CHAPTER 3
MOTOR TRANSPORT

Motor transport is the backbone of the Army's support and sustainment structure, providing mobility on and off the battlefield. Trucks transport personnel, munitions, replacement combat vehicles, petroleum products, critical supply items, and combat casualties. This chapter addresses organizational and operational aspects of the motor transport unit and provides information needed in planning successful operations.

Section I
ORGANIZATION AND OPERATIONS

UNIT ADMINISTRATION

Appendix A contains a breakdown of Army motor transport units according to TOE, mission, assignment, and capability. Figure 3-1 is a sample SOP format for motor transport movements within divisions, logistic commands, and higher echelons. See Figure 3-2, page 3-2, for a sample SOP format for motor transport service. To furnish routine vehicle commitments to subordinate units, use a locally reproduced format. See Figure 3-3, page 3-3, for a sample vehicle commitment work sheet.

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Classification

STANDING OPERATING PROCEDURE

1. GENERAL. Policies and factors involved in movements.

a. Highway regulation. Purpose, application/scope, responsibilities, methods and procedures.

b. Convoy clearance. Minimum vehicle requirements; convoy symbols; procedures; format for requesting and furnishing clearance; routing; halts; convoy composition; restrictions on tracked, overweight, or outsize vehicles.

c. Highway regulation points. Purpose, basis for, responsibilities and procedures, required records.

d. Traffic control. Responsibilities, relationship to highway regulation, coordination with provost marshal.

e. Return loads. Policies, methods, and procedures for securing and reporting.

f. Convoy commanders. Appointment, responsibilities, and functions; relationships with transportation personnel; instructions to be furnished.

g. Halts. Types; policies, procedures, and responsibilities; area policing.

h. Security. Responsibilities; defensive measures.

i. Records and reports. Responsibilities, methods, required reports.

Figure 3-1. Sample format for motor transport movements SOP

j. Communications. Responsibilities, means of communication.

k. Environment. Protection, spill prevention, transporting HAZMAT.

2. SUPPLY MOVEMENTS

a. Releases. When required, methods of obtaining, formats, dissemination, actions required.

b. Diversions and reconsignments. Authority, request procedures.

c. Records and reports. Types of required records and reports.

Classification

Figure 3-1. Sample format for motor transport movements SOP (continued)

Classification

STANDING OPERATING PROCEDURE

1. GENERAL. Policies for control, operation, and maintenance of facilities equipment, and installation; command responsibility; technical supervision required and agencies involved.

2. MISSION. Service provided, extent of operation.

3. ORGANIZATION. Available operating units, location, and operating limits.

4. FUNCTIONS. Scheduled and nonscheduled operations; maintenance of equipment, including responsibilities, procedures, facilities, and inspection practices.

5. PLANNING. Troop and equipment requirements, capability estimates, communication procedure and requirements, rehabilitation requirements.

6. OPERATIONS. Operational procedures and controls, pooling and equipment use.

7. MAINTENANCE. Responsibilities and procedures for maintenance, regulations, and reports.

8. SUPPLY. Responsibilities for supplies, authorized levels, requisitioning procedures, accounting methods, disposal of excesses.

9. INTELLIGENCE AND RECONNAISSANCE. Responsibilities for collection, collation, evaluation, and dissemination of highway transportation intelligence and reconnaissance information.

10. SECURITY. Responsibilities for disaster and defense plans, convoy and cargo security, equipment and facilities.

11. ENVIRONMENT. Responsibilities and procedures for safeguarding water, vegetation, and wildlife. Spill prevention procedures.

12. RECORDS AND REPORTS. Responsibilities for operational and personnel status reports, technical reports, and miscellaneous records/reports.

13. TRAINING. Responsibilities for unit and technical training.

Classification

Figure 3-2. Sample format for motor transport service SOP

20th Transportation Battalion (Truck)
AE APO 00000

Date 24 Sep '96

Subject: Vehicle Commitment

To: CO 86th Trans Co. Mdm (Cgo)

Commitment No 9-108

1. Vehicles w/drivers: 7-12T S&P

Report to: Major Eason

Location: Q200, Warehouse 19

Time: 0730 Date: 25 Sep '96

To transport: 77 tons dry rations.

Destination: Q166, Ludwigsburg -
Trans Off. Bldg. A8

2. Remarks: No return load scheduled
POL available at Q166 for
refueling.

C.H. Mitchell
(Signature)

Major S-3
(Rank & Title)

Figure 3-3. Sample vehicle commitment work sheet

Convoy Briefing

The commander briefs all convoy members before the convoy departs on its mission. A number of topics should be addressed in an effective briefing. With adjustments to local conditions, this briefing should include the following information.

Situation:
- Enemy forces.
- Friendly forces.
- Support units.

Mission:
- Type of cargo.
- Origin.
- Destination.

Execution:
- General organization.
- Time schedule.
- Routes.
- Convoy speed.

- Catch-up speed.
- Vehicle distance.
- Emergency measures (for accidents, breakdowns, and separation from convoy).
- Action of convoy and security personnel if ambushed.
- Medical support.

Administration and logistics:

- Personnel control.
- Billeting.
- Messing.
- Refueling and servicing of vehicles, complying with spill prevention guidelines.

Command and signal:

- Convoy commander's location.
- Assistant convoy commander designation (succession of command).
- Action of security forces commander.
- Serial commanders' responsibilities.
- Arm and hand signals.
- Other prearranged signals.
- Radio frequencies and call signs (for control personnel, security force commanders, fire support elements, reserve security elements, medical evacuation support).

Safety:

- Hazards of route.
- Weather conditions.
- Defensive driving.

Environmental Protection:

- Spill prevention.
- Transporting HAZMAT.

Convoy Commander's Checklist

Before departing, convoy commanders should review the following questions to ensure that arrangements are complete:

- Where is the SP? The RP?
- What route is to be used?
- Has reconnaissance been made? Condition of route determined?
- Can bridges, tunnels, underpasses, and defiles safely accommodate all loaded and tracked vehicles?
- Are critical points known and listed on strip maps?
- What is the size of serials?
- What is the size of march units?
- What is the rate of march?
- What is the vehicle interval on an open road? In built-up areas? At halt?
- What type of column will be used?
- Has provision been made for refueling?
- Has a suitable operations area been selected?
- Have suitable rest- and mess-halt areas been selected?
- Is road movement table needed? Prepared? Submitted?
- Have convoy clearances been obtained? What date?
- Is escort required? Has it been requested?
- Are spare trucks available for emergencies?
- Are vehicles fully serviced and ready for loading?
- Is load properly blocked and braced, neat, and balanced?
- Are drivers properly briefed? By whom? When? Strip maps furnished?
- Is convoy marked front and rear of each march unit? With convoy number when required? Is each vehicle marked? Are convoy flags on the vehicles?
- Are guides in place? Have arrangements been made to post guides?
- Are blackout lights functioning?
- Have maintenance services been alerted?
- Is maintenance truck in rear? Are medics in rear? Is there a loan for casualties?
- Are all interested parties advised of ETA?
- Is officer at rear of convoy ready to take necessary corrective action, such as investigating accidents and unusual incidents and changing loads?
- Who is the trail officer?
- Is there a truck load plan? Who is responsible?
- Is there a truck unload plan? Who is responsible? Do they have the necessary equipment?
- Is there a plan for feeding personnel?
- Have times been established for loading trucks?

• Has time been established for formation of convoy?

• Have times been established for unloading trucks?

• Has time been established for releasing trucks? Who is responsible?

• Is there a carefully conceived plan known to all convoy personnel that can be used in case of an attack?

• Is a written OPORD on hand if required?

• Will a log of road movement be required at end of trip? Are necessary forms on hand?

• Has a weather forecast been obtained?

• Do all personnel have proper clothing and equipment?

• Is there a communications plan? Where will communications equipment be located? Has all communications equipment been serviced?

Convoy Commander's Report

After the move is completed, the convoy commander prepares a report for submission to his immediate superior officer (if required by higher command). A sample report is shown in Figure 3-4, page 3-6. The report may be submitted in the format shown or in the form of a strip map with an appropriate legend attached.

Convoy Clearance

Units that move convoys on MSRs, ASRs, or other controlled routes that require a movement credit (an alphanumeric identifier) must request and receive clearance before beginning movement. A request to move on a controlled route is known as a movement bid. A movement bid is a form or message that details the itinerary of the move, the number and types of vehicles, and movement planning information. The authority to move is passed to the moving unit as a movement credit. The movement bid is submitted through the chain of command to the DTO or Corps/EAC MC detachment within whose area the movement originates. The information required varies according to local regulations. Based on local SOP, as well as the urgency of the requirement, the request may be transmitted in hard copy, electronically, or verbally. In CONUS, DD Forms 1265 and 1266 (Figures 3-5, page 3-8, and 3-6, page 3-10) serve as movement bids. In NATO, STANAGs 2154 and 2155 govern movement bids. Field manuals that contain detailed information on movements bids are FM 55-10 (overseas theaters) and FM 55-312 (CONUS).

In a theater of operations. Before beginning a road movement over a route requiring a movement credit, the unit submits a movement bid through the chain of command as stated above. The movement bid is a dual-purpose document. It can serve either as a request or as an authorization for movement, or both. The requesting agency uses the form to initiate a movement via highway. The movement control organization uses the form to grant clearance and to issue instructions for the road movement. Once the request is received, the movement control organization schedules the movement for the time and over the route requested (if possible). If the move cannot be scheduled at the requested time or on the requested route, the movement control organization notifies the requester. Alternate times and routes are then arranged. After final coordination and approval, the movement control organization issues the necessary movement credit, convoy movement number, and any other required information. The authorization is returned to the requesting agency.

In CONUS. A military convoy must gain permission from the appropriate state and city officials to travel on public highways. To obtain this permission, the following documents should be submitted through the ITO at point of origin:

• DD Form 1265.

• One copy of operations order.

• Four copies of strip map of the proposed convoy route.

• One copy of each document for each state to be crossed.

• One copy of each document for the local ITO.

The request must reach the approving authority (in most cases, the local ITO) at least 10 days before the planned move.

FORWARD LOAD

420 Trans Bn (Trk)		4401 Trans Co (Lt Trk)
28FE0lC (Convoy No)	Twelve 2 1/2-Ton Trucks (No. and type of task vehicles)	16 Feb XX (Date)

TIME

Departed starting point .... 0621 hr
Arrived 1st loading point .... 0630 hr
Departed 1st loading point .... 0800 hr
Time at 1st loading point .... 1 hr 30 min
Arrived HRP .... 1200 hr
Departed HRP .... 1205 hr
Time at 1st unloading point .... 33 min

SUPPLIES AND PERSONNEL

Cargo (STONs) 50.2
Class of supplies I
Number of personnel 0

DISTANCE

Odometer reading of lead vehicle (at 1st loading point) .... 21,324 mi
Odometer reading of lead vehicle (at starting point) .... 21,322 mi
Total forward (no load) .... 2 mi
Odometer reading of lead vehicle (at 1st unloading point) .... 21,381 mi
Total forward (loaded) .... 57 mi

REMARKS

Starting point – company area, RJ 124/167
Weak bridge 6.4 mi east of 1st loading point. Road generally in poor condition between starting point and 1st unloading point.

RETURN LOAD

TIME

Arrived 2d loading point (same as 1st unloading point) .... 1245 hr
Departed 2d loading point .... 1300 hr
Time at 2d loading point .... 15 min
Arrived 2d unloading point .... 1400 hr
Departed 2d unloading point .... 1415 hr
Time at 2d unloading point .... 15 min

Figure 3-4. Sample convoy commander's report

SUPPLIES AND PERSONNEL

Cargo (STONs) 10.0
Class of supplies ..... II and IV
Number of personnel 120

DISTANCE

Odometer reading of lead vehicle (at 2d unloading point) ..... 21,396 mi
Odometer reading of lead vehicle (at 2d loading point) ..... 21,381 mi
Total return (loaded) ..... 15 mi
Odometer reading of lead vehicle (at starting point) ..... 21,346 mi
Total return (no load) ..... 40 mi

REMARKS

Road in excellent condition between 2d loading point and starting point.

ROUND TRIP DATA

TIME

Returned to starting point ..... 1,654 mi
Total round trip time ..... 10 hr 33 min
Total travel time (including halts) ..... 8 hr
Total loading time ..... 1 hr 45 min
Total unloading time ..... 48 min

SUPPLIES AND PERSONNEL

Cargo (STONs of Class I) 50.2
(STONs of Class II and IV) 10.0
Number of personnel 120

DISTANCE

Total distance (loaded) ..... 72 mi
Total distance (unloaded) ..... 42 mi
Total round trip distance ..... 114 mi

REMARKS

Average rate of march = 14.2 MIH.
Ton-miles forward = 2,861; return = 150.
Passenger-miles forward = 0; return = 1,800.

/s/ ______________________

/t/ Thomas A. Young
(Convoy commander)

2d Lt, 4401 Trans Co (Lt Trk)
(Rank/grade and organization)

Figure 3-4. Sample convoy commander's report (continued)

REQUEST FOR CONVOY CLEARANCE

DATE: Jan XX

SECTION I - GENERAL

1. ORGANIZATION	2. STATION	3. CONVOY COMMANDER
100th Trans Co (Lt Med Trk)	Fort Eustis, VA 23604	John J. Jones 1LT, TC

4. PERSONNEL STRENGTH a. OFFICER	b. ENLISTED	5. POINT OF ORIGIN	6. DESTINATION
1	47	Fort Eustis, VA	Fort A. P. Hill, VA

7. DATE AND TIME	7a. DEPARTURE	7b. ARRIVAL	8. RATE OF MARCH
	20 0700 Jan XX	20 1002 Jan XX	40 MIH

SECTION II - CONVOY COMPOSITION

9. NUMBER OF EACH TYPE OF VEHICLE AND DESCRIPTION *(Include towed equipment)*

1 1/4-ton truck, utility
20 5-ton tractor w/19 stake and platform semitrailers (1 bobtail)
1 5-ton wrecker

SAMPLE

10. TOTAL NUMBER OF VEHICLES	11. NUMBER OF OVERSIZE/ OVERWEIGHT VEHICLES	12a. NO. OF SERIALS	12b. TIME INTERVAL	13a. NO. OF MARCH UNITS	13b. TIME INTERVAL
22	21	1	NA	2	2 min

SECTION III - ROUTE DATA

14. PROPOSED ROUTING *(Indicate US Routes, State Routes, etc)*

Interstate 64, State Route 168, State Route 33, Interstate 64, Interstate 95, State Route 207, US 301 to Fort A. P. Hill.

15. ETA AND ETD AT STATE LINES, MAJOR ROAD JUNCTIONS, MAJOR BRIDGES AND TUNNELS, METROPOLITAN AREAS AND OVERNIGHT HALT SITES *(Continue on a separate sheet if additional space is required)*

LOCATION	ETA	DATE	ETD	DATE
I-64	0700		0705	20 Jan XX
Rt # 168	0732		0737	
15-min rest halt, Rt # 33	0754		0814	
I-64	0835		0840	
I-95	0859		0904	
Rts 207-301	0957		1002	

SECTION IV - LOGISTICAL DATA

16. BRIEF GENERAL DESCRIPTION OF CARGO *(Brief general description; i. e., organizational impedimenta, etc.) (Within security limitations)*

Class I (packaged rations)

DD FORM 1 JAN 56 1265

Figure 3-5. Sample DD Form 1265, Request for Convoy Clearance

17. ARE EXPLOSIVES TO BE TRANSPORTED? ☐ YES ☒ NO (If YES, describe below)

CLASS	AMOUNT	DESCRIPTION	VEHICLES TO BE USED NO.	TYPE
		NA		

18. STATEMENT WHY EXPLOSIVES CANNOT BE TRANSPORTED COMMERCIALLY (Movements involving explosives and/or other dangerous articles are required to comply with all applicable regulations or directives)

NA

19. LOGISTICAL SUPPORT REQUIRED AT OVERNIGHT HALT SITES? ☐ YES ☒ NO (If YES, complete the following) (Use separate sheet if additional space is required)

DATE	INSTALLATION	GAS (gals)	OIL (qts)	RATIONS	BILLETS	OTHER
	NA					

20. REMARKS

ETA is the time the first vehicle clears the referenced point.

