

CHAPTER 8
WEIGHT AND BALANCE

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CHAPTER 8

WEIGHT AND BALANCE

8-10 Leveling

NOTE

Perform leveling and weighing in a zero-wind environment.

NOTE

Verify spirit level is calibrated by placing level on a designated surface and noting bubble position. Rotate spirit level 180°; verify bubble is in the same position.

8-11 Leveling for Weight and Balance

NOTE

Main rotor blade position does not affect weight and balance calculations.

1. Jack helicopter per Section 7-10.
2. Refer to Figure 8-1. Place a spirit level laterally on F463-1 aft tunnel cover. Verify cover is flat; if cover is not flat, remove cover and place spirit level across keel panel flanges.
3. Adjust jacks at (landing gear) aft strut assembly jack lugs/tabs until helicopter is level laterally.
4. Position spirit level longitudinally on aft tunnel cover, or atop left or right keel panel if cover is removed. Adjust jack under ground handling ball until helicopter is level longitudinally.

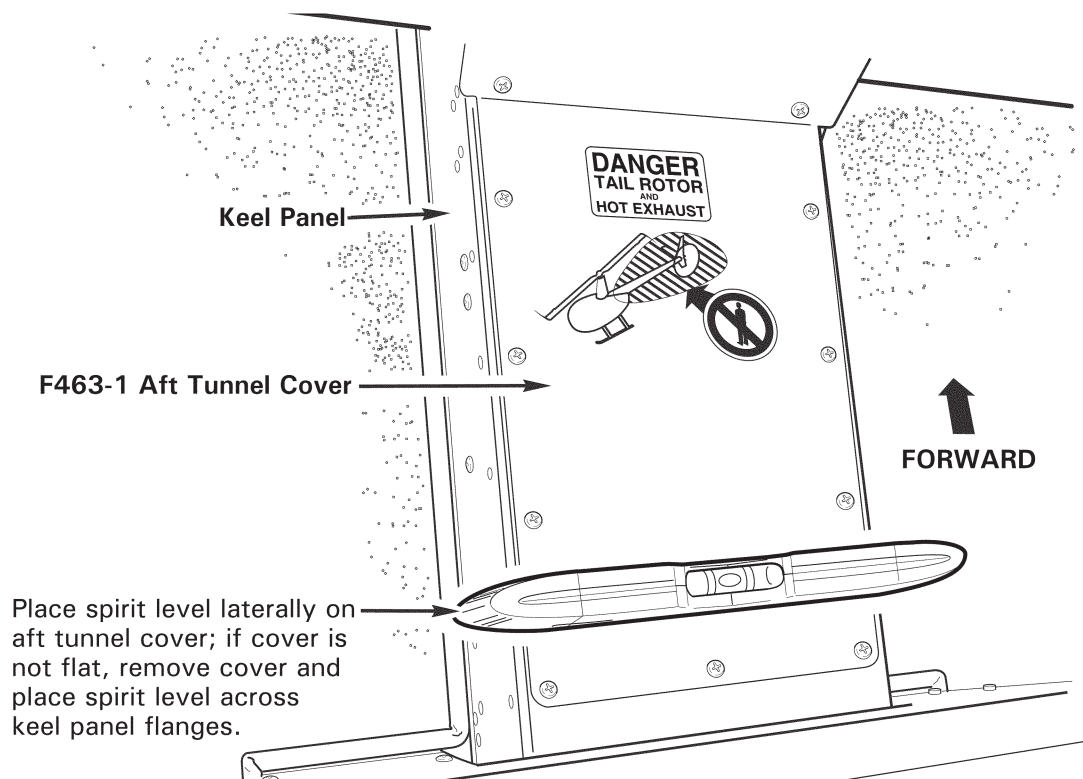


FIGURE 8-1 LEVELING FOR WEIGHT AND BALANCE
(Lateral shown; view looking down between aft seat footwells)

