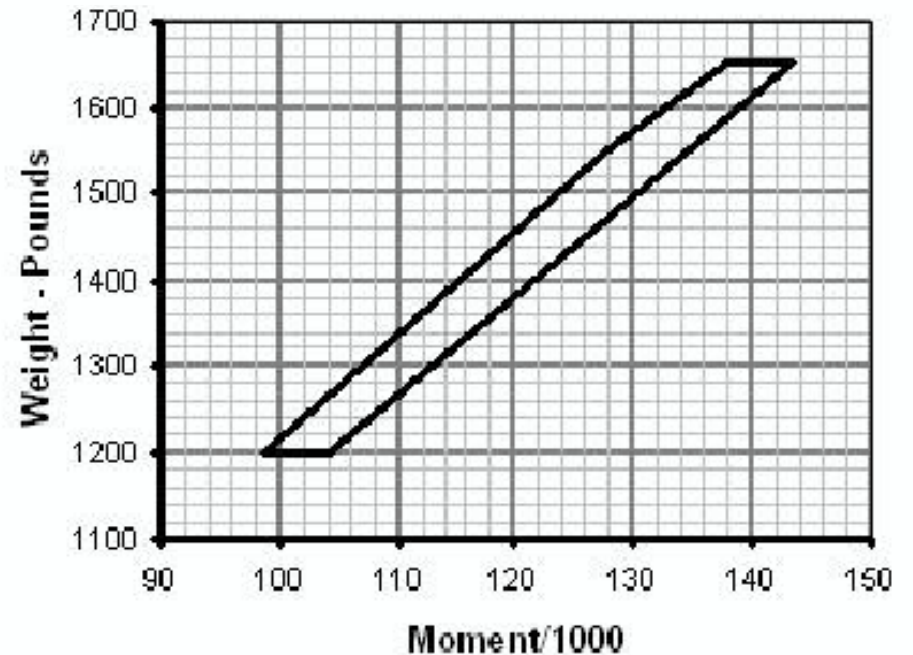
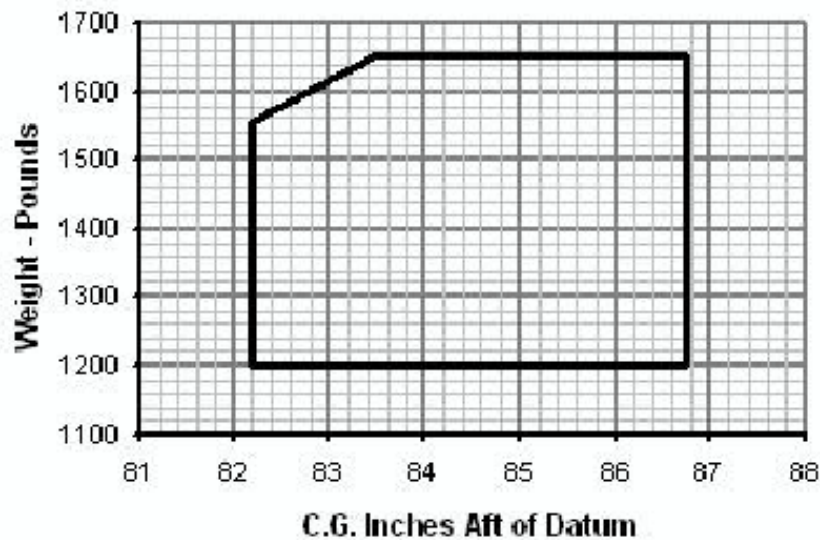
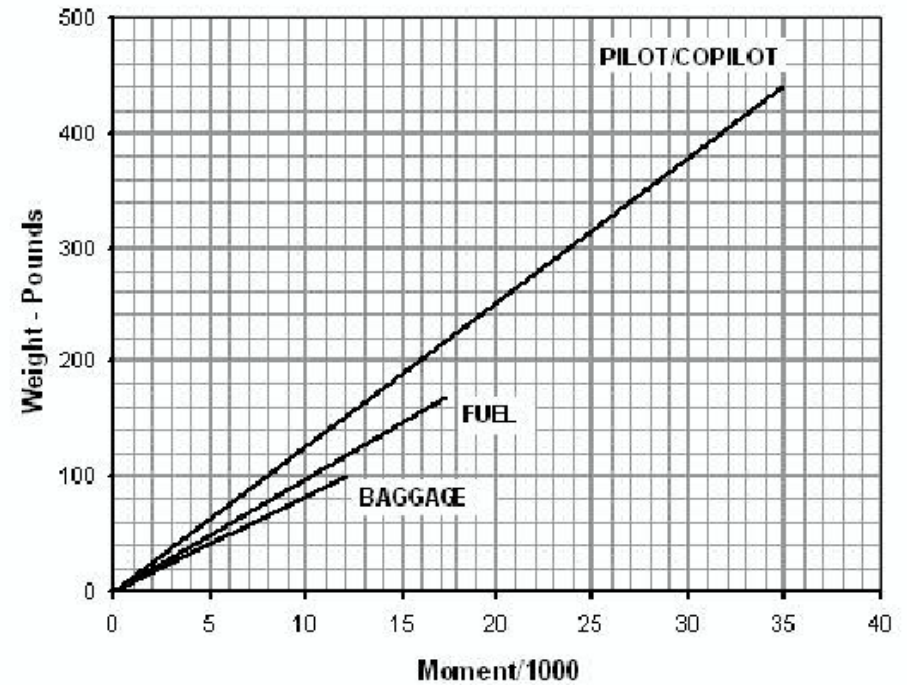


