SECTION 6
WEIGHT AND BALANCE EQUIPMENT LIST

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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.

In order to achieve the performance and flight characteristics which are designed into the airplane, it must be flown with approved weight and center of gravity limits. Although the airplane offers flexibility of loading, it cannot be flown with full fuel tanks and a full complement of passengers or a normal crew and both cabin and cargo pod (if installed) loading zones filled to maximum capacity. The pilot must utilize the loading flexibility to ensure the airplane does not exceed its maximum weight limits and is loaded within the center of gravity range before takeoff.

Weight is important because it is a basis for many flight and structural characteristics. As weight increases, takeoff speed must be greater since stall speeds are increased, the rate of acceleration decreases, and the required takeoff distance increases. Weight in excess of the maximum takeoff weight may be a contributing factor to an accident, especially when coupled with other factors such as temperature, field elevation, and runway conditions, all of which may adversely affect the airplane's performance. Climb, cruise, and landing performance will also be affected. Flights at excess weight are possible, and may be within the performance capability of the airplane, but loads for which the airplane was not designed may be imposed on the structure, especially during landing.

The pilot should routinely determine the balance of the airplane since it is possible to be within the maximum weight limit and still exceed the center of gravity limits. An airplane loading which exceeds the forward center of gravity limit may place heavy loads on the nose wheel, and the airplane will be slightly more difficult to rotate for takeoff or flare for landing. If the center of gravity is too far aft, the airplane may rotate prematurely on takeoff, depending on trim settings.

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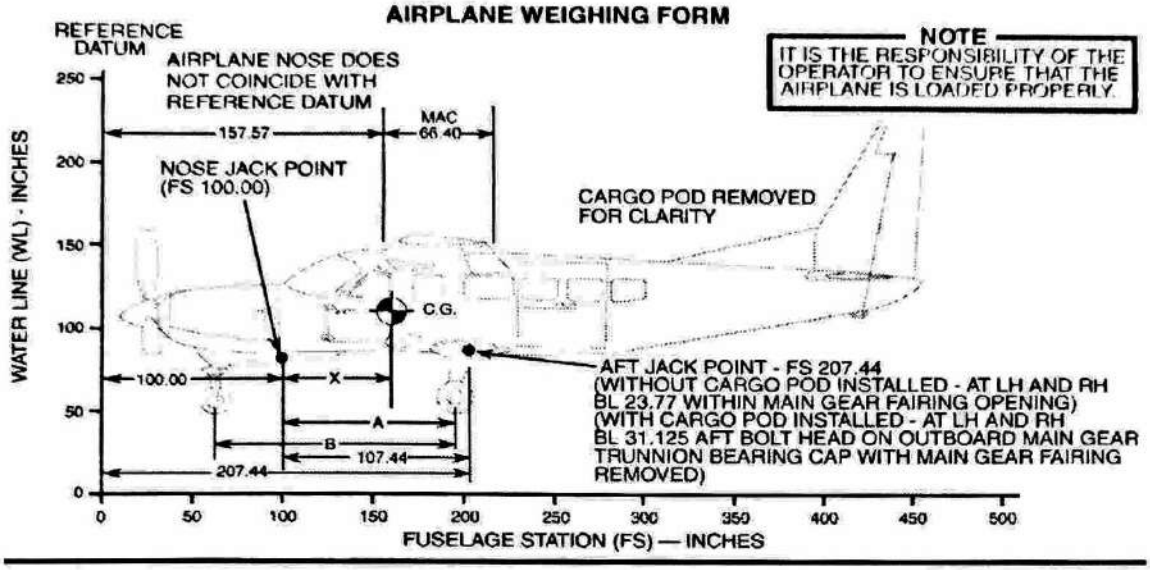
AIRPLANE WEIGHING FORM



NOTE

IT IS THE RESPONSIBILITY OF THE OPERATOR TO ENSURE THAT THE AIRPLANE IS LOADED PROPERLY.

LOCATING CG WITH AIRPLANE ON LANDING GEAR

FORMULA for Longitudinal CG

$$(X) = (A) - \frac{(\text{Nose Gear Net Weight})(\quad) \times (B)}{\text{Nose and Main Landing Gear Weight Totaled}(\quad)} = (\quad) \text{ Inches}$$

CG Arm of Airplane = 100 + (X) = ( ) Inches Aft of Datum

MEASURING A AND B

MEASURE A AND B PER PILOT'S OPERATING HANDBOOK INSTRUCTIONS TO ASSIST IN LOCATING CG WITH AIRPLANE WEIGHED ON LANDING GEAR

LOCATING CG WITH AIRPLANE ON JACK PADS

FORMULA for Longitudinal CG

$$\text{CG Arm of Airplane} = 207.44 - \frac{107.44 \times (\text{Nose Jack Point Net Weight})(\quad)}{\text{Nose and Aft Jack Point Weight Totaled}(\quad)} = (\quad) \text{ Inches Aft of Datum}$$

LEVELING PROVISIONS

LONGITUDINAL – LEFT SIDE OF FUSELAGE AT FS 209.00 & 227.00
LATERAL – SEAT RAILS AFT OF PILOT AND FRONT PASSENGER SEATS

LOCATING PERCENT MAC

FORMULA for Percent MAC

$$\text{CG Percent MAC} = \frac{(\text{CG Arm of Airplane}) - 157.57}{0.6640}$$

AIRPLANE AS WEIGHED TABLE

POSITION	SCALE READING	SCALE DRIFT	TARE	NET WEIGHT
LEFT SIDE				
RIGHT SIDE				
NOSE				
AIRPLANE TOTAL AS WEIGHED				

BASIC EMPTY WEIGHT AND CENTER-OF-GRAVITY TABLE

ITEM	WEIGHT (POUNDS)	CG ARM (INCHES)	MOMENT/1000 (INCH-POUNDS)
AIRPLANE (CALCULATED OR AS WEIGHED) (INCLUDES ALL UNDRAINABLE FLUIDS AND FULL OIL)			
DRAINABLE UNUSABLE FUEL AT 6.7 POUNDS PER GALLON S/N 20800001 Thru 20800130 Not Modified With SK208-52 S/N 20800001 Thru 20800130 Modified With SK208-52 And S/N 20800131 And On	20.1 24.1	185.7 186.4	
BASIC EMPTY WEIGHT			

2685T1094

Figure 6-1. Airplane Weighing Form

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SAMPLE WEIGHT AND BALANCE RECORD

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

AIRPLANE MODEL				SERIAL NO.				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 /1000	WT (LB.)	ARM (IN.)	MOMENT /1000	WT (LB.)	MOMENT /1000
			AS DELIVERED								

Figure 6-2. Sample Weight and Balance Record

INTRODUCTION (Continued)

A properly loaded airplane, however, will perform as intended. Before the airplane is licensed, a basic empty weight, center of gravity (C.G.) and moment are computed. Specific information regarding the weight, arm, moment, and installed equipment for this airplane as delivered from the factory can be found in the plastic envelope in the back of this handbook. Using the basic empty weight and moment, the pilot can determine the weight and moment for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved Center of Gravity Moment Envelope.

WARNING

IT IS THE RESPONSIBILITY OF THE PILOT TO MAKE SURE THAT THE AIRPLANE IS CORRECTLY LOADED. OPERATION OUTSIDE OF PRESCRIBED WEIGHT AND BALANCE LIMITATIONS COULD RESULT IN AN ACCIDENT AND SERIOUS OR FATAL INJURY.

AIRPLANE WEIGHING PROCEDURES

1. Preparation:
   A. Remove all snow, ice or water which may be on the airplane.
   B. Inflate tires to recommended operating pressure.
   C. Lock open fuel tank sump quick-drains and fuel reservoir quick-drain to drain all fuel. Drain fuel can.
   D. Service engine oil as required to obtain a normal full indication (MAX HOT or MAX COLD, as appropriate, on dipstick).
   E. Move sliding pilot and front passenger seats to position the seat locking pins on the back legs of each seat at station 145. Aft passenger seats (if installed) have recommended fixed positions identified with a code on the seat rails to show the position of each seat front attachment. In the event the aft seats were moved to accommodate a custom loading, they should be returned to the coded locations prior to weighing.
   F. Raise flaps to fully retracted position.
   G. Place all control surfaces in neutral position.

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AIRPLANE WEIGHING PROCEDURES (Continued)

2. Leveling:
   A. Place scales under each wheel (minimum scale capacity, 2000 pounds nose, 4000 pounds each main). The main landing gear must be supported by stands, blocks, etc., on the main gear scales to a position at least four (4) inches higher than the nose gear as it rests on an appropriate scale. This initial elevated position will compensate for the difference in waterline station between the main and nose gear so that final leveling can be accomplished solely by deflating the nose gear tire.
   B. Deflate the nose tire to properly center the bubble in the level (see Figure 6-1). Since the nose gear strut contains an oil snubber for shock absorption rather than an air/oil strut, it can not be deflated to aid in airplane leveling.
3. Weighing:
   A. Weigh airplane in a closed hangar to avoid errors caused by air currents.
   B. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare from each reading.
4. Measuring:
   A. Obtain measurement A by measuring horizontally (along airplane center line) from a line stretched between the main wheel centers to a plumb bob dropped from the center of the nose jack point located below the firewall and housed within the nose strut fairing.
   B. Obtain measurement B by measuring horizontally and parallel to the airplane centering, from center of nose wheel axle, left side, to a plumb bob dropped from the line between the main wheel centers. Repeat on right side and average the measurements.
5. Using weights from item 3 and measurements from item 4, the airplane weight and C.G. can be determined.
6. Basic empty weight may be determined by completing Figure 6-1.

WEIGHT AND BALANCE

The following information will enable you to operate your Cessna within the prescribed weight and center of gravity limitations. To figure weight and balance, use the Sample Loading Problem, Weight and Moment Tables, and Center of Gravity Moment Envelope as follows:

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.

Use the Weight and Moment Tables to determine the moment/1000 for each additional item to be carried; then list these on the loading problem.

NOTE

Information on the Fuel Weight And Moment Tables is based on average fuel density at fuel temperatures of 60°F. However, fuel weight increases approximately 0.1 lb./gal. for each 25°F decrease in fuel temperature. Therefore, when environmental conditions are such that the fuel temperature is different than shown in the chart headings, a new fuel weight calculation should be made using the 0.1 lb./gal. increase in fuel weight for each 25°F decrease in fuel temperature. As an example, consider the chart for Jet A fuel which has an average density of 6.7 lbs./gal. Assume the tanks are completely filled and the fuel temperature is at 35°F (25°F below the 60°F noted on the chart).

Calculate the revised fuel weight by multiplying the total usable fuel by the sum of the average density (stated on chart) plus the increase in density estimated for the lower fuel temperature. In this particular sample, as shown by the calculation below, the resulting fuel weight increase due to lower fuel temperature will be 33.6 lbs. over the 2224 lbs. (for 332 gallons) shown on the chart, which might be significant in an actual loading situation:

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WEIGHT AND BALANCE (Continued)

332 gal. X (6.7 + 0.1 lb./gal.) = 2257.6 lbs. revised fuel weight.

Then calculate the revised fuel moment. The revised moment is in direct proportion to the revised fuel weight:

$$\frac{\text{X (revised moment)}}{\text{408.8 (average moment)}} = \frac{\text{2257.6 (revised weight)}}{\text{2224 (average weight)}}$$

$$X = (408.8 \times 2257.6) \div 2224$$

The revised moment of X = 414.97. A value of 415 would be used on the Sample Loading Problem as the moment/1000 in conditions represented by this sample.

NOTE

Information on the Crew And Passenger and Baggage/Cargo Weight And Moment Tables is based on the pilot and front passenger sliding seats positioned for average occupants (e.g., station 135.5), the aft passenger fixed seats (if installed) in the recommended position coded on the seat rails, and the baggage or cargo uniformly loaded around the center (e.g., station 168.4 in zone 1) of the zone fore and aft boundaries (e.g., stations 155.4 and 181.5 in zone 1) shown on the Loading Arrangements diagrams. For loadings which may differ from these, the Loading Arrangements diagrams and Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft C.G. range limitations (seat travel and baggage/cargo area limitations). 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 Weight And Moment Tables. For example, if seats are in any position other than stated on the Internal Cabin Loading Arrangements diagram, the moment must be calculated by multiplying the occupant weight times the arm in inches. A point 9 inches forward of the intersection of the seat bottom and seat back (with cushions compressed) can be assumed to be the occupant C.G. For a reference in determining the arm, the forward face of the raised aft baggage floor is fuselage station 284.0.

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WEIGHT AND BALANCE (Continued)

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

WARNING

IT IS THE RESPONSIBILITY OF THE PILOT TO MAKE SURE THAT THE AIRPLANE IS CORRECTLY LOADED. OPERATION OUTSIDE OF PRESCRIBED WEIGHT AND BALANCE LIMITATIONS COULD RESULT IN AN ACCIDENT AND SERIOUS OR FATAL INJURY.

WEIGHT AND BALANCE PLOTTER

A Weight And Balance Plotter is provided to quickly determine the weight and balance of the airplane when loading. If the plotter shows a marginal condition developing, or if there is a question concerning the results in any way, then a more precise weight and balance should be determined using the weight and balance procedure in this section. Instructions for use of the plotter are included on the plotter.

CREW/PASSENGER LOADING

Six-way adjustable seats are provided for the pilot and front passenger, and these seats slide fore and aft on tracks having adjustment holes for seat position. On the Standard 208, aft passenger seating is available in two configurations, Commuter seating and Utility seating. In Commuter seating, two individual, fixed-position passenger seats are located on the left side of the cabin, and three two-place, fixed-position, bench-type seats are located on the right side of the cabin. An "O" code marking on the aft seat tracks represents the recommended position for placement of the front leg plunger of each Commuter seat. In Utility seating, all seats are individual, fixed-position, collapsible seats which, if removed, can be folded for storage in the aft baggage area. Four passenger seats are located on the left side of the cabin, and four seats are located on the right side. An "X" code marking on the aft seat tracks represents the recommended position for placement of the front leg plunger of each Utility seat. Refer to the Internal Cabin Loading Arrangements diagram for the C.G. arm (fuselage station) of the pilot and all passenger seating positions.

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CREW/PASSENGER LOADING (Continued)

WARNING

NONE OF THE AIRPLANE SEATS ARE APPROVED FOR INSTALLATION FACING AFT. ALSO, THE LEFT-HAND ONE-PLACE SEATS IN THE COMMUTER CONFIGURATION MUST NOT BE INSTALLED ON THE OUTBOARD AND MIDDLE SEAT TRACKS USED FOR THE RIGHT-HAND TWO-PLACE SEATS OF THE COMMUTER CONFIGURATION, EVEN THOUGH THE ONE-PLACE COLLAPSIBLE SEATS IN THE UTILITY CONFIGURATION ARE NORMALLY INSTALLED IN THIS LOCATION.

BAGGAGE/CARGO LOADING

CABIN AREA

To facilitate the carrying of large or bulky items, all aft seats (Standard 208 only) and the front passenger seat may be removed from the airplane. If a cargo barrier and its three barrier nets are available for installation, removal of the front passenger seat may not be desired. Mission requirements will dictate whether the barrier is to be used and the number of seats removed. If seats are removed for hauling cargo and the cargo barrier and its nets added, the basic empty weight and c.g. moment of the airplane should be adjusted so that these values accurately represent the weight and moment of the airplane before loading. To calculate the new weight and moment, refer to the airplane equipment list and acquire the weight and c.g. arm of each item of equipment to be removed or added, then record these values on Figure 6-2, Sample Weight And Balance Record, to assist in the calculation. For each item of equipment, multiply its weight by its c.g. arm to provide the moment for that item. Subtract weights of removed items (seats) and add weights of installed items (cargo barrier and its nets) to the original basic empty weight to provide a new basic empty weight. Likewise, subtract the moments of removed items and add the moments of installed items to the original moment to provide a new airplane moment. (Remember that the moment value is to be divided by 1000 to reduce the number of digits.) The new basic empty weight and moment/1000 can be used as illustrated in the Sample Loading Problem when figuring airplane loading with the selected items of equipment removed/installed.