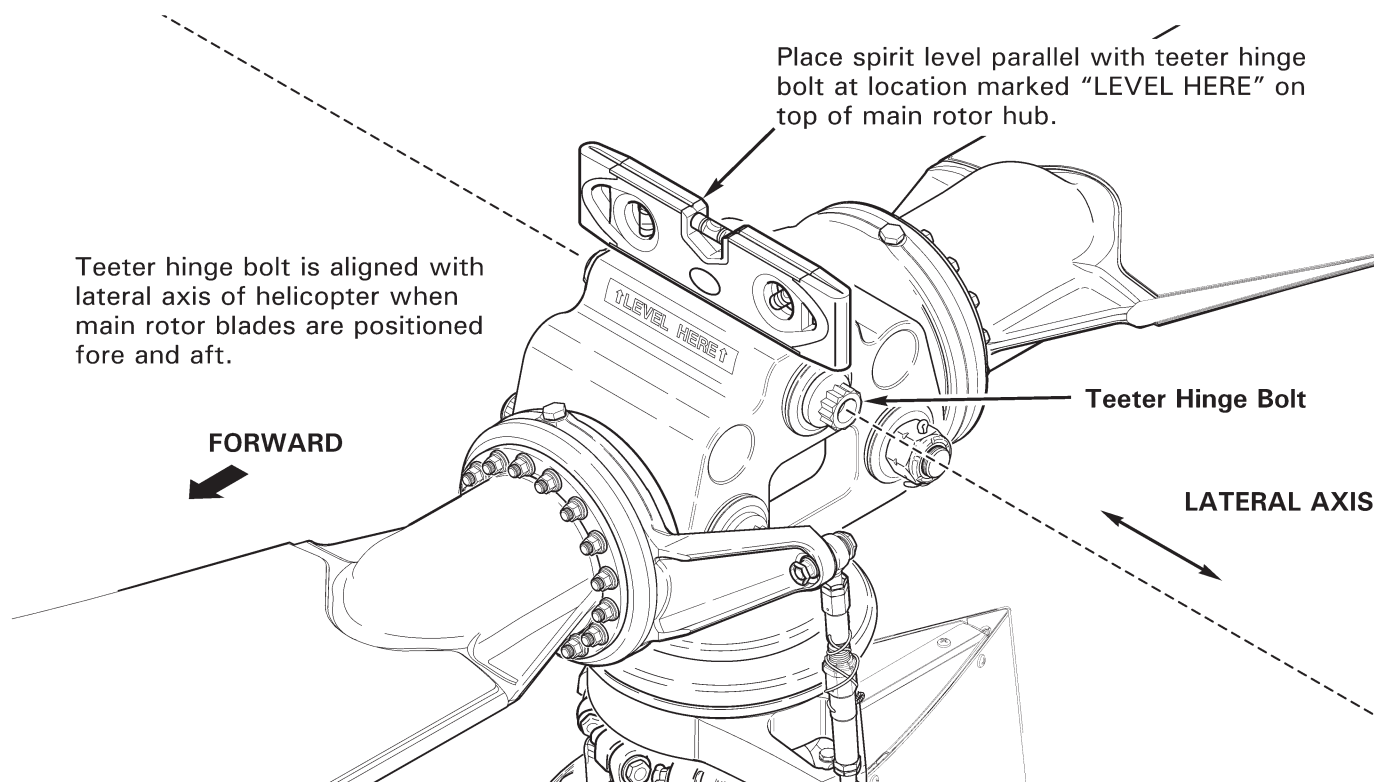


FIGURE 8-2 LEVELING FOR RIGGING
(Lateral shown)

8-12 Leveling for Rigging

1. Refer to Figure 8-2. Place cyclic stick in vertical position and apply cyclic friction. Position main rotor blades approximately fore and aft and apply rotor brake. (Teeter hinge bolt is aligned with lateral axis of helicopter.)
2. Jack helicopter per Section 7-10.
3. Place a spirit level parallel with teeter hinge bolt at location marked "LEVEL HERE" on top of main rotor hub.
4. Adjust jack at (landing gear) aft strut assembly jack lugs/tabs until helicopter is level laterally.
5. Release rotor brake and rotate main rotor until teeter hinge bolt is aligned with longitudinal axis of the helicopter. Apply rotor brake. Verify cyclic stick is in vertical position with friction applied.
6. Adjust jack under ground handling ball until helicopter is level longitudinally. Remove spirit level.

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8-20 Weighing

Reweigh helicopter when helicopter empty weight and empty weight center of gravity have been modified and if the accuracy of additional calculations is suspect.