Liberty XL-2: 519XL Weight and Balance Worksheet

	Weight (lbs)	Arm (in)	Moment / 1,000 (in.lbs.)
Empty Wt	1,189	83.02	98.71
Pilot		79.27	
Passenger		79.27	
Fuel (6 lbs/gal)		102.29	
Baggage (100 lbs max.)		120.50	
Total Weight (1,653 max)		Wt. and Bal. as of 5/16/2007	
Total Moment / 1,000			
Loaded C. G. Location			



Advanced Aircraft Service
8622 Gibbs Dr
San Diego, CA. 92123
858-560-7599 Fax 858-560-7507

Date:

Aircraft: Liberty XL-2
S/N: 14
N#: N519XL

Weight Point	Weight
LH main wheel	459.0
RH main wheel	463.0
Nose/Tail wheel	267.0
Aircraft Weight	1189.0
Aircraft weighed with oil: Full <input checked="" type="checkbox"/>	Empty
Aircraft weighed with fuel: Full <input type="checkbox"/>	Empty <input checked="" type="checkbox"/>

Item	Weight	Arm	Moment
Aircraft	1189.0	83.02	98710.78
Fuel			
Oil			
	1189.0	83.02	98710.78

New Empty Weight **1189.0**
New Empty Weight C.G. **83.02**
New Useful Load **464.0 lbs**

Inspector: 

I.D.#: AP547969946

Date: 5/16/07

SECTION 6
WEIGHT & BALANCE

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Section 6
WEIGHT AND BALANCE

Liberty Aerospace, Inc.
XL2

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FAA APPROVED: 2/19/2004
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P/N 135A-970-005
Initial Release



INTRODUCTION

This section describes the procedure for establishing the basic empty weight and moment of the airplane. When this moment is divided by the airplane weight, the result is the moment arm of center of gravity location (C.G.). Sample forms are provided for reference, and may be photocopied as required. Procedures for calculating weight and moment, and ensuring compliance with aircraft limitations, are also included. A comprehensive list of standard and optional equipment available for this airplane is provided at the back of this section.

It should be noted that specific information regarding the weight, arm, moment, and installed equipment for this airplane, as delivered from the factory, can only be found in the original weight and balance report incorporated in this section.

WARNING

It is the responsibility of the pilot-in-command to ensure that the airplane is loaded properly. Operation outside of prescribed weight and balance limitations could result in an accident and serious or fatal injury.

AIRPLANE WEIGHING PROCEDURES

LEVELING

The airplane must be level both laterally and longitudinally before it is weighed.

To determine lateral level, place a beam level across both cabin doorsills (and at exact right angles to the airplane centerline) with the doors open. Measurement from the forward or aft end of the doorsill may be used to determine that the level has been placed correctly.

To determine longitudinal level, place a beam level lengthwise along either cabin doorsill with the cabin door open.

