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SECTION 6

WEIGHT AND BALANCE

*For 1982 and preceding models only.
**For 1983 and subsequent models only.

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 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 licensed, 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.

6.3 AIRPLANE WEIGHING PROCEDURE

At the time of licensing, 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 3 minutes at 1000 RPM on each tank to ensure 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

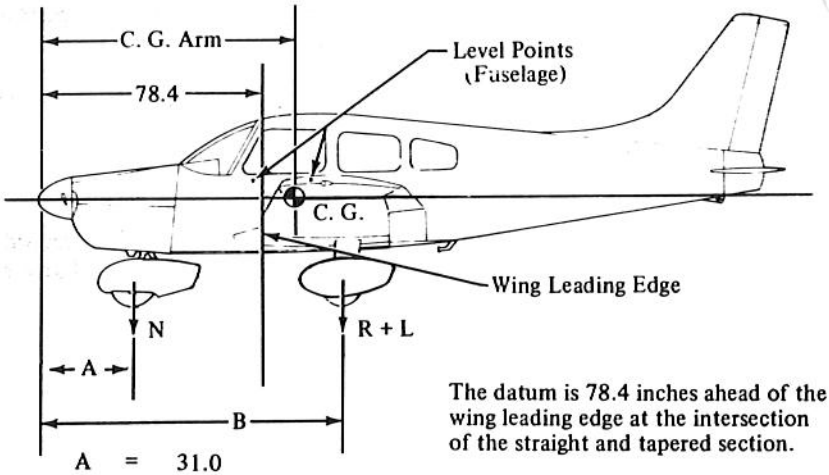
(1) With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

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-28-181 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 = 31.0

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 licensed at the factory. These figures apply only to the specific airplane serial number and registration number shown.

The basic empty weight of the airplane as licensed at 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-28-181 ARCHER II

Airplane Serial Number 2890095

Registration Number HB-PLY

Date 11/15/88

AIRPLANE BASIC EMPTY WEIGHT

Item	Weight (Lbs)	x C.G. Arm (Inches Aft of Datum)	= Moment (In-Lbs)
Actual Standard Empty Weight* ~~Computed~~	1434.3	85.1	122095
Optional Equipment	168.9	105.3	17793
Basic Empty Weight	1603.2	87.3	139888

*The standard empty weight includes full oil capacity and 2.0 gallons of unusable fuel.

AIRPLANE USEFUL LOAD

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

Normal Category (2558 lbs.) - (1603.2 lbs.) = 954.8 lbs.

Utility Category (2138 lbs.) - (1603.2 lbs.) = 534.8 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

PA-28-181	Serial Number 2890095		Registration Number HB-PLY			Page Number	
Date	Item No.	Description of Article or Modification	Added (+) Removed (-)	Weight Change			Running Basic Empty Weight	
				Wt. (Lb.)	Arm (In.)	Moment /~~100~~	Wt. (Lb.)	Moment /~~100~~
11/15/88		As Licensed					1603.2	139888
15.12.88	28	Silencer TECHNIFIR	+	7.2	33.86	2,44	1610,4	140132
20.5.98		Intercom PM-1000	+	1.4	58.5	81.9	1611.8	140213.9
19.3.02		Exchange ELT Kanad 406	+/-				1610.7	139351.3
3.10.03	28	Rem. Mecanair and Inst. Liese Silencer V76-L	-	5.2	40.865	2.125	1605.5	139739.4
27.1.07		Installation GPS / Remove ADF	+/-				1600.70	139224.40
12.3.08		Replace XPDR by GTX 328					1601.80	139288.31
30.11.10		Neuwägung nach Neulackierung		durch Komprecht			1603.8	137813.98
14.06.12		Change elec Trim System					1602.0	137454.46

PA-28-181	Serial Number	Registration Number	Page Number

Date	Item No.	Description of Article or Modification	Added (+) / Removed (-)	Weight Change			Running Basic Empty Weight	
				Wt. (Lb.)	Arm (In.)	Moment 100	Wt. (Lb.)	Moment / 100

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	1590.0	87.5	139125
Pilot and Front Passenger	340.0	80.5	27370
Passengers (Rear Seats)*	340.0	118.1	40154
Fuel (48 Gallon Maximum)	288.0	95.0	27360
Baggage (200 Lbs. Maximum)*		142.8	
Ramp Weight (2558 Lbs. Normal, 2138 Lbs. Utility Maximum)	2558	91.5	234009
Fuel Allowance For Engine Start, Taxi and Run Up	-8	95.0	-760
Takeoff Weight (2550 Lbs. Normal, 2130 Lbs. Utility Maximum)	2550.0	91.5	233249

The center of gravity (C.G.) of this sample loading problem is at 91.5 inches aft of the datum line. Locate this point (91.5) 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 ENSURE THAT THE AIRPLANE IS LOADED PROPERLY.

