

SECTION 6 WEIGHT AND BALANCE / EQUIPMENT LIST

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NOTE

The data in this section utilizes pounds for weight and inches aft of datum for C of G.

INTRODUCTION

This section describes the procedure for establishing the Basic Empty Weight and Moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided.

It should be noted that specific information regarding the weight, arm, moment and installed equipment for an airplane as delivered from the factory can only be found in the plastic envelope carried in the back of the Pilot's Operating Handbook.

WARNING

IT IS THE RESPONSIBILITY OF THE PILOT TO ENSURE 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

1. Preparation:

- a) Inflate tires to recommended operating pressures.
- b) De-fuel airplane. Refer to FAC2-M200 Maintenance Manual.
- c) Service engine oil as required to obtain a normal full indication.
- d) Move sliding seats to the most forward position.
- e) Raise flaps to the fully retracted position.
- f) Place all control surfaces in neutral position.
- g) Remove all non-required items from airplane.

2. Levelling:

- a) Jack up the tail wheel on a stand such that the baggage compartment floor is near level.
- b) Place scales under each wheel (minimum scale capacity, 1000-pounds each main, 500 pounds tail wheel).
- c) Deflate the main wheel and/or lower or raise the tail wheel to properly centre the bubble in the level longitudinally and laterally (See Figure 6-1).

3. Weighing:

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

4. Measuring:

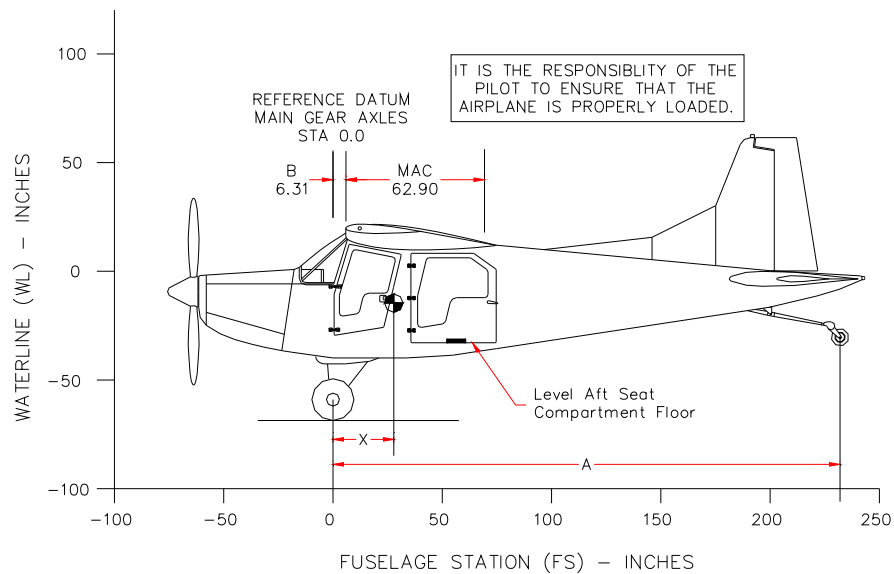
- a) Obtain measurement A by measuring horizontally and parallel to the airplane centre line, from centre of tail wheel axle, left side, to a plumb bob dropped from the line between the main wheel centres. Repeat on right side and average the measurements.

5. Calculate C.G. and Weight:

- a) Using weights from Item 3 and measurements from Item 4, the airplane Basic Empty Weight and C.G. can be determined by completing the table in Figure 6-1.

6. C.G. can also be expressed in terms of its location as a percentage of the airplane Mean Aerodynamic Chord (MAC) using the formula provided in Figure 6-1.

AIRPLANE WEIGHING FORM



MEASURE "A"
Measure "A" per item 4 of this Section, to assist in locating CG with airplane weighed on landing gear

LEVELING PROVISIONS
Longitudinal & Lateral:
Floor of the Aft Seat Compartment

Figure 6-1 Airplane Weighing Form (Sheet 1 of 3)

Weighing Point	Tare (lbs)	Scale Reading (lbs)	Net Weight (lbs)	Arm (inches)	Moment (in-lbs)
Tail				A =	
R Main				0.0	
L Main				0.0	
Total (Weighed)				CG=	
CG = Total Moment / Total Net Weight					
Use spaces below to add or subtract items from weighed condition.					
Empty Weight				CG=	
Drainable Unusable Fuel (6 lbs/USG), 1.7 USG			10.2	21.8	222.4
Basic Empty Weight					
Net Weight = Scale Reading - Tare Moment = Net Weight * Arm Arm is measured from the aircraft datum (main wheel axle).					