WEIGHING

Required Equipment:

- Three mechanical or electrical scales, minimum capacity 800 lbs each main gear, and 500 lbs nose gear.
- Ramps to roll airplane onto scales; chocks to secure airplane wheels on scales; shim material to level airplane.

Procedure:

NOTE

Weighing must be carried out indoors and in a location free from air currents.

- a. Verify that all required equipment is installed and complete. Ensure that any other items are removed from baggage area and cockpit storage pockets, etc.
- b. Drain all fuel from airplane. Then add published amount of unusable fuel to the fuel tank (1.5 U.S. gallons).
- c. Service engine oil to maximum mark on dipstick.
- d. Ensure flaps are retracted and all flight controls are in neutral position.

- e. Roll airplane onto scales. Ensure that nose wheel is centered and that main wheel legs do not exert any side loads on scales. Close both canopy doors. Chock all wheels securely. NOTE: tare weight of chocks must be subtracted from airplane wheel weights.
- f. Use shim materials as necessary to level airplane laterally and longitudinally.

NOTE

Shim materials may be used either on or under scales for leveling. If used on scales, tare weight of shim materials must be subtracted from airplane wheel weights. Make the last "fine adjustments" to achieve perfect level by letting small amounts of air out of the airplane tires.

For calculating the aircraft weight and center of gravity, the distance between the XL2's nose wheel and main wheels is 57.51 inches (measurement 'y'), with the midpoint being 28.75 inches (Figure 6-1). The distance between the centerline of the two main gears is 70.36 inches, or 35.18 inches from centerline of each main wheel to centerline of airplane (Figure 1-1).

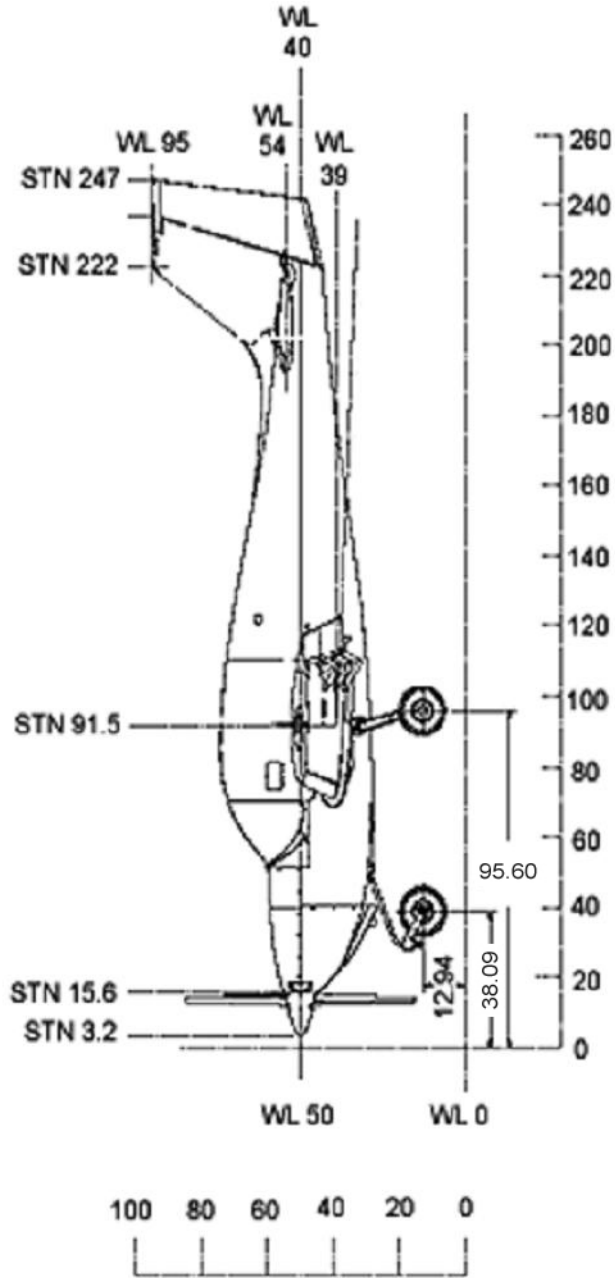


Figure 6-1 Airplane Dimensional Data

DETERMINING AIRPLANE WEIGHT & BALANCE

This XL2 airplane was weighed just prior to initial delivery and a basic empty weight and center of gravity was established. The distance from nose wheel to main wheels is 57.51 inches. This dimension is used to calculate the aircraft weight and center of gravity.