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

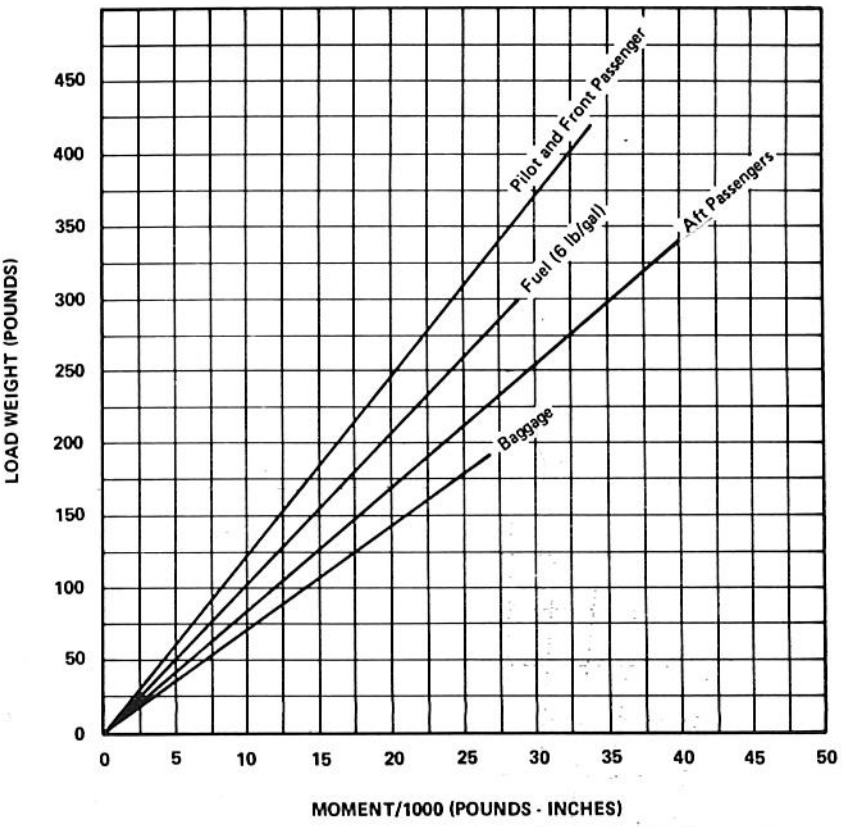
SAMPLE LOADING PROBLEM (NORMAL CATEGORY)
Figure 6-9

	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Empty Weight			
Pilot and Front Passenger		80.5	
Passengers (Rear Seats)*		118.1	
Fuel (48 Gallon Maximum)		95.0	
Baggage (200 Lbs. Maximum)*		142.8	
Ramp Weight (2558 Lbs. Normal, 2138 Lbs. Utility Maximum)			
Fuel Allowance For Engine Start, Taxi and Run Up	-8	95.0	-760
Takeoff Weight (2550 Lbs. Normal, 2130 Lbs. Utility Maximum)			

