

Summary Report for Individual Task
551-88H-1508
Mark Center of Balance for a Multi-axle or Tracked Vehicle
Status: Approved

Distribution Restriction: Approved for public release; distribution is unlimited.

Destruction Notice: None

Foreign Disclosure: FD5 - This product/publication has been reviewed by the product developers in coordination with the Transportation School, Fort Lee, VA foreign disclosure authority. This product is releasable to students from all requesting foreign countries without restrictions.

Condition: Assigned as a CargoChecker Handler in an operational environment, during day or night, in normal weather conditions, given a requirement to mark the center of balance for a multi-axle or tracked vehicle, a completed risk assessment, a safety briefing, safety clothing and protective equipment, a multi-axle vehicle or tracked vehicle with operator, masking tape, black marker, calculator, pencil, note pad, clipboard, tape measure, a minimum of two calibrated scales, wooden beam, and references. This task should not be trained in MOPP 4.

Standard: Mark center of balance for a multi-axle or tracked vehicle without injury to personnel or damage to equipment.

Special Condition: None

Safety Risk: Medium

MOPP 4: Never

Task Statements

Cue: Your unit has been tasked to mark center of balance for Multi-axle or Tracked vehicles for deployment/redeployment.

DANGER

Adhere to all DANGER statements listed in the equipment or vehicle technical operator's manual applicable to this procedure. Failure to comply may result in injury to personnel or damage to equipment.

WARNING

Adhere to all WARNING statements listed in the equipment or vehicle technical operator's manual applicable to this procedure. Failure to comply may result in injury to personnel or damage to equipment.

CAUTION

Adhere to all CAUTION statements listed in the equipment or vehicle technical operator's manual applicable to this procedure. Failure to comply may result in injury to personnel or damage to equipment.

Remarks: None

Notes: None

Performance Steps

1. Identify all vehicle measurement points (see Figure 3-5).

Note: The following terms are used to calculate the center of balance:

CB = Center of balance - Vehicle center of balance measured in inches from the reference datum line (RDL).

RDL = Reference datum line - The forward front edge of the vehicle.

FAW = Front axle weight - The total weight of the front axle measured in pounds.

FFE = Front Forward Edge.

IAW = Intermediate axle weight - The total weight of the intermediate axle measured in pounds.

RAW = Rear axle weight - The total weight of the rear axle measured in pounds.

GW = Gross weight - Total weight of the vehicle measured in pounds.

D-1 = Distance-1 - The distance from the RDL to the center of the front axle measured in inches.

D-2 = Distance-2 - The distance from the RDL to the center of the intermediate axle measured in inches.

D-3 = Distance-3 - The distance from the RDL to the center of the rear axle measured in inches.

FOH = Front overhang - distance in inches from front bumper to center of front axle.

ROH = Rear overhang - distance from rear axle or center of tandem axles to rear bumper.

WB = Wheel base - distance in inches from center of front axle to center of rear axle or center of tandem axles.

W-1 = Weight-1 - Total weight of the front axle measured in pounds.

W-2 = Weight-2 - Total weight of the intermediate axle measured in pounds.

W-3 = Weight-3 - Total weight of the rear axle measured in pounds.

Moment = The product obtained by multiplying the axle weight by the distance of that axle from the RDL.

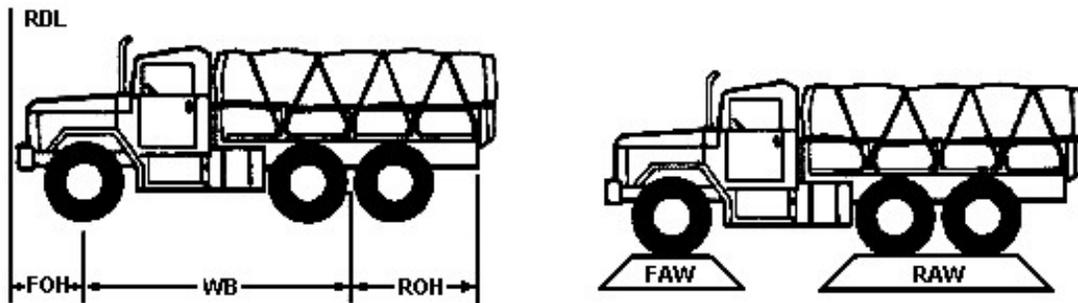


Figure 3-5
Vehicle Measurement Points

CAUTION

You must ground guide the vehicle every time it moves. Do not stand directly in front of the vehicle while ground guiding it.