Figure 6-1 Airplane Weighing Form (Sheet 2 of 3)

LOCATING CG WITH AIRPLANE ON LANDING GEAR

Formula for Longitudinal CG (X):

$$(X) = \frac{\text{TAIL GEAR NET WEIGHT} * (A)}{\text{TAIL \& MAIN LANDING GEAR WEIGHT TOTALLED}} \\ = () \text{ IN. AOD}$$

LOCATING CG AS A PERCENT OF MAC

Formula for Percent MAC:

$$\text{CG Percent MAC} = \frac{\{(\text{CG Arm of Airplane}) - (B)\} * 100}{(\text{MAC})} \\ = \frac{\{(\text{CG Arm of Airplane}) - 6.31\} * 100}{62.9}$$

Figure 6-1 Airplane Weighing Form (Sheet 3 of 3)

SAMPLE WEIGHT AND BALANCE RECORD

SAMPLE WEIGHT AND BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

DATE		AIRPLANE MODEL		DESCRIPTION OF ARTICLE OR MODIFICATION	SERIAL NO.				PAGE NO.
					WEIGHT CHANGE		RUNNING BASIC		
ITEM NO.					ADDED (+)	REMOVED (-)	EMPTY WEIGHT		
IN	OUT	WT. (LB.)	ARM (IN.)	MOMENT (/1000)	WT. (LB.)	ARM (IN.)	MOMENT (/1000)	WT. (LB.)	
				AS DELIVERED					

Figure 6-2 Sample Weight and Balance Record

LOADING INSTRUCTIONS (WEIGHT AND BALANCE)

The following information will enable you to operate your FBA-2C2 within the prescribed weight and centre of gravity limitations. To determine weight and balance, use the Sample Problem (Figure 6-5), Loading Graph (Figure 6-6), and Centre of Gravity and Moment Envelopes (Figure 6-7 and Figure 6-8) as follows:

1. Take the Basic Empty Weight and Moment from appropriate weight and balance records carried in your airplane and enter them in the column titled YOUR AIRPLANE on the Sample Loading Problem.

NOTE

In addition to the Basic Empty Weight and Moment noted on these records, the C.G. arm (fuselage station) is also shown, but need not be used on the Sample Loading Problem. The moment which is shown must be divided by 1000 and this value used as the moment/1000 on the loading problem.

2. Use the Loading Graph to determine the moment/1000 for each additional item to be carried; then list these on the loading problem.

NOTE

Loading Graph information for the pilot, passengers and baggage is based on seats positioned for average occupants and baggage loaded in the centre of the aft baggage compartment as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft C.G. range limitations (seat travel and baggage compartment limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the position of the load is different from that shown on the Loading Graph.

3. Total the weights and moments/1000 and plot these values on the centre of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

LOADING ARRANGEMENT (SPLIT BENCH SEAT)

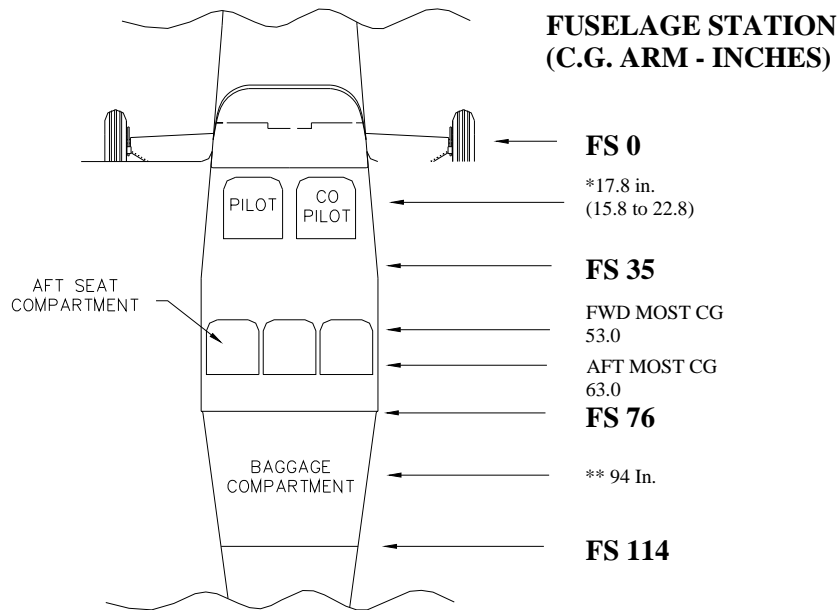


Figure 6-3 Loading Arrangements (Split Bench Seat)

* Pilot or passenger centre of gravity on adjustable seats positioned for average occupant. Numbers in parentheses indicate forward and aft limits of occupant centre of gravity range.

** Arm measured to the centre of the areas shown.

- NOTES:
1. The usable fuel C.G. arm for integral tanks is located at station 21.8.
 2. The aft door forward edge (approximate station 35) or the bend in the baggage compartment floor (approximate station 76) can be used as convenient interior reference points for

determining the location.