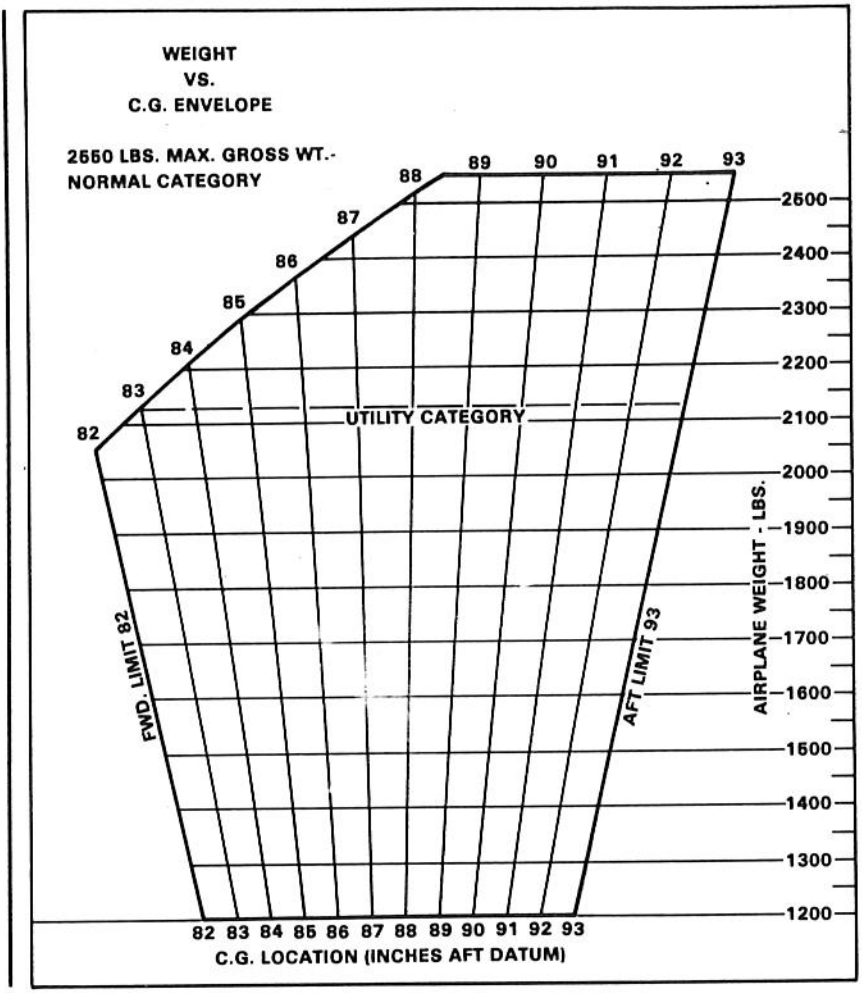
Totals must be within approved weight and C.G. limits. It is the responsibility of the airplane owner and the pilot to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Weight and Balance Data Form (Figure 6-5). If the airplane has been altered, refer to the Weight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

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

WEIGHT AND BALANCE LOADING FORM
Figure 6-11



LOADING GRAPH
Figure 6-13



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.

The "Basic Empty Weight and Center of Gravity" location is taken from the Weight and Balance Form (Figure 6-5), the Weight and Balance Record (Figure 6-7) or the latest FAA major repair or alteration form.

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 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

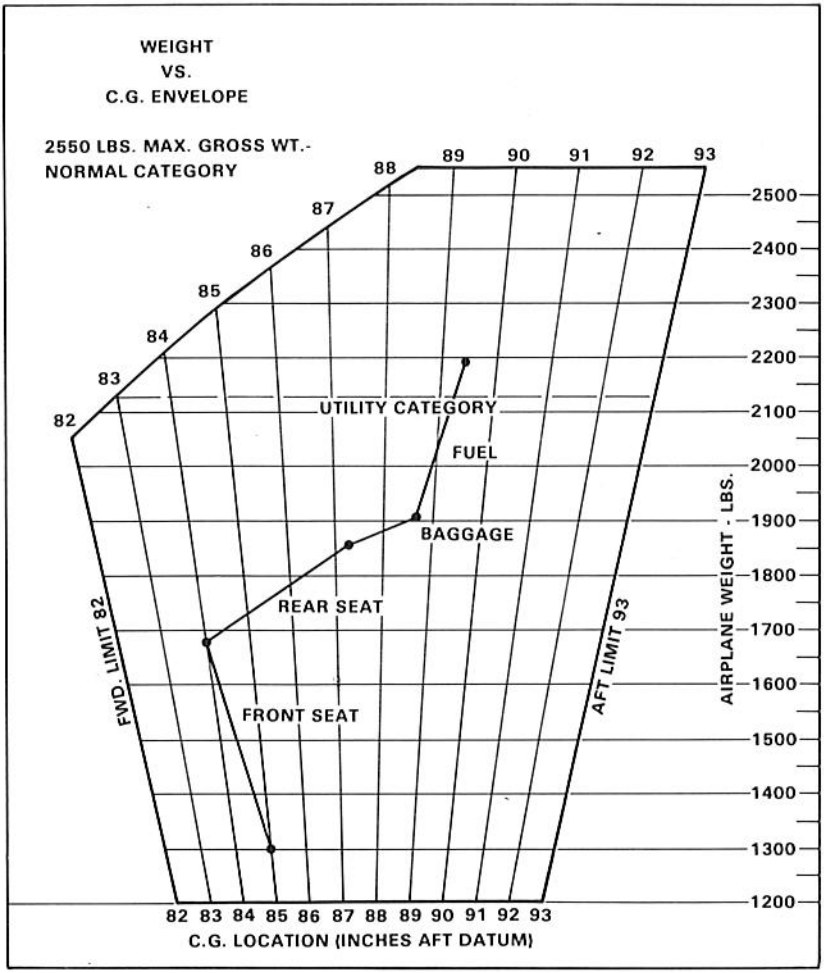
A sample problem will demonstrate the use of the weight and balance plotter.

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 weighing 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 Figure 6-17.)
(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.