With all the seats except the pilot's seat removed, a large cabin volume (341.4 cubic feet, less the volume required for the pilot) is available for baggage/cargo; if a cargo barrier is installed, the total volume available for cargo behind the barrier is 254 cubic feet. Cargo can be loaded through the large, almost square, two-piece cargo door. The floor is flat from the firewall at station 100, except in the rudder pedal area, to the aft side of the cargo door (station 284), and has a 200 pound per square foot allowable loading. Strategically located nutplates are provided which will allow the installation of plywood flooring (standard equipment on the Cargomaster) for ease of loading and distribution of concentrated loads (see Figure 6-11). Between stations 284 and 308, additional baggage/cargo space is provided on a raised floorboard approximately 5 inches above the main floorboard.

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BAGGAGE/CARGO LOADING (Continued)

CABIN AREA (Continued)

In the area of the removed front passenger seat, "I" section seat tracks are installed from station 125 to 159.98, and tie-down block assemblies (available from any Cessna Dealer) which clamp to the tracks can be installed to serve as tie-down attach points. From station 158 aft to the raised baggage/cargo floor, the seat tracks are designed to receive quick-release tie-down fittings which can be snapped into the tracks at intervals of 1 inch. The raised baggage/cargo floor contains eight (8) anchor plates to which quick-release tie-down fittings can be attached. If rope, cable or other fittings are used for tie-downs, they should be rated at a minimum of 2100 pounds when used with all fittings noted in the table on Figure 6-9, except the double-stud quick-release tie-downs which require a 3150 pound rating. Maximum allowable cargo loads will be determined by the individual zone weight limitations and by the airplane weight and C.G. limitations. The number of tie-downs required is dependent on the load(s) to be secured. Figure 6-9 shows the maximum allowable cargo weight for each type of cargo tie-down attachment.

On the Cargomaster, the sidewalls in the cargo area are marked with vertical lines to facilitate the identification of the six (6) loading zones. Markings located on the sidewalls between the lines identify each zone by number and display the maximum load which can be carried within the zones. Refer to Maximum Zone/Compartment Loadings for maximum zone weight limits.

CAUTION

THE MAXIMUM LOAD VALUES MARKED IN EACH ZONE ARE PREDICATED ON ALL CARGO BEING TIED DOWN WITHIN THE ZONES.

A horizontal line labeled "75%" is prominently marked along each sidewall as a loading reference. As indicated on a placard on the lower cargo door, zones forward of the last loaded zone must be at least 75% full by volume. Whenever possible, each zone should be loaded to its maximum available volume prior to loading the next zone. An additional placard located on the right sidewall between zones 5 and 6 cautions that if the load in zone 5 exceeds 400 pounds, a cargo partition net (if available) is required aft of the load or the load must be secured to the floor.

(Continued Next Page)

BAGGAGE/CARGO LOADING (Continued)

CABIN AREA (Continued)

A cargo barrier and three barrier nets are available for installation directly behind the pilot's and front passenger's seats. The barrier and nets preclude loose cargo from moving forward into the pilot's and front passenger's stations during an abrupt deceleration. The barrier consists of a U-shaped assembly of honeycomb composite construction. The assembly attaches to the four pilot and front passenger seat rails at the bottom at station 153 and to the wing carry-thru spar at the top at approximately station 166. The cargo barrier nets consist of three nets: one for the left sidewall, one for the right sidewall, and one for the center. The left and right nets fill in the space between the barrier assembly and the airplane sidewalls. The side nets are fastened to the airplane sidewalls and the edge of the barrier with six (6) quick-release fasteners each, three on each side. The center net fills in the opening in the top center of the barrier. The center net is fastened with four (4) fasteners, two on each side. Horizontal lines, labeled 75, are marked on the aft side of the cargo barrier. Placards above the horizontal lines caution that the maximum allowable load behind the barrier is 2900 pounds total, and that zones forward of the last loaded zone must be at least 75% full by volume. Refer to Figure 6-6 for additional details.

WARNING

WHEN UTILIZED, THE CARGO BARRIER AND ITS ATTACHED NETS PROVIDE CARGO FORWARD CRASH LOAD RESTRAINT AND PROTECTION OF THE PILOT AND FRONT PASSENGER; HOWEVER, THE CARGO MUST STILL BE SECURED TO PREVENT IT FROM SHIFTING DUE TO TAKEOFF, FLIGHT, LANDING, AND TAXI ACCELERATIONS AND DECELERATIONS. ON THE STANDARD 208, IF PASSENGERS AS WELL AS CARGO ARE LOCATED AFT OF THE BARRIER, CARGO PLACEMENT MUST ALLOW MOVEMENT AND EXIT OF THE PASSENGERS AND THE CARGO MUST BE SECURED FOR CRASH LOAD RESTRAINT CONDITIONS. REFER TO CARGO LOAD RESTRAINT IN THIS SECTION FOR ADDITIONAL INFORMATION CONCERNING CARGO RESTRAINT WITH AND WITHOUT A CARGO BARRIER.

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BAGGAGE/CARGO LOADING (Continued)

CABIN AREA (Continued)

WARNING

MAKE SURE THE BARRIER NET FASTENERS ARE SECURED FOR TAKEOFF, LANDING, AND INFLIGHT OPERATIONS, AND ARE MOMENTARILY DETACHED ONLY FOR MOVEMENT OF THE NETS FOR LOADING/ UNLOADING OF ITEMS THROUGH THE CREW AREA.

Three cargo partition nets are available and can be installed to divide the cargo area into convenient compartments. Partitions may be installed in all of the five locations at stations 181.5, 208, 234, 259, and 284. The cargo partitions are constructed of canvas with nylon webbing reinforcement straps crisscrossing the partition for added strength. The ends of the straps have quick-release fasteners which attach to the floor tracks and two floor-mounted anchor plates located just forward of the raised cargo floor and other anchor plates on the sidewalls and ceiling. Four straps have adjustable buckles for tightening the straps during installation of the partition. Refer to Figure 6-7 for additional details.

Zones divided by cargo partitions can be loaded without additional tie-downs provided a total loaded density for each partitioned zone does not exceed 9.75 pounds per cubic foot and the zone is more than 75% full. Cargo loading that does not meet these requirements must be secured to the cabin floor.

CAUTION

THE MAXIMUM CARGO PARTITION LOAD IS THE SUM OF ANY TWO ZONES. NO MORE THAN TWO ADJACENT ZONES CAN BE DIVIDED BY ONE PARTITION. THE PARTITIONS ARE DESIGNED TO PREVENT THE CARGO FROM SHIFTING FORWARD AND AFT IN FLIGHT; THEY SHOULD NOT BE CONSIDERED ADEQUATE TO WITHSTAND CRASH LOADS AND DO NOT REPLACE THE NEED FOR A CARGO BARRIER.

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BAGGAGE/CARGO LOADING (Continued)

CABIN AREA (Continued)

A restraining net is available and can be installed on the inside of the airplane over the cargo door opening. The restraining net precludes loose articles from falling out the cargo door when the doors are opened. The restraining net consists of two halves which part in the center of the door opening. The front and rear halves slide fore and aft, respectively, on a rod to open the net. The net is attached to the sidewall by screws and nutplates along the front and rear edges of the net. When the net is closed, the two halves are held together by snap-type fasteners. Refer to Figure 6-8 for additional details.

Various tie-down belt assemblies and tie-down ring anchors are available for securing cargo within the airplane; the belts may also be used for tying down the airplane. A standard configuration is offered and contains three 3000-pound rated belt assemblies with ratchet-type adjusters and six single-stud, quick-release tie-down ring anchors. A heavy-duty configuration consists of three 5000-pound rated belts with ratchet-type adjusters and six double-stud, quick-release anchors. Three 5000-pound rated belts with overcenter-type locking devices are also available for heavy-duty use. The six single-stud and double-stud tie-down ring anchors are also available separately. The single-stud anchors can be attached to any tie-down point in the airplane which isn't placarded for attachment of partition nets only, whereas the double-stud anchors can be attached to the aft seat tracks only. See Figure 6-9 for maximum load ratings and tie-down ring anchor spacing restrictions.

Refer to Maximum Zone/Compartment Loading for maximum zone weight limits.

CAUTION

THE MAXIMUM ZONE WEIGHT LIMITS IN EACH ZONE ARE PREDICATED ON ALL CARGO BEING TIED DOWN WITHIN THE ZONES.

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BAGGAGE/CARGO LOADING (Continued)

CABIN AREA (Continued)

MAXIMUM ZONE/COMPARTMENT LOADINGS

Maximum zone loadings are as follows:

			Weight Limits (Lbs)		
	Zone/ Compart -ment	Volume (Cubic Feet)	*Secured By Tie-Downs	**Unsecured Using Partitions or in Cargo Pod	C.G. (Station Location)
Fuselage	1	40.6	1410	395	168.4
	2	49.4	1430	480	194.8
	3	48.9	1410	475	221.0
	4	43.5	1380	420	246.5
	5	40.1	1270	390	271.5
	6	31.5	320(Cargomaster) 325 (Std. 208)	305	296.0
Cargo Pod	A	23.4	---	230	132.3
	B	31.5	---	310	182.1
	C	28.8	---	280	239.6

NOTE

*This is the maximum cargo allowed in the bay indicated.

**Density must be 9.75 LBS/FT^3 or less and bay 75% or more full.

(Continued Next Page)

BAGGAGE/CARGO LOADING (Continued)

CARGO POD

The airplane can be equipped with an 83.7 cubic foot capacity cargo pod attached to the bottom of the fuselage. The pod is divided into three compartments (identified as zones A, B, and C) by bulkheads and has a maximum floor loading of 30 pounds per square foot and maximum load weight limit of 820 pounds. Each compartment has a loading door located on the left side of the pod. The doors are hinged at the bottom, and each has two latches. When the latch handles are rotated to the horizontal position with the doors closed, the doors are secured. Refer to Figure 6-4 and 6- 13 for additional details.

CENTER OF GRAVITY PRECAUTIONS

Since the airplane can be used for cargo missions, carrying various types of cargo in a variety of loading configurations, precautions must be taken to protect the forward and aft C.G. limits. Load planning should include a careful comparison of the mission requirements with the volume and weight limitation in each loading zone and the final airplane C.G. Cargo loaded in the forward zones may need to be balanced by loading cargo in one or more aft zones. Conversely, loadings can not be concentrated in the rear of the airplane, but must be compensated by forward cargo to maintain balance. Under ideal conditions, loadings should be accomplished with heavy items on the bottom and the load distributed uniformly around the C.G. of the cabin cargo area zone and/ or cargo pod compartment. Loading personnel must maintain strict accountability for loading correctly and accurately, but may not always be able to achieve an ideal loading. A means of protecting the C.G. aft limit is provided by supplying and aft C.G. location warning area between 38.33 MAC and the maximum allowable aft C.G. of 40.33 MAC. The warning area is indicated by shading on the C.G. Moment Envelope (Figure 6-18) and C.G. Limits (Figure 6-19). **This shaded area should be used only if accurate C.G. determination can be obtained.**

(Continued Next Page)

BAGGAGE/CARGO LOADING (Continued)

CARGO POD (Continued)

CAUTION

EXERCISE CAUTION WHILE LOADING OR UNLOADING HEAVY CARGO THROUGH THE CARGO DOORS. AN IDEAL LOADING IN EVERY OTHER RESPECT CAN STILL CAUSE TAIL TIPPING AND STRUCTURAL DAMAGE IF PROPER WEIGHT DISTRIBUTION IS IGNORED. FOR EXAMPLE, HEAVY CARGO LOADED THROUGH THE DOORS AND PLACED MOMENTARILY IN ZONES 4 AND 5, PLUS THE WEIGHT OF PERSONNEL REQUIRED TO MOVE IT TO A FORWARD ZONE, COULD CAUSE AN OUT-OF-BALANCE CONDITION DURING LOADING.

CARGO LOAD RESTRAINT

PREVENTION OF MOVEMENT

Cargo restraint requires the prevention of movement in five principal directions: forward, aft, upward (vertical), left (side), and right (side) These movements are the result of forces exerted upon the cargo due to acceleration or deceleration of the airplane in takeoffs and landings as well as forces due to air turbulence in flight. Correct restraint provides the proper relationship between airplane configuration (with or without barrier), weight of the cargo, and the restraint required. Restraint is required for flight, landing, and taxi loads and for crash loads.

Cargo must be tied down for flight, landing and taxi load restraint and/or crash load restraint. **When a cargo barrier is not installed,** all cargo must be prevented from movement in the five principal directions and secured to provide crash load restraint. The maximum rated loads specified for loadings without a barrier in the table on Figure 6-9 should be used for each tie-down. Consistent use of these loading criteria is important, and it is the responsibility of the pilot to assure the cargo is restrained properly. **When a cargo barrier is installed,** cargo aft of the barrier must also be secured to prevent movement in the five principal directions, but only to the extent that shifting due to flight, landing, and taxi loads is provided. The maximum rated loads specified for loadings with a barrier installed shown in the table of Figure 6-9 should be used for each tie-down. With a barrier installed, all cargo must be loaded such that loading zones forward of the last loaded zone must be 75% full by volume.

(Continued Next Page)

BAGGAGE/CARGO LOADING (Continued)

CARGO LOAD RESTRAINT (Continued)

PREVENTION OF MOVEMENT (Continued)

WARNING

IN SPECIAL LOADING ARRANGEMENTS WHICH ALLOW THE CARRIAGE OF PASSENGERS AS WELL AS CARGO BEHIND THE BARRIER ON THE STANDARD 208, ALL CARGO MUST BE SECURED TO PREVENT MOVEMENT IN THE FIVE PRINCIPAL DIRECTIONS AND PROVIDE THE SAME CRASH LOAD RESTRAINT AS THOUGH A BARRIER WAS NOT INSTALLED USING THE MAXIMUM RATED LOADS SPECIFIED FOR LOADING WITHOUT A BARRIER. IN THIS ARRANGEMENT, CARGO PLACEMENT MUST ALLOW FOR MOVEMENT AND EXIT OF THE PASSENGERS. THE PILOT MUST BE RESPONSIBLE TO MAKE SURE CORRECT LOAD RESTRAINT IN ALL LOADINGS.

Refer to Figure 6-15 for diagrams of typical cargo tie-down methods for prevention of movement. Also, the cargo partition nets available for the airplane can be installed at stations 181.5, 208, 234, 259 and 284 to divide the cabin cargo area into compartments. If the partitions are used, they must be used in conjunction with the cargo barrier. Since partitions are not designed to withstand crash loads, they cannot be considered as a replacement for the barrier. Each partition will withstand the forward and aft operational loads applied during takeoff, flight and landing by any two (2) zones forward or aft of the partition. Use of the partitions will allow loading of the zones without tying down the cargo if the load density is not more than 9.75 pounds per cubic foot and the zone is more than 75% full. Cargo loading that does not meet these requirements must be secured to the cabin floor.

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BAGGAGE/CARGO LOADING (Continued)

CARGO LOAD RESTRAINT (Continued)

LOADING OF PIERCING OR PENETRATING ITEMS

Regardless of cargo location, items of a piercing or penetrating nature shall be located so that other cargo is loaded between the barrier/nets, cargo partitions, and rear wall and the piercing or penetrating items to provide a buffer. The density of this cargo shall be sufficient to restrain the piercing or penetrating items from passing through the barrier/nets, partitions, and rear wall under critical emergency landing conditions. If the condition cannot be complied with, the piercing or penetrating items shall be tied down separately.

