - TSO C91				
279	Emergency Locator Transmitter (Narco Model ELT-10)	_____	3.5	236.2	827
	a. Antenna and Coax	_____	0.3	224.4	67
	b. Shelf and Access Hole	_____	0.5	235.4	118
	Cert. Basis - TSO C91				
280	Microphone				
	a. Piper Dwg. 68856-10	_____	0.3	69.9	21
	b. Piper Dwg. 68856-11	_____	0.6	69.9	42
	c. Piper Dwg. 68856-12	_____	0.3	69.9	21

*Weight includes antenna coax wire to Marker Beacon Receiver.

(m) Radio Equipment
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
281	Boom Microphone, Headset Piper Dwg. 37921-2	_____	0.3	80.5	24
283	Cabin Speaker Piper Dwg. 99220	_____	1.1	99.0	109
285	Headset Piper Dwg. 68856-10	_____	0.5	60.0	30

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(n) Miscellaneous
(Optional Equipment)

Item No.		Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
321		Zinc Chromate Finish Piper Dwg. 79700	_____	5.0	158.0	790
323		Stainless Steel Control Cables Piper Dwg. 79700	_____	–	–	–
325		Air Conditioner Piper Dwg. 99575-4	_____	68.3	103.6	7076
327		Overhead Vent System a. Piper Dwg. 76304-9 b. Piper Dwg. 76304-15	_____ _____	6.4 5.7	159.6 148.9	1022 849
329		Overhead Vent System with Ground Ventilating Blower a. Piper Dwg. 76304-10 b. Piper Dwg. 76304-16	_____ _____	14.9 14.2	172.2 168.5	2566 2393
331		Rear Seat Vents Piper Dwg. 68556	_____	2.5	98.0	245
333		Assist Step Piper Dwg. 65384	_____	1.8	156.0	281
335		Super Cabin Sound Proofing Piper Dwg. 79030-2	_____	18.1	86.8	1571
337	C	Adjustable Front Seat (Left) Piper Dwg. 79591-0/79591-2	_____	*6.6	80.3	530
339		Adjustable Front Seat (Right) Piper Dwg. 79591-1/79591-3	_____	*6.6	79.6	525
341		Headrests (2) Front Piper Dwg. 79337-18	_____	2.2	94.5	208
342		Shoulder Harness Inertia (Front) (2) Piper Dwg. PS50039-4-20 Pacific Scientific 1107447-13 (Black)	_____	1.3	119.5	155

*Weight and moment difference between standard and optional equipment.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
343	Inertia Safety Belts (Rear) (2) 0.8 lbs. each, Piper PS50039-4-14 Pacific Scientific 1107319-01 American Safety Eqpt. Corp. 500853-401 (Black)	_____	1.6	140.3	224
344	Shoulder Harness - Fixed (Rear) (2) Piper Dwg. PS50039-4-22 American Safety Eqpt. Corp. 501385-403 Davis Acft. Prod. Inc. FDC-7275-16-2 (Black)	_____	1.1	140.3	154
345	Shoulder Harness - Inertia (Rear) (2) Piper Dwg. PS50039-4-19 Pacific Scientific 1107447-01 (Black)	_____	1.3	140.3	187
346	Sun Visors Piper Dwg. 66991-0	_____	1.5	85.0	128
347	Assist Strap Piper Dwg. 79455	_____	0.2	109.5	22
349	Curtain and Rod Installation Piper Dwg. 67955-2	_____	4.2	124.0	521
351	Luxurious Interior Piper Dwg. 67952-4	_____	*14.5	98.3	1425
352	Deluxe Carpeting Piper Dwg. 66801	_____	*2.6	97.8	254
355	Fire Extinguisher a. Piper Dwg. 76167-2, Scott 42211-00	_____	4.6	71.0	327
	b. Piper Dwg. 37872-2, Graviner HA 1014-01	_____	5.6	57.9	324
357	Tow Bar Piper Dwg. 99458	_____	1.3	156.0	203

*Weight and moment difference between standard and optional equipment.

(n) Miscellaneous
(Optional Equipment) (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
361	Locking Gas Cap Piper Dwg. 39830-2	_____	*0.1	94.1	9

*Weight and moment difference between standard and optional equipment.

TOTAL OPTIONAL EQUIPMENT	_____	_____	_____

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