SAMPLE PROBLEM



SAMPLE PROBLEM
Figure 6-17

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EQUIPMENT LIST

The following is a list of equipment which may be installed in the airplane. Items marked with an "X" were installed on the airplane described below when licensed by the manufacturer. Piper Aircraft Corporation will not revise this equipment list once the aircraft is licensed. It is the owner's responsibility to retain this equipment list and to amend it to reflect changes in equipment installed in this airplane.

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-28-181, ARCHER II

SERIAL NO. 2890095 REGISTRATION NO. HB-PLY DATE: 11/02/88

(a) Propeller and Propeller Accessories

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
1	Propeller, Sensenich 76EM8S5-0-62 Piper Spec. PS50077-42 Cert. Basis - TC P4EA		34.5	3.8	131
3	Spinner, Piper Dwg. 65805-0				
	a. Bulkhead		1.9	8.6	16
	b. Dome		2.6	-0.3	-1

(b) Engine and Engine Accessories

11	Engine - Lycoming Model				
	a. O-360-A4A Piper Dwg. 62941-17 Cert. Basis - TC 286	____	285.0	20.9	5957
	b. O-360-A4M Piper Dwg. 62941-16 Cert. Basis - TC E286	X	281.0	20.9	5873
13	Oil Filter				
	a. Lycoming No. 75528, (AC #OF5578770)	____	3.3	35.5	117
	b. Lycoming No. LW-13743, (Champion CH-48110) Cert. Basis - TC E286	X	2.8	35.5	99
15	Alternator - 60 Amp				
	a. ~~Chrysler AA1964~~, Per PAC Dwg. 99945-3 Prestolite	X	13.5	14.0	189
	b. Prestolite ALY 6422, Per PAC Dwg. 99891-0	____	*10.5	14.0	147
17	Engine Driven Fuel Pump Lycoming Dwg. 73297, 74082, 75148 or 75246 Cert. Basis - TC E286		1.7	36.3	62
19	~~Electric Fuel Pump, Facet Model 478360~~		1.8	36.8	66
21	Fuel Valve, Piper Dwg. 66945 System Components Corp., P/N SP-2378-B3 or Allen Aircraft Products Inc., P/N 6S122		0.4	61.9	25
22	Petersen MOGAS STC SA2660CE1/SE2563CE w/ 2 ea auxiliary fuel pumps P/N 80218	X	neg 2.2.2007	-	-

Ullger 643 CH.V2LUb.2001

*Used only if air conditioner is installed. Weight included in weight of air conditioner installation.

(b) Engine and Engine Accessories (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
23	Oil Cooler, Piper Dwg. 18622 (Harrison P/N C-8526250) or (Niagara P/N N.D.M. 20002A)		1.9	41.3	78
25	Air Filter, Fram Model CA-161 PL or Purolator AFP-2		0.9	29.5	27
27	Starter, Lycoming No. 76211, (Prestolite MZ4218) Cert. Basis - TC E286		*18.0	14.5	261
28	Silencer ~~MECANAIR STC No SA 78-20-23~~ LIESE V26-L' LBA STC SA0654	X	~~7.2~~ 2.0	~~33.26~~ 15.75	~~244~~ 31.5
(c)	Landing Gear and Brakes				
35	Two Main Wheel Assemblies, Piper Dwg. 63370-0 & -1 a. Cleveland Aircraft Products Wheel Assembly No. 40-86 Brake Assembly No. 30-55 Cert. Basis - TSO C26a b. Two Main 4-Ply Rating Tires 6.00-6 with Regular Tubes Cert. Basis - TSO C62		32.3	109.6	3540
37	One Nose Wheel				
	a. Cleveland Aircraft Products Wheel Assembly No. 40-76B, (Less Brake Drum) Cert. Basis - TSO C26a		4.3	31.0	133
	b. McCauley Industrial Corp. Wheel Assembly No. D-30625 Cert. Basis - TSO C26b		5.5	31.0	171
	c. One Nose Wheel 4-Ply Rating Tire 6.00-6 with Regular Tube Cert. Basis - TSO C62		8.5	31.0	264
39	Handbrake Master Cylinder, Piper Dwg. 65842 Cleveland Aircraft Products No. 10-22		0.6	60.9	37
41	Toe Brake Cylinders				
	a. Cleveland Aircraft Product No. 10-27		0.7	53.0	37
	b. Gar-Kenyon Instruments No. 17000		0.4	53.0	21
(d)	Electrical Equipment				
51	Voltage Regulator, Piper Dwg. 68804-3 or -4		0.4	51.9	21
53	Battery, Piper Dwg. 76454, (Rebat S-25)		21.9	168.0	3679
55	Starter Relay, Piper Dwg. 99130-2 (RBM Controls P/N 111-111)		1.0	45.8	46
57	Overvoltage Relay, Piper Dwg. 76454 (Wico X16799)		0.5	55.4	28

3.10.03 Hälliger Can 643

*Included in engine weight.