TRANSPORTATION OF HAZARDOUS MATERIALS

Special protection of the airplane and training of personnel are key considerations in conducting approved transportation of hazardous materials.

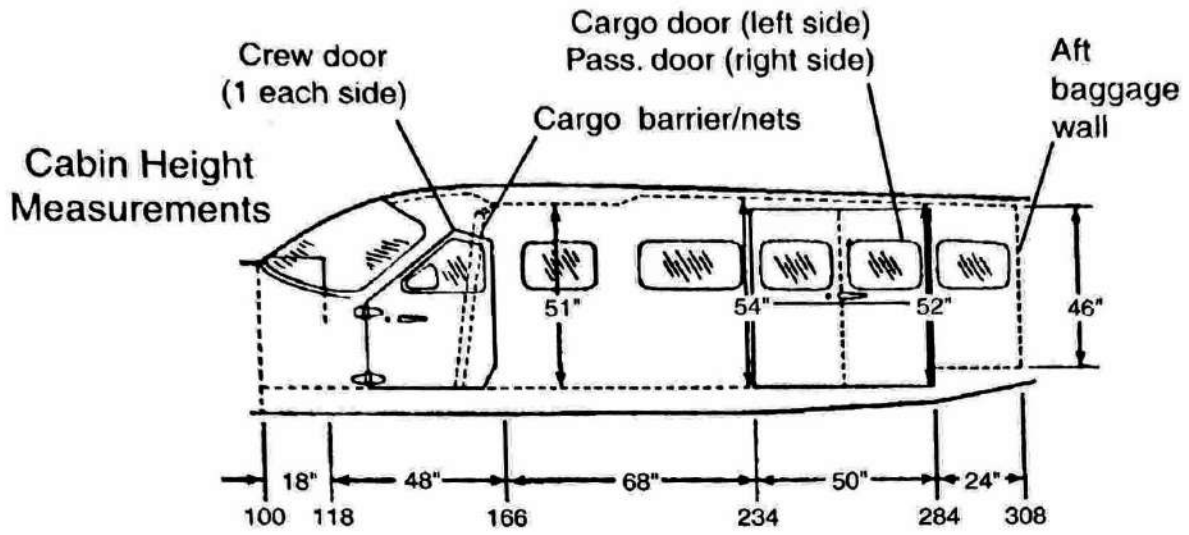
Protection against the damaging effects of leakage of hazardous materials has not been provided in the cabin cargo area or cargo pod. Therefore provisions should be made to ensure this protection if carriage of these materials is planned.

In addition to the pilot-in-command and flight crew member (if used), other personnel such as cargo receiving and loading personnel should be properly trained concerning the acceptance, handling, storage, loading and unloading of hazardous materials if these materials are to be carried. Information and regulations pertaining to the air transportation of hazardous materials is outlined in the Code of Federal Regulations (CFR) Title 49 and in the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air. Additional details on training subject matter and location references for this information are included in the Cargo Loading Manual for this airplane. Some general guidelines important to safe carriage of hazardous materials are also described in the Cargo Loading Manual.

EQUIPMENT LIST

For a complete list of the required and optional equipment installed in the airplane as delivered from the manufacturer, refer to the equipment list furnished with the airplane.

A39185



Door Opening Dimensions

	Width (Top)	Width (Mid/ Overall)	Width (Bottom)	Height (Front)	Height (Mid/ Overall)	Height (Rear)
Crew Doors	11 7/8"	35 5/8"	31 7/8"	24 3/8"	41 3/4"	44 3/4"
Cargo Door	49"	49"	49"	50"	50"	50"
Passenger Door	24"	24"	24"	50"	50"	50"

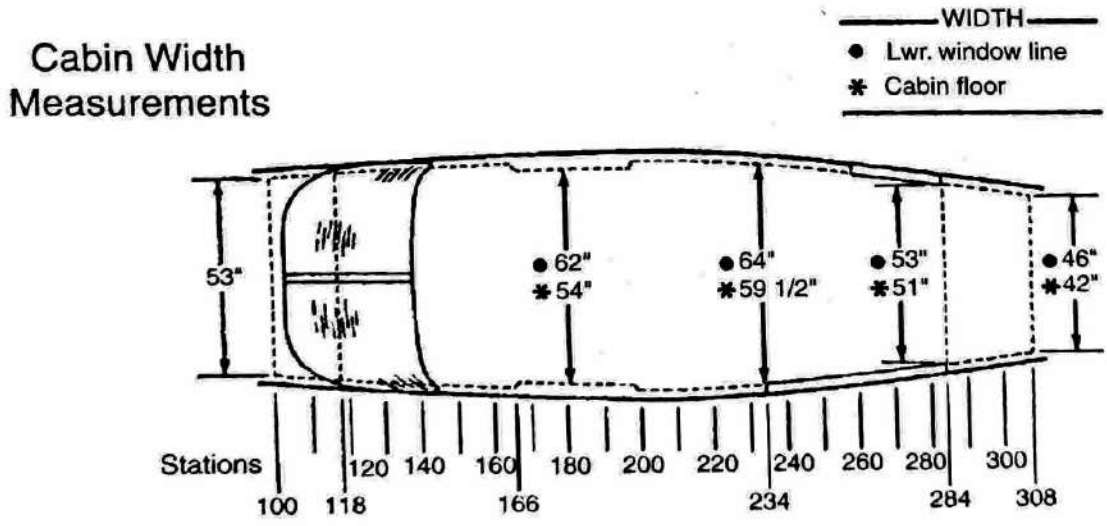
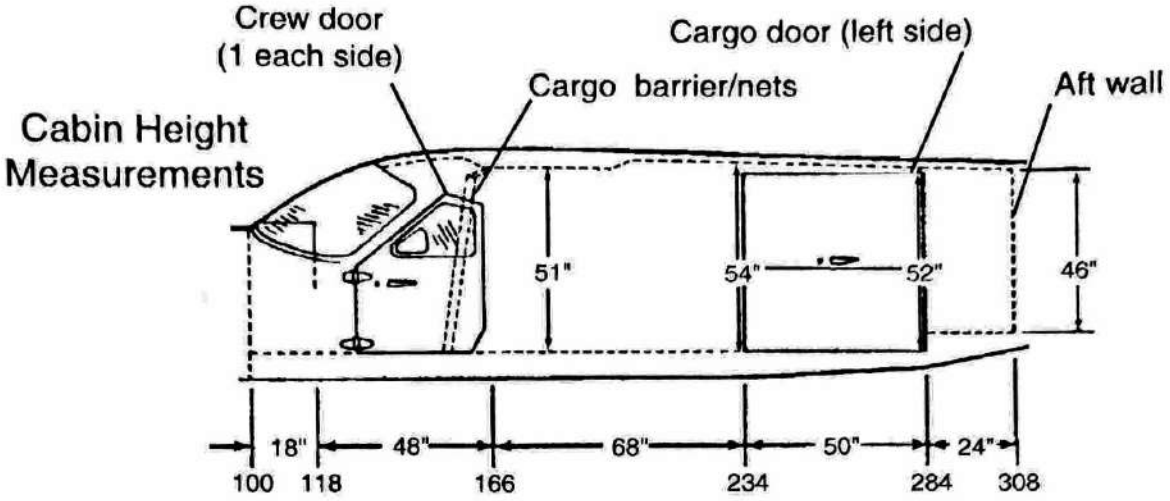


Figure 6-3. Internal Cabin Dimensions (Passenger Version)
(Sheet 1 of 2)

A39186



Door Opening Dimensions

	Width (Top)	Width (Mid/ Overall)	Width (Bottom)	Height (Front)	Height (Mid/ Overall)	Height (Rear)
Crew Doors	11 7/8"	35 5/8"	31 7/8"	24 3/8"	41 3/4"	44 3/4"
Cargo Door	49"	49"	49"	50"	50"	50"

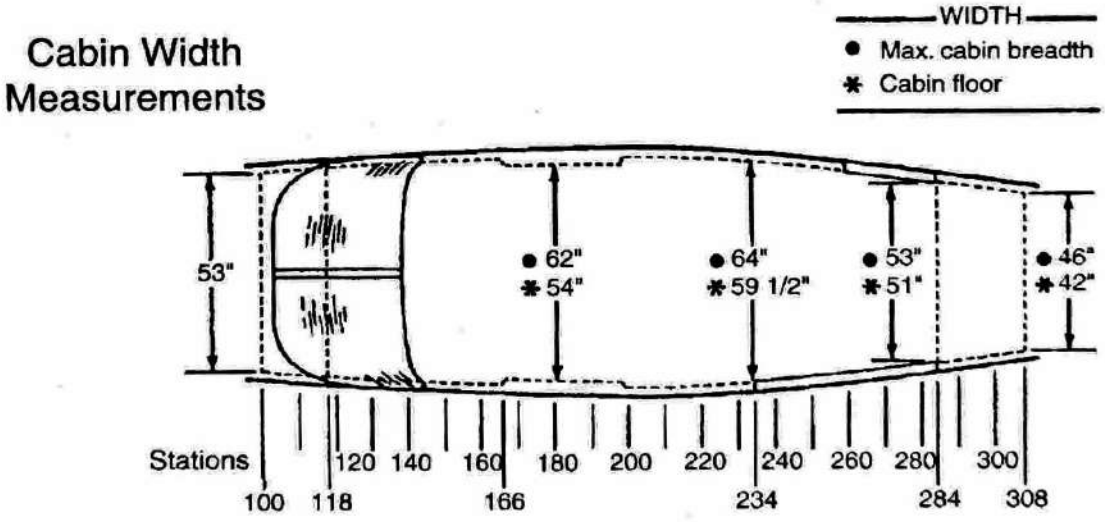
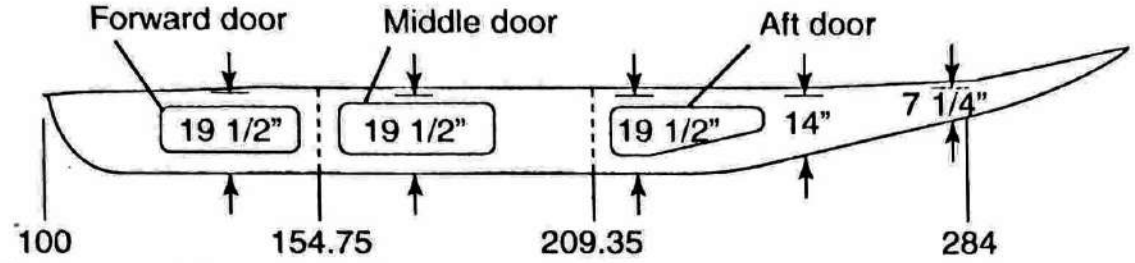


Figure 6-3. Internal Cabin Dimensions (Cargo Version)
(Sheet 2 of 2)

A39187

Cargo pod height measurements



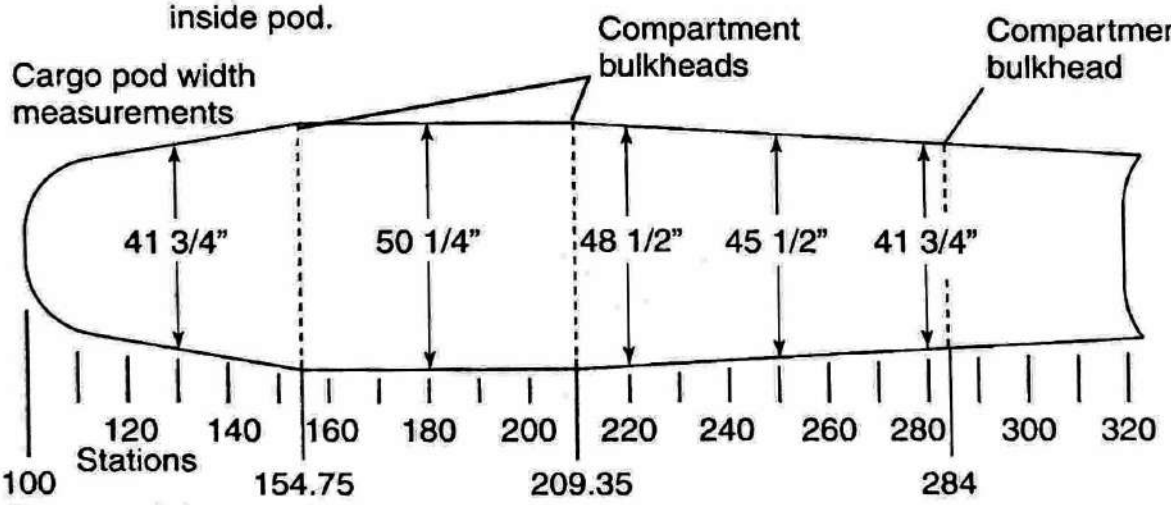
Notes 1: Height dimensions are approximate and measured at fuselage station shown from bottom of fuselage to inside floor.

Notes 2: Width dimensions are approximate and measured at fuselage station shown and on waterline 68.00 inside pod.

Door Opening Dimensions

	Width	Height (Front)	Height (Mid)	Height (Rear)
Forward door	27 1/2"	---	14 1/2"	---
Middle door	20 1/2"	---	15 1/4"	---
Aft door	30 1/2"	13 1/2"	---	8 1/2"

Cargo pod width measurements



Cargo pod door markings

Forward compartment	Center compartment	Aft compartment
Max. weight 230 lbs.	Max. weight 310 lbs.	Max. weight 280 lbs.
Max. floor loading 30 lbs. per sq. ft.	Max. floor loading 30 lbs. per sq. ft.	Max. floor loading 30 lbs. per sq. ft.
No sharp edges	No sharp edges	No sharp edges

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Figure 6-4. Internal Pod Dimensions and Load Markings