Maintain a continuous record of the helicopter's weight and balance using the Weight and Balance Record in R66 Pilot's Operating Handbook (POH) Section 6.

NOTE

Verify scales are calibrated. Operate scales according to scale manufacturer's instructions.

NOTE

Never weigh the helicopter in the wind. Weigh helicopter on a flat, hard surface in a zero-wind environment for accurate scale readings.

8-21 Preparing Helicopter for Weighing

1. Defuel helicopter per Section 12-42.
2. Service engine oil, hydraulic fluid, and main & tail rotor gearboxes per Chapter 12.
3. Clean aircraft per Section 20-10. Ensure helicopter is completely dry prior to weighing.
4. Remove foreign objects from baggage compartments and stowage areas.
5. Verify cowlings, removable panels, cabin doors, removable controls, and R66 Pilot's Operating Handbook (POH) are installed.
6. Verify Equipment List/Weight and Balance Data sheet (RF 134) and modifications recorded in the Weight and Balance Record correspond with installed equipment and recorded equipment locations.

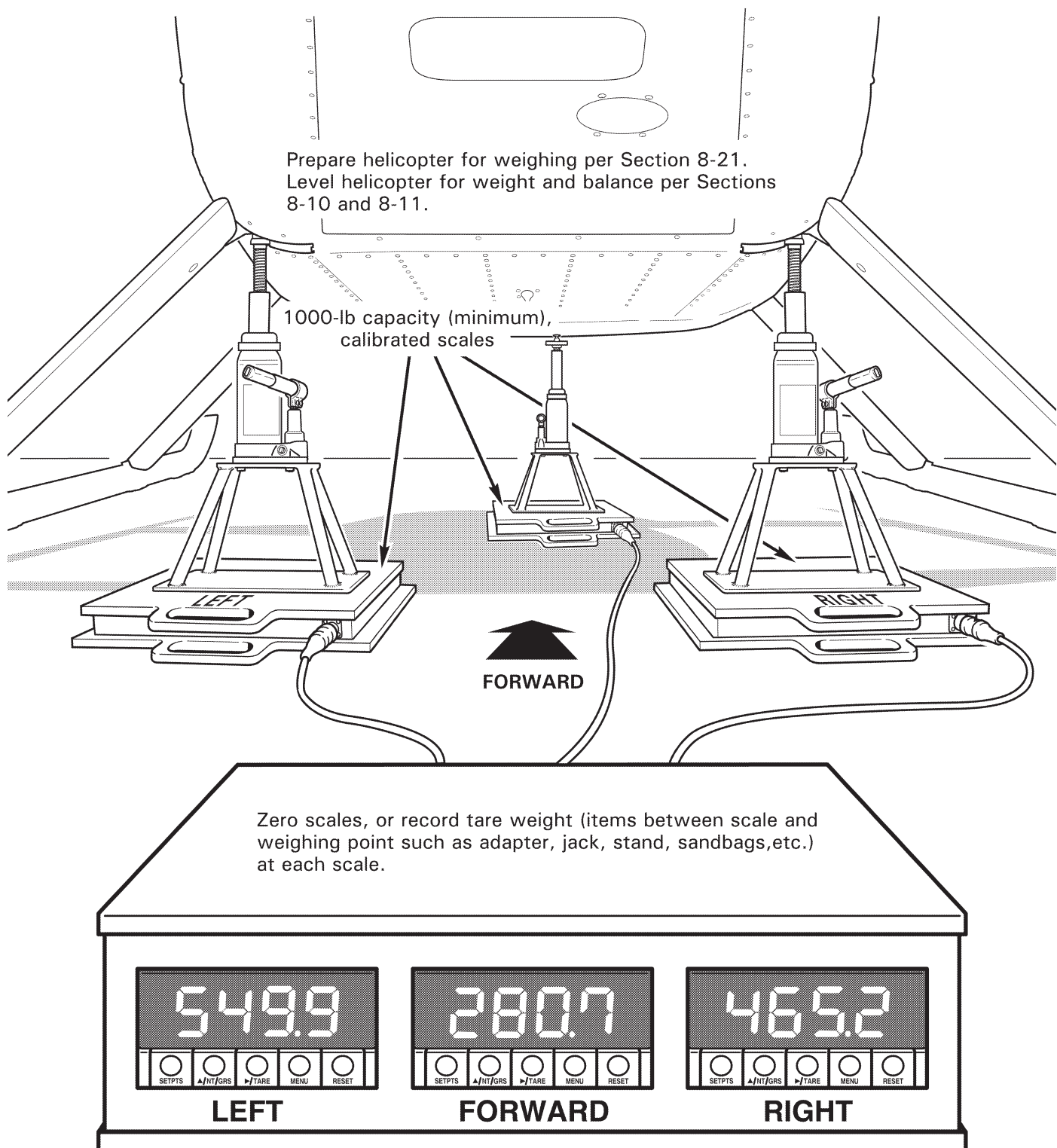


FIGURE 8-3 WEIGHING
(Scale indications for demonstration only)

8-22 Weighing Procedure and Calculations

NOTE

- Arm is the distance in inches from datum.
- Datum is located 100 inches forward of main rotor centerline.
- CG (arm) is determined by dividing total moment by total weight.

1. Refer to Section 8-20. Prepare helicopter for weighing per Section 8-21.
2. Refer to Figure 8-3. Place a jack and one 1000-lb capacity (minimum) scale under each (landing gear) aft strut assembly jack lug/tab and under the ground handling ball.
3. Zero scales, or record tare weight (items between scale and weighing point such as adapter, jack, stand, sandbags, etc.) at each scale.
4. Level helicopter for weight and balance per Sections 8-10 and 8-11. Remove spirit level. If removed, carefully replace F463-1 aft tunnel cover, unsecured, on top of keel panels.