2. Weigh axles (see Figure 3-6).

- a. Instruct driver to position front axle of vehicle on scales.
- b. Instruct driver to apply parking brake, turn off ignition, and dismount vehicle.
- c. Obtain weight from scales for front axle.
- d. Combine the weight from the two scales to make (W1).
- e. Record (FAW) on note pad as W1.
- f. Apply strip of masking tape above front axle on both sides of the vehicle.
- g. Record (FAW) on the masking tape. (example: FAW 12,500 pounds)

- h. Instruct driver to remount vehicle and drive forward until the intermediate axle is centered on the scales.
- i. Instruct driver to apply parking brake, turn off ignition, and dismount vehicle.
- j. Obtain weight from the scales for intermediate axle.
- k. Combine weight from the two scales to make (W2).
- l. Record (IAW) on note pad as W2.
- m. Apply strip of masking tape above intermediate axle on both sides of vehicle.
- n. Record (IAW) on the masking tape. (example: IAW = 12,900 pounds).
- o. Instruct driver to remount vehicle and drive forward until the rear axle is centered on the scales.
- p. Instruct driver to apply parking brake, turn off ignition, and dismount the vehicle.
- q. Obtain weight from scales for the rear axle.
- r. Combine the weight from the two scales to make (W3).
- s. Record (RAW) on note pad as W3.
- t. Apply strip of masking tape above the rear axle on both sides of the vehicle.
- u. Record (RAW) on the masking tape. (example: RAW 12,700 pounds)
- v. Order driver to remount vehicle and drive forward until vehicle has cleared the scales.

Note: If enough portable scales are available, the entire vehicle can be taken onto the scales at one time. Chalk can be used if tape is not available.

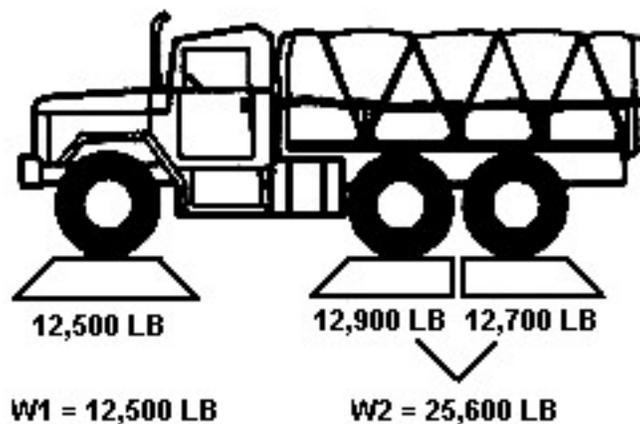


Figure 3-6
Axle Weights

3. Measure axle distances (see Figure 3-7).

Note: Measure the intermediate and rear axles separately when they are 48 inches or more apart measured from center to center.

- a. Measure distance from the RDL to the center of the front axle wheel hub.
- b. Record distance on worksheet as D1 in inches (example: D1 = 70 inches).
- c. Measure from the RDL to the center of the intermediate axle wheel hub.
- d. Record distance on worksheet as D2 in inches (example: D2 = 222 inches).
- e. Measure from the RDL to the center of the rear axle wheel hub.
- f. Record distance on the worksheet as D3 in inches (example: D3 = 276 inches).