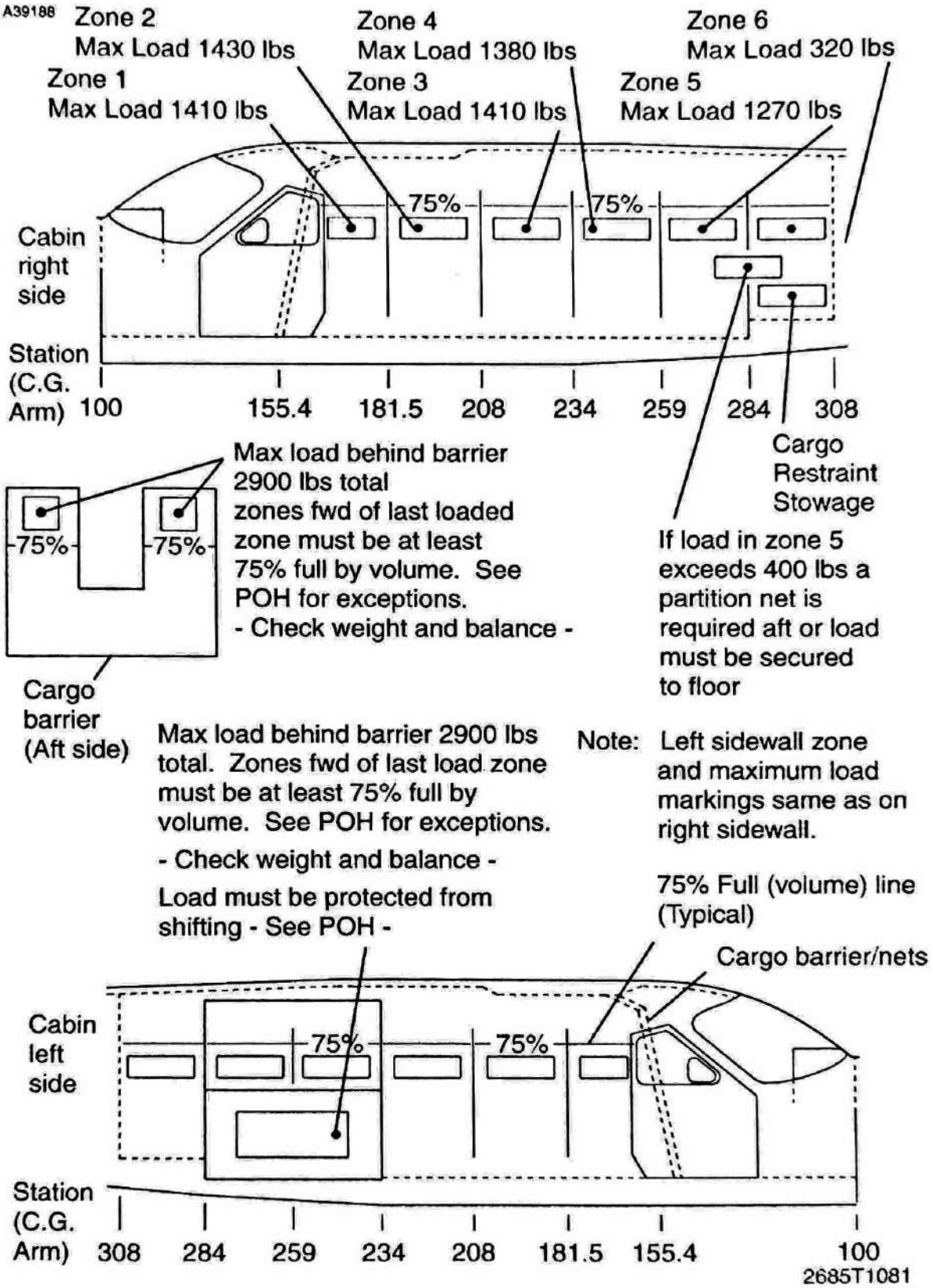
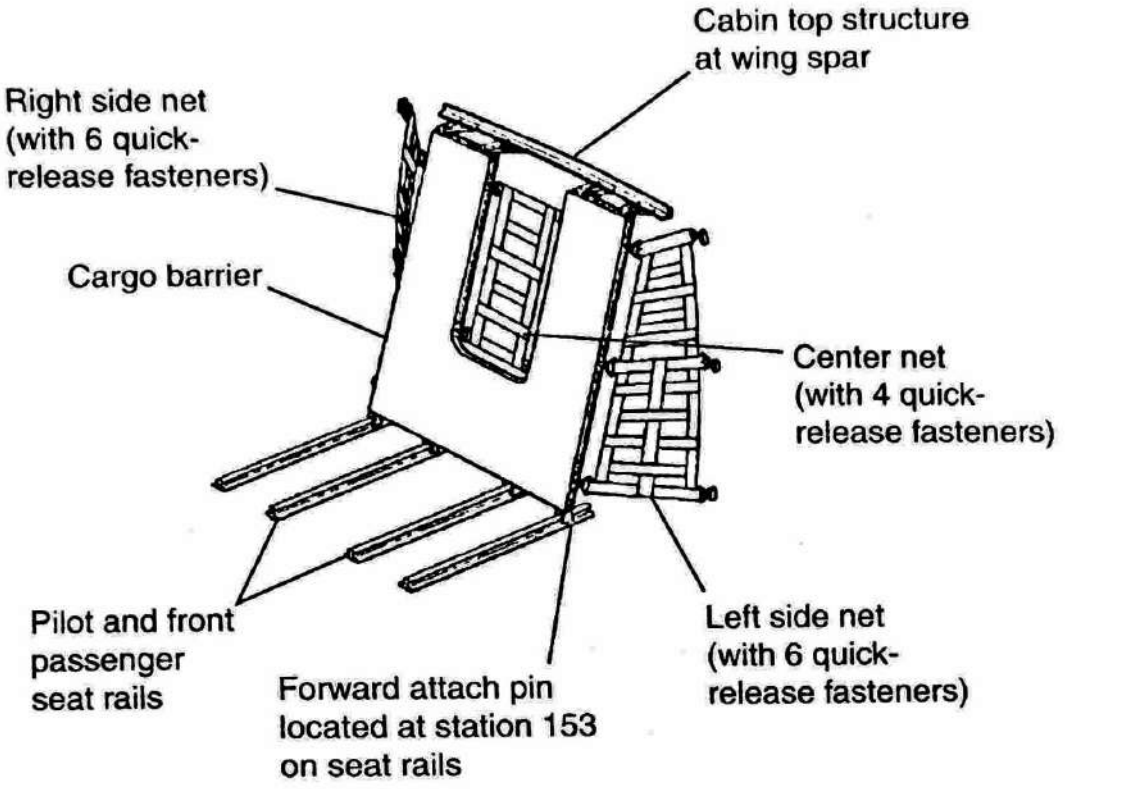
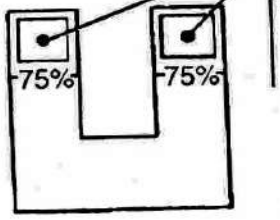


Figure 6-5. Internal Cabin Load Markings (Cargomaster Only)

A39189





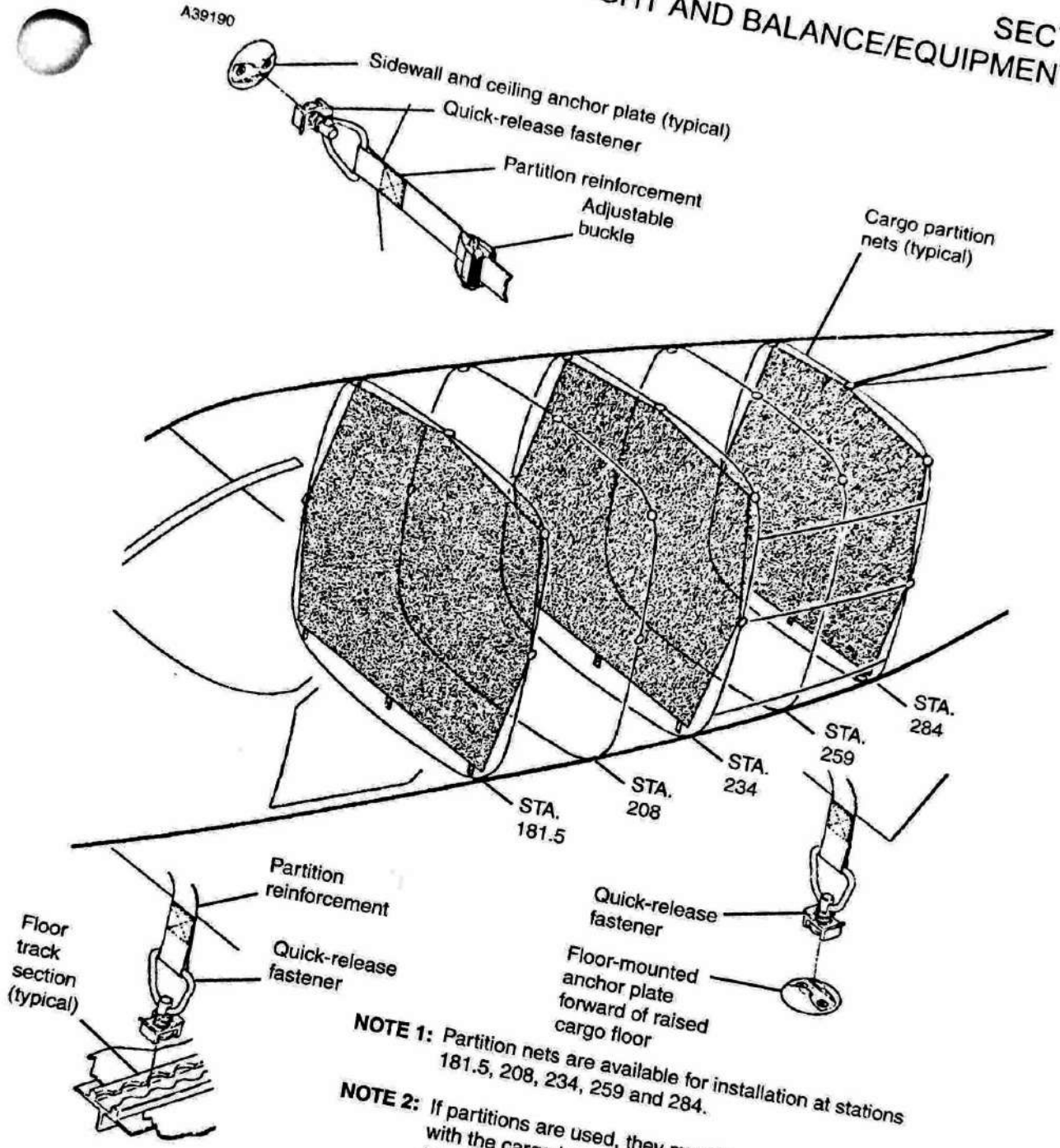
Max load behind barrier
2900 lbs total
Zones fwd of last loaded zone must be at least 75% full by volume. See POH for exceptions.
- check weight and balance

CARGO BARRIER (AFT SIDE) LOAD MARKINGS

NOTE 1: The cargo barrier and attached nets must be installed to provide forward crash load restraint.

NOTE 2: The quick-release fasteners which secure the center and isle nets allow momentary detachment of nets for loading/unloading of items through the crew area.

Figure 6-6. Cargo Barrier/Nets and Load Markings



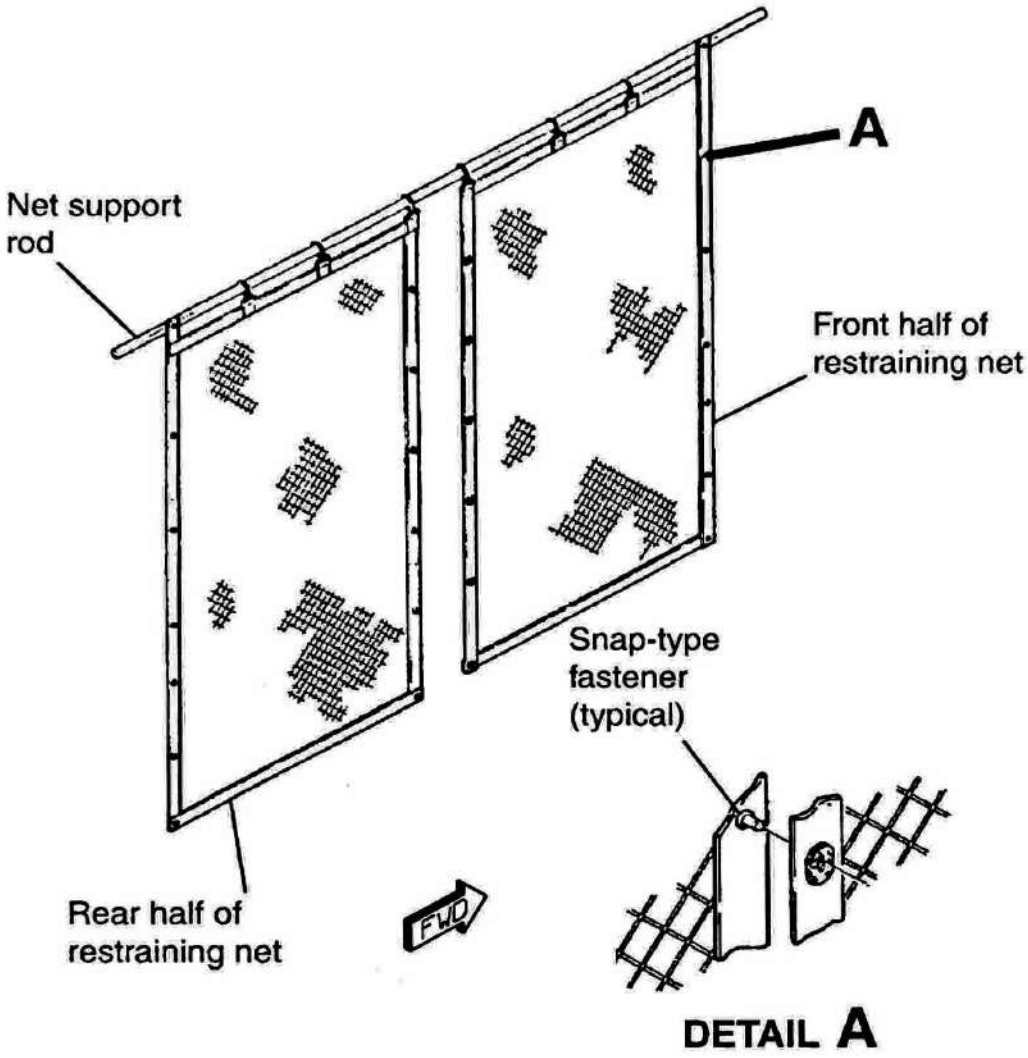
NOTE 1: Partition nets are available for installation at stations 181.5, 208, 234, 259 and 284.

NOTE 2: If partitions are used, they must be used in conjunction with the cargo barrier. Since partitions are not designed to withstand crash loads, they cannot be considered as a replacement for the barrier.

NOTE 3: Each partition will withstand the forward and aft operational loads applied during takeoff, flight and landing by any two (2) zones forward or aft of the partition. Use of the partitions will allow loading of the zones without tying down the cargo if the load density is no more than 9.75 pounds per cubic foot and the zone is more than 75% full. Cargo loading that does not meet these requirements must be secured to the cabin floor.

Figure 6-7. Cargo Partition Nets

A39191



NOTE 1: Restraining net installed inside of airplane over cargo door opening.

NOTE 2: Net halves should be pulled closed and snapped together to prevent articles from falling out of door opening when cargo doors are opened.

Figure 6-8. Cargo Door Opening Restraining Net

A39192

Item	Location	* Maximum Rated Load (Pounds)	
		Without Cargo Barrier/Nets Installed	With Cargo Barrier Nets Installed
Tie-down block on seat track	On front passenger seat tracks	100	100
Single-stud quick-release Tie-down on seat track	On aft passenger seat tracks	100	200
Single-stud quick-release Tie-down on baggage floor Anchor plates	On raised baggage floor	100	200
Double-stud quick-release Tie-down on seat track	On aft passenger seat tracks	150	300

When utilizing the aft seat rails for tying down cargo, minimum spacing for single-stud quick release tie-down rings is 12 inches.

*Tie-downs are required toward and aft of cargo load to prevent the load form shifting. The type of tie-downs available, the sum of their individual rated loads, and the height and length of the load whether configured with or without a cargo barrier/nets, and whether passengers are carried aft of the cargo barrier/nets, are the determining factors in selecting the number of tie-downs needed.

FOR EXAMPLE:

A 600-pound load which has a height dimension that is equal to or less than its length dimension requires a minimum of six (6) tie-downs (3 forward and 3 aft). When the cargo barrier/nets are installed, the number of tie-downs can be reduced by 1/2 as long as load shifting can be prevented. The minimum number of tie-downs for this example would then be 4 (3+1, to utilize an even number of tie-downs). Regardless of whether the cargo barrier/nets are installed, if the cargo height is greater than its Length, then the minimum number of tie-downs must be doubled. If passengers are carried aft of the cargo barrier/nets, cargo must be secured per the requirements without the barrier/nets installed. Refer to Cargo Load Restraint in this section for additional information.