However, major modifications, loss of records, addition or relocation of equipment, completion of service bulletins, and weight-gain over time, may require re-weighing of the aircraft to keep the basic empty weight and center of gravity current. All changes to the basic empty weight and center of gravity are the responsibility of the pilot-in-command.

1. Preparation:
 - a. Inflate tires to recommended operating pressures.
 - b. Service brake reservoir.
 - c. Remove the fuel tank sump drain fittings and fuel gascolator valve drain plug to drain all fuel.
 - d. Service engine oil.
 - e. Raise flaps up.
 - f. Place all control surfaces in neutral position.
 - g. Verify equipment installation and location by comparison to equipment list.
 - h. Tare the scales.
2. Leveling:
 - a. Place scales under each wheel (scale capacity, 500 lbs nose, 1000 lbs each main).
 - b. Level longitudinally with a spirit level placed on the pilot doorsill and laterally with a spirit level placed across the doorsills. Alternately, level airplane by sighting the forward and aft tool holes along waterline 50.0. Shim underneath scales as required to attain proper level.
3. Weighing:
 - a. With the airplane level, doors closed, and brakes released, record the weight shown on each scale.

4. Multiply the weight for each main wheel by its distance aft of the reference datum. This is the wheel moment. Multiply the weight for the nose wheel by its distance aft of the reference datum. This is the nose wheel moment.

$$\text{Moment (in.lbs.)} = \text{Net Weight (lbs.)} \times \text{Arm (in.)}$$

5. Calculate and record the as-weighed moment by totaling the appropriate columns.
6. Determine and record the as-weighed C.G. in inches aft of datum using the following formula:

$$\text{C.G. (in.)} = \text{Total Moment (in.lbs.)} \div \text{Total Weight (lbs.)}$$

5. Add or subtract any items not included in the as-weighed condition to determine the empty condition. Application of the above C.G. formula will determine the C.G. for this condition.
6. Add the correction for engine oil (15 lbs at STN 38.09), if the airplane was weighed with oil drained. Add the correction for unusable fuel (9.0 lbs at STN 102.29) to determine the Basic Empty Weight C.G. by applying the above C.G. formula.
7. Record the new weight and C.G. values on the Weight and Balance Record (Figure 6-1).

The above procedure determines the airplane Basic Empty Weight, moment, and center of gravity in inches aft of datum. Add all three moments together (left and right main wheel or jack point plus nose wheel). This is the (empty airplane) total moment. Divide the total moment by the total empty weight (sum of left, right, and nose wheel weights). The result, expressed in inches aft of the reference datum, is the location of the empty airplane's center of gravity.

NOTE

To reduce the number of digits in calculations, it is acceptable to divide moments by 1000, and express them as "moment/1000." Care must be exercised to maintain consistency throughout all calculations.

CALCULATION OF C.G. IN TERMS OF STATION

Location of the forward edge of canopy hoop (the forward edge of the open canopy door) as Station 70.75, which is 70.75 inches aft of the reference datum (Figure 6-2).