LOADING ARRANGEMENT (HAMMOCK SEAT)

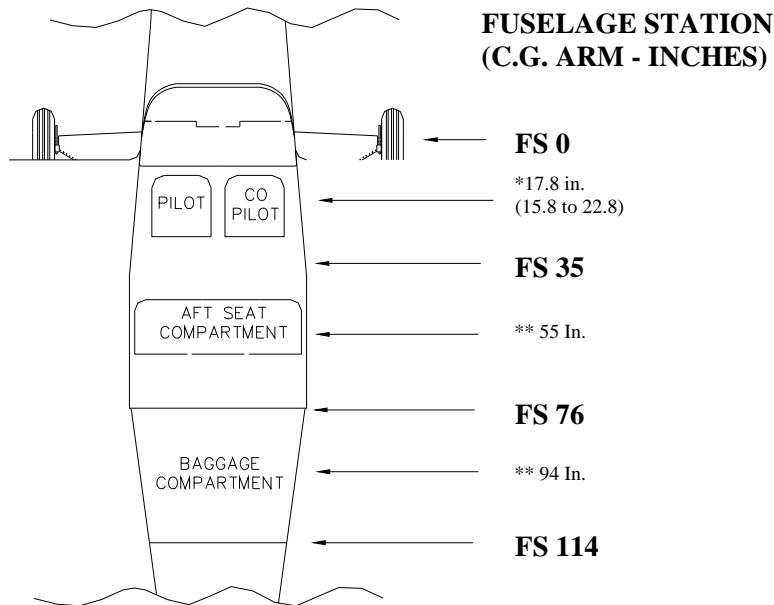


Figure 6-4 Loading Arrangements (Hammock Seat)

* Pilot or passenger centre of gravity on adjustable seats positioned for average occupant. Numbers in parentheses indicate forward and aft limits of occupant centre of gravity range.

** Arm measured to the centre of the areas shown.

- NOTES:
1. The usable fuel C.G. arm for integral tanks is located at station 21.8.
 2. The aft door forward edge (approximate station 35) or the bend in the baggage compartment floor (approximate station 76) can be used as convenient interior reference points for determining the location.

ITEM DESCRIPTION	WEIGHT AND MOMENT TABULATION					
	SAMPLE AIRPLANE		ARM (inch)	YOUR AIRPLANE		MOMENT (pound- inch/1000)
	WEIGHT (pound)	MOMENT (pound- inch/1000)		WEIGHT (pound)	MOMENT (pound- inch/1000)	
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil).	2000	31.1	15.6			
2. Usable Fuel (At 6.0 pound./U.S. gallon) 98 U.S. gallons Maximum 60 U.S. gallons (used for example)	360	7.8	21.8			
3. Pilot and Front Passenger (Station 17.8 & 200 pounds each)	400	7.1	17.8			
4. Rear Passenger (Station 55.0 & 200 pounds each)	400	22.0	55.0			
5. Main Baggage Area (Station 76 to 114; 250 pounds. Max @ Station 94)	100	9.4	94.0			
6. Ramp Weight and Moment (add columns)	3260	77.5				
7. Fuel Allowance for Engine Start, Taxi and Run-Up	-7	-0.2	21.8			
8. Takeoff Weight and Moment (Subtract Step 7 from Step 6)	3253	77.4				
9. Locate this point (3253 at 77.4) on the Centre of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.						

Figure 6-5 Sample Loading Problem (Sheet 1 of 2)

YOUR AIRPLANE	
WEIGHT (pounds)	MOMENT (pound- inch/1000)

YOUR AIRPLANE	
WEIGHT (pounds)	MOMENT (pound- inch/1000)

YOUR AIRPLANE	
WEIGHT (pounds)	MOMENT (pound- inch/1000)

NOTE

When several loading configurations are representative of your operation, it may be useful to fill out one or more of the above columns so specific loadings are available at a glance.

Figure 6-5 Sample Loading Problem (Sheet 2 of 2)