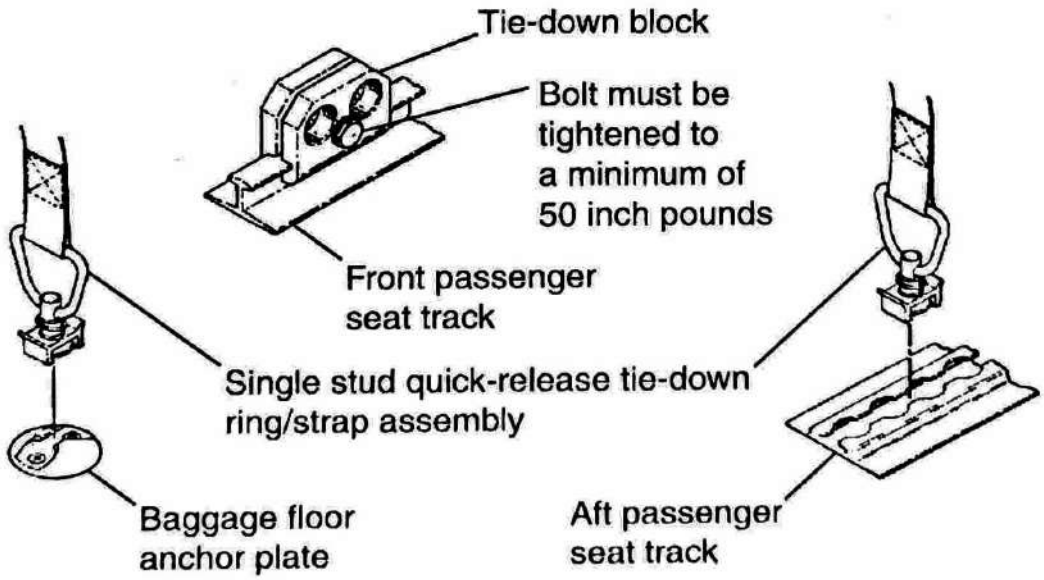


Figure 6-9. Cargo Tie-Down Equipment (Sheet 1 or 2)

A39193

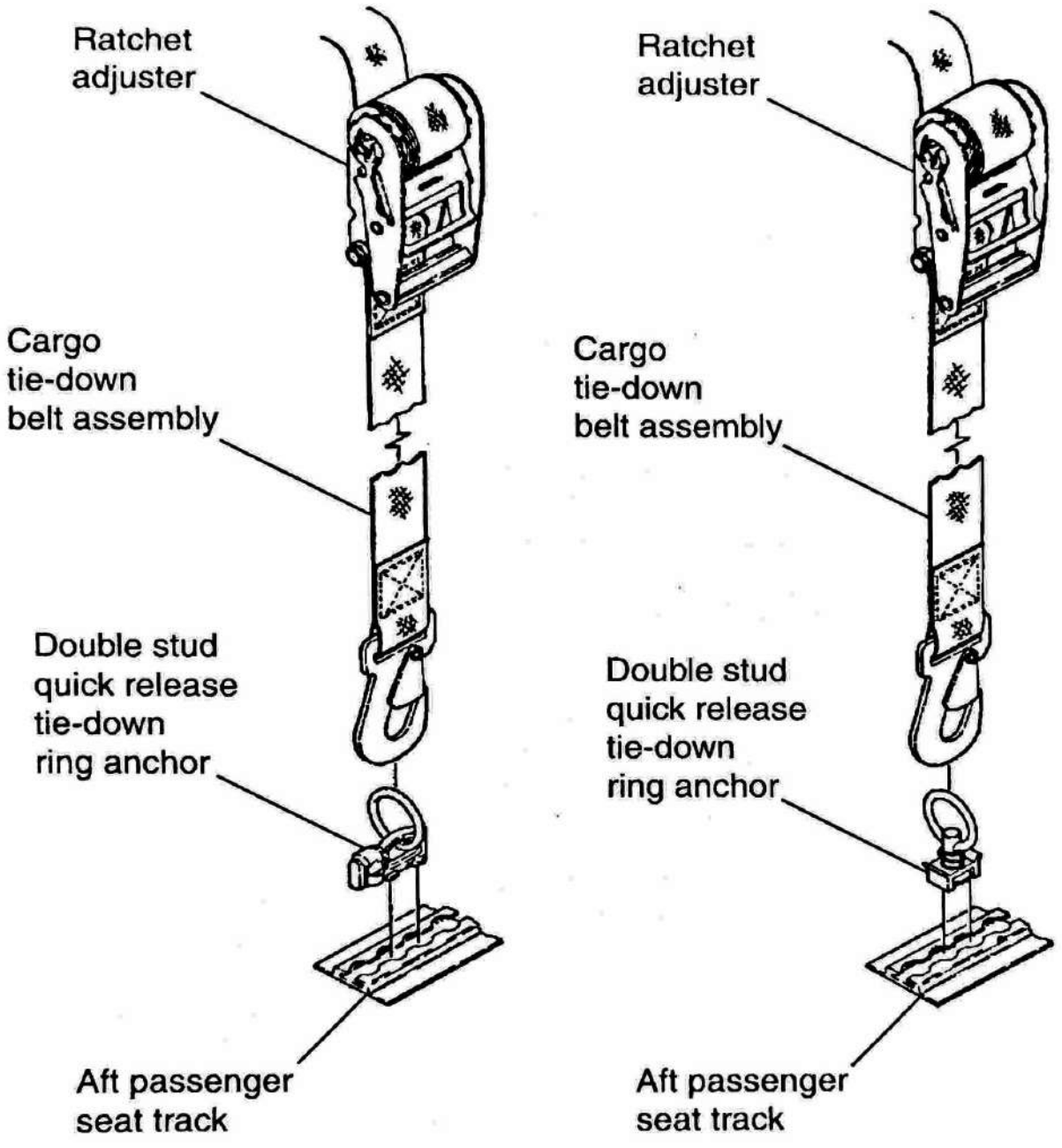
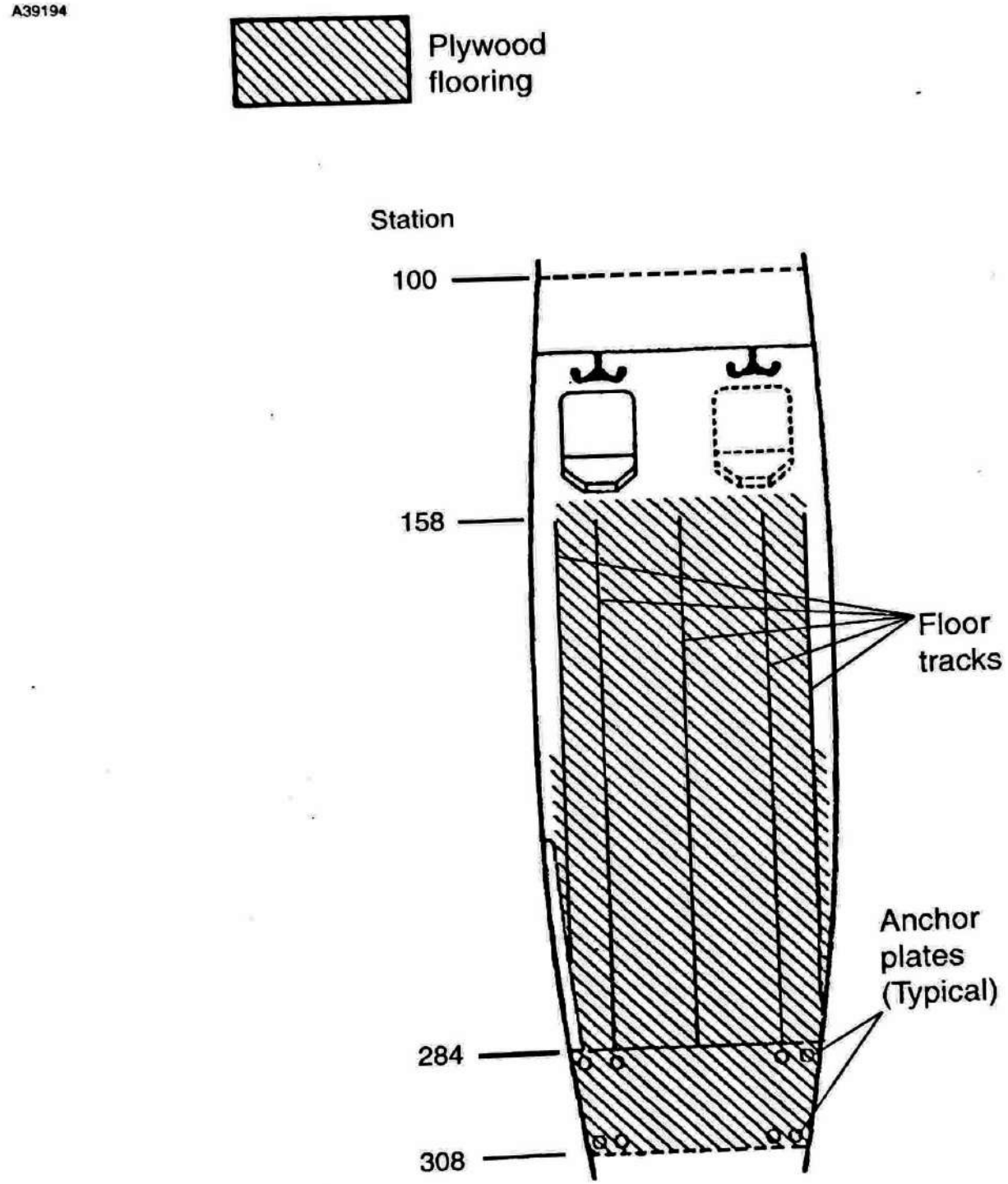


Figure 6-9. Cargo Tie-Down Equipment (Sheet 2 or 2)



NOTE: Plywood flooring and anchor plates are secured by screws.

Figure 6-10. Floor Track, Anchor Plate and Plywood Flooring Arrangement

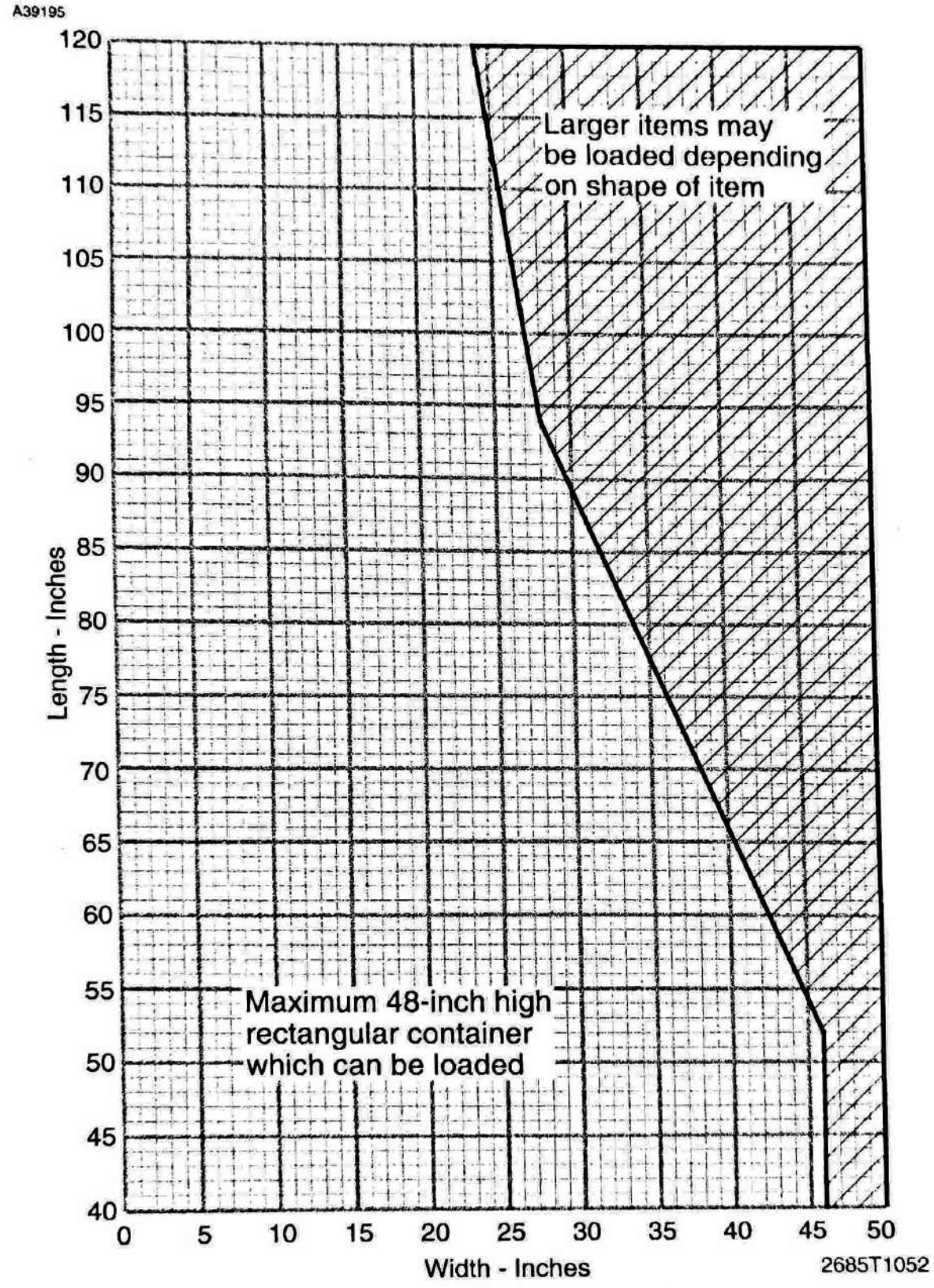


Figure 6-11. Maximum Cargo Sizes

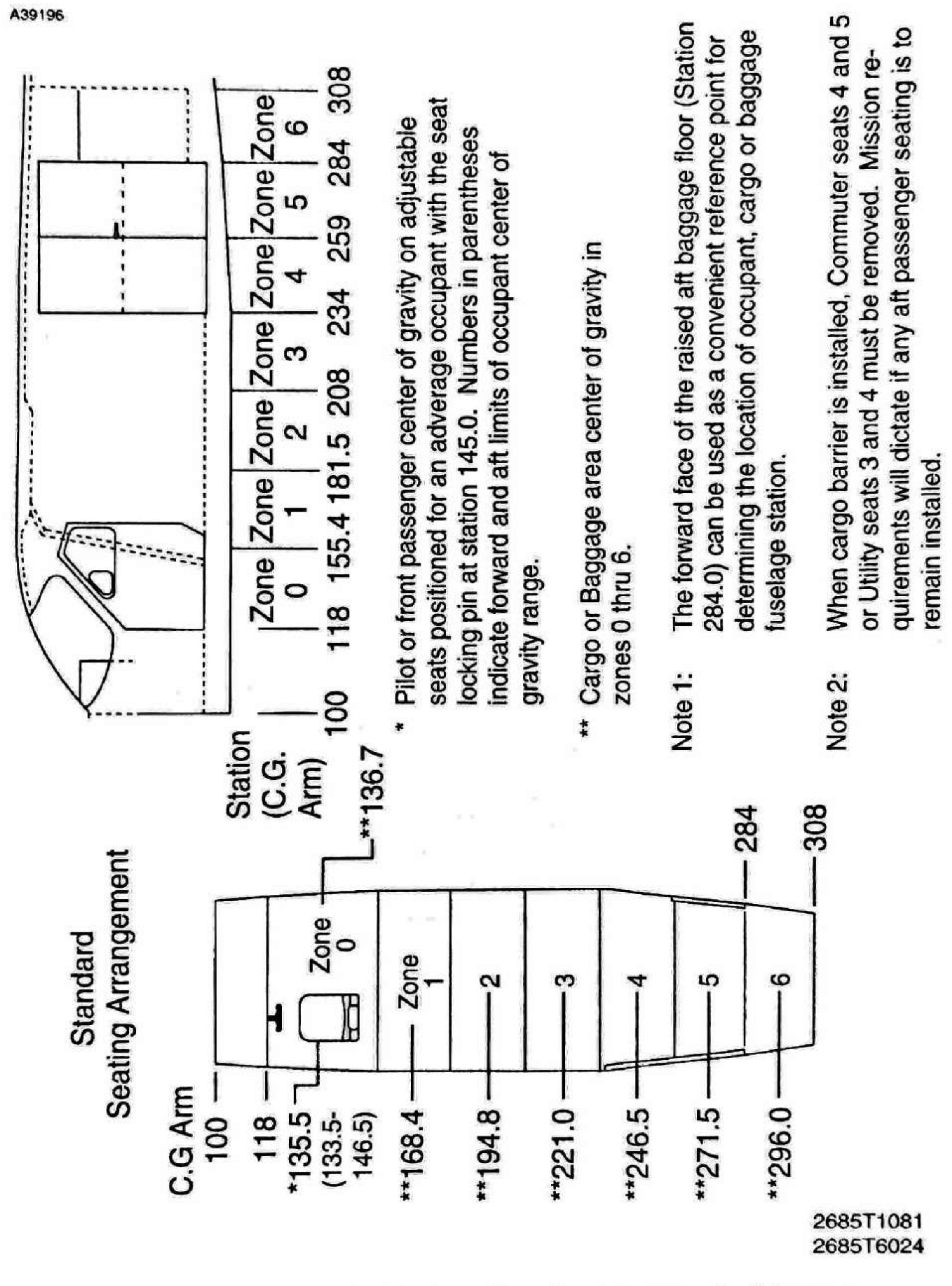


Figure 6-12. Internal Cabin Loading Arrangements (Passenger Version) (Sheet 1 of 3)

