The loaded weight for this fl ght is 5,064 pounds, and the CG is located at 42.47 inches aft of the datum.

To determine that the weight and CG are within the allowable range, refer to the CG range chart in *Figure 6-4*. Draw a line vertically upward from 42.47 inches from the datum and one horizontally from 5,064 pounds. These lines cross inside the envelope, showing that the airplane is properly loaded.
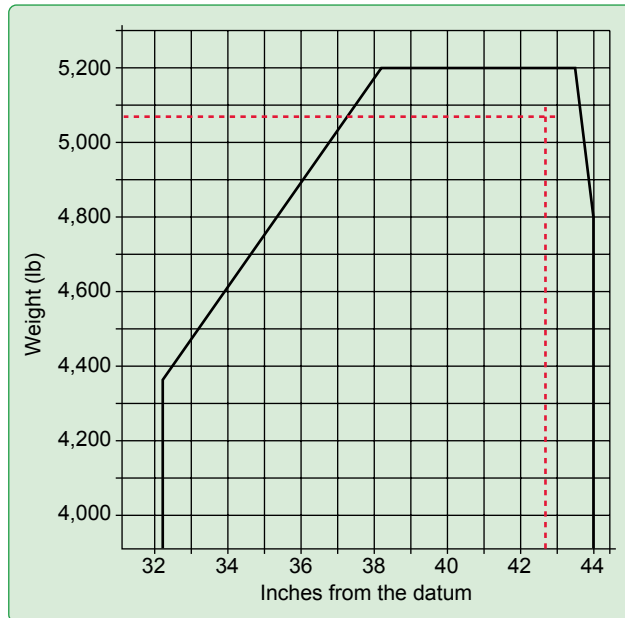
Figure 6-4. *Sample CG range chart.*

Determining the CG in Percentage of Mean Aerodynamic Chord (MAC)

Refer again to *Figures 6-2* and *6-3*.

The loaded CG is 42.47 inches aft of the datum.

The MAC is 61.6 inches long.

The LEMAC is located at station 20.1.

The CG is 42.47 – 20.1 = 22.37 inches aft of LEMAC.

Use the formula in *Figure 6-5* to find the CG in percent MAC.

$$CG \text{ in } \% \text{ MAC} = \frac{CG \text{ in inches from LEMAC} \times 100}{MAC}$$

$$= \frac{22.37 \times 100}{61.6}$$

$$= 36.3\% \text{ MAC}$$

Figure 6-5. *Finding CG in percent MAC.*

The loaded CG is located at 36.3 percent MAC.

The Chart Method Using Weight and Moment Indexes

As mentioned in the previous chapter, anything that can be done to make careful preflight planning easier makes flying safer. Many manufacturers furnish charts in the Pilot's Operating Handbook/Aircraft Flight Manual (POH/AFM) that use weight and moment indexes rather than weight, arm, and moments. The charts also help reduce errors by including tables of moment indexes for the various weights.

Consider the loading for this particular flight

Cruise fuel flow = 16 gallons per hou

Estimated time en route = 2 hours, 10 minutes

Reserve fuel = 45 minutes = 12 gallons

Total required fuel = 47 gallons

The pilot completes a chart like the one in *Figure 6-6* using moment indexes from tables in *Figures 6-7* and *6-8*.

The moments divided by 100 in the index column are found in the charts in *Figures 6-7* through *6-9*. If the exact weight is not in the chart, interpolate between the weights that are included. When a weight is greater than any of those shown in the charts, add the moment indexes for a combination of weights to get that which is desired. For example, to get the moments divided by 100 for the 320 pounds in the front seats, add the moment index for 100 pounds (105) to that for 220 pounds (231). This gives the moment index of 336 for 320 pounds in the front seats.

Use the moment limits versus weight envelope in *Figure 6-10* to determine if the weight and balance conditions are within allowable limits for both takeoff and landing at the destination. The moment limits versus weight envelope is an enclosed area on a graph of three parameters. The diagonal line representing the moment divided by 100 crosses the horizontal line representing the weight at the vertical line representing the CG location in inches aft of the datum. When the lines cross inside the envelope, the aircraft is loaded within its weight and CG limits.

Takeoff: – 3,781 lb and 4,296 moment divided by 100

Landing: – 3,571 lb and 4,050 moment divided by 100