ETD is the time the last vehicle clears the referenced point.

SAMPLE

21. REQUESTING AGENCY		22. APPROVING AGENCY	
100th Trans Co (Lt Med Trk)			
23. REQUESTED BY (Typed name, grade and title)		24. APPROVED BY (Typed name, grade and title)	
CHARLES C. CHESTNUT			
25. DATE 5 Jan XX	26. SIGNATURE Charles C. Chestnut	27. DATE	28. SIGNATURE

INSTRUCTIONS: In cases where bona-fide emergencies exist, the information contained on DD Form 1265 and DD Form 1266 may be transmitted to the appropriate headquarters by telephone or electric transmission. In this event, reference will be made to item numbers in the sequence in which they appear on the form. Items which do not apply will be so indicated.

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Figure 3-5. Sample DD Form 1265, Request for Convoy Clearance (continued)

REQUEST FOR SPECIAL HAULING PERMIT

DATE: 5 Jan XX

SECTION I - GENERAL

1. ORGANIZATION	2. STATION	3. DATE OF MOVEMENT a. STARTING	b. COMPLETION
100th Trans Co (Lt Med Trk)	Fort Eustis, VA 23604	0700 20 Jan XX	1830 21 Jan XX

4. POINT OF ORIGIN	5. DESTINATION
Fort Eustis, VA	Fort Drum, NY

6. ARRIVAL AT STATE LINES

DATE	TIME	STATE LINE
20 Jan XX	1308	VA/MD
20 Jan XX	1440	MD/PA
21 Jan XX	1145	PA/NY

7. ROUTING (Stipulate US Routes, State Routes, etc.)

IS 64, VA 168, VA 33, IS 64, IS 95, IS 495E, US1, IS 695, IS 83, IS 81, US 11

8. ESCORT REQUIREMENTS

None

SAMPLE

SECTION II - VEHICLE AND LOAD DATA

DESCRIPTION (a)	TYPE (5-ton etc) (b)	NO. OF VEHICLES (c)	REGISTRATION NUMBER (d)	HEIGHT (e)	WIDTH (f)	LENGTH (g)	WEIGHT (h)
9. VEHICLE							
a. TRUCK							(Empty)
b. TRUCK-TRACTOR	5-ton	8	See Item 12	103.5	98.3	158.3	(Empty) 18,560
c. TRAILER							(Empty)
d. SEMI-TRAILER	12-ton	8	See Item 12	108.3	97.3	348.5	(Empty) 14,240
e. OTHER (Specify)							(Empty)
10. LOAD Orgn Impedimenta							5,000
11. OVERALL (Vehicle and load)				108.3	98.3	526	(Gross) 37,800

12. DESCRIPTION OF LOAD (Brief general description: Organization impedimenta, etc.) (Within security limitations)

Organization impedimenta.

Registration Numbers

Trac		Tlr	Trac		Tlr
5E5551	–	5T9991	5E5555	–	5T9995
5E5552	–	5T9992	5E5556	–	5T9996
5E5553	–	5T9993	5E5557	–	5T9997
5E5554	–	5T9994	5E5558	–	5T9998

13. LOAD OVERHANG	a. FRONT	b. REAR	c. LEFT SIDE	d. RIGHT SIDE
	NA	NA	NA	NA

DD FORM 1 JAN 56 1266

Figure 3-6. Sample DD Form 1266, Request for Special Hauling Permit

14. NUMBER OF AXLES	1	2							
	AXLE 1 a	AXLE 2 b	AXLE 3 c	AXLE 4 d	AXLE 5 e	AXLE 6 f	AXLE 7 g	AXLE 8 h	TOTAL i
15. NUMBER OF TIRES	2	4	4	4	4				18
16. TIRE WIDTH (Inches)	11	11	11	11	11				
17. TIRE SIZES	1100 x 20	1100 x 20	1100 x 20	1100 x 20	1100 x 20				
18. AXLE LOAD (Empty)	8,244	6,958	6,958	5,320	5,320				32,800
19. AXLE LOAD (Loaded)	9,044	8,058	8,058	6,320	6,320				37,800

20. AXLE SPACING (See Item 14 for identification)	A SPACING	B SPACING	C SPACING	D SPACING	E SPACING	F SPACING	G SPACING
	140	54	162	52			

21. REMARKS

22. MOVEMENT BY HIGHWAY IS
- [ ] ESSENTIAL TO NATIONAL DEFENSE
- [X] IN THE INTEREST OF NATIONAL DEFENSE

SAMPLE

23. REQUESTING AGENCY	24. APPROVING AGENCY
100th Trans Co (Lt Med Trk)	
25. REQUESTED BY (Typed name, grade and title)	26. APPROVED BY (Typed name, grade and title)
Charles C. Chestnut, CPT, TC, Commanding	

27. DATE	28. SIGNATURE	29. DATE	30. SIGNATURE
5 Jan XX	Charles C. Chestnut		

INSTRUCTIONS

GENERAL:

DD Form 1266 "Request for Special Hauling Permit" will be used to obtain special hauling permits for the movement of oversize/overweight vehicles over public highways when accompanying a convoy or when traveling separately.

This form, in duplicate and accompanied by letter of transmittal, will be forwarded through the local transportation officer so as to reach the appropriate headquarters not less than [illegible] (10) working days prior to the starting date of the movement. Letters of transmittal will contain complete itinerary and explanation of the movement. One (1) letter of transmittal is sufficient when several DD Forms 1265 and 1266 involving one (1) [illegible] are forwarded to the appropriate headquarters.

In cases where bona-fide emergencies exist, the information contained in this form and DD Form 1265 may be transmitted to the appropriate headquarters by telephone or electric transmission. In this event, reference will be made to item numbers in the sequence in which they appear on the forms. Items which do not apply will be so indicated.

SPECIFIC:

Item 9A, B, C, and D - Complete nomenclature of vehicles involved. More than one unit may be included, provided units are identical in equipment, load characteristics, routing and movement date. Total number of units shall be indicated prominently.

Item 9E - Note all units other than standard highway vehicles; road equipment, guns, etc.

Item 9 (d) - Indicate the registration number for each unit or combination of units. Use additional page if required.

Item 14 - Indicate appropriate number of axles by inserting number in proper circles. Block out circles not applicable.

Item 21 - For movement through the District of Columbia, include name of manufacturer of equipment.

Figure 3-6. Sample DD Form 1266, Request for Special Hauling Permit (continued)

Special hauling permit. In CONUS, the DD Form 1266 is used to request permission to move oversize or overweight vehicles over public roads. Four copies of the form are required, plus a copy for each state to be crossed. The request must reach the approving authority at least 15 days before the planned move. Only identical vehicles with loads of uniform weight and dimensions may be listed on the same DD Form 1266.

PLANNING

Planning ensures the allocation of transportation assets to meet mission requirements based on command priorities and to identify potential shortfalls.

General Planning Factors

Motor transport planning, particularly in its early stages, must be based on a set of broad planning factors and assumptions. These planning factors should be used only in the absence of specific data relating to the current situation. Because of the different services performed, loads carried, and terrain crossed, caution should be exercised when using the following:

- Task vehicle availability rate – the average number of assigned task vehicles not in maintenance and available for daily mission support. See Appendix C for TVAR data on specific vehicle types.
- Vehicle payload capacity – the rated cargo capacity of the vehicle. During planning, the off-road payload capacity of the equipment is used to determine allowable highway load capacities.
- Operational hours per shift – the number of hours per shift in which vehicles and drivers are normally employed. Use 10 hours per shift for planning purposes.
- Operational day – the number of hours per day in which vehicles and drivers are normally employed. Use 20 hours (two 10-hour shifts) per day for planning purposes. The remaining 4 hours of the day are for scheduled maintenance.
- Daily round trips – the average number of daily round trips a vehicle can make per day, use an average of two trips per day (1 trip per shift x 2 shifts) for vehicles involved in line-haul operations and four trips per day (2 trips per shift x 2 shifts) for local haul operations.
- Operational distance per shift – the average one-way distance that cargo can be hauled within allotted operational hours per shift. Use 90 miles/144 kilometers for line-haul operations and 20 miles/32 kilometers for local haul operations.
- Rate of march in the hour – the average number of miles/kilometers that can be covered in an hour (includes all halts during movement). Use 20 MIH (32 KMIH) if traveling over good roads and 10 MIH (16 KMIH) for bad roads. In addition to the road surface, consideration must be given to any terrain, weather, or hostile activity that may effect the rate of march.
- Delay times – basically any time taken away from the physical forward movement of cargo (any time not included in the rate of march). Delay times include loading and unloading, line-haul relay time, rest halts, and any other delays en route that can be anticipated but are not included in rate of march calculations.
  - Straight trucks: 2.5 hours for loading and unloading time per round trip (straight haul).
  - Semitrailers: 2.5 hours for loading and unloading time per round trip (straight haul).
  - Container transporters: 1.5 hours for loading and unloading time per round trip (straight haul).
  - Truck tractors in semitrailer relay operations: 1 hour per line-haul segment (per relay round trip in semitrailer relay operations).
  - Palletized Load System: 0.5 hours for loading and unloading time per round trip (straight haul).

Movement Requirement Formulas

Use the following formulas to compute unit and vehicle requirements on the basis of planning estimates, actual operational data, or a combination of both. Be sure to compute the load in the appropriate commodity unit (STONs, containers, gallons, etc.).

Turnaround time: total time consumed in a round trip movement (including delays). Delay factors must be accurate. To determine turnaround time use the following formula.

$$\text{turnaround time} = \frac{2 \times \text{distance}}{\text{rate of march (MIH/KIH)}} + \text{delays}$$

Unit lift operations: the amount of cargo a truck company can move at one time (one-time lift). To determine the number of vehicles or truck companies to move a given commodity in one lift, use the following formulas.

$$\text{required vehicles} = \frac{\text{commodity quantity to be moved}}{\text{capacity* per vehicle}}$$

$$\text{required companies} = \frac{\text{commodity quantity to be moved}}{\text{capacity* per vehicle} \times \text{average number of vehicles available per company}}$$

* Appropriate commodity capacity (STONs, containers, gallons, etc.)

Daily lift operations: the amount of cargo a truck company can move in a day making a number of trips. The amount of cargo moved will vary based on running times, delays, terrain, and weather. Use the following formula (steps) to compute the number of truck companies required to move a given amount in sustained operations.

Step 1: Compute the trip turnaround time =

$$\frac{2 \times \text{distance}}{\text{rate of march}} + \text{delays}$$

Step 2: Compute the required companies =

$$\frac{\text{commodity quantity to be moved}}{\text{capacity per vehicle} \times \text{average number of vehicles available per company} \times \text{operational day}}$$

The number of vehicles required can be determined by omitting the vehicle availability factor from the formula.

$$\text{required vehicles} = \frac{\text{commodity quantity to be moved}}{\text{capacity per vehicle} \times \text{vehicle availability}}$$

Specific loads: loads consisting of one or more items that, because of their peculiarities, involve a variation in the normal planning process to determine vehicle requirements for the operation. Items may or may not be packaged with unusual size, shape, cube, or weight. In such cases, attempt first to determine vehicle requirements by test loading or by using operational data available from previous similar operations. If test loading is not feasible or operational data unavailable, use the following steps to determine vehicle requirements.

NOTE: The vehicle payload and compartment cube capacity can be obtained from the vehicle data plate, technical manual, or Section II of this chapter. The weight and cubic volume of a specific item or load can be obtained from the shipper, service representative, or applicable technical manual.

Step 1: Determine the number of items that may be loaded onto one vehicle by cargo weight.

$$\frac{\text{vehicle payload capacity}}{\text{weight of item to be transported}}$$

Step 2: Determine the number of items that may be loaded onto one vehicle by cube capacity.

$$\frac{\text{vehicle compartment capacity}}{\text{cube of item to be transported}}$$

If the value using cargo weight is the lesser value, then the weight of the computed load will exceed the vehicle's payload capacity before all available compartment space is filled. If the value using cargo cube is the lesser, the computed cargo load will "cube out" (exceed the cubic cargo space available in the vehicle) before it "weighs out" (exceeds the vehicle payload capacity).

Step 3: Determine the number of vehicles required to transport the load based on mission necessity (one-time lift or daily sustained operation).

$$\frac{\text{number of items to be transported}}{\text{number of items that can be transported per vehicle}}$$

(select the lesser value of Steps 1 and 2)

Local haul calculations: Use the following steps to determine the number of truck companies required to support a local haul network.

Step 1: Compute the turnaround time =

$$\frac{2 \times \text{distance}}{\text{rate of march (MIH)}} + \text{delays}$$

Step 2: Compute required companies =

$$\frac{\text{commodity quantity to be moved} \times \text{turnaround time (from Step 1)}}{\text{capacity per vehicle} \times \text{average number of vehicles available per company} \times \text{operational day}}$$

Local haul backhaul calculations: Use the following steps to determine the number of truck companies required to support a local haul backhaul operation.

Step 1: Compute the turnaround time =

$$\frac{2 \times \text{distance}}{\text{rate of march (MIH)}} + \text{delays}$$

Step 2: Compute required companies =

$$\frac{\text{commodity quantity to be moved} \times \text{turnaround time (from Step 1)}}{\text{capacity per vehicle} \times \text{average number of vehicles available per company} \times \text{operational day}}$$

Step 3: Compute required additional companies =

$$\frac{\text{commodity quantity to be backhaul} \times \text{delay time}}{\text{capacity per vehicle} \times \text{average number of vehicles available per company} \times \text{operational day}}$$

Line-haul calculations: Use the following steps to determine the number of truck companies required to support a line-haul leg.

Step 1: Compute the segment distance =

$$\frac{\text{(operational hours per shift - delays)} \times \text{rate of march}}{2}$$

Step 2: Compute the number of segments required per leg.

$$\frac{\text{total distance to travel}}{\text{segment distance from (Step 1)}}$$

Step 3: Compute the turnaround time =

$$\frac{2 \times \text{distance}}{\text{rate of march (MIH)}} + \text{delays (delay time} \times \text{\# of segments)}$$

Step 4: Compute required companies =

$$\frac{\text{commodity quantity to be moved} \times \text{turnaround time (from Step 3)}}{\text{capacity per vehicle} \times \text{average number of vehicles available per company} \times \text{operational day}}$$

Line-Haul Operational Planning Exercise

The seven procedural steps that follow demonstrate how to systematically plan and establish a motor transport network.

Step 1: Determine requirements and resources available. The following daily cargo tonnage and container (20-foot) requirements are provided by the staff movements officer:

Origin	Destination	STONs	Containers
Red Port	SB #1	1200	100
Red Port	SB #2	900	50
SB #1	SB #2	700	
Bravo Beach	SB #1	500	

By conducting a thorough map reconnaissance, you determine the need for the following transport units to support the transportation network (Figure 3-7, page 3-15):

- Medium truck company, TOE 55727L100 (equipped with M915 tractors and M872 trailers) to support all line-haul operations. To facilitate an efficient port clearance, this truck company will also be used for local haul operations between the port and TT #3.
- Medium truck company, TOE 55728L100 (equipped with M931 tractors and M871 trailers) to support the local haul operations at TT #1 and TT #2.