LOADING GRAPH

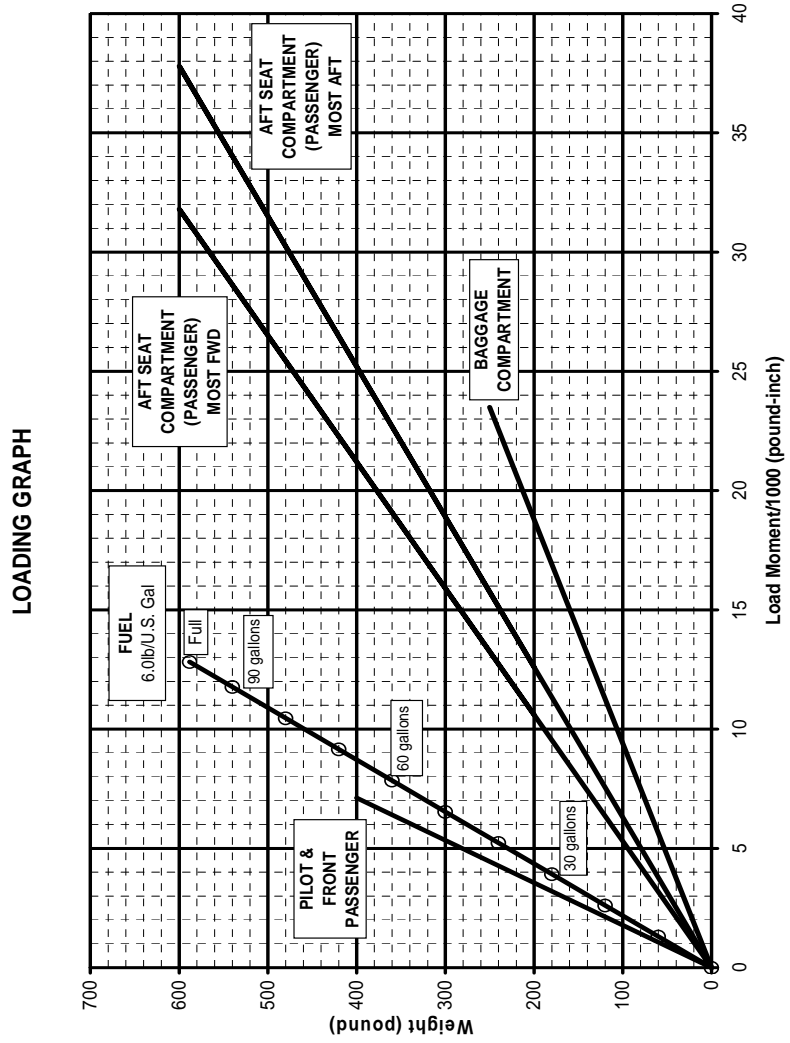


Figure 6-6 Loading Graph

CENTER OF GRAVITY MOMENT ENVELOPE

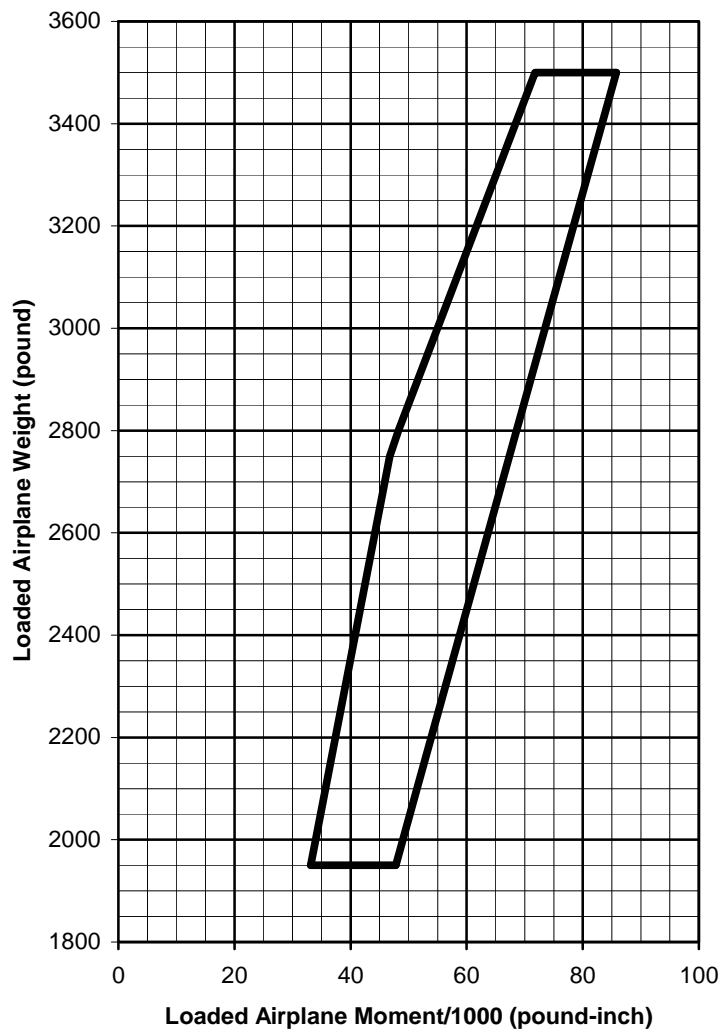


Figure 6-7 Loaded Airplane Moment/1000 (pound-inch)