5. Calculate net weights:

Weighing Point	Scale Indication	Tare Weight	Net Weight
Forward:	_____	_____	_____ lb
Left:	_____	_____	_____ lb
Right:	_____	_____	_____ lb

8-22 Weighing Procedure and Calculations (continued)

6. Calculate weight and CG per the following table. Adjust ballast per steps 6b thru 6e as required until calculated CG is between 101.50 and 102.50 per step 6a.

Item	Weight (lb)		Longitudinal CG (arm, inches)		Moment (in.-lb)
Forward Net:	_____	x	32.67	=	_____
Left Net:	_____	x	127.35	=	_____
Right Net:	_____	x	127.35	=	_____
Pilot (right forward seat; add):	160.00	x	49.00	=	7840.00
Unusable fuel (add):	6.70	x	110.40	=	739.68
<hr/>					
Calculated weight and CG:	_____		_____		_____

- a. If Calculated CG is between 101.50 and 102.50, (additional) ballast is not required. Proceed to step 7.
- b. If Calculated CG is less than 101.50 and nose ballast is not installed, install empennage ballast per Section 8-32. Reweigh helicopter and calculate new weight and CG per the previous steps.
- c. If Calculated CG is less than 101.50 and nose ballast is installed, determine (minimum) nose ballast to remove:

$$\frac{(102.50 - \text{Calculated CG}) \times \text{Calculated weight}}{97.35} = \text{_____ lb}$$

Round down to nearest 0.25 lb. Remove nose ballast per Section 8-31. Reweigh helicopter and calculate new weight and CG per the previous steps.

- d. If Calculated CG is greater than 102.50 and empennage ballast is installed, remove empennage ballast per Section 8-32. Reweigh helicopter and calculate new weight and CG per the previous steps.
- e. If Calculated CG is greater than 102.50 and empennage ballast is not installed, determine (minimum) additional nose ballast required:

$$\frac{(\text{Calculated CG} - 102.50) \times \text{Calculated weight}}{97.35} = \text{_____ lb}$$

Round up to nearest 0.25 lb. Install nose ballast per Section 8-31. Reweigh helicopter and calculate new weight and CG per the previous steps.