For the purpose of this exercise use the following planning factors to compute requirements:

- Operational day: 20 hours (two 10-hour shifts).
- Vehicle availability percentage: 84.7 percent.
- Rate of march:
  - 32 KIH – between the origin and destination TTs on the MSR.
  - 24 KIH – between Port Red and TT #3, TT #1 and SB #1, TT #2 and SB #2.
  - 16 KIH – between Bravo Beach and TT #3.
- Delays:
  - 2.5 hours per round-trip for all local haul operations (1.25 hours for loading and 1.25 hours for unloading).
  - 1 hour per segment (relay round trip) for line-haul operations.
- Vehicle capacity (from Table 3-1, page 3-16, and Table 3-2, page 3-21).

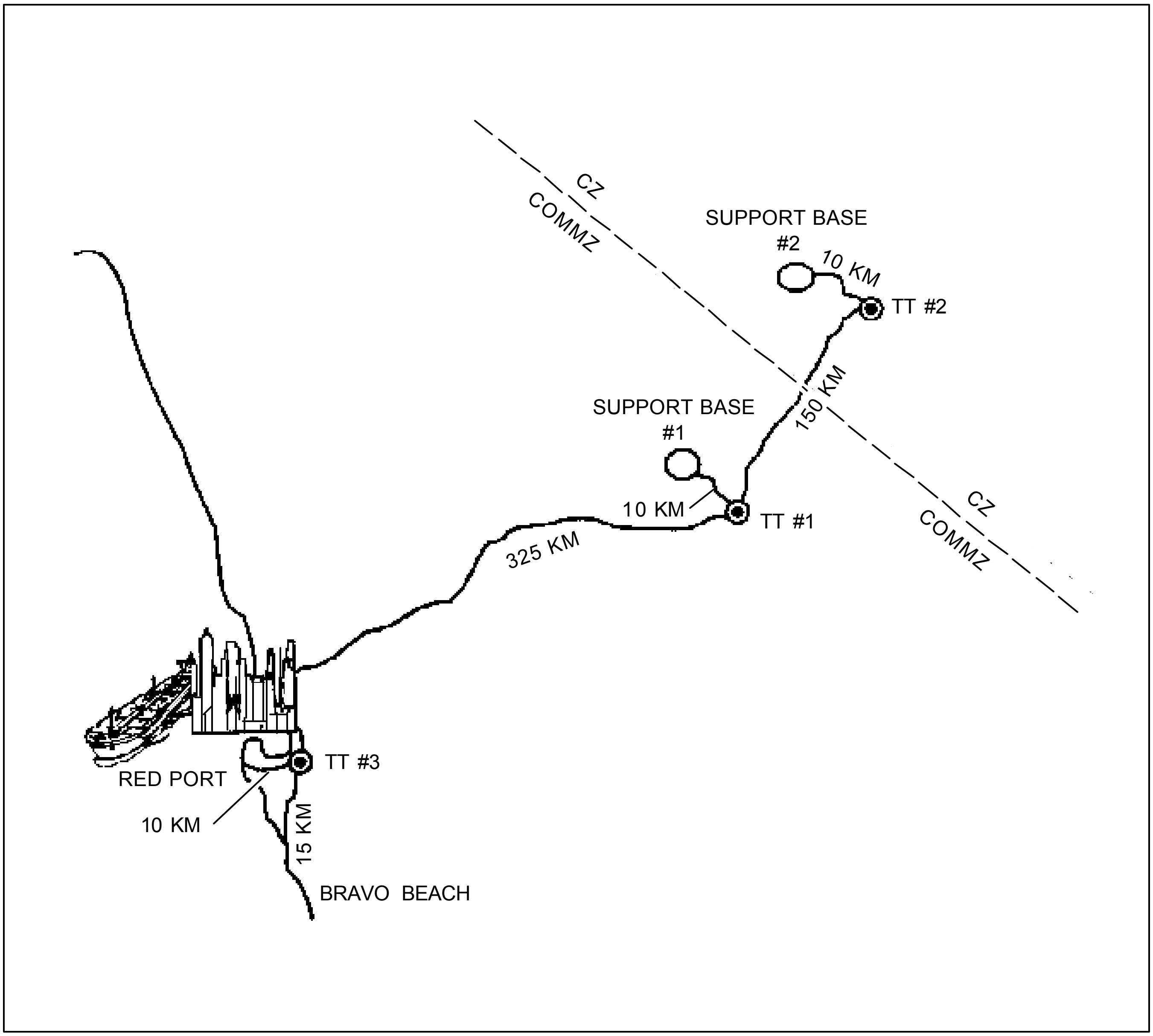


Figure 3-7. Transportation network

Table 3-1. Truck performance data

VEHICLE	PAYLOAD (lb)	MAXIMUM GRADE w/Towed Load	MAXIMUM GRADE w/o Towed Load	MAXIMUM SPEED (MPH)	CRUISING RANGE (mi)	TOWED LOAD ALLOWANCE (lb)	FORDING DEPTH w/o Kit (in)	FORDING DEPTH w/Kit (in)
Small unit support vehicle, M973	4,961	40	60	31	186	NA	NA	NA
Truck, utility, 1/4-T, 4 x 4, M151A1, M151A2	800	60	—	56	300	1,170	21	60
Truck, cargo, 1 1/4-T, 4 x 4, M998	2,500	—	60	65	337	3,400	30	60
Truck, cargo, 1 1/4-T, 4 x 4, M1097	4,400	—	60	65	275	4,200	30	60
Truck, utility, 3/4-T, 4 x 4, M1009	1,200	—	30	55	250	3,000[1]	20	—
Truck, cargo, 1 1/4-T, 4 x 4, M880, M881, M882	1,600	—	30	55	200	3,000	16	—
Truck, cargo, 1 1/4-T, 4 x 4, M883, M884, M885, w/comm shelter	1,600[2]	—	30	55	200	3,000	16	—
Truck, cargo, 1 1/4-T, 4 x 2, M890	1,600[1]	—	30	55	200	3,000[1]	16	—
Truck, cargo, 1 1/4-T, 4 x 4, M1008	2,900	—	30	55	250	3,000	20	—
Truck, cargo, 1 1/4-T, 4 x 4, M1028	3,600	—	30	55	250	3,000	20	—
Truck, cargo, 2 1/2-T, 6 x 6, M35A1	5,000	45	60	56	320	6,000	30	72
Truck, cargo, 2 1/2-T, 6 x 6, M35A2	5,000	45	60	56	300	6,000	30	72
Truck, cargo , 2 1/2-T, 6 x 6, M35A2C	5,000	45	60	56	300	6,000	30	72
Truck, cargo, 2 1/2-T, M36A2	5,000	45	60	56	320	6,000	30	72
Truck, tk, fuel-svc, 1,200-gal, 2 1/2-T, M49A2C	600 gal[3]	45	60	56	300	6,000	30	72

Table 3-1. Truck performance data (continued)

VEHICLE	PAYLOAD (lb)	MAXIMUM GRADE w/Towed Load	MAXIMUM GRADE w/o Towed Load	MAXIMUM SPEED (MPH)	CRUISING RANGE (mi)	TOWED LOAD ALLOWANCE (lb)	FORDING DEPTH w/o Kit (in)	FORDING DEPTH w/Kit (in)
Truck, tk, water-svc, 1,200-gal, 2 1/2-T, 6 x 6, M50A2	400 gal[4]	45	60	56	300	6,000	30	72
Truck, tk, water-svc, 1,200-gal, 2 1/2-T, 6 x 6, M50A3	500 gal	45	60	56	300	6,000	30	72
Truck, dump, 2 1/2-T, 6 x 6, M342A2	5,000	45	60	56	275	6,000	30	72
Truck, van, 2 1/2-T, 6 x 6, M292A1, M292A2, M292A5	5,000	45	60	56	300	6,000	30	72
Truck, trac, 2 1/2-T, 6 x 6, M275A2	7,000[5]	36	60	56	250	17,000[6]	30	72
Truck, van, shop, 2 1/2-T, 6 x 6, M109A3	5,000	45	60	56	300	6,000	30	72
Truck, dump, 5-T, 6 x 6, M51	10,000	47	60	52	488	15,000	30	78
Truck, dump, 5-T, 6 x 6, M51A2	10,000	47	60	54	477	15,000	30	78
Truck, dump, 5-T, 6 x 6, M817	10,000	31	60	52	480	15,000	30	78
Truck, dump, 5-T, 6 x 6 M929, M931	10,000	31	60	55	480	15,000	30	78
Truck, dump, 5-T, 6 x 6, M929A1, M930A1	10,000	31	60	55	500	15,000	32	80
Truck, trac, 5-T, 6 x 6, M52	15,000[5]	28	68	53	300	30,000[6]	30	78
Truck, trac, 5-T, 6 x 6, M52A1	15,000[5]	47	60	54	477	30,000[6]	30	78
Truck, trac, 5-T, 6 x 6, M52A2	15,000[5]	47	60	54	477	37,000[6]	30	78
Truck, trac, 5-T, 6 x 6, M931A1, M931A2	15,000[5,7]	31	51	63	460	37,500[6,7]	32	80

Table 3-1. Truck performance data (continued)

VEHICLE	PAYLOAD (lb)	MAXIMUM GRADE w/Towed Load	MAXIMUM GRADE w/o Towed Load	MAXIMUM SPEED (MPH)	CRUISING RANGE (mi)	TOWED LOAD ALLOWANCE (lb)	FORDING DEPTH w/o Kit (in)	FORDING DEPTH w/Kit (in)
Truck, trac, 5-T, 6 x 6, M818	15,000[5,7]	42	60	52	300	37,500[6,7]	30	78
Truck, trac, 5-T, 6 x 6, M932A1	15,000[5,7]	31	51	63	460	37,500[6,7]	32	80
Truck, cargo, 5-T, 6 x 6, M54	10,000	51	60	53	214	15,000	30	78
Truck, cargo, 5-T, 6 x 6, M54A1, M54A1C	10,000	47	60	54	350	15,000	30	78
Truck, cargo, 5-T, 6 x 6, M54A2, M54A2C	10,000	47	60	54	350	15,000	30	78
Truck, cargo, 5-T 6 x 6, M55A2,	10,000	47	60	54	350	15,000	30	78
Truck,cargo, 5-T, 6 x 6, M55	10,000	46	60	52	225	15,000	30	78
Truck, cargo, 5-T, 6 x 6, M813, M813A1	10,000	55	60	52	350	15,000	30	78
Truck,cargo, 5-T, 6 x 6, M814	10,000	52	60	52	350	15,000	30	78
Truck, cargo, 5-T, 6 x 6, M923, M925	10,000	42	60	55	350	15,000	30	78
Truck, cargo, 5-T, 6 x 6, M923A1, M925A1, M923A2, M925A2	10,000	42	60	63	350	15,000	30	78
Truck, cargo, 5-T, M927, M928	10,000	38	60	55	350	15,000	30	78
Truck, cargo, 5-T, 6 x 6, M927A1, M928A1, M927A2, M928A2	10,000	38	60	63	350	15,000	30	78
Truck, wkr, 5-T, 6 x 6, M62	5,000	36	58	53	214	15,000	30	78
Truck, wkr, 5-T, 6 x 6, M816	7,000	46	60	52	500	20,000	32	78

Table 3-1. Truck performance data (continued)

VEHICLE	PAYLOAD (lb)	MAXIMUM GRADE w/Towed Load	MAXIMUM GRADE w/o Towed Load	MAXIMUM SPEED (MPH)	CRUISING RANGE (mi)	TOWED LOAD ALLOWANCE (lb)	FORDING DEPTH w/o Kit (in)	FORDING DEPTH w/Kit (in)
Truck, wkr, 5-T, 6 x 6, M936A1	7,000	31	60	63	500	20,000	32	78
Truck, wkr, 5-T, 6 x 6, M936A2	7,000	31	60	63	500	20,000	32	78
Truck, van, expansible, 5-T, 6 x 6, M291A1, M291A1C, M291A1D, M291A2C	5,000	—	60	58	350	15,000	30	78
Truck, van, expansible, 5-T, 6 x 6, M820	5,000	52	60	52	350	15,000	—	—
Truck, van, expansible, 5-T, 6 x 6, M934	5,000	41	60	55	350	15,000	30	78
Truck, van, expansible, 5-T, 6 x 6, M934A1	5,000	41	60	63	350	15,000	30	78
Truck, van, expansible, 5-T, 6 x 6, M934A2	5,000	41	60	63	350	15,000	30	78
Truck, stake, 5-T, 6 x 6, M821	10,000	43	60	60	350	15,000	30	78
Truck, cargo, 10-T, 8 x 8, M977	22,000	30	60	57	300	20,000	48	—
Truck, cargo, 10-T, 8 x 8, M978	18,000	30	60	57	300	20,000	48	—
Truck, cargo, 10-T, 8 x 8, M984	31,000	30	60	57	300	20,000	48	—
Truck, cargo, 10-T, 8 x 8, M985	21,729	30	60	57	300	20,000	48	—
Truck, trac, 10-T, 6 x 6, M916	40,000[5]	33	—	59	300	126,000[6]	20	—
Truck, trac, 10-T, 6 x 6, M916A1	68,000[8]	20	—	54	300	130,000[6]	20	—
Truck, trac,10-T, 8 x 6, M920	70,000[5]	28	—	64	300	99,620[6]	24	—

Table 3-1. Truck performance data (continued)

VEHICLE	PAYLOAD (lb)	MAXIMUM GRADE w/Towed Load	MAXIMUM GRADE w/o Towed Load	MAXIMUM SPEED (MPH)	CRUISING RANGE (mi)	TOWED LOAD ALLOWANCE (lb)	FORDING DEPTH w/o Kit (in)	FORDING DEPTH w/Kit (in)
Truck, trac, 10-T, 6 x 6, M123A1C	30,000[5]	47	60	44	350	80,000[6]	78	30
Truck, trac, 14-T, 6 x 4, M915	30,000[5]	41.1	—	65	396	84,000[6]	24	—
Truck, trac, 14-T, 6 x 4, M915A1	28,400[5]	19.9	—	58	357	84,000[6]	20	—
Truck, trac, 14-T, 6 x 4, M915A2	50,000[8]	20	—	56	300	105,000[6]	20	—
Truck, trac, 16.5-T, 10 x 10, PLS, M1074	33,000	30	—	50	225	50,000	48	—
Truck, trac, 16.5-T, 10 x 10, PLS w/crane, M1075	33,000	30	—	50	225	50,000	48	—
Truck, trac, 22 1/2-T, 8 x 6, M911	48,000[5]	20	—	43	300	137,000[6]	28	—
Truck, trac, 22 1/2-T, 8 x 8, M1070	46,000[5]	15	—	45	325	190,400[6]	28	—

[1] Highway requirement only.

[2] Increased loads authorized for several specific S250 shelter payloads.

[3] 1,200-gallon capacity for cross-country authorized by DA waiver, subject to local commander's discretion.

[4] 1,000-gallon capacity for cross-country authorized by DA waiver, subject to local commander's discretion.

[5] Vertical loads on the fifth wheel only.

[6] Towed load is the total weight of the semitrailer and payload.

[7] Vehicles approved for use with M871 semitrailer carrying loads up to 44,800 pounds.

[8] Vertical load on tractor.