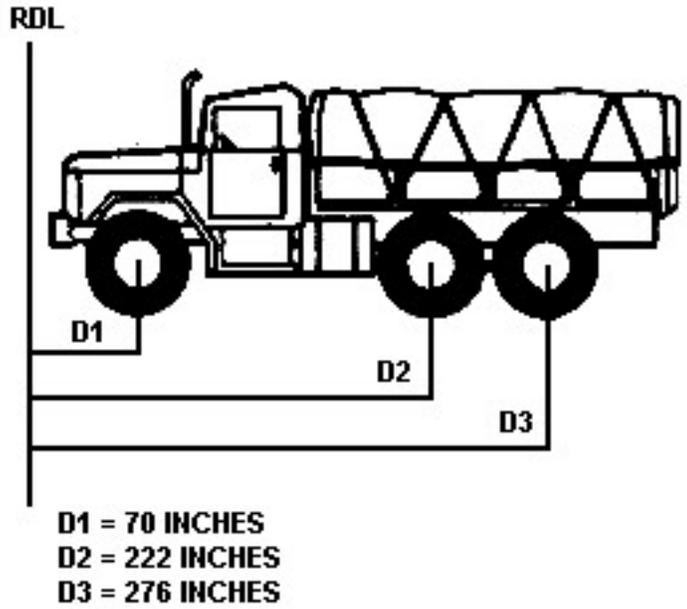


Figure 3-7
Axle Distances

4. Determine axle distance for tandem axle vehicles (see Figure 3-8).
- Note: Compute CB from RDL to tandem midpoint. Use this method only when intermediate and rear axles are less than 48 inches apart measured from the center of intermediate to the center of the rear axle.
- a. Measure distance from the RDL to the center of the front axle wheel hub.
 - b. Record distance on the worksheet as D1 in inches (example: D1 = 70 inches).
 - c. Measure from the RDL to the center of the tandem axles.
 - d. Record distance on the worksheet as D2 in inches (example: D2 = 249 inches).

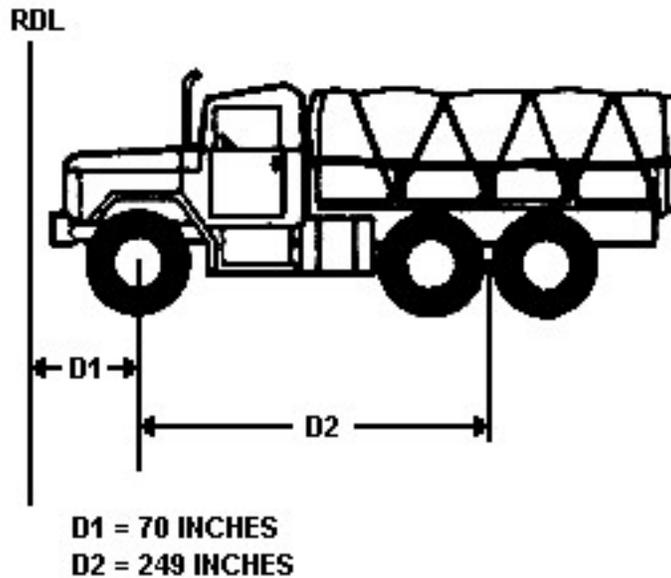


Figure 3-8
Determining Axle Distance for Tandem Axle Vehicles

5. Compute center of balance.
 - a. Determine moments by multiplying weights by distances to obtain moments and then adding moments together.
 - b. Determine gross weight by adding all axle weights together.
 - c. Divide the total moments by the gross weight to obtain the center balance in inches.
 - d. Round off answer to the nearest whole inch (example: 56.9 inches is rounded up to 57 inches).

Example formula (see Figure 3):
 3-axle vehicle:
$$\frac{[(W1 \times D1) + (W2 \times D2) + (W3 \times D3)]}{\text{Gross Weight}} = \text{Center of Balance}$$

Example computation:

$$\frac{(70" \times 12,500 \text{ lbs}) + (222" \times 12,900 \text{ lbs}) + (276" \times 12,700 \text{ lbs})}{38,100 \text{ lbs}} = 190" \text{ from RDL}$$

Note: When using tandem formula, simply add the weight of the intermediate and rear axles to form one weight (W2). In this case there would not be a W3.

Example formula:
 Tandem-axle vehicle:
$$\frac{[(W1 \times D1) + (W2 \times D2)]}{\text{Gross Weight}} = \text{Center of Balance}$$

Example computation:

$$\frac{(70" \times 12,500 \text{ lbs}) + (249" \times 25,600 \text{ lbs})}{38,100 \text{ lbs}} = 190" \text{ from RDL}$$

6. Mark center of balance.
 - a. Measure from RDL to CB distance that was obtained from computations (see Figure 3-9).
 - b. Mark CB by forming a T-shape with masking tape or by making "T" with chalk; the vertical portion of the "T" represents the center of balance mark (see Figure 3-10).