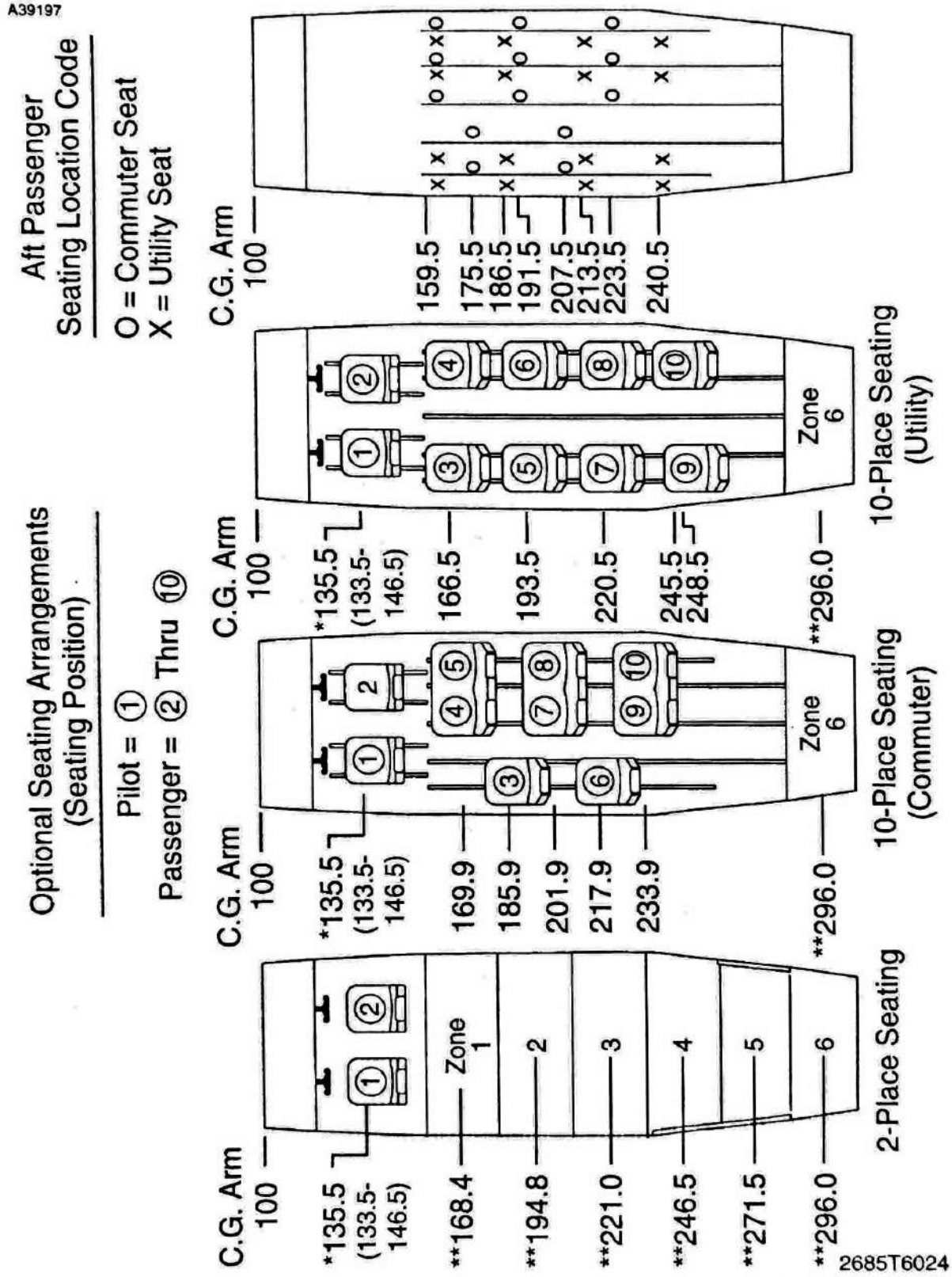


Figure 6-12. Internal Cabin Loading Arrangements (Passenger Version) (Sheet 2 of 3)

A39198

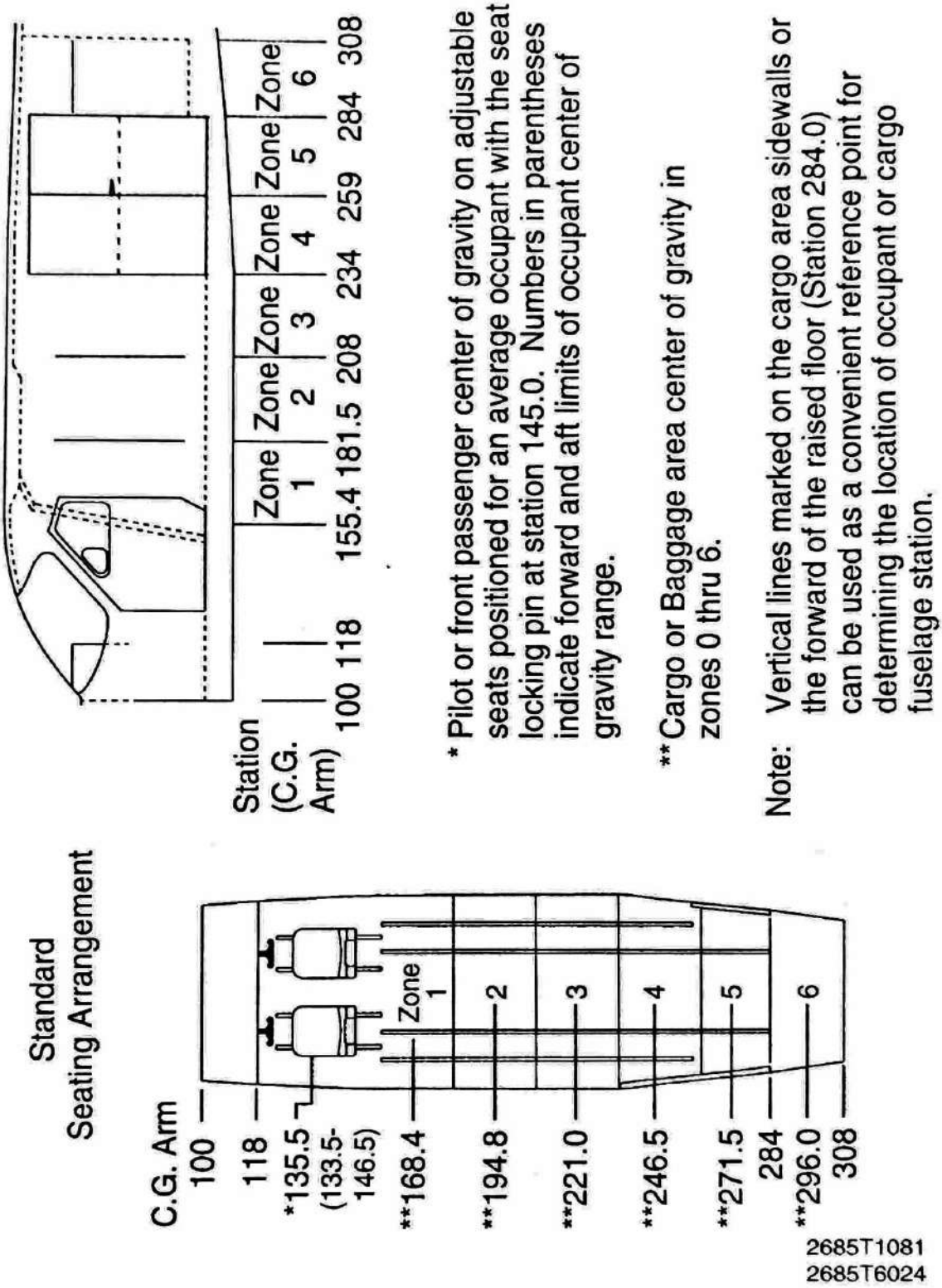
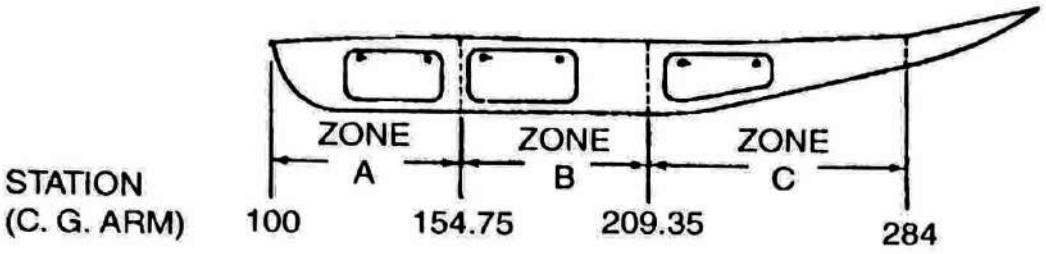
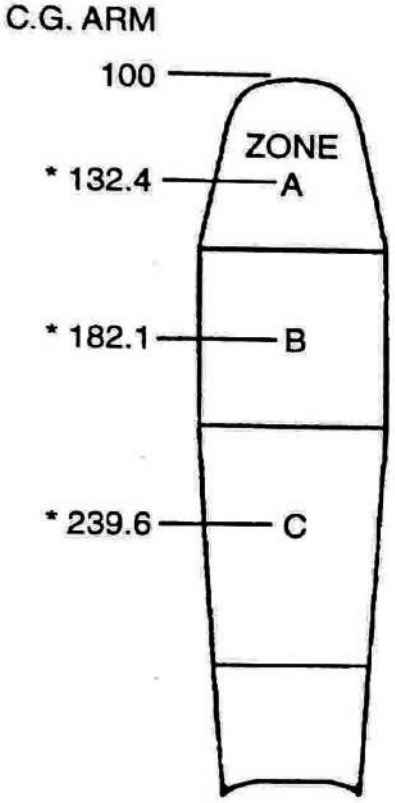


Figure 6-12. Internal Cabin Loading Arrangements (Passenger Version) (Sheet 3 of 3)

A39199



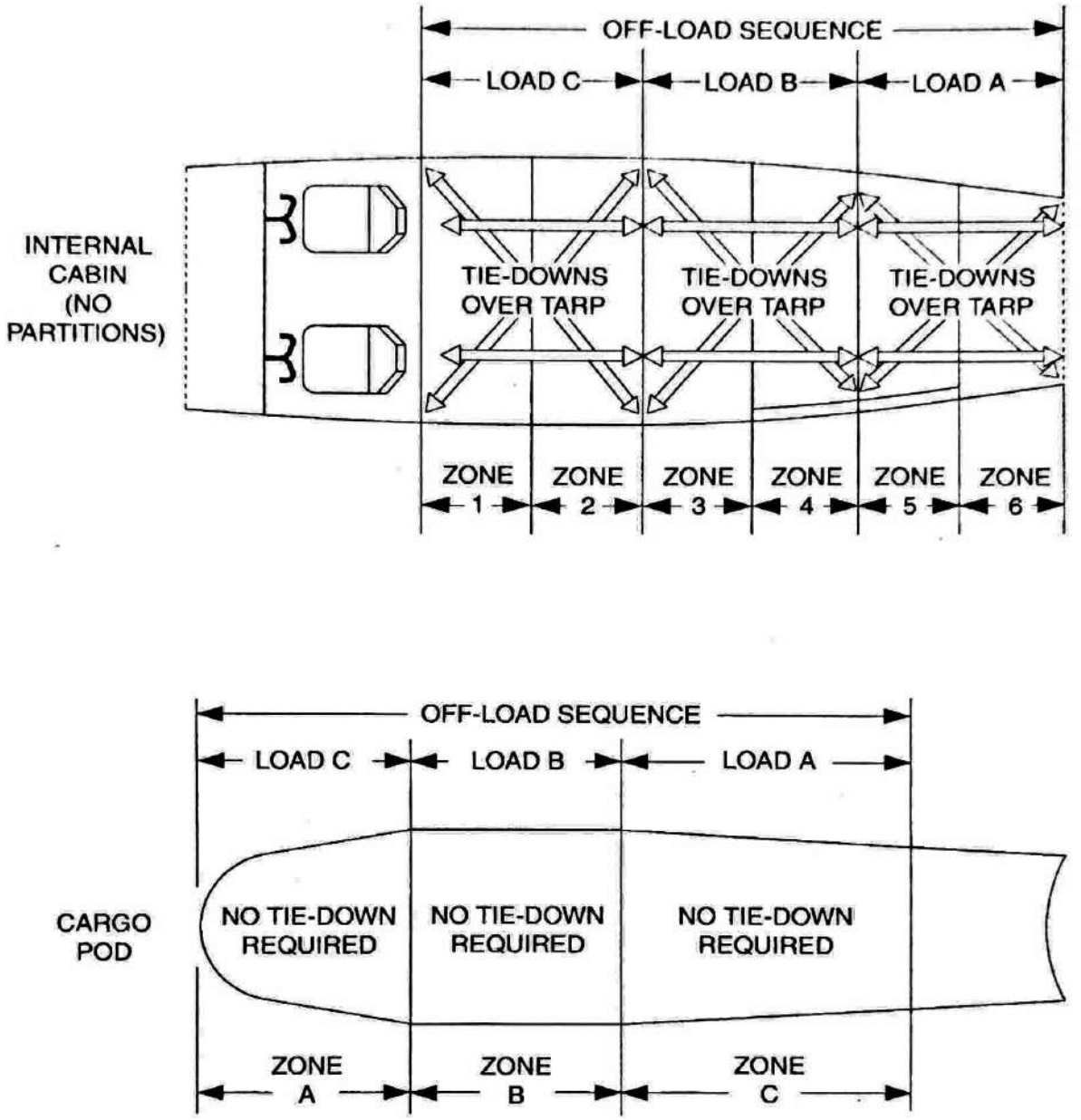


* Cargo area center of gravity in Zones A, B, and C

NOTE: Compartment bulkheads separating Zones A and B (Station 154.75) and Zones B and C (Station 209.35) can be used as a reference point for determining the location of cargo fuselage station.