Table 3-2. Truck performance data – Family of Medium Tactical Vehicles (FMTV)

VEHICLE	PAYLOAD (lb)	MAXIMUM GRADE w/Towed Load	MAXIMUM GRADE w/o Towed Load	MAXIMUM SPEED (MPH)	CRUISING RANGE (mi)	TOWED LOAD ALLOWANCE (lb)	FORDING DEPTH w/o Kit (in)	FORDING DEPTH w/Kit (in)
Truck, cargo, 2 1/2-T, 4 x 4, M1078	5,000	30	60	55	400+	9,520	36	60
Truck, van, 2 1/2-T, 4 x 4, M1079	5,000	30	60	55	400+	9,520	36	60
Truck, cargo, 2 1/2-T, 4 x 4, LAPES, M1081	5,000	30	60	55	400+	9,520	36	60
Truck, cargo, 5-T, 6 x 6, M1083	10,000	30	60	55	300+	21,000	36	60
Truck, cargo w/MHE, 5-T, 6 x 6, M1084	10,000	30	60	55	300+	21,000	36	60
Truck, long, cargo, 5-T, 6 x 6, M1085	10,000	30	60	55	300+	21,000	36	60
Truck, long, cargo, w/MHE, 5-T, 6 x 6, M1086	10,000	30	60	55	300+	21,000	36	60
Truck, van, expansible, 5-T, 6 x 6, M1087	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Truck, trac, 5-T, 6 x 6, M1088	40,000[1]	22	60	55	300+	21,000	36	60
Truck, wkr, 5-T, 6 x 6, M1089	—	22	60	55	300+	21,000	36	60
Truck, dump, 5-T, 6 x 6, M1090	10,000	30	60	55	300+	21,000	36	60
Truck, tk, fuel/water-svc, 1,500/2,000-gal, 6 x 6 M1091	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Truck, cargo, 5-T, 6 x 6, LAPES/AD, M1093	10,000	30	60	55	300+	21,000	36	60
Truck, dump, 5-T, 6 x 6, LAPES, M1094	10,000	30	60	55	300+	21,000	36	60

[1] Vertical load on fifth wheel.

[2] Not available at time of publication.

Step 2: Establish a motor transport schematic (Figure 3-8). The schematic assists the planner by providing a graphical representation of the transportation distribution network.

Step 3: Determine network workload requirements. Determine the total workload throughout the transportation infrastructure and annotate requirements on the transport schematic (which now becomes a workload schematic). The workload schematic (Figure 3-9, page 3-23) depicts commodity by segment and assists the planner in the efficient allocation of resources.

Step 4: Assess the highway tonnage capability. The tonnage capabilities of roads and bridges are important considerations when selecting routes. The gross weight of the heaviest load vehicle should not exceed the rated tonnage capacity of the weakest bridge. It is difficult to determine exact tonnage capabilities of a highway for sustained operations because conditions vary. In the absence of more accurate data, use Table 3-3, page 3-23, as a guide for highway tonnage capabilities. This table gives estimates of supply support tonnage capabilities for various conditions involved with sustained operations. The following steps will enable the planner to assess a highway's capabilities. When more than one condition is involved in a step, apply the most restrictive factor.

- Select the type of road surface.
- Select the area of operation.
- Apply the narrow roadway factor as applicable.
- Apply one of the three limiting terrain factors to the new capability (if applicable). Apply only the most restrictive terrain factor.
- Apply the bad weather factor to the new capability (if weather is expected for a sustained period).
- Determine the workload requirement (convert all commodities to STONs).
- Identify excess or shortfall capacity.

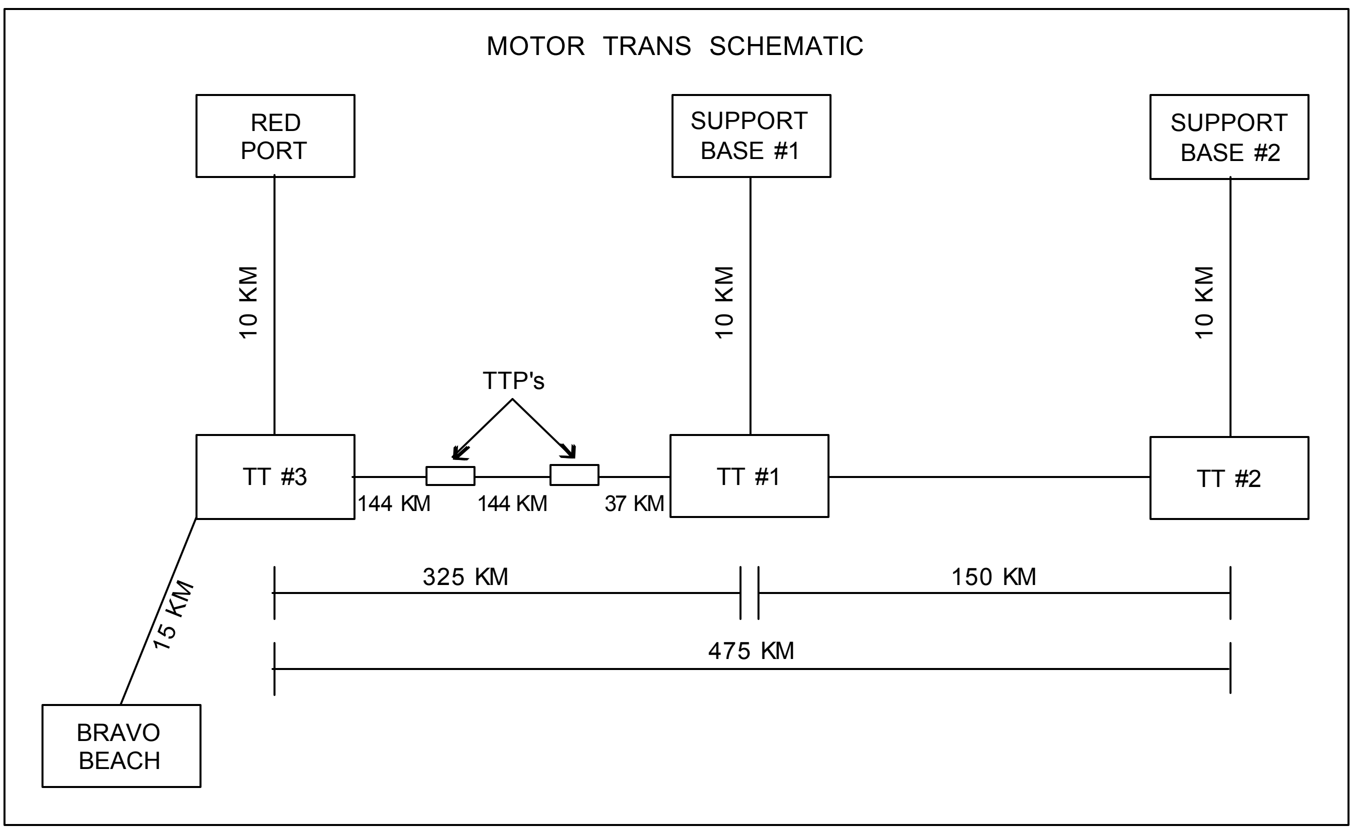


Figure 3-8. Transportation distribution network

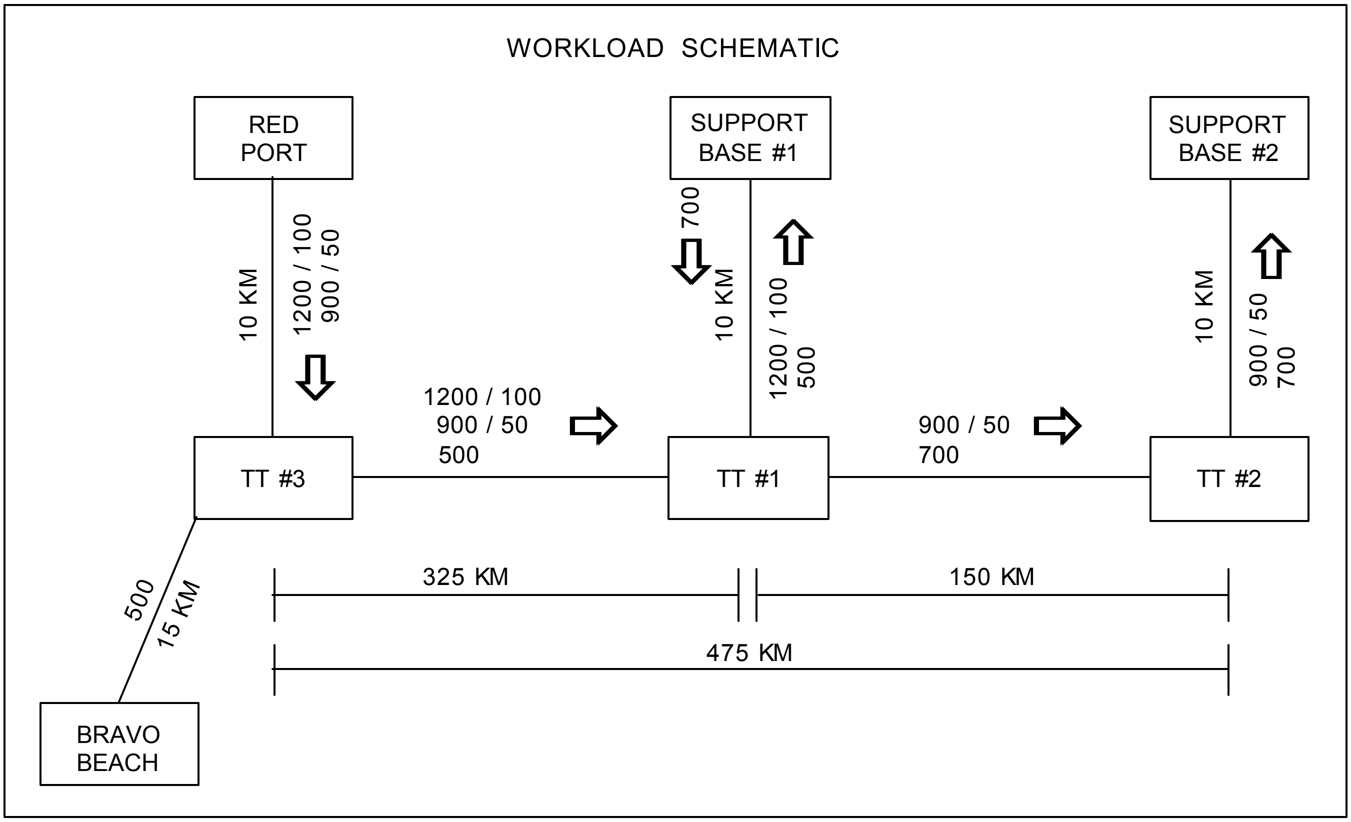


Figure 3-9. Transportation network workload

Table 3-3. Highway tonnage capabilities

HIGHWAY TYPE	DAILY TONNAGE FORWARD (STONs)			REDUCTION FACTORS FOR VARIOUS CONDITIONS (%)				
	Optimum Dispatch (Rear Area)	Supply Traffic (COMMZ)	Supply Traffic (CZ)	Narrow Roadway (Less than 24 ft or 7.20 m)	Rolling Terrain	Hills with Curves	Mountains	Seasonal Bad Weather
Concrete	60,000	36,000	8,400	25	10	30	60	20
Bituminous	45,000	27,000	7,300	25	10	30	60	30
Bituminous-treated	30,000	18,000	5,800	25	20	40	65	40
Gravel	10,150	6,090	3,400	25	20	50	70	60
Dirt	4,900	2,940	1,600	25	25	60	80	90

Step 5: Determine the number of required truck companies. Use Table A-1, page A-9, and Table A-2, page A-12, to determine planning capabilities of the appropriate truck companies. All three units are authorized 60 tractors each (cargo trucks for the light truck company), rendering 50 (60 x 84.7 percent) trucks available for daily tasking and planning purposes. To determine the line-haul and local haul truck company requirements see Figure 3-10. For the types of vehicles used in this exercise, the most restrictive TVAR is used.

LINE-HAUL TRUCK COMPANY REQUIREMENTS

- Line-haul leg between TT #3 and TT #1

Step 1: Segment distance = (10-1) x 32 KIH = 144 km

Step 2: Number of segments = 325 km = 2.26 = 3 segments 144 km

Step 3: Turnaround time = 2 x 325 km + 3 = 23.31 hr 32 KIH

Step 4: Truck companies required

$$\text{STONs} = \frac{2600 \text{ STONs} \times 23.31 \text{ hr}}{7.02 \text{ STONs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{60{,}606}{7{,}020} = 8.6$$

$$\text{Contrs} = \frac{150 \text{ contrs} \times 23.31 \text{ hr}}{2 \text{ contrs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{3{,}495.5}{2{,}000} = 1.7$$

- Line-haul leg between TT #1 and TT #2

Step 1: Segment Distance =

$$\frac{(10 - 1) \times 32 \text{ KIH}}{2} = 144 \text{ km}$$

Step 2: Number of Segments =

$$\frac{150 \text{ km}}{144 \text{ km}} = 1.04 = 1 \text{ segment}$$

Step 3: Turnaround time =

$$\frac{2 \times 150 \text{ km}}{32 \text{ KIH}} + 1 = 10.37 \text{ hr}$$

LOCAL HAUL TRUCK COMPANY REQUIREMENTS

- Local haul network between Port Red and TT #3

Step 1: Turnaround time $= \frac{2 \times 10 \text{ km}}{24 \text{ KIH}} + 2.5 = 3.33 \text{ hr}$

Step 2: Truck companies required

$$\text{STONs} = \frac{2100 \text{ STONs} \times 3.33 \text{ hr}}{7.02 \text{ STONs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{6{,}993}{7{,}020} = 1.0$$

$$\text{Contrs} = \frac{150 \text{ contrs} \times 3.33 \text{ hr}}{2 \text{ contrs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{499.5}{2{,}000} = .25$$

- Local haul network between TT #1 and SB #1

Step 1: Turnaround time $= \frac{2 \times 10 \text{ km}}{24 \text{ KIH}} = 2.5 = 3.33 \text{ hr}$

Step 2: Truck companies required

$$\text{STONs} = \frac{1700 \text{ STONs} \times 3.33 \text{ hr}}{4.8 \text{ STONs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{5{,}661}{4{,}800} = 1.2$$

$$\text{Contrs} = \frac{100 \text{ contrs} \times 3.33 \text{ hr}}{1 \text{ STON} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{333}{1{,}000} = .33$$

Step 3: Additional Truck companies required

$$\text{STONs} = \frac{700 \text{ STONs} \times 2.5 \text{ hr}}{4.8 \text{ STONs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{1{,}750}{4{,}800} = .36$$

- Local haul network between TT #2 and SB #2

Step 1: Turnaround time $= \frac{2 \times 10 \text{ km}}{24 \text{ KIH}} + 2.5 = 3.33 \text{ hr}$

Step 2: Truck companies required

$$\text{STONs} = \frac{1600 \text{ STONs} \times 3.33 \text{ hr}}{4.8 \text{ STONs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{5{,}328}{4{,}800} = 1.1$$

$$\text{Contrs} = \frac{50 \text{ contrs} \times 3.33 \text{ hr}}{1 \text{ STON} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{166.5}{1{,}000} = .17$$

- Local haul network between Bravo Beach and TT #1

Step 1 : Turnaround time =

$$\frac{2 \times 10 \text{ km}}{16 \text{ KIH}} + 2.5 = 3.75 \text{ hr}$$

Step 2: Truck companies required

$$\text{STONs} = \frac{500 \text{ STONs} \times 3.75 \text{ hr}}{4.8 \text{ STONs} \times 50 \text{ veh} \times 20 \text{ hr}} = \frac{1{,}875}{4{,}800} = .39$$

Figure 3-10. Line-haul and local haul truck company requirements

Step 6: Total truck companies required by TOE type:

- 55727L100 (MED TRK) – 14.26
- 55728L100 (MED TRK) – 3.55

See Table 3-4 for number of truck companies required by segment.

Step 7: Establish command and control structure:

- Total truck companies required: 17.81 = 18
- Total battalions required: 3.6 = 4
- Total groups required: .80 = 1
- TTPs required: 2
- TTP teams required: 10 (3 truck terminals and 2 TTPs x 2 teams per location)

TRANSPORT OPERATIONS

Transport operations support a variety of missions depending on unit locations and situations. Whether in CONUS or overseas, motor transport units are usually employed in a general support role within a specified area or along specific routes. The following paragraphs address various aspects of motor transport operations.