- c. Write gross weight on the horizontal portion of the "T" formed by the masking tape or chalk mark.
- d. Write the letters "CB" on the vertical portion of the T-shape; also annotate the CB in inches. (example: 190 inches)

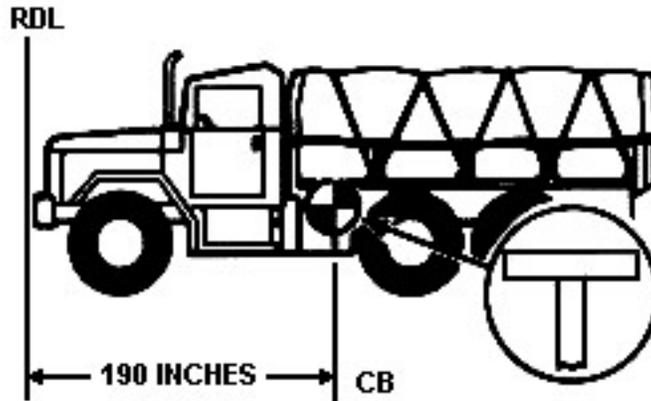


Figure 3-9
Measuring from RDL to CB

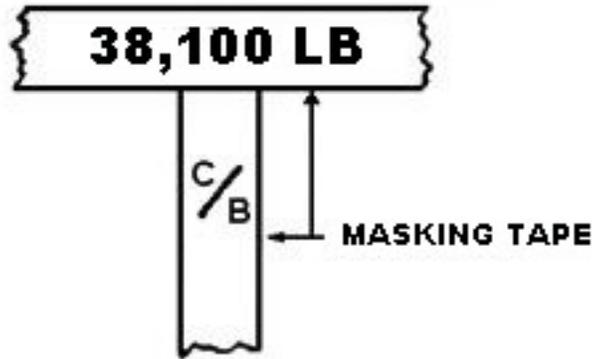


Figure 3-10
Marking the CB

7. Determine the weight of a tracked vehicle.
 - a. Order driver to drive vehicle onto a platform scale large enough to accommodate the entire vehicle (see Figure 3-11).
 - b. Record weight of tracked vehicle.

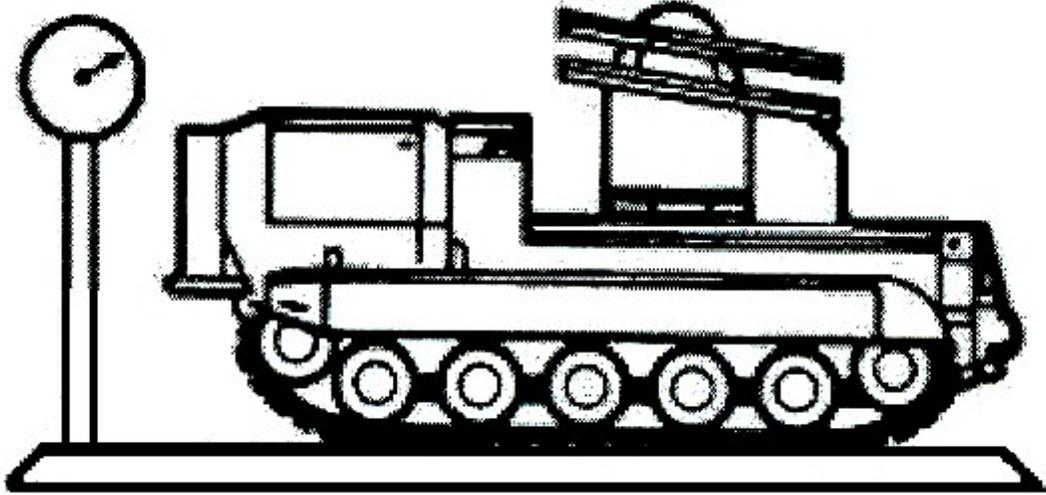


Figure 3-11
Determining the Weight of a Tracked Vehicle

8. Determine center of balance of a tracked vehicle.
 - a. Order driver to drive the vehicle onto a wooden beam or pole until the vehicle tilts forward (see Figure 3-12).
 - b. Mark the side of the vehicle at the point of tilt.