Figure 6-13. Cargo Pod Loading Arrangements

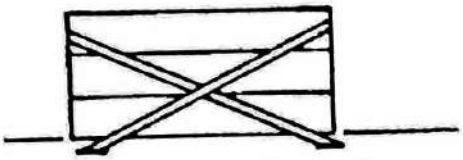
A39200



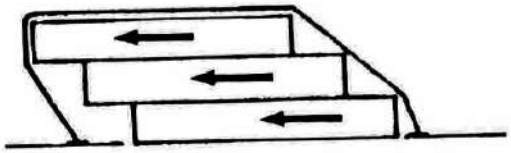
NOTE: If cargo partitions are not utilized, individual loads must be secured by adequate tie-downs over tarps.

Figure 6-14. Loading Tie-Down by Zone and Load (Off-Loading Sequence)

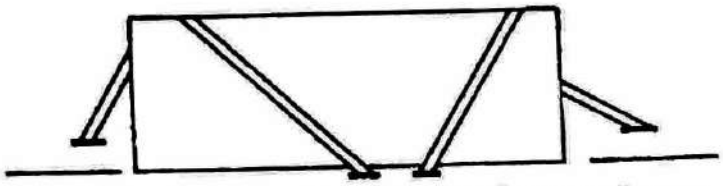
A39201



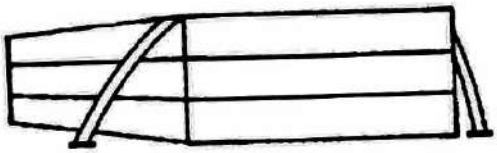
Cargo properly tied,
no shifts occur



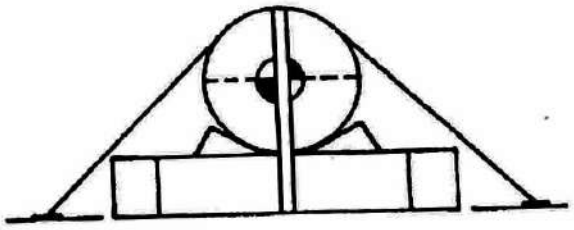
Cargo improperly tied,
shifts occur



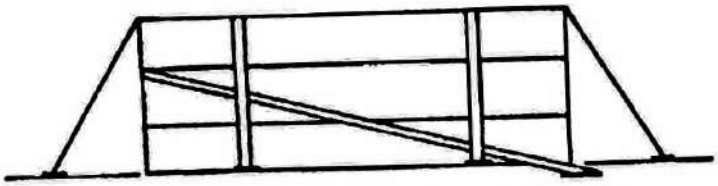
Multiple forces secured by fewer straps



Upward cargo restraint



Cylindrical cargo tie-down



Proper tie-down for all forces

Figure 6-15. Typical Cargo Restraint Methods

A39202

CREW AND PASSENGERS (COMMUTER SEATING)						
WEIGHT (POUNDS)	PILOT/ FRONT PASS. SEATS ① AND ② ARM = 136.5	AFT PASSENGER SEATS				
		④ AND ⑤ ARM = 169.9	③ ARM = 185.9	⑦ AND ⑧ ARM = 201.9	⑥ ARM = 217.9	⑨ AND ⑩ ARM = 233.9
	MOMENT/1000					
10	1.4	1.7	1.9	2.0	2.2	2.3
20	2.7	3.4	3.7	4.0	4.4	4.7
30	4.1	5.1	5.6	6.1	6.5	7.0
40	5.4	6.8	7.4	8.1	8.7	9.4
50	6.8	8.5	9.3	10.1	10.9	11.7
60	8.1	10.2	11.2	12.1	13.1	14.0
70	9.5	11.9	13.0	14.1	15.3	16.4
80	10.8	13.6	14.9	16.2	17.4	18.7
90	12.2	15.3	16.7	18.2	19.6	21.1
100	13.5	17.0	18.6	20.2	21.8	23.4
110	14.9	18.7	20.4	22.2	24.0	25.7
120	16.3	20.4	22.3	24.2	26.1	28.1
130	17.6	22.1	24.2	26.2	28.3	30.4
140	19.0	23.8	26.0	28.3	30.6	32.7
150	20.3	25.5	27.9	30.3	32.7	35.1
160	21.7	27.2	29.7	32.3	34.9	37.4
170	23.0	28.9	31.6	34.3	37.0	39.8
180	24.4	30.6	33.5	36.3	39.2	42.1
190	25.7	32.3	35.3	38.4	41.4	44.4
200	27.1	34.0	37.2	40.4	43.6	46.8
210	28.5	35.7	39.0	42.4	45.8	49.1
220	29.8	37.4	40.9	44.4	47.9	51.5
230	31.2	39.1	42.8	46.4	50.1	53.8
240	32.5	40.8	44.6	48.5	52.3	56.1
250	33.9	42.5	46.5	50.5	54.5	58.5
260	35.2	44.2		52.5		60.8
270	36.6	45.9		54.5		63.2
280	37.9	47.6		56.5		65.5
290	39.3	49.3		58.6		67.8
300	40.6	51.0		60.6		70.2
310	42.0	52.7		62.6		72.5
320	43.4	54.4		64.6		74.8
330	44.7	56.1		66.6		77.2
340	46.1	57.8		68.6		79.5
350	47.4	59.5		70.7		81.9
360	48.8	61.2		72.7		84.2
370	50.1	62.9		74.7		86.5
380	51.5	64.6		76.7		88.9
390	52.8	66.3		78.7		91.2
400	54.2	68.0		80.8		93.6

Figure 6-16. Weight And Moment Tables (Sheet 1 of 9)

A39203

CREW AND PASSENGERS (UTILITY SEATING)						
WEIGHT (POUNDS)	PILOT/ FRONT PASS. SEATS ① AND ② ARM = 135.5	AFT PASSENGER SEATS				
		③ AND ④ ARM = 166.5	⑤ AND ⑥ ARM = 193.5	⑦ AND ⑧ ARM = 220.5	⑨ ARM = 248.5	⑩ ARM = 245.5
	MOMENT/1000					
10	1.4	1.7	1.9	2.2	2.5	2.5
20	2.7	3.3	3.9	4.4	5.0	4.9
30	4.1	5.0	5.8	6.6	7.5	7.4
40	5.4	6.7	7.7	8.8	9.9	9.8
50	6.8	8.3	9.7	11.0	12.4	12.3
60	8.1	10.0	11.6	13.2	14.9	14.7
70	9.5	11.7	13.5	15.4	17.4	17.2
80	10.8	13.3	15.5	17.6	19.9	19.6
90	12.2	15.0	17.4	19.8	22.4	22.1
100	13.5	16.6	19.3	22.0	24.8	24.5
110	14.9	18.3	21.3	24.3	27.3	27.0
120	16.3	20.0	23.2	26.5	29.8	29.5
130	17.6	21.6	25.2	28.7	32.3	31.9
140	19.0	23.3	27.1	30.9	34.8	34.4
150	20.3	25.0	29.0	33.1	37.3	36.8
160	21.7	26.6	31.0	35.3	39.8	39.3
170	23.0	28.3	32.9	37.5	42.2	41.7
180	24.4	30.0	34.8	39.7	44.7	44.2
190	25.7	31.6	36.8	41.9	47.2	46.6
200	27.1	33.3	38.7	44.1	49.7	49.1
210	28.5	35.0	40.6	46.3	52.2	51.6
220	29.8	36.6	42.6	48.5	54.7	54.0
230	31.2	38.3	44.5	50.7	57.2	56.5
240	32.5	40.0	46.4	52.9	59.6	58.9
250	33.9	41.6	48.4	55.1	62.1	61.4
260	35.2	43.3	50.3	57.3	64.6	63.8
270	36.6	45.0	52.2	59.5	67.1	66.3
280	37.9	46.6	54.2	61.7	69.6	68.7
290	39.3	48.3	56.1	63.9	72.1	71.2
300	40.6	49.9	58.0	66.1	74.5	73.6
310	42.0	51.6	60.0	68.4	77.0	76.1
320	43.4	53.3	61.9	70.6	79.5	78.6
330	44.7	54.9	63.9	72.8	82.0	81.0
340	46.1	56.6	65.8	75.0	84.5	83.5
350	47.4	58.3	67.7	77.2	87.0	85.9
360	48.8	59.9	69.7	79.4	89.5	88.4
370	50.1	61.6	71.6	81.6	91.9	90.8
380	51.5	63.3	73.5	83.8	94.4	93.3
390	62.8	64.9	75.5	86.0	96.9	95.7
400	54.2	66.6	77.4	88.2	99.4	98.2

Figure 6-16. Weight And Moment Tables (Sheet 2 of 9)

A39204

FUEL (JET A, JET A-1, JET B, JP-1 AND JP-8 WITH DENSITY OF 6.7 LBS./GAL. AT 60°F)					
GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES	GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES
5	33	6.1	175	1172	216.5
10	67	12.3	180	1206	222.6
15	100	18.6	185	1239	228.8
20	134	24.8	190	1273	234.9
25	167	31.0	195	1306	241.1
30	201	37.2	200	1340	247.2
35	234	43.4	205	1373	253.3
40	268	49.6	210	1407	259.5
45	301	55.8	215	1440	265.6
50	335	62.0	220	1474	271.8
55	368	68.2	225	1507	277.9
60	402	74.4	230	1541	284.0
65	435	80.6	235	1574	290.2
70	469	86.8	240	1608	296.3
75	502	93.0	245	1641	302.4
80	536	99.2	250	1675	308.5
85	569	105.4	255	1708	314.7
90	603	111.6	260	1742	320.8
95	636	117.8	265	1775	326.9
100	670	123.9	270	1809	333.0
105	703	130.1	275	1842	339.1
110	737	136.3	280	1876	345.2
115	770	142.5	285	1909	351.4
120	804	148.7	290	1943	357.5
125	837	154.8	295	1976	363.6
130	871	161.0	300	2010	369.7
135	904	167.2	305	2043	375.8
140	938	173.3	310	2077	381.9
145	971	179.5	315	2110	388.0
150	1005	185.7	320	2144	394.1
155	1038	191.8	325	2177	400.2
160	1072	198.0	327	2189	402.3
165	1105	204.1	330	2211	406.3
170	1139	210.3	332	2224	408.8

Figure 6-16. Weight And Moment Tables (Sheet 3 of 9)

A39205

FUEL (JP-4 WITH DENSITY OF 6.5 LBS./GAL. AT 60°F)					
GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES	GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES
5	33	5.9	175	1138	210.0
10	65	12.0	180	1170	216.0
15	98	18.0	185	1203	221.9
20	130	24.0	190	1235	227.9
25	163	30.1	195	1268	233.9
30	195	36.1	200	1300	239.8
35	228	42.1	205	1333	245.8
40	260	48.1	210	1365	251.7
45	293	54.2	215	1398	257.7
50	325	60.2	220	1430	263.6
55	358	66.2	225	1463	269.6
60	390	72.2	230	1495	275.5
65	423	78.2	235	1528	281.5
70	455	84.2	240	1560	287.4
75	488	90.2	245	1593	293.4
80	520	96.2	250	1625	299.3
85	553	102.2	255	1658	305.3
90	585	108.2	260	1690	311.2
95	618	114.2	265	1723	317.1
100	650	120.2	270	1755	323.1
105	683	126.2	275	1788	329.0
110	715	132.2	280	1820	334.9
115	748	138.2	285	1853	340.9
120	780	144.2	290	1885	346.8
125	813	150.2	295	1918	352.7
130	845	156.2	300	1950	358.6
135	878	162.2	305	1983	364.6
140	910	168.2	310	2015	370.5
145	943	174.1	315	2048	376.4
150	975	180.1	320	2080	382.3
155	1008	186.1	325	2113	388.2
160	1040	192.1	327	2123	390.1
165	1073	198.1	330	2145	394.1
170	1105	204.0	332	2158	396.6

Figure 6-16. Weight And Moment Tables (Sheet 4 of 9)

A39206

FUEL (JP-5 WITH DENSITY OF 6.8 LBS./GAL. AT 60°F)					
GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES	GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES
5	34	6.2	175	1190	219.7
10	68	12.5	180	1224	225.9
15	102	18.8	185	1258	232.2
20	136	25.1	190	1292	238.4
25	170	31.4	195	1326	244.7
30	204	37.8	200	1360	250.9
35	238	44.1	205	1394	257.1
40	272	50.4	210	1428	263.4
45	306	56.6	215	1462	269.6
50	340	62.9	220	1496	275.8
55	374	69.2	225	1530	282.0
60	408	75.5	230	1564	288.3
65	442	81.8	235	1598	294.5
70	476	88.1	240	1632	300.7
75	510	94.4	245	1666	306.9
80	544	100.7	250	1700	313.1
85	578	107.0	255	1734	319.4
90	612	113.2	260	1768	325.6
95	646	119.5	265	1802	331.8
100	680	125.8	270	1836	338.0
105	714	132.1	275	1870	344.2
110	748	138.3	280	1904	350.4
115	782	144.6	285	1938	356.6
120	816	150.9	290	1972	362.8
125	850	157.1	295	2006	369.0
130	884	163.4	300	2040	375.2
135	918	169.7	305	2074	381.4
140	952	175.9	310	2108	387.6
145	986	182.2	315	2142	393.8
150	1020	188.4	320	2176	400.0
155	1054	194.7	325	2210	406.2
160	1088	200.9	327	2223	408.4
165	1122	207.2	330	2244	412.3
170	1156	213.4	332	2258	414.9

Figure 6-16. Weight And Moment Tables (Sheet 5 of 9)

A39207

FUEL (AVIATION GASOLINE WITH DENSITY OF 6.0 LBS./GAL. AT 60°F)					
GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES.	GALLONS	WEIGHT (POUNDS)	MOMENT/1000 ARM VARIES
5	30	5.5	175	1050	193.8
10	60	11.1	180	1080	199.3
15	90	16.6	185	1110	204.9
20	120	22.2	190	1140	210.4
25	150	27.7	195	1170	215.9
30	180	33.3	200	1200	221.4
35	210	38.9	205	1230	226.9
40	240	44.4	210	1260	232.4
45	270	50.0	215	1290	237.9
50	300	55.5	220	1320	243.4
55	330	61.1	225	1350	248.9
60	360	66.6	230	1380	254.3
65	390	72.2	235	1410	259.8
70	420	77.7	240	1440	265.3
75	450	83.3	245	1470	270.8
80	480	88.8	250	1500	276.3
85	510	94.4	255	1530	281.8
90	540	99.9	260	1560	287.3
95	570	105.5	265	1590	292.7
100	600	111.0	270	1620	298.2
105	630	116.5	275	1650	303.7
110	660	122.1	280	1680	309.2
115	690	127.6	285	1710	314.6
120	720	133.1	290	1740	320.1
125	750	138.6	295	1770	325.6
130	780	144.2	300	1800	331.1
135	810	149.7	305	1830	336.5
140	840	155.2	310	1860	342.0
145	870	160.7	315	1890	347.5
150	900	166.3	320	1920	352.9
155	930	171.8	325	1950	358.4
160	960	177.3	326	1957	359.6
165	990	182.8	330	1980	363.8
170	1020	188.3	332	1992	366.1

Figure 6-16. Weight And Moment Tables (Sheet 6 of 9)