Motor Park Facility

The layout of motor parks varies, depending on space and conditions (Figure 3-11, page 3-26). For new construction, a single structure should be built to economize on construction costs and operating expenses. The typical motor park should include the following facilities:

- Motor park office. This office should be in the motor park operations area.
- Dispatch office. All vehicular operations are controlled through this office. If at all possible, it should be at the exit of the motor park. This allows the dispatcher to visibly check vehicles leaving the parking area.
- Driver's room. For orderly operation, the drivers' room should be near, but separate from, the dispatch office.
- Vehicle washing facilities. These facilities should be available in all weather conditions. They should be located so that drainage flows away from parking areas and buildings. Automatic washing facilities should be considered when feasible.
- Motor pool/shop operations. Activities in the motor pool/shop include regularly scheduled preventive maintenance and services, general repairs, spot painting, minor body work, carpentry, and welding.

Fire hazards and environmental restrictions may require that some functions be performed at other locations. For example, painting and welding must be carried out in separate areas. Mission requirements and vehicle availability determine which work is performed first.

- Parts room. This facility is centrally located within the main shop building to afford easy access to parts and tools. It should include an issue counter, bins, and tool racks.

Table 3-4. Number of truck companies required by segment

	STONs	CONTRS	ADDNL	TOTAL
TT #3 to TT #l line-haul leg	8.6	1.75		10.35
TT #1 to TT #2 line-haul leg	2.4	0.26		2.66
Red Port to TT #3 local haul	1.0	0.25		1.25
TT #l to SB #1 local haul	1.2	0.33	0.36	1.89
TT #2 to SB #2 local haul	1.1	0.17		1.27
Bravo Beach to TT #3 local haul	0.39			0.39
TOTAL	14.69	2.76	0.36	17.81

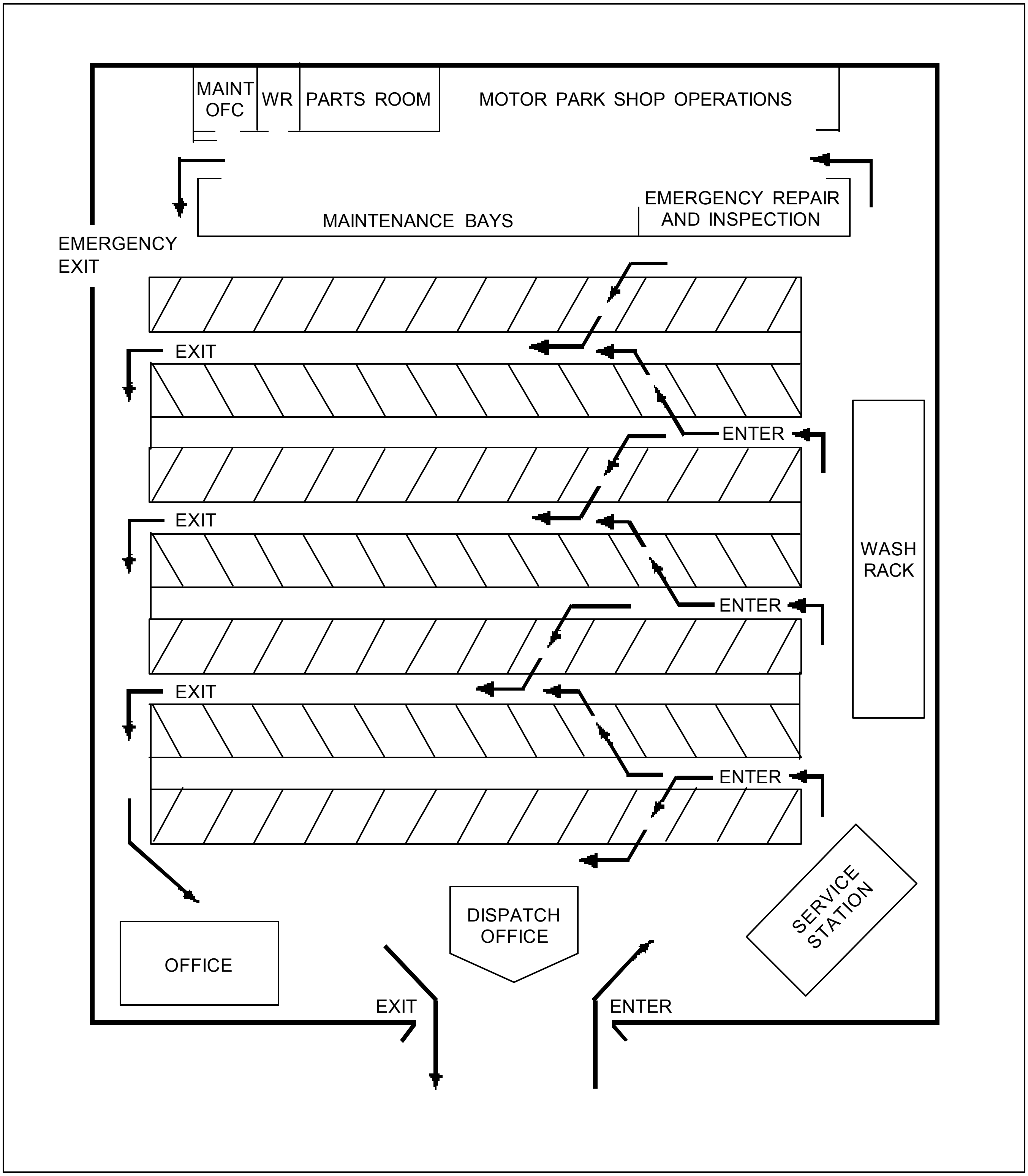


Figure 3-11. Motor park facility layout

Vehicle Loading

The driver is responsible for the proper loading of the vehicle. To begin, place heavy supplies at the bottom of the load, distributing them evenly over the cargo floor. Distributing weight equally ensures that the load will not shift. The following rules also apply to vehicle loading:

- Do not distribute the load loosely or build it too high. High, loosely distributed loads cause swaying, making the vehicle difficult to handle and increasing the danger of overturning or losing cargo. Generally, cargo is not stacked above the top of the side rails.
- If the truck has an open body, put a tarpaulin over the cargo to protect against sun, dust, rain, and pilferage.
- Place barrels and drums on their sides parallel with the length of the truck; brace and pyramid them. If the possibility of leakage prohibits this placement, set the drums upright. Note that fewer drums can be loaded in the same space with the upright arrangement.
- Combine boxed, crated, and packaged cargo with like items or items of compatible shapes or transportability codes.
- Load sacked cargo separately, ensuring that the sacks cannot be punctured by odd-shaped items. Stack sacked cargo in overlapping layers to prevent shifting.

Figure 3-12 shows the right and wrong placements of loads in trucks and semitrailers.

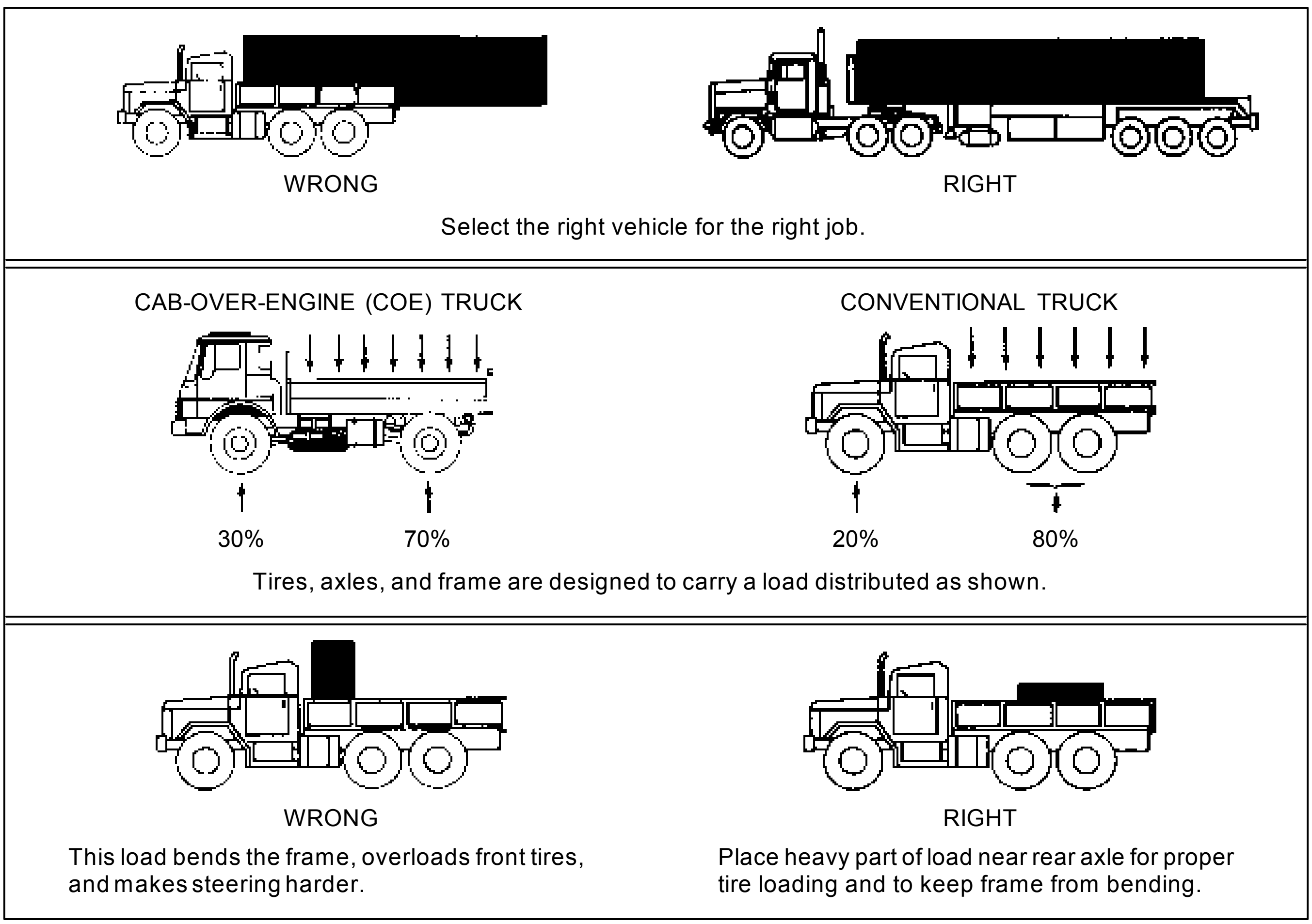
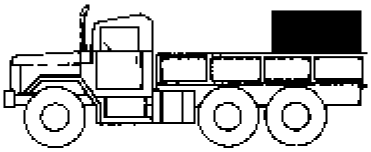
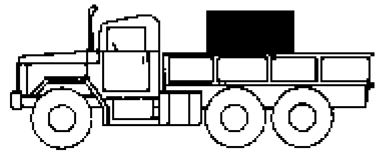


Figure 3-12. Load placement in trucks and semitrailers



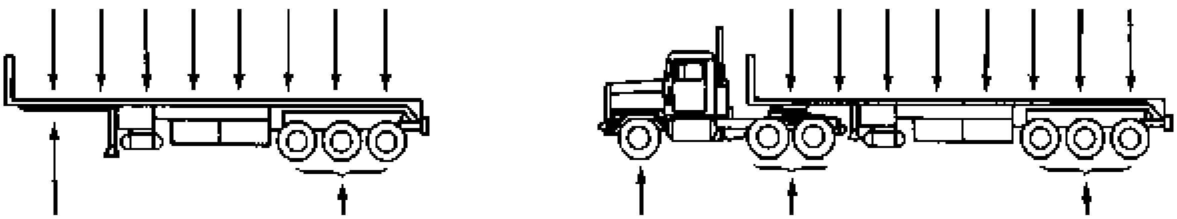
WRONG

This load bends the frame, overloads rear tires, and makes steering almost impossible.



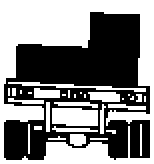
RIGHT

Set a concentrated load just ahead of the rear axle with the longest side on the floor, if possible.



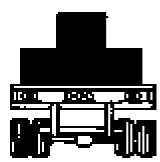
45% 55% 20% 40% 40%

Distribute trailer loads equally between the rear tires and the fifth wheel. This placement transfers the load to the tractor.



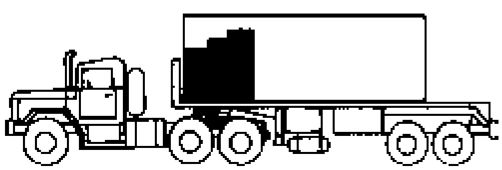
WRONG

This placement overloads one spring and set of tires. Brakes lock on the light side, causing skids.



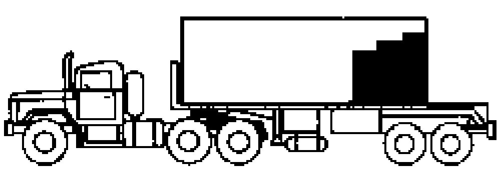
RIGHT

Nothing is overloaded; frame will not twist and loosen cross-member rivets.



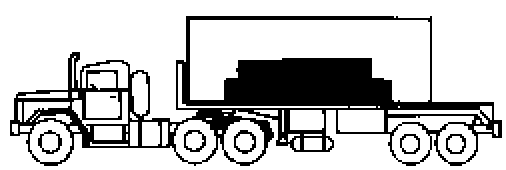
WRONG

This placement shortens tire life and bends the truck rear-axle housing. Applying the trailer brakes may lock the wheels and cause flat spots and skidding.



WRONG

This placement overloads trailer rear wheels so that brakes will not function properly and rubber scuffs away.



RIGHT

Distribute the load over the full trailer floor.

Figure 3-12. Load placement in trucks and semitrailers (continued)

Road Movement Tables

Convoy commanders use road movement tables (Figure 3-13) to track progress during movement. These tables help to ensure that convoys arrive and clear each CP on schedule. They are particularly useful if including such details in the body of the OPORD would complicate it or make it unduly long. Road movement tables often require a wider distribution than normal OPORDs. Copies are issued to convoy operating personnel, movement regulating team personnel, and traffic control posts. For security reasons, tables may not include dates or locations. The road movement table is assigned a security classification based on its contents. The table's classification is not necessarily the same as that of the OPORDs. The road movement table may be issued as an annex to the OPORD. If issued alone the table must be signed and authenticated in the same way as other orders.

The road movement table shows the date of the move, units involved, number of vehicles, and load class of the heaviest vehicle. It also shows the routes and times when serials will arrive at and clear critical points.

(Classification)

Annex B – "Movement Table" to Operation Order for Movement No
Map:

Copy No
Issuing HQ
Place of Issue
Date-Time Group of Signature
Message Reference No

General Data:
1. Average speed:
2. Traffic density:
3. Halts:
4. Routes (between start points and release points):
5. Critical points:
   (a) Start points.
   (b) Release points.
   (c) Other critical points.
6. Main routes to start points:
7. Main routes from release points:

Serial or Movement Number	Date	Unit/ Formation	Number of Vehicles	Load Class of Heaviest Vehicles	From	To	Route	Route to Start Point	Critical Points			Route from Release Point	Remarks
									Ref	Due (hr)	Clear (hr)		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)

Authentication:
Appendixes:
Distribution:

(Classification)

Figure 3-13. Suggested format for road movement table

A strip map (Figure 3-14) may also be published as an annex to an OPORD. When a strip map is used, its details should correspond to the data in the road movement table, and it should be distributed to the lowest practical level. Where practical and appropriate, a strip map may include the following data–

- Start point.
- Release point.
- Route numbers.
- Town names.
- Critical points.
- Check points.
- Distance between CPs.
- Total distance.
- North orientation.