7. Lower helicopter per Section 7-10. Secure aft tunnel cover.

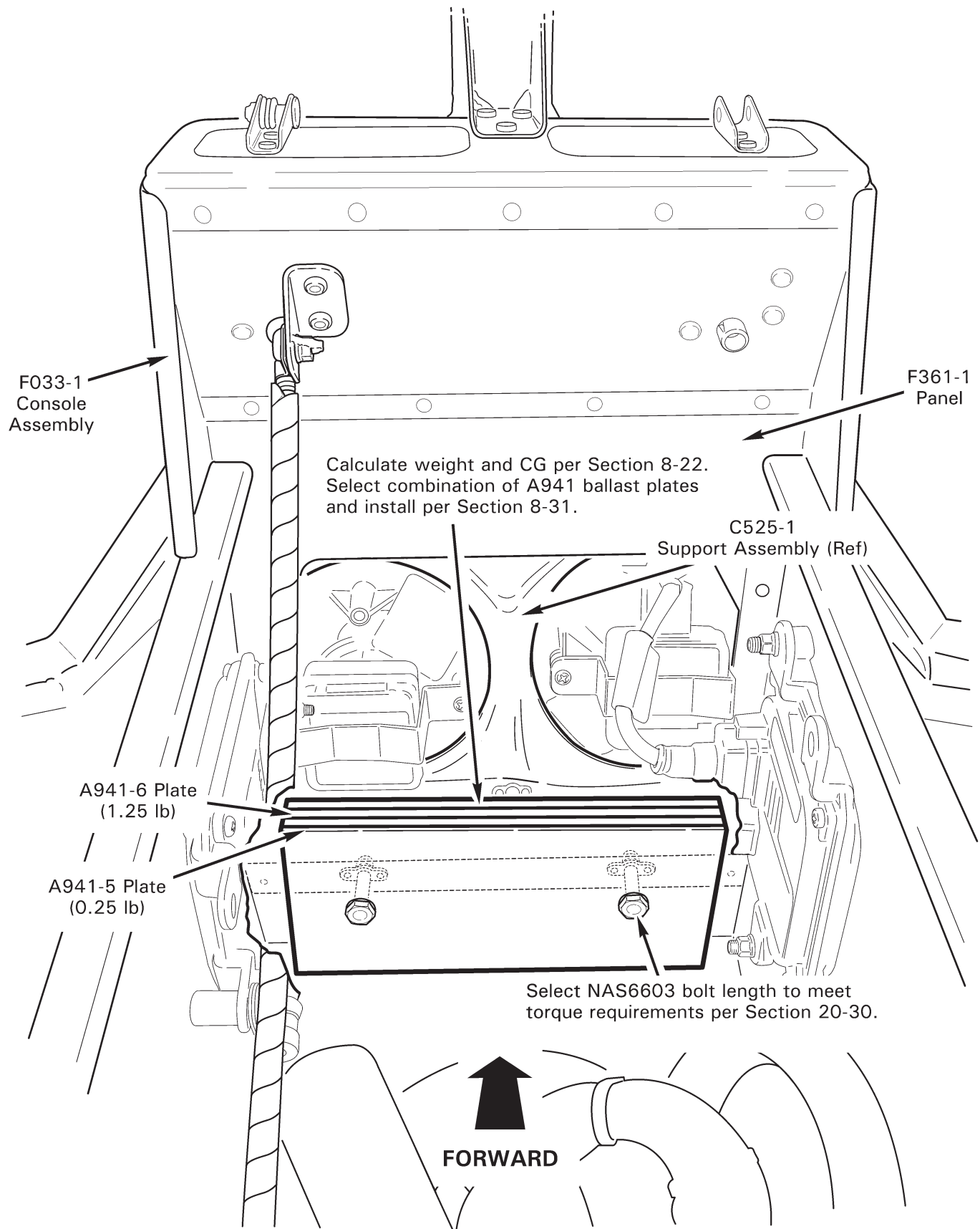
8-22 Weighing Procedure and Calculations (continued)

8. Calculate basic empty weight and longitudinal CG:

Item	Weight (lb)	Longitudinal CG (arm, inches)	Moment (in.-lb)
Forward Net:	_____ x	32.67	= _____
Left Net:	_____ x	127.35	= _____
Right Net:	_____ x	127.35	= _____
Unusable fuel (add):	6.70 x	110.40	= 739.68
Basic empty weight and longitudinal CG:	_____	_____	_____

9. Calculate basic empty weight and lateral CG:

Item	Weight (lb)	Lateral CG (arm, inches)	Moment (in.-lb)
Forward Net:	_____ x	4.13	= _____
Left Net:	_____ x	- 16.73	= _____
Right Net:	_____ x	16.73	= _____
Unusable fuel (add):	6.70 x	- 20.70	= - 138.69
Basic empty weight and lateral CG:	_____	_____	_____

**FIGURE 8-4 NOSE BALLAST**

(View inside lower console assembly with upper console hinged aft)

8-30 Fixed Ballast

8-31 Nose Ballast

Refer to R66 Illustrated Parts Catalog (IPC) Figure 8-1.