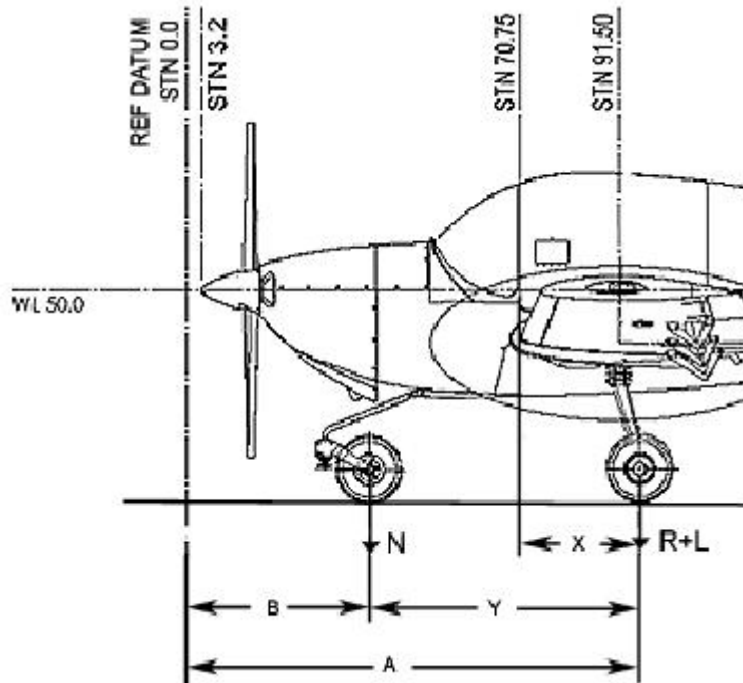


Figure 6-2 Airplane Dimensional Data

$$A = 95.60", B = 38.09", Y = 57.51"$$

AIRPLANE WEIGHING RECORD

Position	Scale Reading	-Tare wt (lbs)	=Net wt (lbs)
L Main (L)			
R Main (R)			
Nose (N)			
Total as Weighed			

Table 6-1 Airplane Weighing Record

EMPTY CENTER OF GRAVITY CALCULATION

Item	Individual Wt (lbs)	X ARM (inches aft of datum)	Moment/ 1000 (in.lbs.)
L Main (L)		95.60	
R Main (R)		95.60	
Nose (N)		38.09	
Total Wt			
Total Moment/ 1000			
Total Moment/1000 Divided by Total Wt (ARM = empty A/C center of gravity)			

Table 6-2 Empty Center of Gravity Calculation

CENTER OF GRAVITY LIMITS

	Gal.	Weight (lbs)	Arm (in)	Moment (in.lbs.)
Empty Wt		1174	83.20	97676.8
Pilot			79.27	
Copilot			79.27	
Fuel	0.0		102.29	
Baggage			120.50	
Zero Fuel		1174	83.20	97676.8
Ramp Weight		1174	83.20	97676.8

Table 6-3 Center of Gravity Limits

AIRPLANE LOADING DIAGRAM

The diagram below indicates the locations and arms of variable loads including pilot and passenger, fuel, and baggage.