Route Reconnaissance

A route reconnaissance overlay (Figure 3-15, page 3-31) is an accurate and concise report of the conditions affecting traffic flow along a specified route. It is the preferred method of preparing a route reconnaissance report. A route or road reconnaissance can be either technical or tactical and is required for both the hasty and deliberate reconnaissance. An overlay and DA Form 1711-R (engineer reconnaissance report) normally satisfy the requirements of hasty route reconnaissance. However, if more detail is required to support the reconnaissance, the overlay is supplemented with written reports describing critical route characteristics in more detail. See Figure 3-16, page 3-32, for an explanation of route reconnaissance overlay symbols.

The following checklist should be reviewed when preparing reconnaissance reports:

- Identification and location of the reconnoitered route.
- Distance between points that should be easily recognized both on the ground and on the map.
- Percent of slope and length of grades that have a 7 percent slope or greater.
- Sharp curves with a radius of 82 feet or less.
- Bridge military load classifications, limiting dimensions, and suitable bypasses.
- Locations and limiting data for fords and ferries.
- Route constrictions, such as underpasses, that are below minimum standard and, if appropriate, the distances these constrictions extend.
- Locations and limiting dimensions of tunnels and suitable bypasses.
- Suitable areas for short halts and bivouacs that offer drive-off facilities, adequate dispersion cover, and concealment.
- Areas of rockfalls and rockslides that may present a traffic hazard.
- Environmentally sensitive or protected areas.

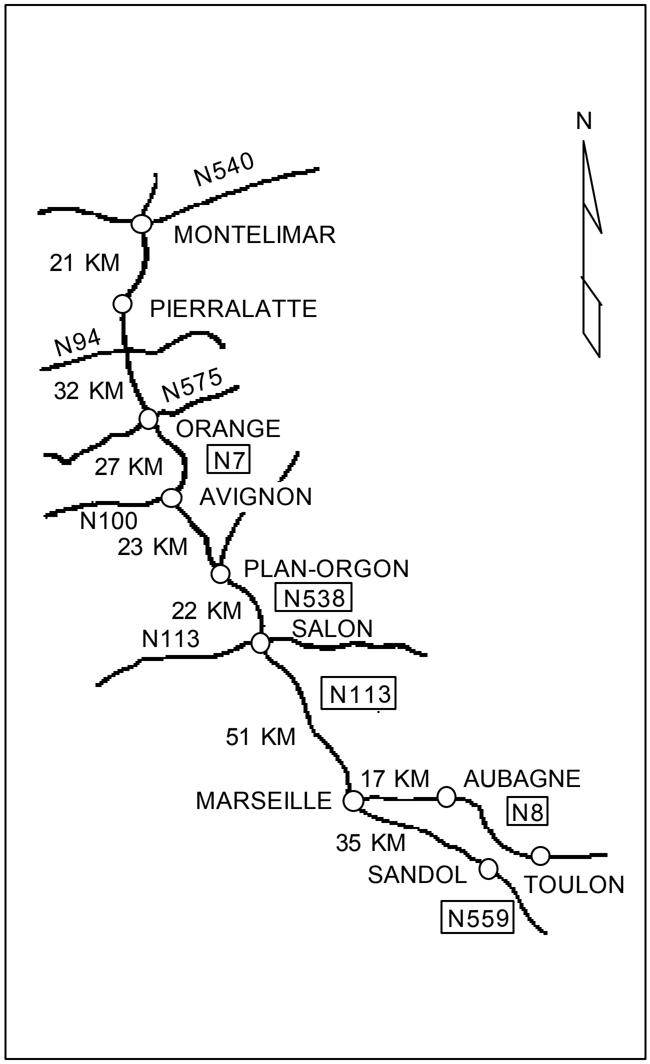


Figure 3-14. Sample strip map

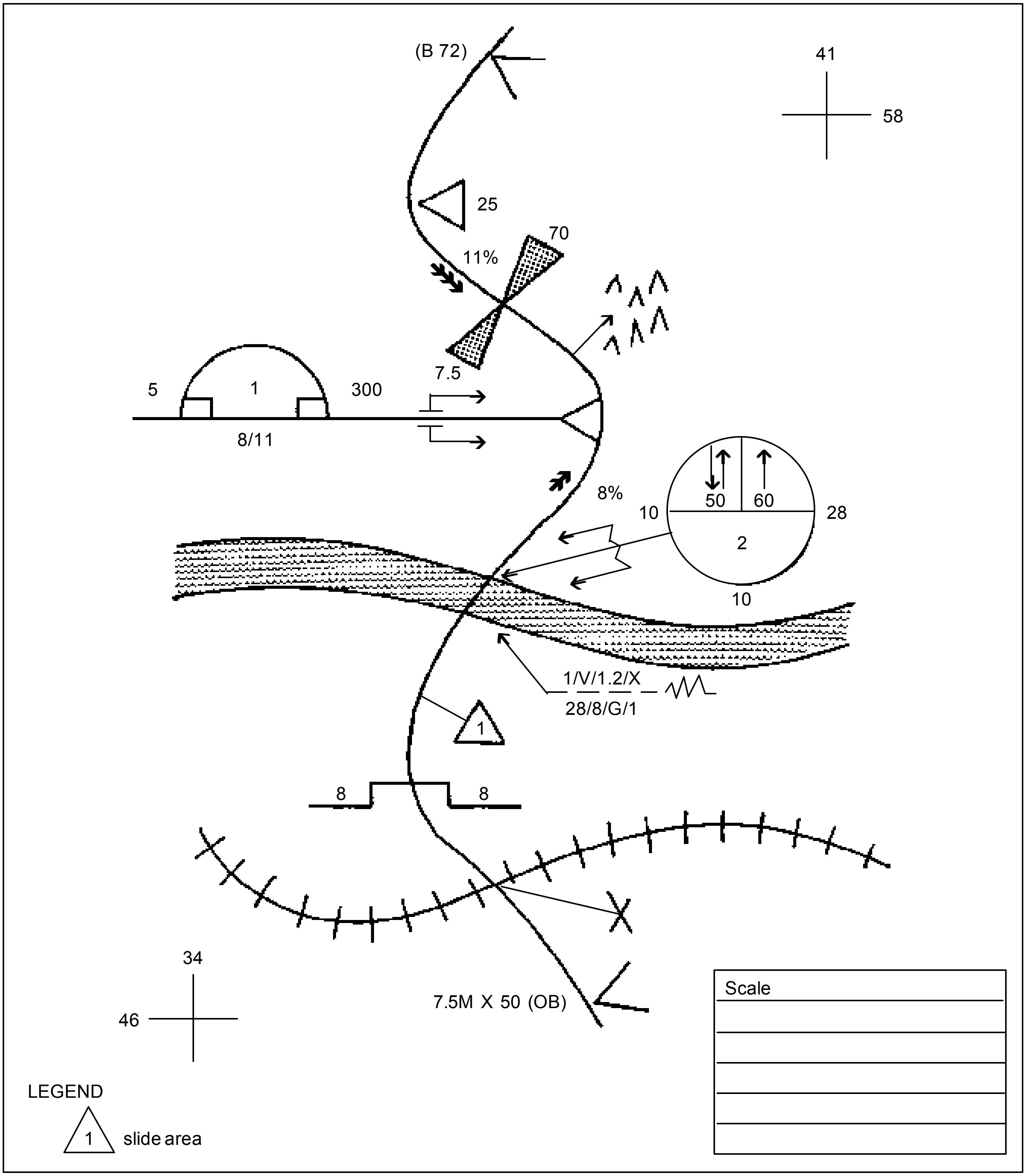


Figure 3-15. Sample route reconnaissance overlay

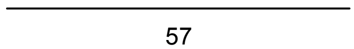
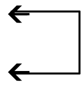
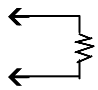
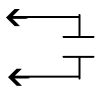
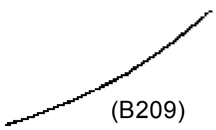
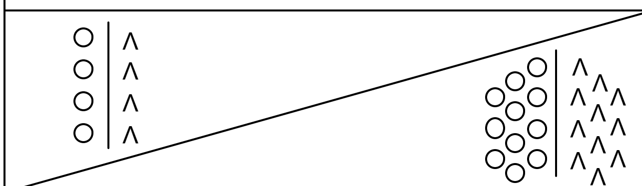
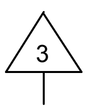
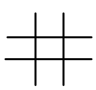
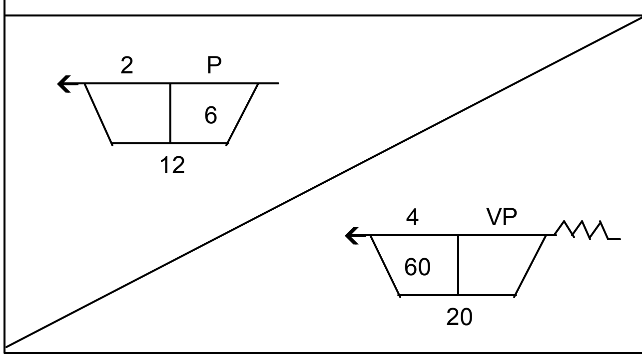
SYMBOL	DESCRIPTION
	Axial route. Use a solid line and identify the route by an odd number.
	Bypass easy. Use when the obstacle can be crossed in the immediate vicinity by a US 2 1/2-ton truck (or NATO equivalent) without work to improve the bypass.
	Bypass difficult. Use when the obstacle can be crossed in the immediate vicinity, but some work to improve the bypass is necessary.
	Bypass impossible. Use when the obstacle can be crossed only by repairing or constructing a feature, or by detouring around the obstacle.
	Civil or military route designation. Write the designation in parentheses along the route. Drawn to scale of map.
	Concealment. Show roads lined with trees by a single line of circles for deciduous trees and a single line of inverted Vs for evergreen trees. Show woods bordering a road by several rows of circles for deciduous trees and several rows of inverted Vs for evergreen trees.
	Critical points. Number, in order, and describe critical points on DA Form 1711-R. Use critical points to show features not adequately covered by other symbols on the overlay.
	Damage or destruction.
	Ferry. Draw arrow to the map location of the ferry. The data above the symbol shows, in order, the left approach, ferry serial number, ferry type, and right approach. The data inside the symbol shows, from left to right, the military load classification and the dead weight capacity in tons. The number below the symbol shows the turn-around time in minutes. A question mark indicates unknown information. Difficult approaches are shown by a straight line. Ferry type – V = vehicular, P = pedestrian

Figure 3-16. Route reconnaissance symbols

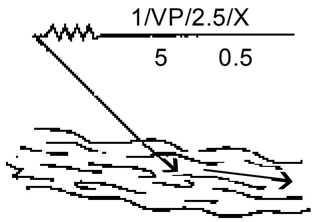
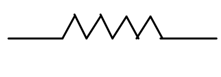
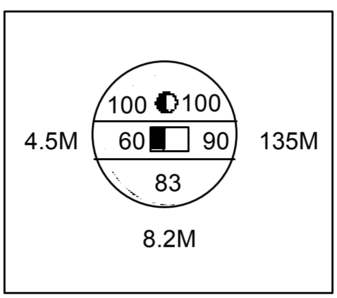
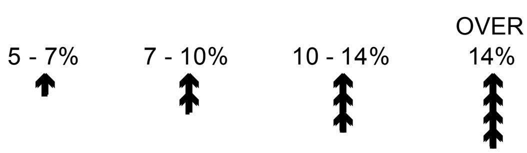
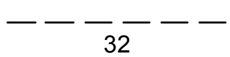
<table>
<tr><th>SYMBOL</th><th>DESCRIPTION</th></tr>
<tr><td>
</td><td>Ford. Draw arrow to the ford location. The data above the line shows, in order, the left bank approach, the ford serial number, ford type, stream velocity (in meters per second), seasonal limitations, and right bank approach. The left and right banks are determined by looking downstream. The data below the line shows, in order, length, width, bottom type, and depth. All measurements are in meters. Question marks indicate unknown information.
Ford type – V = vehicular, P = pedestrian
Seasonal limiting factors –
X = no seasonal limitations except for limited duration after sudden flooding.
Y = significant seasonal limitations.
Bottom type –
M = mud
C = clay
S = sand
G = gravel
R = rock
P = artificial paving</td></tr>
<tr><td></td><td>Approach conditions –
Difficult
Easy</td></tr>
<tr><td>
</td><td>Full NATO bridge symbol. Indicate wheeled vehicles in the upper third of the symbol with the two-way wheeled classification at the left and the one-way wheeled classification at the right. Show tracked vehicles in the center third of the symbol with the two-way tracked classification at the left and the one-way tracked classification at the right. Place the bridge serial number in the lower third of the symbol. Draw the arrow to the location of the bridge and show bypass conditions on the arrow shaft. Place traveled way width below the symbol, overhead clearance to the left of the symbol, and overall length to the right of the symbol.</td></tr>
<tr><td>
</td><td>Grades. Show the actual percent of grade. Any grade of 7 percent or more is an obstruction and is included in the route classification formula. Arrows point uphill, and the length of the arrow represents the length of grade if the map scale permits.</td></tr>
<tr><td>
</td><td>Lateral route. Use a broken line and identify the route by an even number.</td></tr>
</table>

Figure 3-16. Route reconnaissance symbols (continued)

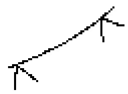
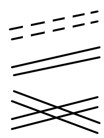
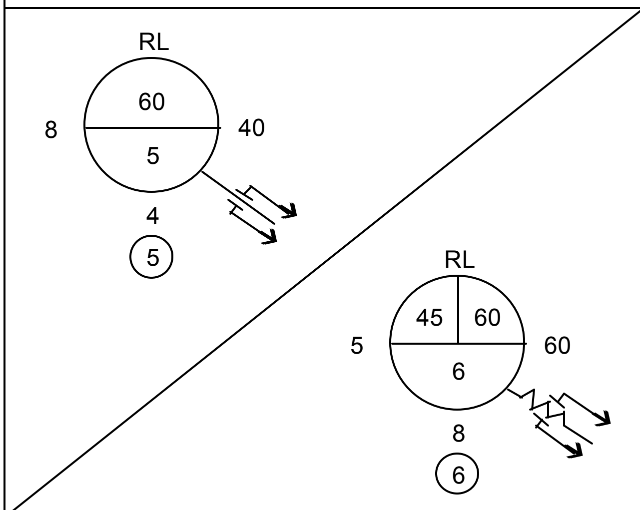
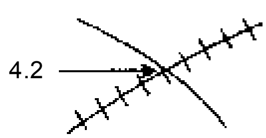
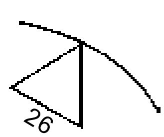
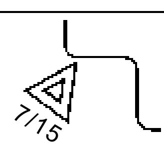
SYMBOL	DESCRIPTION
	Limits of sector. Show the beginning and ending of the reconnoitered section of a route or road with this symbol.
	Obstacles. Place the center of the symbol over the location of the blocked part of the route. Use parallel broken lines for a proposed block, parallel lines for a prepared but passable block, and crossed lines for a completed block.
	Overhead clearance unlimited.
	Parking area.
	Railway bridge symbol. Place RL above the symbol to indicate a railway bridge. At the left of the symbol, show the overhead clearance. Show the overall length of the bridge at the right of the symbol. Indicate the traveled way width below the symbol and underline it if it is below standard for the classification. Inside the symbol, show the bridge classification in the upper half. If the class is different for single- and double-flow traffic, show single-flow on the left and double-flow on the right. Place the railway bridge serial number in the lower half of the symbol. Draw an arrow to the map location of the bridge. On the arrow shaft, indicate the ease of adapting the bridge for road vehicle use. A zigzag line means it would be difficult to adapt, and a straight line means it would be easy to adapt. Place the bypass symbol on the arrow shaft to indicate bypass conditions.
	Railroad grade crossing. Use this symbol to show a level crossing where passing trains would interrupt traffic flow. If there is a power line present, show its height, in meters, from the ground. Underline the overhead clearance if it is less than 4.3 meters.
	Sharp curve. Point the vertex of triangle to map location of curve and indicate the radius of the curve, in meters, outside the triangle. A curve of 45 meters or less must be reported on the overlay, and a curve of 25 meters or less is an obstruction.
 -45m or less to need recording -25m or less to be (c=3)	Series of sharp curves. Point the vertex of the triangle at the first curve in the series. Indicate the number of curves in the series (left) and the radius of the sharpest curve (right).