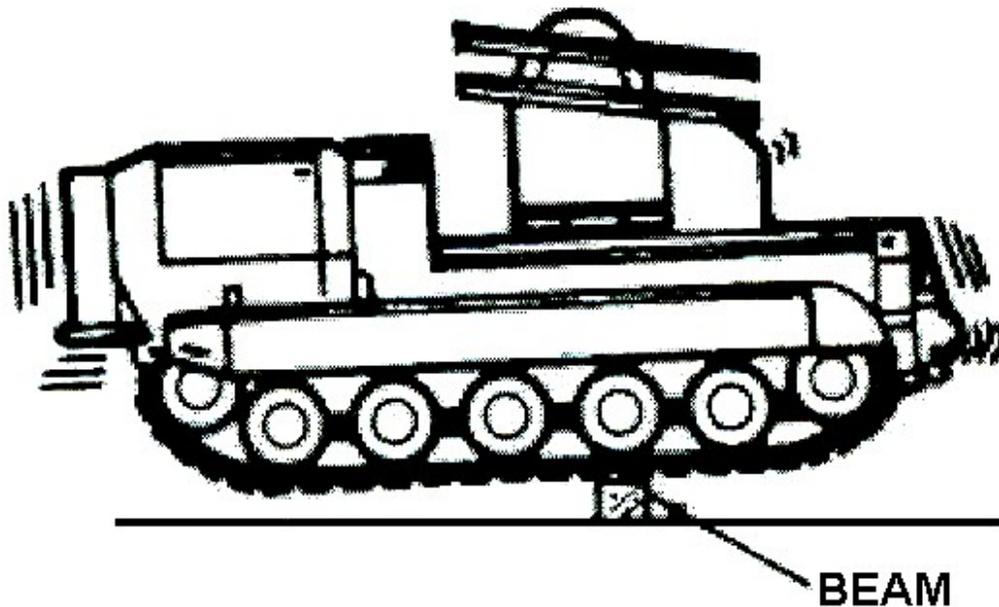


Figure 3-12
Determining the Center of Balance of a Tracked Vehicle

9. Mark center of balance and gross weight of a tracked vehicle.

(Asterisks indicates a leader performance step.)

Evaluation Guidance: Score the Soldier GO if all performance steps are passed (P). Score the Soldier NO-GO if any performance step is failed (F). If the Soldier fails any step, show what was done wrong and how to do it correctly.

Evaluation Preparation: Ensure that all materials required to perform the task are available. Tell the Soldier that he/she will be evaluated on marking the center of balance for a multi-axle or tracked vehicle.

PERFORMANCE MEASURES	GO	NO-GO	N/A
1. Identified vehicle measurement points.			
2. Weighed axles.			
3. Measured axle distances.			
4. Determined axle distance for tandem axles (if applicable).			
5. Computed center of balance.			
6. Marked center of balance.			
7. Determined weight of tracked vehicle.			
8. Determined center of balance of tracked vehicle.			
9. Marked center of balance and gross weight of tracked vehicle.			

Supporting Reference(s):

Step Number	Reference ID	Reference Name	Required	Primary
	DTR 4500.9-R	Part II Cargo Movement	Yes	No
	TB 55-46-1	Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Other Outsize/Overweight Equipment (in TOE Line Item Number Sequence)	Yes	No
	TC 4-13.17	Cargo Specialist's Handbook	Yes	No

Environment: Environmental protection is not just the law but the right thing to do. It is a continual process and starts with deliberate planning. Always be alert to ways to protect our environment during training and missions. In doing so, you will contribute to the sustainment of our training resources while protecting people and the environment from harmful effects. Refer to FM 3-34.5 Environmental Considerations and GTA 05-08-002 ENVIRONMENTAL-RELATED RISK ASSESSMENT.