(d) Electrical Equipment (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
59	Stall Warning Device, Piper Dwg. 76454 (Safe Flight P/N C52207-4)		0.2	80.2	16
61	Stall Warning Horn, Piper Dwg. 76454 (Safe Flight P/N 35214)		0.2	58.8	12
63	Radio Master Switch Relay 6041H298, Piper Dwg. 39870		0.5	59.5	30
	(e) Instruments				
69	Airspeed Indicator, Piper Spec. PS50049-30S Cert. Basis - TSO C2b	———	0.6	61.8	37
71	Altimeter, Piper Spec. PS50008-2 or -3 Cert. Basis - TSO C10b	X ———	1.1	60.9	67
73	Compass Cert. Basis - TSO C7c		0.9	59.9	54
75	Tachometer, Piper Dwg. 62177-14		0.7	61.2	43
77	Engine Cluster (Left), Piper Dwg. 86552-7		0.8	62.4	50
79	Engine Cluster (Right), Piper Dwg. 86552-9		0.8	62.4	50
	(f) Miscellaneous				
91	Forward Seat Belts (2) Piper Spec. 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
93	Rear Seat Belts (2) Piper Spec. 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
95	Left Front Seat, Piper Dwg. 89023-2	———	15.5	84.0	1302
97	Right Front Seat, Piper Dwg. 89023-3	———	15.5	84.0	1302
99	Right Rear Seat, Piper Dwg. 89027-3		14.5	123.0	1784
101	Left Rear Seat, Piper Dwg. 89027-2		14.5	123.0	1784
103	Shoulder Harness (2), (Front Seats Only) Piper PS50039-4-20 Pacific Scientific P/N 1107447-13, Black		1.4	119.5	167

(f) Miscellaneous (cont)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
105	Baggage Straps, Piper Dwg. 66804-0 & 66805-0		1.3	142.8	186
107	Tow Bar, Piper Dwg. 99458-0		1.3	156.0	203
	(g) Engine and Engine Accessories (Optional Equipment)				
115	Carburetor Ice Detector, Piper Dwg. 39684-2	_____	0.5	59.7	30
	(h) Propeller and Propeller Accessories (Optional Equipment)				
	(i) Landing Gear and Brakes (Optional Equipment)				
131	Nose Wheel Fairing, Piper Dwg. 37896-3	X	3.8	36.3	138
133	Main Wheel Fairings, Piper Dwg. 79893-2, -3	X	17.0	113.6	1931
	(j) Electrical Equipment (Optional Equipment)				
141	Instrument Panel Lights, Piper Dwg. 76454	X	0.3	62.8	19
143	Instrument Light, Grimes 15-0083-7 or Whelen A300-W-14	X	0.1	99.0	10
145	Cabin Light, Piper Dwg. 95229	X	0.3	99.0	30
147	Landing Light, G.E., Model 4509	X	0.5	13.1	7
149	Wing Tip Recognition Lights Piper Dwg. 87487	_____	1.0	94.1	94
150	Navigation Lights (Wing) (2) Red/White & Green/White With White Strobe Whelen Model A600	X	5.8	157.9	916
151	Navigation Lights (Wing) (2) Red/White & Green/White With Red Strobe Whelen Model A600	_____	5.8	157.9	916
153	Navigation Lights (Wing) (2) Red/White & Green/White Whelen Model A675	_____	0.5	106.6	53
155	Navigation Light (Rear) (1), Grimes Model 2064 (White)	_____	0.2	281.0	56
157	Rotating Beacon Whelen Eng. Co. P/N WRML-12 Piper Dwg. 63892 or 63518	_____	1.5	263.4	395

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

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
159	Heated Pitot Head, Piper Dwg. 69041-7	X	0.4	100.0	40
~~161~~	~~Piper Pitch Trim, Piper Dwg. 67496-3~~ SUPERSEDED AVIONTEC CH.145.0181 m.c. 12	X	~~4.7~~	~~145.6~~	~~684~~
163	Battery, PS50133.H., Rebat R35	X	*5.1	168.0	857
165	Auxiliary Power Receptacle, Piper Dwg. 68815	X	2.7	178.5	482
167	External Power Cable, Piper Dwg. 62355		4.6	142.8	657
169	Lighter, #200462, 12 Volt, Universal	X	0.2	62.9	13
14.6.12 AVIONTEC AG CH.145.0181	S-Tec Manual elec Trim System	X	2.9	112	324.8