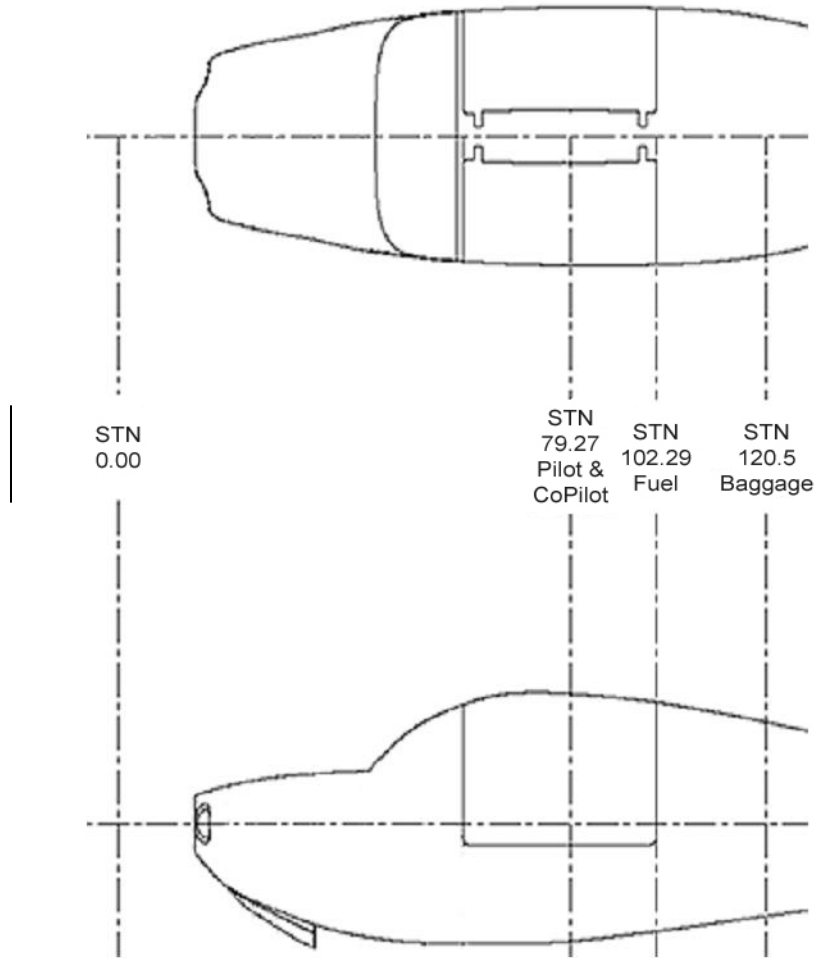


Figure 6-3 Fuselage Stations

LOADING GRAPH

To determine the moment/1000 for the pilot and copilot, fuel, and baggage, enter the graph at the actual weight of each item at the left. Read across to the diagonal line for that item (pilot/copilot, fuel, or baggage), then read down to determine the moment/1000.

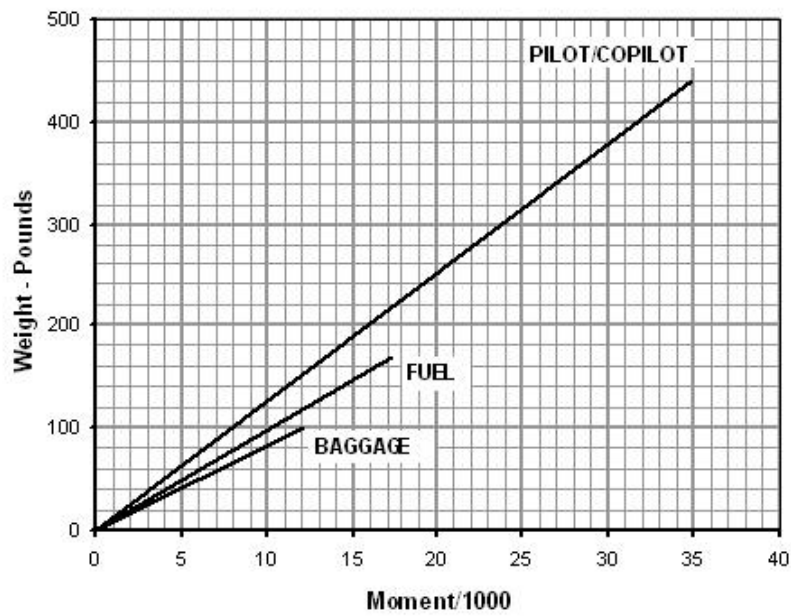


Figure 6-4 Loading Graph

LOADING CHART

Use the following chart to determine the moment/1000 for fuel and payload items to complete Airplane Loading Worksheet (Table 6-4).

Weight (lbs)	Moment/1000		
	Pilot & CoPilot STN 79.27	Baggage STN 120.5	Fuel STN 102.29
20	1.59	2.41	2.05
40	3.17	4.82	4.09
60	4.76	7.23	6.14
80	6.34	9.64	8.18
100	7.93	12.05	10.23
120	9.51		12.27
140	11.10		14.32
160	12.68		16.37
180	14.27		
200	15.85		
220	17.44		
240	19.02		
260	20.61		
280	22.20		
300	23.78		
320	25.37		
340	26.95		
360	28.54		
380	30.12		
400	31.71		
420	33.29		

Table 6-4 Loading Chart

AIRPLANE LOADING WORKSHEET

Instructions:

Use the following worksheet to calculate airplane weight and balance prior to each flight. It is recommended that this page be photocopied to provide a supply of loading worksheets. Moments for each item may be calculated (item weight x item arm = item moment/1000) or determined from the graph on page 6-15.