CENTER OF GRAVITY RANGE ENVELOPE

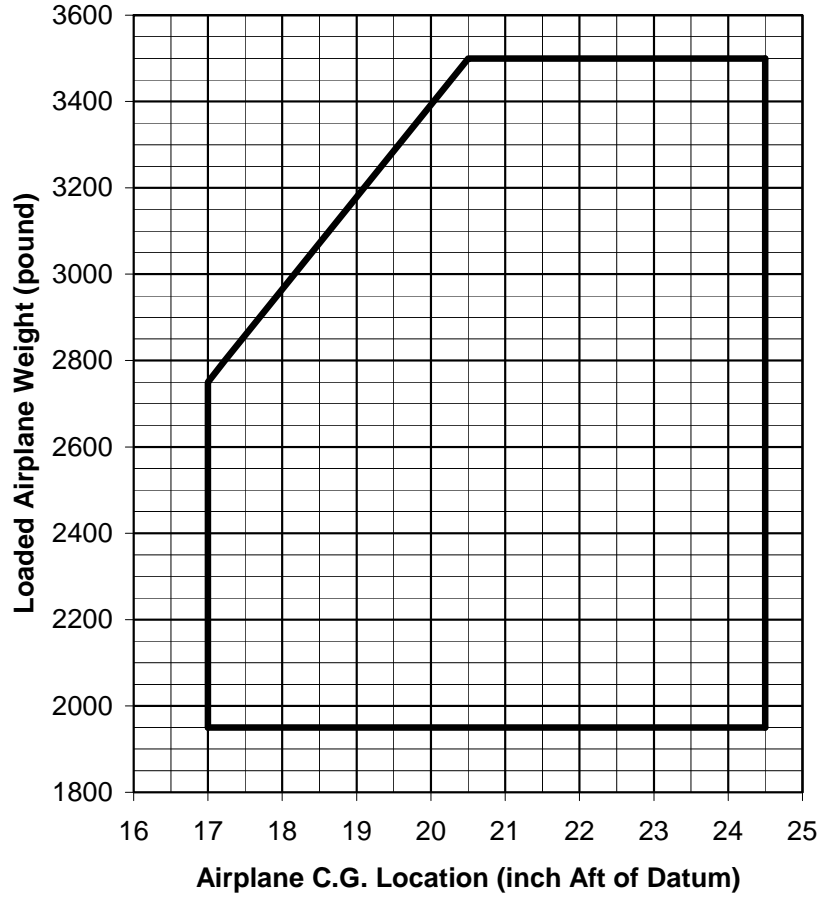


Figure 6-8 Airplane CG Location (inch Aft of Datum)

CARRIAGE OF CARGO

There are two distinct areas where cargo may be carried (refer to Figure 6-9):

- The passenger compartment located behind the crew seats (after removal of one or more of the three passenger seats)
- The baggage compartment located behind the three passenger seats

It is recommended that the heaviest cargo be located in the forward part of the airplane and the lightest in the rear part of the airplane in order to keep the centre of gravity within limits.

It is essential to properly secure cargo before flight.

CARGO TIE-DOWN

The airplane is equipped with multiple tie-down points. The load ratings for the tie-down points are given in Figure 6-9.

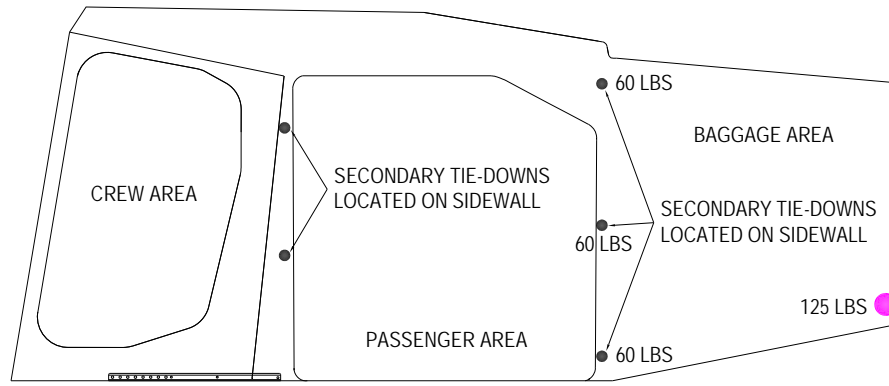
Only the total rated load of the tie-downs located aft of the cargo are to be considered when determining adequate restraint.

For example, a 750 lbs load would require a minimum of three tie-downs rated at 250 lbs each to be located aft of the load. It should also be noted that additional tie-downs located forward of the load would also be needed to properly secure the cargo.