(k) Instruments (Optional Equipment)

187	Vacuum System Installation, With Airborne Model 211cc Pump	X	4.5	39.1	176
188	Auxiliary Vacuum System, Piper Dwg. 87774-2	X	15.5	42.5	659
189	Attitude Gyro, Piper Dwg. 99002-9 Cert. Basis - TSO C4c		2.2	59.4	131
191	Directional Gyro, Piper Dwg. 99003-8 Cert. Basis - TSO C5c		3.3	59.7	197
193	Tru-Speed Indicator, Piper Spec. PS50049-30T Cert. Basis - TSO C2b	X	(same as standard equipment)		
195	Encoding Altimeter, Piper PS50008-6 or -7 Cert. Basis - TSO C10b, C88		*0.9	60.3	54
197	Altitude Digitizer, (United Instruments P/N 5125-P3) Cert. Basis - TSO C88		1.0	51.5	52
199	Vertical Speed, Piper Dwg. 99010-2, -4 or -5 Cert. Basis - TSO C8b	X	1.0	65.9	66
201	Alternate Static Source, Piper Dwg. 35493	X	0.4	61.0	24
203	Turn and Slip Indicator, Piper PS50030-2 or -3 Cert. Basis - TSO C3b	X	2.6	59.7	155
205	Exhaust Gas Temperature, Piper Dwg. 99026	X	0.7	55.4	39
~~207~~	~~Engine Hour Meter, Piper Dwg. 79548-0~~ FLIGHT TIME COUNTER "WINTER 1510" 18.4.05 CH.2LUb.2001	X	0.3	61.0 ~~61.2~~	18.3
209	Clock	X	0.4	62.4	25
211	Control Wheel Digital Clock, Piper Dwg. 87347-3		0.3	71.9	22
213	Air Temperature Gauge, Piper Dwg. 99479-0 or -2	X	0.2	72.6	15

*Weight and moment difference between standard and optional equipment.

(l) Autopilots (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
223	Century 21 Autopilot with Directional Gyro 52D254	_____	8.7	72.6	632
	Cert. Basis - STC SA3352SW	_____	3.3	59.4	196
225	King KAP 100 Autopilot, Piper Dwg. 39874-( )				
	Cert. Basis - STC SA1565CE-D	_____	15.2	97.4	1480
227	King KAP 100 Autopilot with KCS 55A Compass System, Piper Dwg. 39874-( )				
	Cert. Basis - STC SA1565CE-D	_____	21.2	113	2396
229	King KAP 150 Autopilot, Piper Dwg. 39874-( )				
	Cert. Basis - STC SA1565CE-D	_____	21.2	115.2	2442
231	King KAP 150 Autopilot with KCS 55A Compass System, Piper Dwg. 39874-( )				
	Cert. Basis - STC SA1565CE-D	_____	27.2	137	3726
	(m) Radio Equipment (Optional Equipment)				
245	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				
247	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 C40c, C36c				
249	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				
251	Collins IND-351 ( ) VOR/LOC/GS Indicator				
	Cert. Basis - TSO C40a, C36c	_____	1.3	60.2	78
253	Collins GLS-350 Glide Slope Receiver				
	Cert. Basis - TSO C34c	_____	2.0	181.8	364
255	Collins DME-451 w/IND. 451/450				
	Cert. Basis - TSO C66a	_____	8.0	174.9	1399
257	Collins RCR-650A ADF Receiver and Antenna and IND-650A Indicator				
	Cert. Basis - TSO C41c	_____	6.6	104.8	692
259	Collins AMR-350 Audio/Marker Panel				
	Cert. Basis - TSO C35d, C50b	_____	*3.3	110.0	363