Figure 3-16. Route reconnaissance symbols (continued)

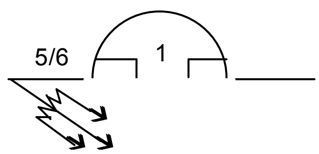
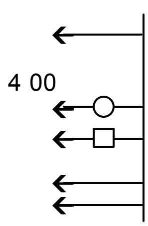
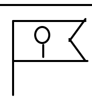
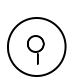
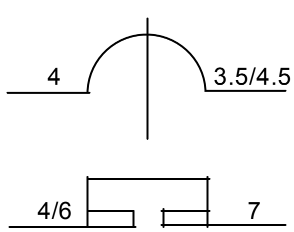
SYMBOL	DESCRIPTION
10.5 m/X/120/00 6 m/Z/30/4.1 m/(OB) 9 m/V/40/5 m/(OB) (W)	Routes classification formula. Express the formula in the order of route width, route type, military load classification, minimum overhead clearance, obstructions, if present, and special conditions. Route types – X = all-weather route Y = limited all-weather route A = fair-weather route Special conditions (T) = regular snow blockage (W) = regular flooding
	Tunnel. Draw arrow to map location of tunnel. Place bypass condition symbol on arrow. Show minimum and maximum overhead clearances to the left of the symbol, the tunnel serial number inside the symbol, and the total tunnel length to the right of the symbol. Below the symbol, show the traveled way width. If sidewalks are present, follow with a slash and the total traveled way, including sidewalks. Underline the traveled way if the road entering the tunnel is wider than the traveled way of the tunnel. Use a question mark to show unknown information.
	Turnout. Use this symbol to show the possibility of driving off the road. Draw the arrow in the direction of the turnout (right or left of road). For wheeled vehicles, draw a small circle on the shaft of the arrow. For tracked vehicles, draw a small square on the shaft of the arrow and place the length of the turnout, in meters, at the tip of the arrow. When a turnout is longer than 1 kilometer, use double arrows.
	Traffic control headquarters.
	Traffic control post.
	Underpass constrictions. Draw the symbol over the road. Place the width of the traveled way, in meters, to the left of the symbol. If sidewalks are present, follow the traveled way width with a slash and the total width, including sidewalks. Underline the traveled way width if the road entering the underpass if wider than the underpass traveled way. Show the overhead clearance, in meters, to the right of the symbol. Show both minimum and maximum overhead clearances, if different.

Figure 3-16. Route reconnaissance symbols (continued)

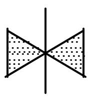
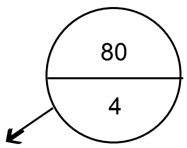
SYMBOL	DESCRIPTION
?	Unknown or doubtful information.
4  120	Width constriction. The number at the left shows the narrowest width of the constriction, and the one at the right is the total constricted length. Both dimensions are in meters.
	Bridge. Arrow extends to the bridge's location on the map. Lower portion of symbol indicates the bridge serial number; the upper portion indicates military load classification. Classification numbers must be underlined if width or overhead clearance is below minimum standard.

Figure 3-16. Route reconnaissance symbols (continued)

Traffic Circulation Plan

A traffic circulation plan (Figure 3-17, page 3-37) is a map overlay or graphic representation that shows a road net and gives necessary information and traffic restrictions. The circulation plan establishes one-way, two-way, and alternating routes of traffic flow. Routes must be available for a circular flow in the required directions. A one-way route normally requires a return route in the opposite direction. Adequate access and egress routes must be provided to prevent congestion of MSRs. The traffic circulation plan includes–

- All MSRs, checkpoints, and highway regulation points.
- Route names, direction of travel, boundaries, and principal supply activities.
- Any restrictive route features, critical points, and rest and refuel areas.
- Traffic control points if provided by the provost marshal before publication.

Traffic circulation plans frequently combine a standard map with an overlay to give the needed information. If the necessary information is too much to put on one overlay, use separate overlays for different types of information.

Tonnage capacities of roads and bridges are important considerations when selecting routes. The gross weight of the heaviest loaded vehicle should not exceed the rated tonnage capacity of the weakest bridge. It is difficult to determine exact tonnage capabilities of highways for sustained operations because conditions will vary. Also, the volume of tactical, administrative, and local traffic using supply routes may exceed that of cargo-hauling vehicles. This traffic further restricts highway transport capabilities.

In the absence of more accurate data, refer back to Table 3-3, page 3-23, as a guide for highway tonnage capabilities. This table gives estimates of supply support tonnage capabilities for various conditions. Sustained operations, adequate road maintenance, and two-way traffic are assumed. When more than one limiting condition is involved, apply the reduction factors in the same order as they appear in the table (left to right):

- First, narrow roadway.
- Second, terrain (rolling hills or mountains).
- Third, weather (if conditions are sustained).

Size and weight limits change periodically as a result of road and bridge construction. Planners must verify local limits and clearance and exemption methods with local military or civilian agencies before putting vehicles on the road.

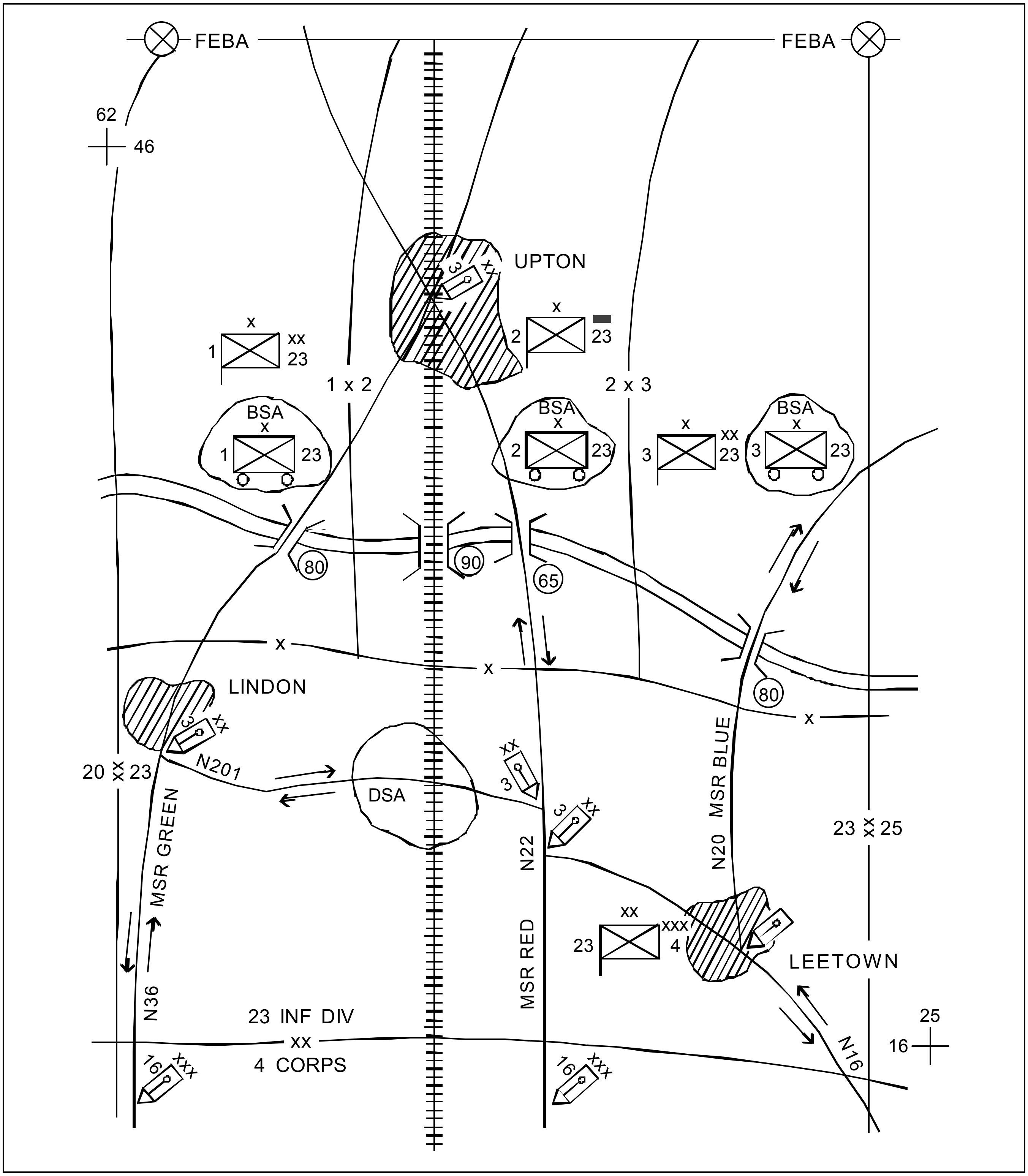


Figure 3-17. Sample traffic circulation plan

Military Load Classification System

The military load classification system is a load-capacity rating system based on vehicle weight and its effect on routes and bridges. In this classification system, whole numbers are assigned to vehicles, bridges, and routes. Most allied military vehicles are externally marked with their respective classification number. Military load classifications are assigned to bridges and routes based on their safe-load capacity and physical dimensions. See FM 5-36 for a detailed discussion of the military load classification system.

Vehicles. Except for prime movers, self-propelled vehicles in Class 3 or higher and towed vehicles in Class 1 or higher are marked to indicate their class. Prime movers are marked either with their own class or the class of the normal combination of prime mover with trailer or semitrailer. Markings on trucks should be on the right front, on or above the bumper, and below the driver's vision. Markings are lusterless black numerals on a lusterless forest green background. See Figure 3-18 for examples of truck markings. See FM 5-170 for weight classification listings of specific vehicles.

Bridges. Every military bridge is posted with a number capacity to indicate the highest weight-class vehicle that can safely cross. Heavier vehicles are barred except in special cases; for example, crossing at reduced speed or in limited numbers. Fixed bridges may also be marked with the length in feet of the span which corresponds to the posted capacity.

There are two types of bridge signs: classification (circular) signs and information (rectangular) signs. In both types, symbols or letters appear in black on a yellow background. See Figure 3-19, page 3-39, and Figure 3-20, page 3-40, for examples.