$$C.G. = \text{Total Moment} \div \text{Total Weight}$$

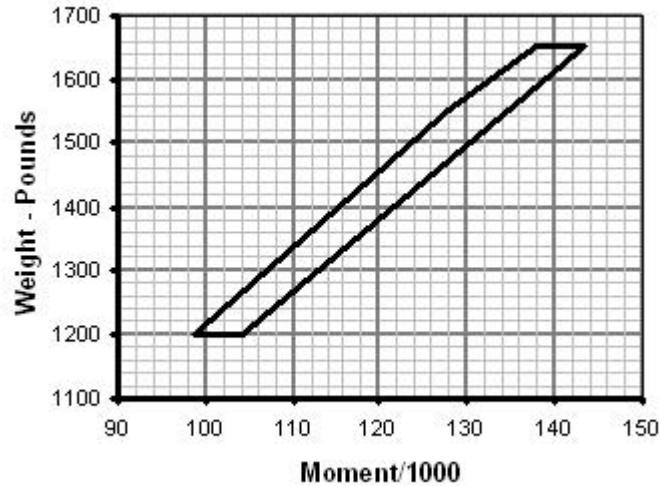
	Gal.	Weight (lbs)	Arm (in)	Moment (in.lbs.)
Empty Wt		1,189	83.02	98,711
Pilot			79.27	
Passenger			79.27	
Fuel (6 lbs/gal)			102.29	
Baggage (100 lbs max)			120.50	
Total Wt				
Total Moment ÷1000				
Loaded C.G. Location				

Table 6-5 Airplane Loading Worksheet

Use either the "Loaded Airplane Total Moment Limitations" or "Loaded Airplane Center of Gravity (ARM) Limitations" charts on the next two pages to determine that airplane loaded weight and balance are within limitations.

LOADED AIRPLANE TOTAL MOMENT LIMITATIONS

Use the following chart or table to determine if the weight and moment from the completed Airplane Loading Worksheet (Table 6-4) are within limits.



Wt (lbs)	Moment/1000	
	Minimum	Maximum
1200	99	104
1250	103	108
1300	107	113
1350	111	117
1400	115	121
1450	119	126
1500	123	130
1550	127	134
1600	132	139
1653	138	143

Figure 6-5 Moment Limits

LOADED AIRPLANE CENTER OF GRAVITY (ARM) LIMITATIONS

The following chart illustrates the airplane center of gravity envelope as inches from aircraft datum (and as a percentage of MAC).

WEIGHT AND CENTER OF GRAVITY LIMITS

Forward: 82.20 inches aft of datum at 1554 lbs.
Mid: 83.48 inches aft of datum at 1653 lbs.
Aft: 86.75 inches aft of datum at 1653 lbs.

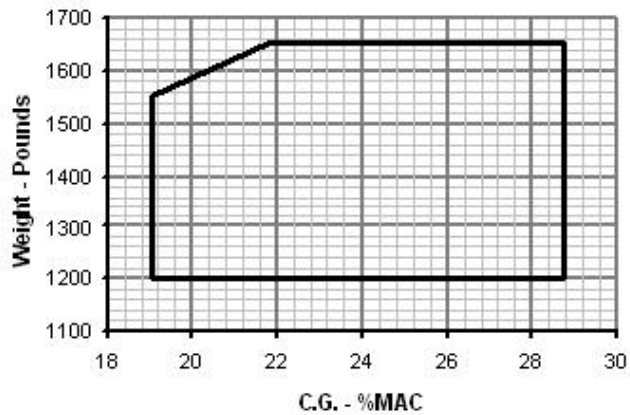
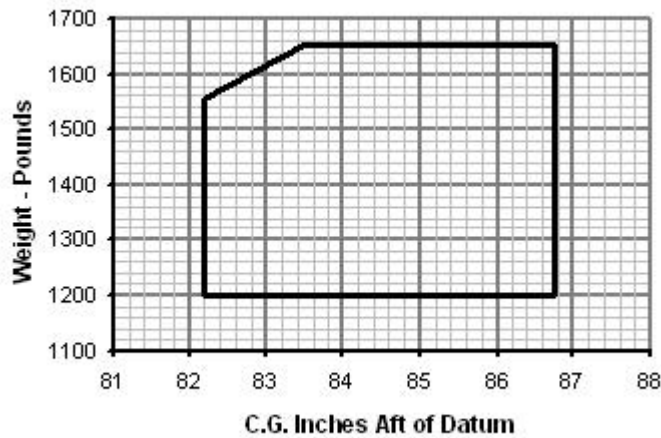


Figure 6-6 Loaded Airplane C.G. Envelope