NOTE

Maximum allowable nose ballast is 15.00 lb.

CAUTION

Altering fixed ballast can appreciably affect helicopter center of gravity (CG). If fixed ballast information is unknown, reweigh helicopter per Section 8-22.

1. Refer to Figure 8-4. Remove screws securing B050-22 or -23 upper console assembly to F033-1 lower console assembly and hinge upper console assembly aft. Protect instrument face with foam support or equivalent.
2. Remove hardware securing A941-5 or -6 ballast plate(s), if installed, to F361-1 panel.
3. Remove or install ballast plates per calculations performed in Section 8-22. Select NAS6603 bolt length to meet torque requirements per Section 20-30. Install hardware, torque bolts per Section 20-32, and torque stripe per Figure 5-1.
4. Hinge upper console assembly forward and install screws securing upper and lower console assemblies. Verify security.
5. Reweigh and/or calculate basic empty weight and CG per Section 8-22.
6. Revise Weight and Balance Record in R66 Pilot's Operating Handbook (POH) Section 6 to reflect ballast removal or installation using the following data:

	Weight	Longitudinal Arm	Longitudinal Moment	Lateral Arm	Lateral Moment
Nose ballast	0-15.00 lb	5.15 in.	Variable	0.00 in.	0.00 in.-lb

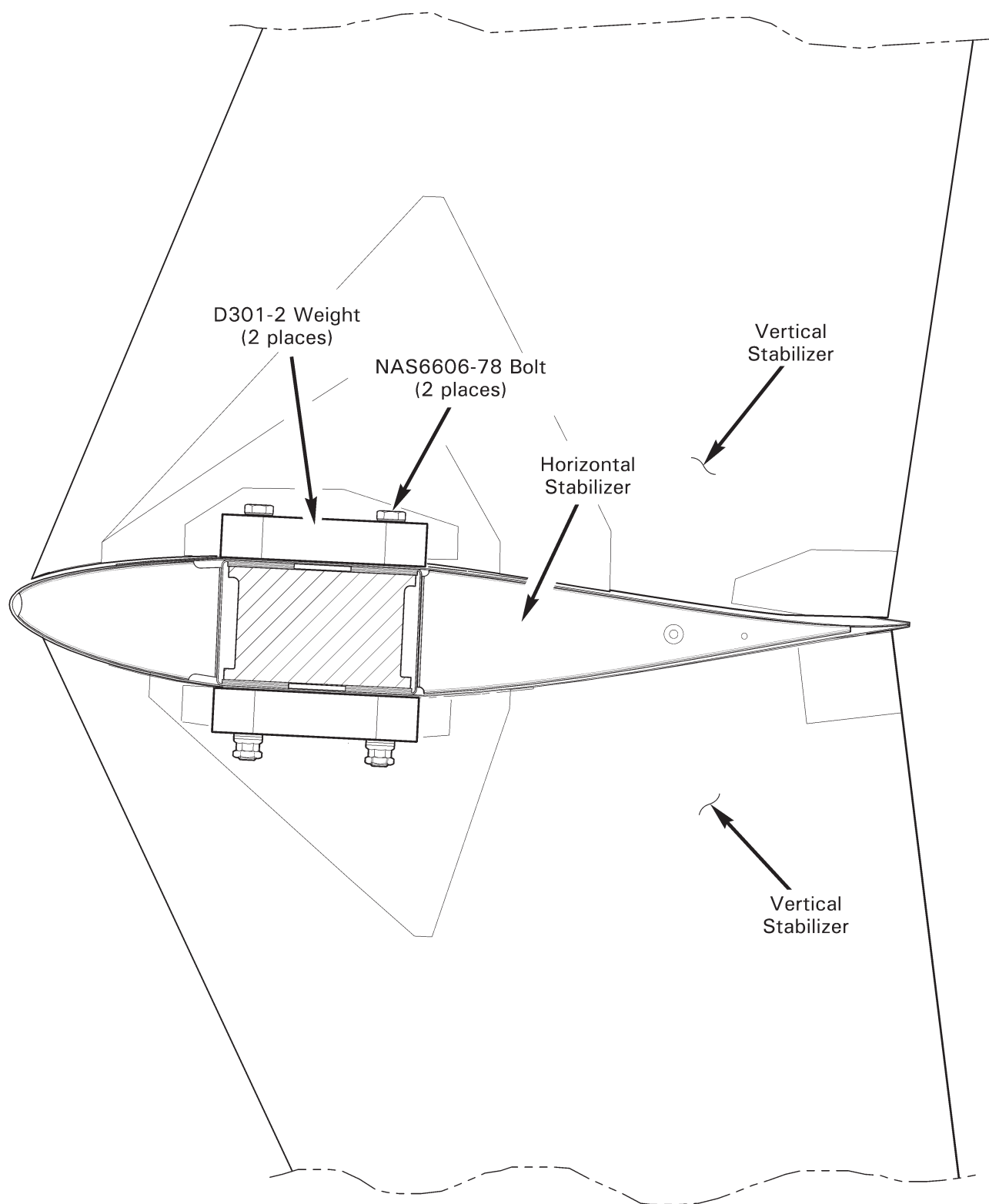


FIGURE 8-5 EMPENNAGE BALLAST

8-32 Empennage Ballast

NOTE

Use only approved materials listed in § 20-70.

CAUTION

Altering fixed ballast can appreciably affect helicopter center of gravity (CG). If fixed ballast information is unknown, reweigh helicopter per § 8-22.

CAUTION

Maximum allowable empennage ballast is 3.00 lb (except Police and E.N.G. Versions).

A. Removal

1. Refer to Figure 8-5. Remove empennage assembly, including D301-2 ballast weights, per § 53-50.
2. Solvent-clean bare metal around and between bolt holes on horizontal stabilizer upper and lower surfaces.