A39208

BAGGAGE/CARGO (CABIN LOCATIONS)				
WEIGHT (POUNDS)	ZONE 0 ARM = 136.7	ZONE 1 ARM = 168.4	ZONE 2 ARM = 194.8	ZONE 3 ARM = 221.0
	MOMENT/1000			
10	1.4	1.7	1.9	2.2
20	2.7	3.4	3.9	4.4
30	4.1	5.1	5.8	6.6
40	5.5	6.7	7.8	8.8
50	6.8	8.4	9.7	11.0
60	8.2	10.1	11.7	13.3
70	9.6	11.8	13.6	15.5
80	10.9	13.5	15.6	17.7
90	12.3	15.2	17.5	19.9
100	13.7	16.8	19.5	22.1
110	15.0	18.5	21.4	24.3
120	16.4	20.2	23.4	26.5
130	17.8	21.9	25.3	28.7
140	19.1	23.6	27.3	30.9
150	20.5	25.3	29.2	33.1
160	21.9	26.9	31.2	35.4
170	23.2	28.6	33.1	37.6
180	24.6	30.3	35.1	39.8
190	26.0	32.0	37.0	42.0
200	27.3	33.7	39.0	44.2
210	28.7	35.4	40.9	46.4
220	30.1	37.0	42.9	48.6
230	31.4	38.7	44.8	50.8
240	32.8	40.4	46.8	53.0
250	34.2	42.1	48.7	55.3
260	35.5	43.8	50.6	57.5
270	36.9	45.5	52.6	59.7
280	38.3	47.2	54.5	61.9
290	39.6	48.8	56.5	64.1
300	41.0	50.5	58.4	66.3
310	42.4	52.2	60.4	68.5
320	43.7	53.9	62.3	70.7
330	45.1	55.6	64.3	72.9
340	46.5	57.3	66.2	75.1
350	47.8	58.9	68.2	77.3
360		60.6	70.1	79.6
370		62.3	72.1	81.8
380		64.0	74.0	84.0
390		65.7	76.0	86.2
400		67.4	77.9	88.4
410		69.0	79.9	90.6
420		70.7	81.8	92.8
430		72.4	83.8	95.0
440		74.1	85.7	97.2
450		75.8	87.7	99.4
460		77.5	89.6	101.7
470		79.1	91.6	103.9
480		80.8	93.5	106.1
490		82.5	95.5	108.3
500		84.2	97.4	110.5

Figure 6-16. Weight And Moment Tables (Sheet 7 of 9)

A39209

BAGGAGE/CARGO (CABIN LOCATIONS)				
WEIGHT (POUNDS)	ZONE 4 ARM = 246.5	ZONE 5 ARM = 271.5	ZONE 6 ARM = 296.0	—— ——
	MOMENT/1000			
10	2.5	2.7	3.0	
20	4.9	5.4	5.9	
30	7.4	8.1	8.9	
40	9.9	10.9	11.8	
50	12.3	13.6	14.8	
60	14.8	16.3	17.8	Moment and weight limits shown for Zones 0 thru 5 are recommendations only; maximum loading is limited by floor loading (200 lbs./ sq. ft.) and loaded airplane C.G. The addition of plywood flooring is recommended to distribute concentrated load on seat tracks and floor structure.
70	17.3	19.0	20.7	
80	19.7	21.7	23.7	
90	22.2	24.4	26.6	
100	24.6	27.1	29.6	
110	27.1	29.9	32.6	
120	29.6	32.6	35.5	
130	32.0	35.3	38.5	
140	34.5	38.0	41.4	
150	37.0	40.7	44.4	
160	39.4	43.4	47.4	
170	41.9	46.2	50.3	
180	44.4	48.9	53.3	
190	46.8	51.6	56.2	
200	49.3	54.3	59.2	
210	51.8	57.0	62.2	
220	54.2	59.7	65.1	
230	56.7	62.4	68.1	
240	59.2	65.2	71.0	
250	61.6	67.9	74.0	
260	64.1	70.6	77.0	
270	66.6	73.3	79.9	
280	69.0	76.0	82.9	
290	71.5	78.7	85.8	
300	73.9	81.4	88.8	
310	76.4	84.2	91.8	
320	78.9	86.9	94.7	
325	80.1	88.2	96.2	
330	81.3	89.6		
340	83.8	92.3		
350	86.3	95.0		
360	88.7	97.7		
370	91.2	100.5		
380	93.7	103.2		
390	96.1	105.9		
400	98.6	108.6		
410	101.1			
420	103.5			
430	106.0			
440	108.5			
450	110.9			
460				
470				
480				
490				
500				

Figure 6-16. Weight And Moment Tables (Sheet 8 of 9)

A39210

BAGGAGE/CARGO (CARGO POD LOCATIONS)			
WEIGHT (LBS.)	ZONE A ARM = 132.4	ZONE B ARM = 182.1	ZONE C ARM = 239.6
	MOMENT/1000		
25	3.3	4.6	6.0
50	6.6	9.1	12.0
75	9.9	13.7	18.0
100	13.2	18.2	24.0
125	16.5	22.8	29.9
150	19.9	27.3	35.9
175	23.2	31.9	41.9
200	26.5	36.4	47.9
225	29.8	41.0	53.9
250	33.1	45.5	59.9
275		50.1	65.9
300		54.6	71.9
325		59.2	

Figure 6-16. Weight And Moment Tables (Sheet 9 of 9)

A39211

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-in. /1000)	Weight (lbs.)	Moment (lb.-in. /1000)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	4265	727.6		
2.*Usable Fuel (332 Gal. Maximum)	1720	316.8		
3. Pilot (Seat 1) (Sta. 133.5 to 146.5)	170	23.0		
4. Front Passenger (Seat 2) (Sta.133.5 to 146.5)	200	27.1		
5. **Aft Passengers (Commuter Seating):				
Seat 3 (Sta. 185.9)	190	35.3		
Seats 4 and 5 (Sta. 169.9)	380	64.6		
Seat 6 (Sta. 217.9)	170	37.0		
Seats 7 and 8 (Sta. 201.9)	340	68.6		
Seats 9 and 10 (Sta. 233.9)	300	70.2		
**Aft Passengers (Utility Seating):				
Seats 3 and 4 (Sta. 166.5)				
Seats 5 and 6 (Sta. 193.5)				
Seats 7 and 8 (Sta. 220.5)				
Seat 9 (Sta. 248.5)				
Seat 10 (Sta. 245.5)				
6. Baggage/Cargo:				
Zone 0 (Sta. 118 to 155.4)				
Zone 1 (Sta. 155.4 to 181.5)				
Zone 2 (Sta. 181.5 to 208)				
Zone 3 (Sta. 208 to 234)				
Zone 4 (Sta. 234 to 259)				
Zone 5 (Sta. 259 to 284)				
Zone 6 (Sta. 284 to 308)	300	88.8		
7. Cargo (Cargo Pod Locations):				
Zone A (Sta. 100 to 154.75)				
Zone B (Sta. 154.75 to 209.35)				
Zone C (Sta. 209.35 to 284)				
8. RAMP WEIGHT AND MOMENT	8035	1459.0		
9. Fuel allowance for engine start, taxi, and runup	–35	–6.4		
10. TAKEOFF WEIGHT AND MOMENT (Subtract Step 9 from Step 8)	8000	1452.6		

11. Locate this point (8000 at 1452.6) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.

* Refer to Weight and Moment Tables for weight and moment of fuel being used.
** Refer to Loading Arrangements Diagram for aft passenger seating arrangements. Do not combine Commuter seating and Utility seating.

Figure 6-17. Sample Loading Problems (Sheet 1 of 2)

A39212

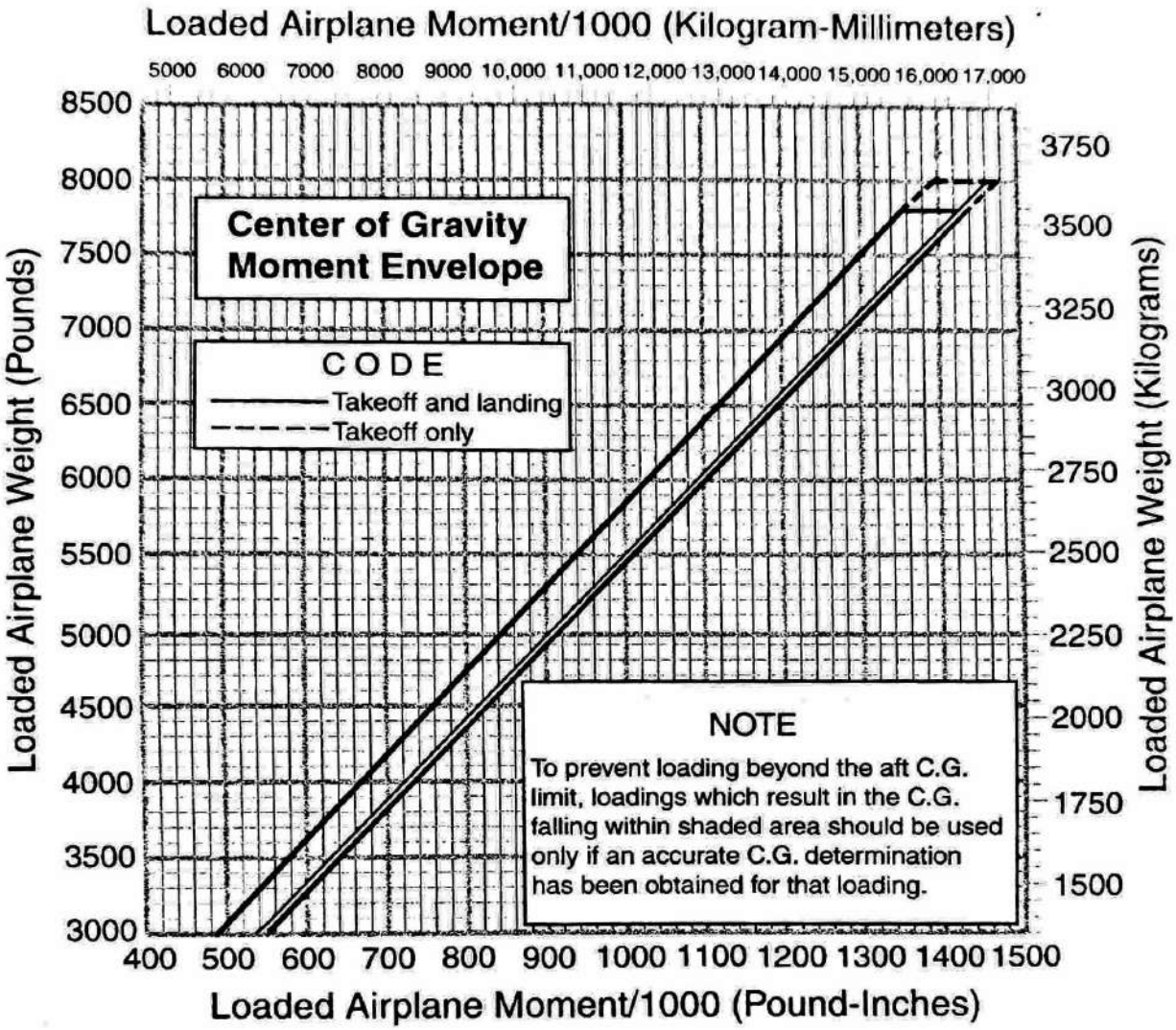
YOUR AIRPLANE		YOUR AIRPLANE		YOUR AIRPLANE		YOUR AIRPLANE	
Weight (lbs.)	Moment (lb.-in.) /1000)	Weight (lbs.)	Moment (lb.-in.) /1000)	Weight (lbs.)	Moment (lb.-in.) /1000)	Weight (lbs.)	Moment (lb.-in.) /1000)

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

⚠ WARNING

It is the responsibility of the pilot 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.

Figure 6-17. Sample Loading Problems (Sheet 2 of 2)

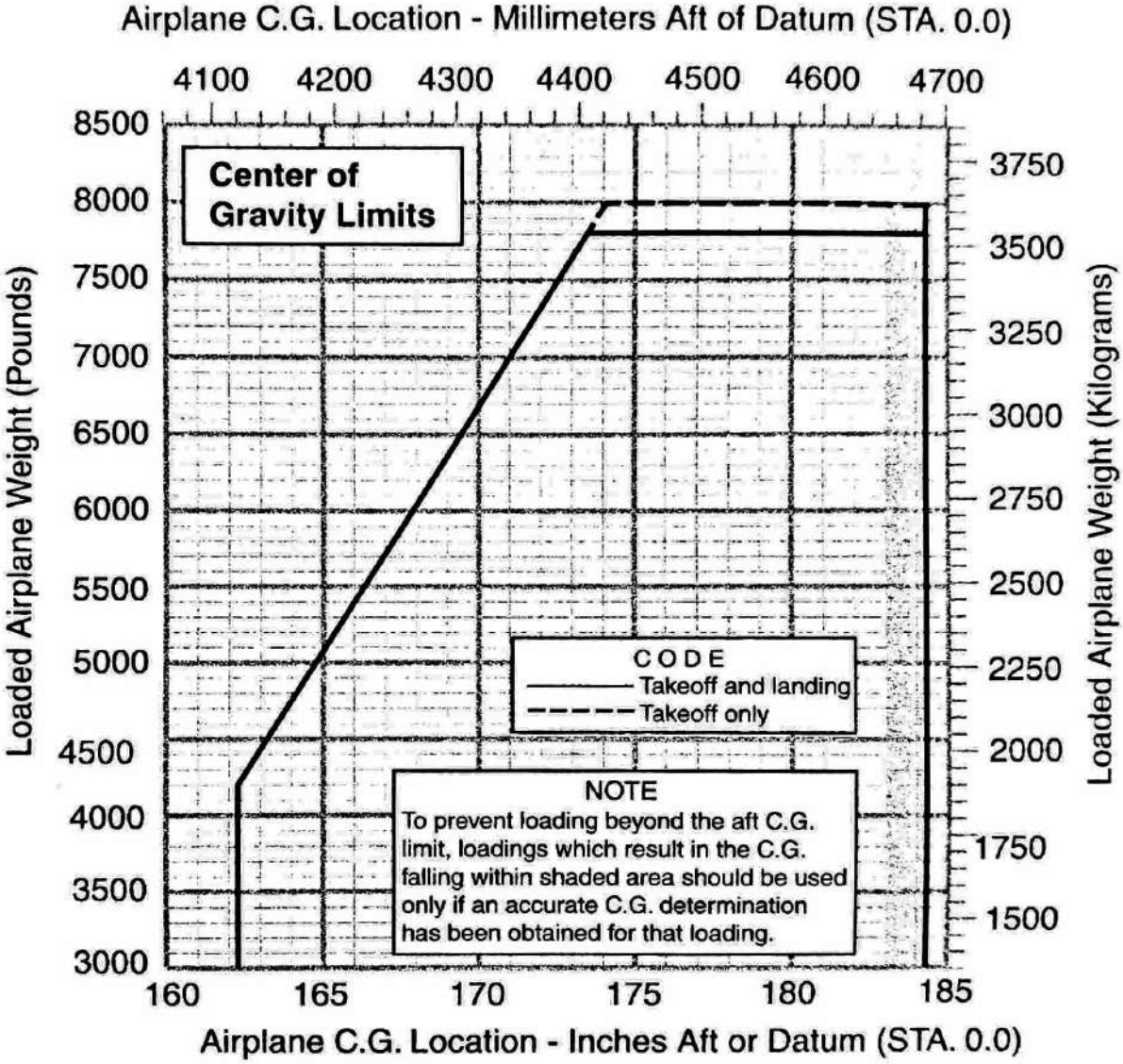


WARNING

IT IS THE RESPONSIBILITY OF THE PILOT TO MAKE SURE THAT THE AIRPLANE IS LOADED CORRECTLY. OPERATION OUTSIDE OF PRESCRIBED WEIGHT AND BALANCE LIMITATIONS COULD RESULT IN AN ACCIDENT AND SERIOUS OR FATAL INJURY.

Figure 6-18. Center of Gravity Moment Envelope

A39214



WARNING

IT IS THE RESPONSIBILITY OF THE PILOT TO MAKE SURE THAT THE AIRPLANE IS LOADED CORRECTLY. OPERATION OUTSIDE OF PRESCRIBED WEIGHT AND BALANCE LIMITATIONS COULD RESULT IN AN ACCIDENT AND SERIOUS OR FATAL INJURY.

Figure 19. Center of Gravity Limits