

- Determine the distance between the CG and the datum by adding the CG in inches aft of LEMAC to the distance from the datum to LEMAC. [Figure 9-13]

$$\begin{aligned}\text{CG (inches from datum)} &= \text{CG inches aft of LEMAC} \\ &\quad + \text{Datum to LEMAC} \\ &= 31.84 + 549.13 \\ &= 580.97 \text{ inches}\end{aligned}$$

**Figure 9-13.** Determining the distance between CG and the datum.

- Determine the moment/1,000 for the original weight. [Figure 9-14]

$$\begin{aligned}\text{Moment}/1,000 &= \frac{\text{Weight} \times \text{Arm}}{1,000} \\ &= \frac{90,000 \times 580.97}{1,000} \\ &= 52,287.3\end{aligned}$$

**Figure 9-14.** Determining the moment/1,000 for the original weight.

- Determine the new weight and new CG by first determining the moment/1,000 of the removed weight. Multiply the weight removed (2,500 pounds) by the centroid of the forward cargo hold (352.1 inches), and then divide the result by 1,000. [Figure 9-15]

$$\begin{aligned}\text{Moment}/1,000 &= \frac{\text{Weight} \times \text{Arm}}{1,000} \\ &= \frac{2,500 \times 352.1}{1,000} \\ &= 880.25\end{aligned}$$

**Figure 9-15.** Determining the moment/1,000 of the removed weight.

- Subtract the removed weight from the original weight and subtract the moment/1,000 of the removed weight from the original moment/1,000. [Figure 9-16]

	Weight (lb)	Moment/1,000	CG (inches from datum)	CG (percent MAC)
Original data	90,000	52,287.3	580.97	22.5
Changes	– 2,500	– 880.3		
New data	87,500	51,407.0	587.51	27.12

**Figure 9-16.** New weights and CG.

- Determine the location of the new CG by dividing the total moment/1,000 by the total weight and multiplying this by the reduction factor of 1,000. [Figure 9-17]

$$\begin{aligned}\text{CG} &= \frac{\text{Total moment}/1,000}{\text{Total weight}} \times 1,000 \\ &= \frac{51,407.0}{87,500} \times 1,000 \\ &= 587.51 \text{ inches behind the datum}\end{aligned}$$

**Figure 9-17.** Determining the location of new CG.

- Convert the new CG location to percent MAC. First, determine the distance between the CG location and LEMAC. [Figure 9-18]

$$\begin{aligned}\text{CG (inches aft of LEMAC)} &= \\ \text{CG (inches from datum)} &- \text{LEMAC} \\ &= 587.51 - 549.13 \\ &= 38.38 \text{ inches}\end{aligned}$$

**Figure 9-18.** Determining the distance between the CG and LEMAC.

- Then, determine the new CG in percent MAC. [Figure 9-19]

$$\begin{aligned}\text{CG \% MAC} &= \left( \frac{\text{Distance CG to LEMA}}{\text{MAC}} \right) \times 100 \\ &= \left( \frac{38.38}{141.5} \right) \times 100 \\ &= 27.12\% \text{ MAC}\end{aligned}$$

**Figure 9-19.** Determining the new CG in percent MAC.

Loading 3,000 pounds of cargo into the forward cargo hold moves the CG forward 5.51 inches, from 27.12 percent MAC to 21.59 percent MAC.