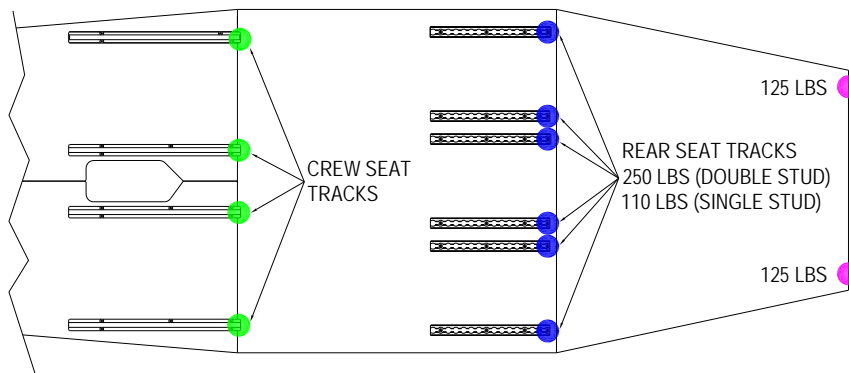
Rope, strap or cable used for tie-down should be rated at a minimum of ten times the load capacity of the tie-down used.

SECTION 6
WEIGHT & BALANCE/EQUIPMENT LIST

FOUND
FBA-2C2
300HP



SIDE VIEW



TOP VIEW

Figure 6-9 Tie-down Load Ratings

PASSENGER COMPARTMENT (CARGO TIE-DOWN)

The primary passenger compartment tie-down points are the six rear seat tracks. Tie-down points are created by installing either single or double stud load ring fittings in the tracks.



Single Stud Track Fitting



Double Stud Track Fitting

It should be noted that single stud fittings are typically rated at half the strength of the double stud fittings. Use a double stud fitting to achieve the full strength of the seat track tie-down point.

Figure 6-10 shows single stud fittings installed in the rear tracks.

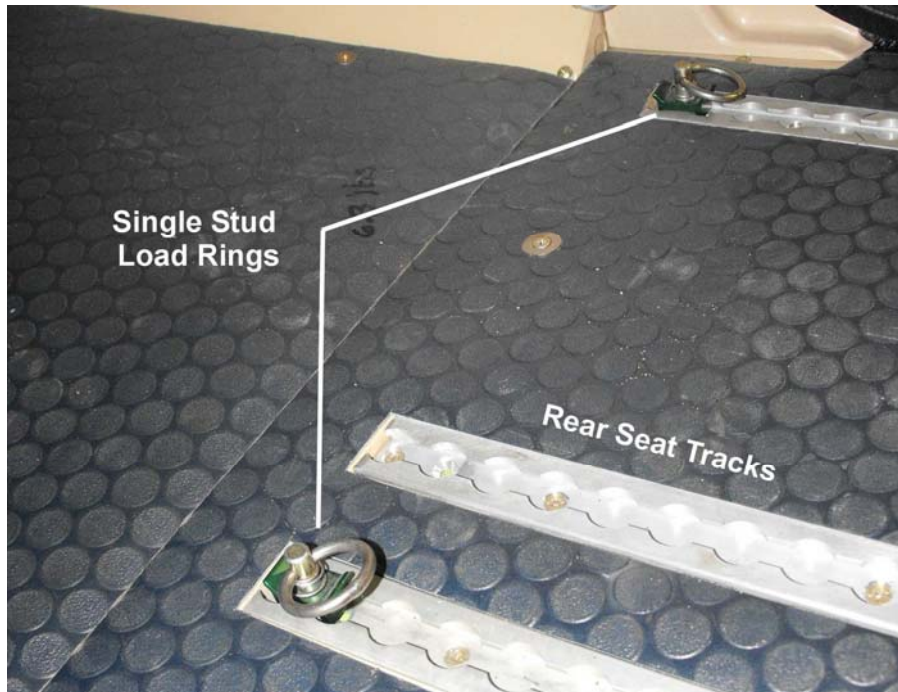


Figure 6-10 Single Stud Load Rings in Rear Seat Tracks

The rear seat track tie-down points should be used in conjunction with the four tie-down points located at the ends of the crew seat tracks to secure cargo in the passenger compartment. Figure 6-11 shows the location of the tie-down rings on the crew seat tracks.

There are four tie-down points located on the sides of the cabin just behind the crew seats. These tie-downs should not be used as the primary tie-down points for securing cargo. They should only be used to “stabilize” the cargo and prevent it from shifting. Figure 6-12 shows these tie-down points being used in conjunction with the primary tie-down points to secure a cargo bin.

There are also six tie-down points located on the sides of the cabin just behind the passenger seats. Again these tie-downs should not be used as the primary attachment points for securing cargo in the passenger compartment. They should only be used in conjunction with the rear seat track tie-down points.