3. Apply light coat zinc-chromate or epoxy primer to bare metal surfaces. While primer is wet, install empennage assembly per § 53-50. Topcoat hardware with colored paint as desired.
4. Reweigh and/or calculate basic empty weight and CG per § 8-22.
5. Revise Weight and Balance Record in R66 Pilot's Operating Handbook (POH) Section 6 to reflect ballast removal using the following data:

Item	Weight	Longitudinal Arm	Longitudinal Moment	Lateral Arm	Lateral Moment
Empennage Ballast	3.00 lb	325.44 in.	976.32 in.-lb	4.45 in.	13.35 in.-lb

B. Installation

1. Refer to Figure 8-5. Remove empennage assembly per § 53-50.
2. Solvent-clean bare metal around and between bolt holes on horizontal stabilizer upper and lower surfaces.
3. Temporarily install D301-2 weights per IPC Figure 8-1. Torque bolts per § 20-32.
4. Trace outline of weights onto horizontal stabilizer upper and lower surfaces using felt-tip, non-permanent marker or tape. Remove weights.

8-32 Empennage Ballast (continued)**B. Installation (continued)**

5. Remove paint within traced outlines on stabilizer by block sanding (to maintain flatness). Finish sanding using 320-grit or finer wet-or-dry sandpaper, or using approved stripper per § 20-71. Similarly, on each D301-2 weight, remove paint from one flat surface which will clamp against stabilizer.
6. Remove tracing media. Solvent-clean bare metal on horizontal stabilizer and weight clamping surfaces.
7. Reweigh and/or calculate basic empty weight and CG per § 8-22.
8. Revise Weight and Balance Record in R66 Pilot's Operating Handbook (POH) Section 6 to reflect ballast installation using the following data:

Item	Weight	Longitudinal Arm	Longitudinal Moment	Lateral Arm	Lateral Moment
Empennage Ballast	3.00 lb	325.44 in.	976.32 in.-lb	4.45 in.	13.35 in.-lb