*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.)
261	Collins TDR-950 Transponder Cert. Basis - TSO C74c	_____	*2.8	62.9	176
263	King - KN 53 Nav/ Receiver	_____	2.8	63.8	179
265	King - KN 53 Nav/ Receiver w/ G.S. Receiver				
	a. Single	_____	3.1	63.8	198
	b. Dual	_____	6.2	63.8	396
267	King KX 155 VHF Comm/ Nav Receiver				
	a. With Audio Amplifier	_____	5.0	58.1	291
	b. With Glide Slope Receiver	X	5.3	58.1	308
	c. Without Glide Slope Receiver	X	4.8	58.1	279
	Cert. Basis - TSO C37b, C38b, C40a, C36a				
269	King KX 165 VHF Comm/ Nav Receiver				
	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				
271	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				
273	King KY-197 Transceiver				
	Cert. Basis - TSO C37b, C38b				
	a. Single	_____	4.2	58.7	247
	b. Dual	_____	8.4	58.7	493
275	King KI 202 VOR/ LOC Indicator				
	Cert. Basis - TSO C40a, C36c	_____	1.3	60.9	79
277	King KI 203 VOR/ LOC Indicator				
	Cert. Basis - TSO C36c, C40a	_____	1.6	59.9	96
279	King KI 204 VOR/ LOC/ GS Indicator				
	Cert. Basis - TSO C34c, C36c, C40a	_____	1.7	60.0	102.0
281	King KI 206 VOR/ LOC/ GS Indicator				
	Cert. Basis - TSO C40a, C36c, C34c	_____	1.3	60.9	79
283	King KI 208 VOR/ LOC Indicator				
	a. Single	X	1.0	59.6	60
	b. Dual	_____	2.0	59.9	120
	Cert. Basis - TSO C36c, C40a				
285	King KI 209 VOR/ LOC/ GS Indicator				
	Cert. Basis - TSO C34c, C36c, C40a	X	1.2	59.9	72
287	King KNS 80 RNAV	_____	7.0	56.6	396
	PS Engineering Intercom PM-1000	X	1.4	58.5	81.9

*Weight includes antenna.

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

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
289	King KN 62A or KN 64 DME	X	3.3	58.3	192
291	~~King KR-86 ADF with KA-42B Loop and Sense Antenna~~	~~X~~		23.1.2007 AVIONITEC AG CH.145.0181	
	a. First		~~7.6~~	~~91.6~~	~~696~~
	b. Second		10.6	107.0	1134
	c. Audio Amplifier		0.8	51.0	41
293	King KR 87 ADF Receiver/Indicator				
	a. Single		4.0	59.0	236
	b. KA 44B Antenna (Single)		3.6	150.6	542
	c. Audio Amplifier		0.8	51.0	41
	Cert. Basis - TSO C41c				
295	King KMA-24 Audio Control Panel	X			
	Cert. Basis - TSO C35d, C50b 8.3.04 AVIONITEC AG JAA/BAZL 146		1.7	65.3	111
297	~~Garmin GTX 320A~~ ~~King KT 76( )/78( ) Transponder~~	~~X~~			
	~~Cert. Basis - TSO C74b~~		~~*3.1~~	~~58.1~~	~~180~~
299	King KT 79 Transponder				
	Cert. Basis - TSO C47c		*3.9	57.6	225
301	King KRA-10 Radio Altimeter		4.3	162.6	699
303	Narco Mark 12D Comm-Nav w/G.S.				
	Cert. Basis - TSO C34c Class D		5.2	57.9	301
305	Narco Mark 12D Comm-Nav without G.S.				
	Cert. Basis - TSO C34c Class D		4.8	57.9	278
307	Narco Comm 810 TSO				
	a. Single		4.0	57.5	230
	b. Dual		8.0	57.5	460
	Cert. Basis - TSO C37b, C38b				
309	Narco Nav 824 TSO				
	a. Single		5.0	57.5	288
	b. Dual		10.0	57.5	575
	Cert. Basis - TSO C36c, C40a				
311	Narco Nav 825 TSO				
	a. Single		5.4	57.5	311
	b. Dual		10.8	57.5	621
	Cert. Basis - TSO C36c, C40a, C34c				
313	Narco ID 824 Indicator TSO				
	a. Single		.9	60.8	55
	b. Dual		1.8	60.8	109
	Cert. Basis - TSO C36c, C40a				
	27.1.2007 AVIONITEC AG CH.145.0181 Skymap III C Moving Map/GPS		2,4	61.0	146.4
	Bendix/King GPS Antenna KA 92		0,4	86.5	34.6
	AVIONITEC AG CH.145.0181 297 Garmin Mode S XPDR GTX 328		4.2	58.1	244