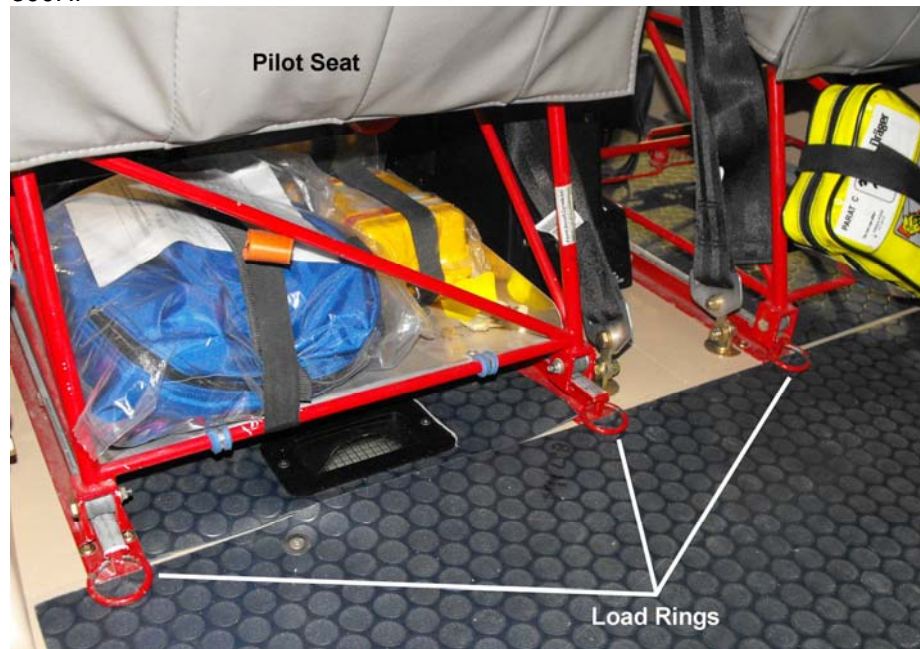


Figure 6-11 Load Rings on Crew Seats

Figure 6-12 shows a cargo bin secured in the passenger compartment using the appropriate tie-down points. There are two (blue) straps running from two rear seat track tie-downs to the tie-downs on the crew seats. A single (orange) strap attached to the outer rear seat tracks tie-downs provides additional forward load capability. Note that this strap has been secured to the top of the cargo bin with an additional strap (blue) to prevent it sliding off the bottom of the bin. A single strap (blue) attached to the tie-downs just aft of the crew seats provides additional stability and helps prevent the cargo bin from sliding aft.

In this example there are four tie-downs located aft of the cargo. These tie-downs are single stud fittings in the rear seat tracks with a load rating of 150 lbs each, for a total load rating of 600 lbs.

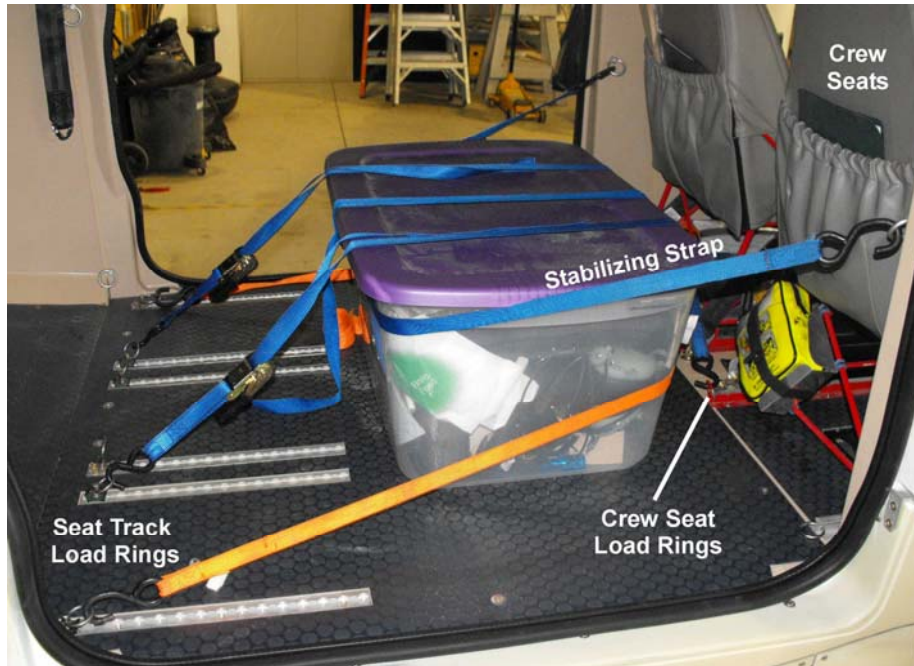


Figure 6-12 Example Cargo Loading in Passenger Compartment



Figure 6-13 Horizontal Strap Secured to Prevent Slippage

BAGGAGE COMPARTMENT (CARGO TIE-DOWN)

The maximum load in the baggage compartment is 250 lbs.

The primary baggage compartment tie-down points are the D-rings located in the lower aft corners of the compartment, as shown in Figure 6-14. These two tie-down points should be used in conjunction with tie-down fittings installed in the rear seat tracks to secure cargo in this compartment. Figure 6-15 shows a cargo bin secured using these tie-downs.