AR 200-1 delineates TRADOC responsibilities to integrate environmental requirements across DOTMLPF and ensures all training procedures, training manuals, and training doctrine includes sound environmental practices and considerations. The Army's environmental vision is to be a national leader in environmental and natural resource stewardship for present and future generations as an integral part of all Army missions. Environmental protection is never completed. Continuously be alert to ways to protect our environment and reduce waste.

Leaders must ensure that their unit has an active and strong environmental program. They must understand the laws and know what actions to take. Leaders bring focus, direction, and commitment to environmental protection. They should ensure the following environmental programs are in place and are being maintained:

- Hazardous materials program.
- Hazardous waste program.
- Hazardous communications program.
- Pollution prevention and hazardous waste minimization recycling program.
- Spill prevention and response plan program.

Safety: In a training environment, leaders must perform a risk assessment in accordance with ATP 5-19, Risk Management. Leaders will complete the current Deliberate Risk Assessment Worksheet in accordance with the TRADOC Safety Officer during the planning and completion of each task and sub-task by assessing mission, enemy, terrain and weather, troops and support available-time available and civil considerations, (METT-TC). Note: During MOPP training, leaders must ensure personnel are monitored for potential heat injury. Local policies and procedures must be followed during times of increased heat category in order to avoid heat related injury. Consider the MOPP work/rest cycles and water replacement guidelines IAW FM 3-11.4, Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection, FM 3-11.5, Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination.

All Soldiers and leaders must maintain a proactive posture towards safety in day-to-day operations. The need for total commitment to safety should be evident to commanders, senior soldiers, and their subordinates. The importance of safety

is intensified for personnel conducting Airfield operations. Safety awareness is most effective at three levels: command, leader, and individual. Observe all Warnings and Cautions and remain aware of the following:
 -Hearing protection requirements.

All operations will be performed to protect and preserve Army personnel and property against accidental loss. Procedures will provide for public safety incidental to Army operations and activities and safe and healthful workplaces, procedures, and equipment. Observe all safety and/or environment precautions regarding electricity, cable, and lines. Provide ventilation for exhaust fumes during equipment operation and use hearing protection when required IAW AR 385-10, the Clean Air Act (CAA) and the CAA amendments, and the OSHA Hazard Communication standard.

Accidents are an unacceptable impediment to Army missions, readiness, morale, and resources. Decision makers at every level will employ risk management approaches to effectively preclude unacceptable risk to the safety of personnel and property affiliated with this task.

- (a) Take personal responsibility.
- (b) Practice safe operations.
- (c) Recognize unsafe acts and conditions.
- (d) Take action to prevent accidents.
- (e) Report unsafe acts and conditions.
- (f) Work as a team.

Prerequisite Individual Tasks : None

Supporting Individual Tasks : None

Supported Individual Tasks :

Task Number	Title	Proponent	Status
551-88H-2508	Direct Marking Center of Balance for a Multi-axle or Tracked Vehicle	551 - Transportation (Individual)	Approved
551-88H-4502	Monitor Air Terminal Operations	551 - Transportation (Individual)	Superseded
551-88H-3512	Manage Aircraft Load Teams	551 - Transportation (Individual)	Superseded

Supported Collective Tasks :

Task Number	Title	Proponent	Status
55-2-4821	Perform Aerial Port of Debarkation Activities for Redeployment	55 - Transportation (Collective)	Approved
55-5-0043	Conduct Aerial Port of Debarkation Operations	55 - Transportation (Collective)	Approved

ICTL Data :

ICTL Title	Personnel Type	MOS Data
MOS 88H - CARGO SPECIALIST SL1	Enlisted	MOS: 88H, Skill Level: SL1, Duty Pos: TAZ
MOS 88H - CARGO SPECIALIST SL2	Enlisted	MOS: 88H, Skill Level: SL2, Duty Pos: ABW
MOS 88H - CARGO SPECIALIST SL3	Enlisted	MOS: 88H, Skill Level: SL3, Duty Pos: TBA
MOS 88H - CARGO SPECIALIST SL4	Enlisted	MOS: 88H, Skill Level: SL4, Duty Pos: TGI