* 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.)
315	Narco ID 825 Indicator TSO				
	a. Single	_____	1.0	60.8	61
	b. Dual	_____	2.0	60.8	122
	Cert. Basis - TSO C36c, C40a, C34c				
317	Narco CP 136M Audio Selector Panel				
	Cert. Basis - TSO C50b, C35d	_____	1.9	59.8	114
319	Narco DME - 890	_____	*5.0	64.4	322
321	Narco DME - 891 Indicator	_____	3.3	68.5	226
323	Narco ADF-841	_____	*8.4	106.9	898
	Cert. Basis - TSO C41c				
325	Narco AT-150 Transponder, Cert Basis - TSO C74c	_____	**3.0	57.3	172
	a. Narco AR-500 Altitude Encoder				
	Cert. Basis - TSO C88	_____	1.0	51.5	52
	b. ~~Narco AR-850~~ Altitude Encoder ACU A30.8	X	.7	51.5	36
	Piper Dwg. 79658, Cert. Basis - TSO C88 (a)				
327	Antenna and Cable				
	a. Nav Receiving VRP-37 or AV-12PPR	X	1.4	195.7	274
	b. #1 VHF Comm PS50040-18	X	1.4	144.3	202
	c. #2 VHF Comm PS50040-18	X	1.5	170.7	256
329	Marker Beacon Antenna, Comant CI-102	X	***1.2	175.0	210
	Piper Dwg. 39737-4				
331	~~Emergency Locator Transmitter, (Narco Model ELT-10)~~	~~X~~	~~3.5~~	~~236.2~~	~~827~~
	~~a. Antenna and Coax~~	~~X~~	~~0.3~~	~~224.4~~	~~67~~
	b. Shelf and Access Hole	X	0.5	235.4	118
332	Dual Mike and Phone Jacks	X	****0.2	61.8	12
333	Microphone				
	a. Piper Dwg. 68856-12 (100T)	X	0.3	69.9	21
335	Boom Mike Headset, Telex Airman 750	_____	0.3	80.5	24
337	Cabin Speaker, Piper Dwg. 99220	X	1.1	99.0	109
339	Headset, Piper Dwg. 68856-10	X	0.5	60.0	30
341	Avionics Cooling Fan Globe P/N 19A6009 14V	X			
	Piper Dwg. 39857-3		0.9	56.4	51
342	Horizontal Situation Indicator	_____	8.2	115	942
	Mitchell P/N NSD 360A				
	Cert. Basis TSO, C6C, C9C, C52A				
331/1	ELT Kanad 406 AF XMITTER	X	2.3	236.2	543
	ELT Antenna	X	0.4	224.4	89

Avionitec AG FOCA 140
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*Weight includes antenna, cable, receiver, and plate assembly.
**Weight includes antenna and cable.
***Includes antenna coax wire to marker beacon receiver.
****Weight is difference between standard mike and phone jack and optional dual mike and phone jack.

(n) Miscellaneous (Optional Equipment)

Item No.	Item	Mark if Instl.	Weight (Pounds)	Arm (In.) Aft Datum	Moment (Lb-In.)
365	Zinc Chromate Finish, Piper Dwg. 79700-2	X	5.0	158.0	790
367	Stainless Steel Control Cables, Piper Dwg. 79700		—	—	—
369	Air Conditioner and Alternator Instl. Piper Dwg. 99575-3		68.3	103.6	7076
371	Overhead Vent System, Piper Dwg. 79853-2		5.7	148.9	849
373	Overhead Vent System with Ground Ventilating Blower Piper Dwg. 79853-3		14.2	168.5	2393
375	Assist Step, Piper Dwg. 65384		1.8	156.0	281
377	Super Cabin Sound Proofing, Piper Dwg. 79601-3		18.1	86.8	1571
379	Adjustable Front Seat (Left) Piper Dwg. 89026-2	X	*6.6	80.7	533
381	Adjustable Front Seat (Right) Piper Dwg. 89026-3	X	*6.8	80.0	544
383	Headrests (2) Front, Piper Dwg. 89028-2	X	2.2	94.5	208
385	Headrests (2) Rear, Piper Dwg. 89028-2	X	2.2	132.1	291
387	Leather Seat Trim, Piper PMS B1005	X	1.6	104.5	167
389	Shoulder Harness - Inertia (Rear) (2) Piper PS50039-4-10 Pacific Scientific 1107447-01 (Black)	X	1.3	140.3	182
391	Assist Strap, Piper Dwg. 79455		0.2	109.5	22
393	Curtain and Rod Installation, Piper Dwg. 67955-2	X	4.2	124.0	521
397	Fire Extinguisher Piper Dwg. 37872-2, Graviner HA1014-01		5.6	57.9	324
399	Locking Gas Cap, Piper Dwg. 39830-2		*0.1	94.1	9
401	Crew Cup Holders (2), Piper Dwg. 87453	X	0.1	62.8	6
403	Approach Plate Holder (2) (On Control Wheel) Piper Dwg. 37907		0.2	74.0	15
405	Static Wicks (6) @ Static Wicks (3) @ Piper Dwg. 78947		0.3 0.2	135.6 272.5	41 55

*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.)
407	Transponder Remote Ident (Switch In Control Wheel) Piper Dwg. 39693		Neg.	Neg.	Neg.
409	Tinted Windows, Piper Dwg. 76361	X	Neg.	Neg.	Neg.
	TOTAL OPTIONAL EQUIPMENT		168.9	105.3	17793