There are six tie-down points located on the sides of the cabin just behind the passenger seats that may be used in conjunction with the primary tie-downs to “stabilize” and prevent cargo from shifting.



Figure 6-14 Primary Tie-downs in Baggage Compartment



Figure 6-15 Cargo Bin Secured in Baggage Compartment

CABIN HEIGHT MEASUREMENTS

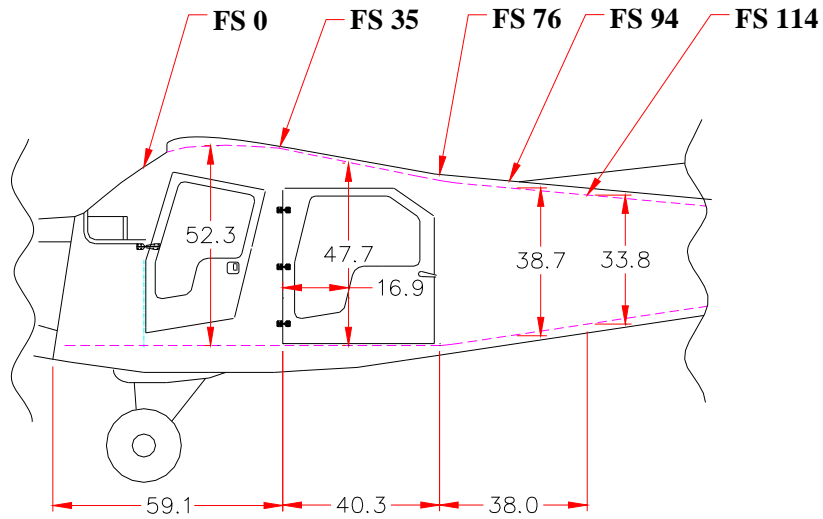


Figure 6-16 Internal Cabin Dimensions

DOOR OPENING DIMENSIONS

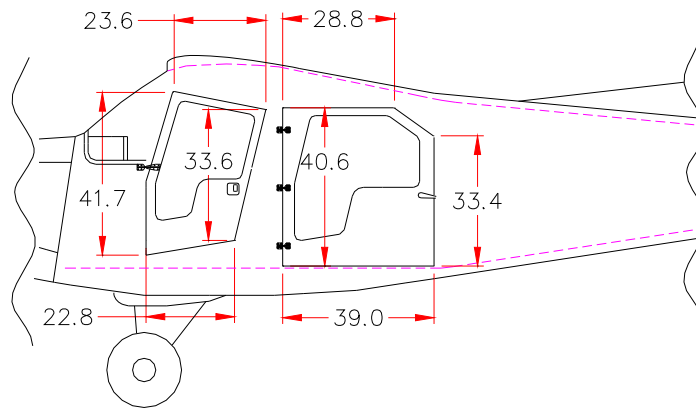


Figure 6-17 Door Opening Dimensions

	Width (Top)	Width (Bottom)	Height (Front)	Height (Rear)
Pilot / Co-Pilot Door	23.6	22.8	41.7	33.6
Aft Door	28.8	39.0	40.6	33.4

CABIN WIDTH MEASUREMENTS

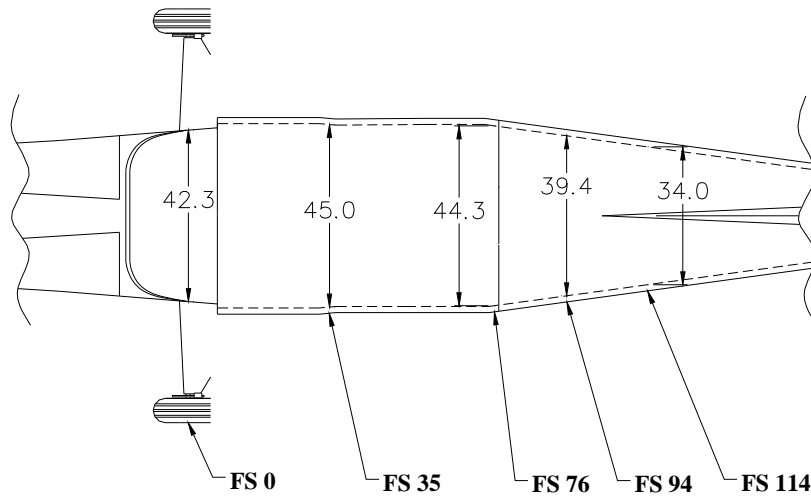


Figure 6-18 Cabin Width Measurements

FOUND
FBA-2C2
300HP

SECTION 6
WEIGHT & BALANCE/EQUIPMENT LIST

COMPREHENSIVE EQUIPMENT LIST

A comprehensive list of the equipment installed in an FBA-2C2 airplane is provided with the Pilot's Operating Handbook at the time of delivery.

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