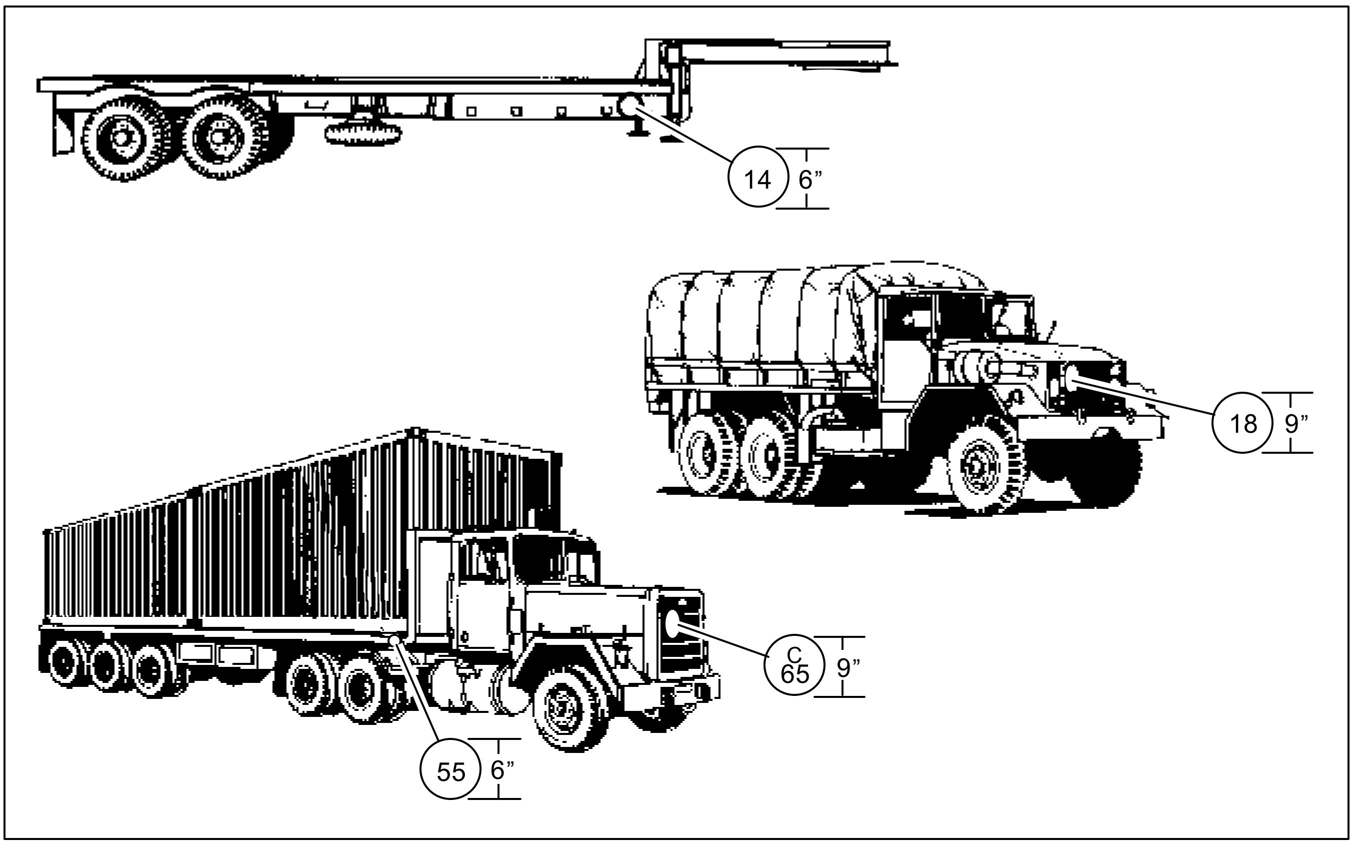


Figure 3-18. Vehicle classification markings

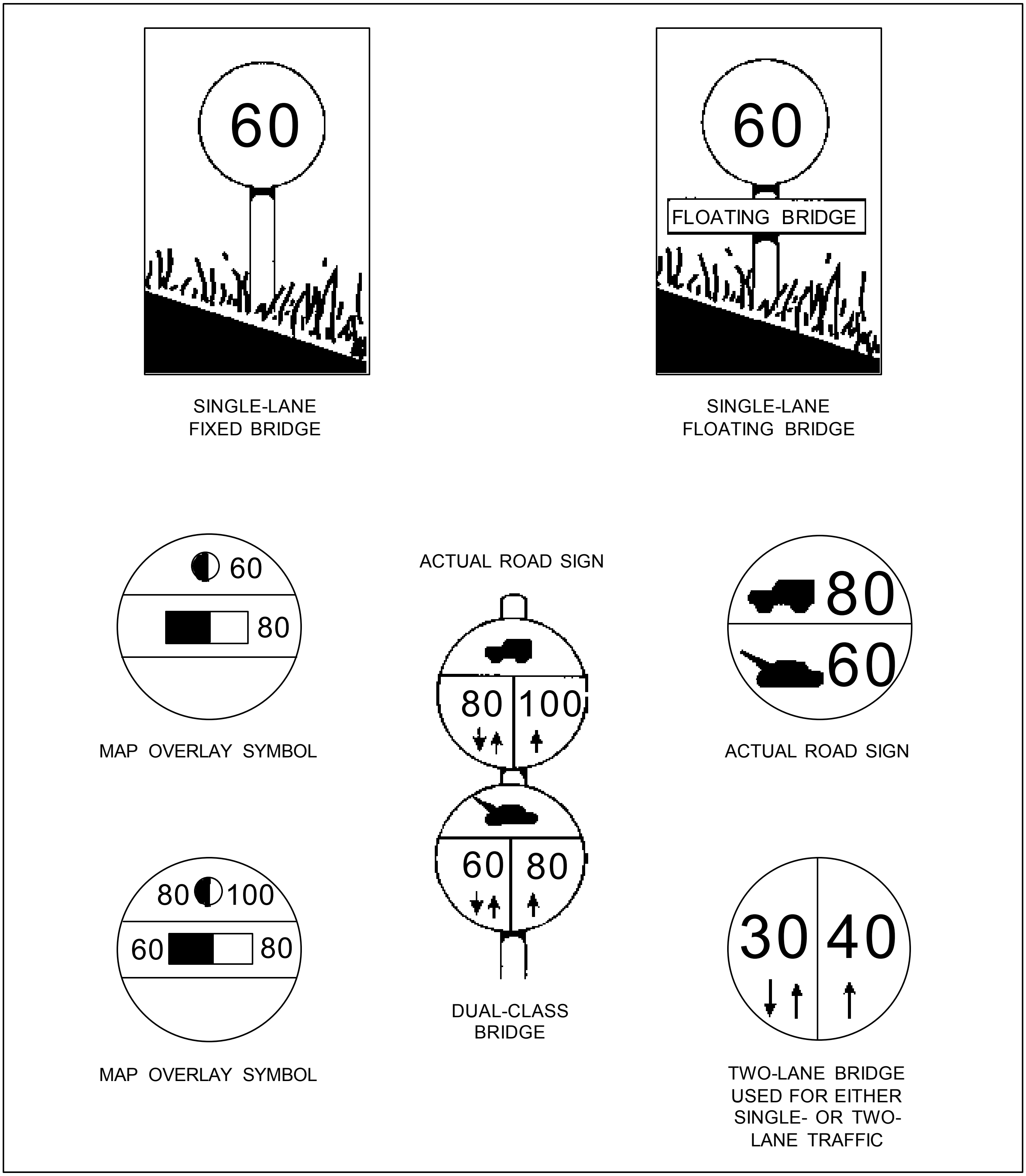


Figure 3-19. Typical bridge signs

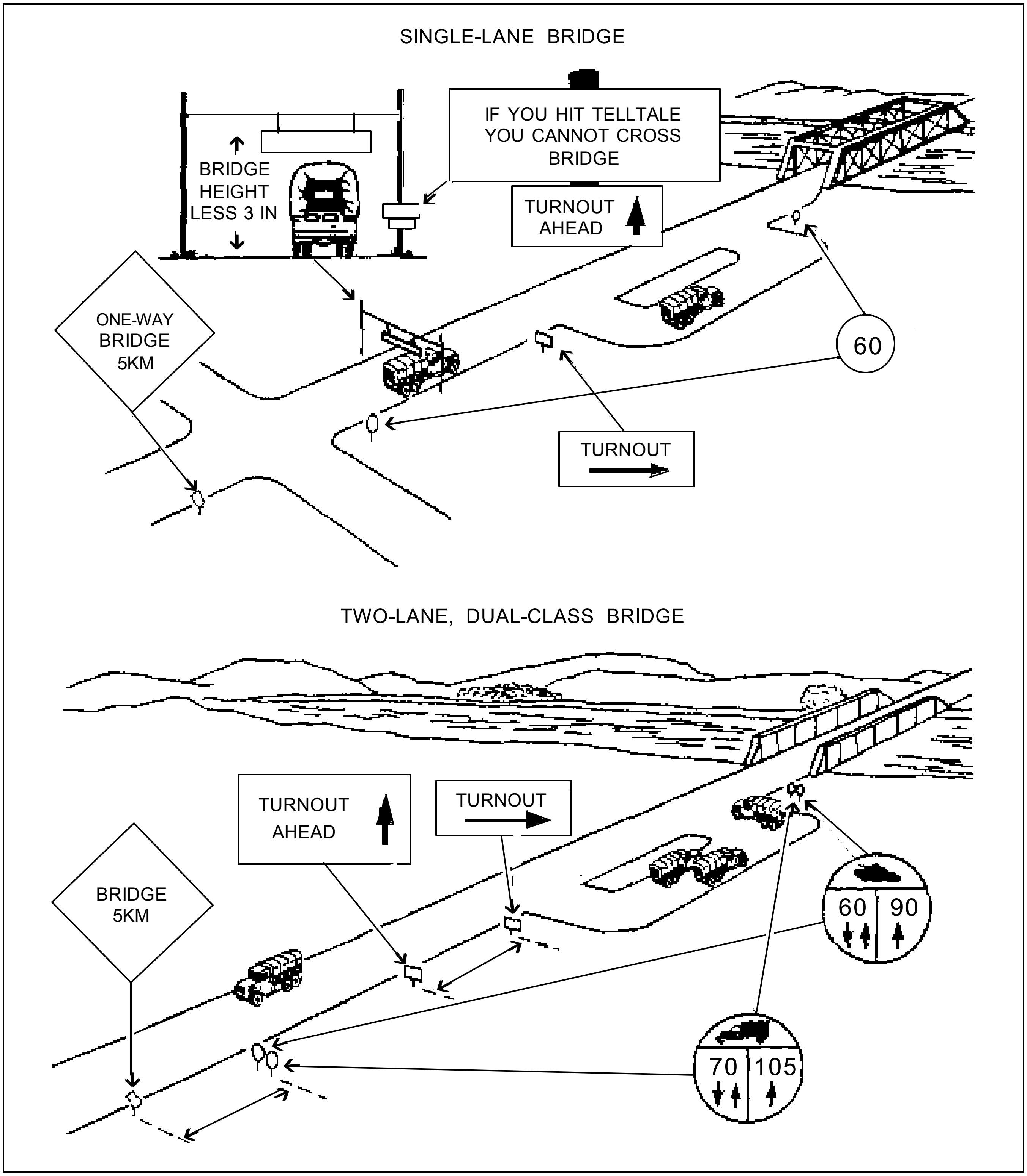


Figure 3-20. Typical placement of bridge signs

Routes. Routes are classified according to the route classification formula. The formula is a brief description of the route that is used with a route reconnaissance overlay. The route classification formula reflects the following:

- Route width.
- Route type.
- Lowest military load classification.
- Obstructions, if any, to traffic flow.
- Overhead clearance.
- Special conditions on the route.

The width of a route, including bridges, tunnels, roads, and other constrictions, is the narrowest width of the traveled way and is expressed in meters or feet. Minimum route widths for wheeled and tracked vehicles in single- and double-flow traffic are shown in Table 3-5.

Type. For classification purposes, the type of route is based on its resistance to the effects of weather. The worst section of the route determines its type. Route types are defined as follows:

- Type X – an all-weather route that, with reasonable maintenance, is passable throughout the year to maximum capacity traffic. Roads on a Type X route normally have waterproof surfaces and are only slightly affected by precipitation and temperature fluctuations. At no time is the route closed to traffic due to weather except for temporary snow or flood blockage.
- Type Y – an all-weather route which, with reasonable maintenance, can be kept open in all weather, although sometimes it is open to less than maximum capacity traffic. Roads on a Type Y route usually do not have waterproof surfaces and are considerably affected by precipitation and temperature fluctuations. Adverse weather conditions may cause traffic to be completely halted for short periods of up to one day at a time, during which heavy use of the road may cause complete collapse of the surface.
- Type Z – a fair-weather route which quickly becomes impassable in adverse weather and can then be kept open only by major repairs/construction. A Type Z route is so seriously affected by weather that traffic may be brought to a halt for long periods.

Table 3-5. Minimum route widths for wheeled and tracked vehicles

TRAFFIC FLOW	WIDTHS	
	Wheeled Vehicles	Tracked Vehicles
Single	18 to 24 ft (5.5 to 7.3 m)	19.5 to 26 ft (6 to 8 m)
Double	Over 24 ft (7.3 m)	Over 26 ft (8 m)

Load. Route load classification is usually determined by the lowest bridge or ferry military load number (regardless of vehicle type or traffic conditions). Using the lowest bridge classification number ensures that the route will not be overloaded. When a proposed route has a military load classification lower than that of the vehicles that must cross it, this fact is shown on the route reconnaissance overlay. A special reconnaissance determines if a change in traffic control procedures, such as a single-flow crossing, would make the route safe for these vehicles. If there is no bridge on the route, the worst section of road governs the route classification.

Obstructions. Obstructions affect the type, amount, and speed of traffic flow. Route obstructions are indicated in the route classification formula by the letters "OB." (An exception is bridge capacities reported separately as a military load classification.) Reconnaissance overlay symbols are used to describe the nature of each obstruction on the overlay. The following obstructions must be reported:

- Overhead obstructions, such as bridges, tunnels, underpasses, wires, and overhanging buildings, that have an overhead clearance under 14 feet (4.3 m).
- Reductions in traveled-way widths which are below the standard minimums prescribed in FM 5-170 for the type of traffic flow. Examples are width reduction due to bridges, tunnels, craters, lanes through mine areas, and projecting buildings or rubble.
- Gradients (slopes) of 7 percent or greater.

- Curves with radius of less than 82 feet (25 meters).
- Ferries.
- Fords.

NOTE: Slopes of 5 percent or more and curves of 45 meters or less must be reported on the reconnaissance overlay (even though they do not meet the obstruction criteria) to ensure that minimal trafficability requirements are reported.

If an obstruction appears in the route classification formula, refer to the route reconnaissance overlay to determine the exact type and location of the obstruction.

Formulas. Examples of typical route classification formulas are shown in Table 3-6.

Convoy Movement

A convoy is a group of vehicles moving from the same origin to destination that are organized under a single commander for the purpose of control. All vehicles normally move at the same march rate. The number of vehicles that make up a convoy will be determined by theater policy, standardization agreements, or host nation traffic regulations. In the absence of policies to the contrary, convoys should consist of six or more vehicles. Also, when 10 or more vehicles per hour are dispatched to the same destination over the same route, they will be considered a convoy.

To aid in control, large columns may be broken down into serials, and serials may be broken down into march units. Each column and each organized element must include the following personnel:

- Commander, either officer or noncommissioned officer, whose place in the column varies to best control the convoy.
- Pacesetter, in the first vehicle of the first element, to lead the column and regulate its speed.
- Trail officer, in each column, travels in the rear of each element to deal with problems that occur within the column.

Table 3-6. Typical route classification formulas

FORMULA	MINIMUM WIDTH OF TRAVELED WAY	ROUTE TYPE	MILITARY LOAD CLASSIFICATION	REMARKS
20 ft Z 10	20 ft	fair weather	10	Based on 20-ft min width of travled way, accommodates wheeled and tracked, single-flow traffic. No obstructions.
20 ft Z 10 (OB)	20 ft	fair weather	10	If used for double-flow traffic, min width of traveled way (20 ft) is considered an obstruction.
7 M Y 50 (OB)	7 M	limited all weather	50	If used for wheeled or tracked vehicles in double-flow traffic, min width of traveled way (7M) is considered an obstruction.
10.5 M X 120 (OB)	10.5 M	all-weather	120	Based on 10.5-m min width of traveled way, accommodates wheeled and tracked vehicles in double-flow traffic.

Column identification. Each column is identified according to STANAG 2027 guidance. For example, a blue flag on the lead vehicle, a green flag on the last vehicle. When moving at night the lead vehicle also shows a blue light and the last vehicle a green light. The column commander's vehicle displays a flag bisected by a diagonal line to form two triangles. The upper triangle is white; the lower is black. In areas where vehicles drive on the left side of the roadway, flags are mounted on the right side of the vehicle; otherwise, they are mounted on the left side.

Each column is identified for the entire movement by a number known as a "movement number" or "identification serial number." The controlling and scheduling movement control organization assigns this number at the time it assigns the movement credit. Command directives or STANAGs normally prescribe that moving units chalk the movement credit on the sides of their vehicles and, if possible, in the front of their vehicles to identify that the movement is authorized. In Europe, the movement number includes a date, organizing authority, and sequence number, as follows:

- Two digits indicating the day of the month when movement is scheduled.
- Three or four letters indicating the organizing authority. First two letters are the national symbols shown in STANAG 1059.
- Two or three digits indicating the serial number assigned by the responsible authority; one letter to identify elements of the column (optional).

For example, movement number 15-JSV-412D identifies column number 8, composed of V Corps vehicles, which will be moved by US authority on the third day of the current month. The elements of a convoy may be identified by adding a letter behind the movement number. Based on circumstances, columns may also be identified IAW theater policy, HN guidance, or other STANAGs.

In CONUS, movement numbers normally include a command identifier, Julian date, and sequence number. For example, a unit from Fort Bragg, NC will move on Julian date 010, and the credit was the first issued for that date. The movement credit would be FB-010-01. Codes may be added after the sequence number to further identify the unit or type of movement. See FM 55-10 for more information.

NOTE: Command directives will determine the makeup of movement numbers in any theater not governed by a STANAG. For a description of how to develop a movement number in CONUS, see FM 55-312.

Movement credit. A movement credit is an allocation granted to one or more vehicles in order to move over a controlled route in a fixed time according to movement instructions. Besides the allocation of a movement number or identification serial number, a movement credit indicates times at which the first and last vehicle of a column are scheduled to pass the entry and exit points. These are the points where the column enters and leaves the controlled route. The credit is a control number. Policies for determining the codes used for movement credits are governed by STANAGs, HN traffic regulations, or command directives.

Preparing for Vehicle Air Movement

Units which must be ready for immediate air movement should make preparations well in advance to avoid delays in loading vehicles on transporting aircraft. Essential items of information which should be known beforehand for each vehicle are–

- Weight with load.
- Dimensions.
- Center of balance.
- Prepared hazardous materials (IAW TM 38-250).

Weight and dimensions. The weight and dimensions of almost all Army equipment can be found in TB 55-46-1. If this publication is not available but a scale is, weigh the item. If an item of equipment is too big to manhandle onto a scale, load it on a vehicle and weigh it on a vehicle scale. Make sure that scales are calibrated.

Center of balance. The CB of cargo items must be determined before the weight and balance of a loaded aircraft can be computed. The shipping agency is responsible for marking each item of cargo with the correct gross weight and a CB point. Mark all items measuring 10 feet or longer and those having a balance point other than at center. Mark vehicles with load-carrying capability to show an empty or loaded CB, whichever is appropriate. Items not marked according to these guidelines will not be accepted for airlift.

The weight and CB of a vehicle is determined after all secondary loads are secured. Secondary loads are items of baggage or cargo transported in truck beds and trailers that must be included in total vehicle weight. Nothing can be added to or removed from a vehicle that has been weighed without afterwards reweighing the vehicle.

Terms used in measuring and weighing vehicles include:

- RDL – reference datum line. Predetermined point from which all measurements are taken.
- FOH – front overhang. Distance in inches from front bumper to center of front axle.
- WB – wheelbase. Distance in inches from center of front axle to center of rear axle or center of tandem axles.
- ROH – rear overhang. Distance from rear or center of tandem axles to rear bumper.
- FAW – front axle weight in pounds.
- RAW – rear axle weight in pounds.
- MOMENT – the product obtained by multiplying the weight at a given point by its distance in inches from the RDL.

To compute the CB of a vehicle, multiply the weight of each axle by its distance from the RDL. The result is called the moment. Next divide the moment by the gross weight of the vehicle. The resulting CB figure is the number of inches measured aft from the RDL to the point where the vehicle will balance. Compute CB to the nearest whole inch.

$$\frac{(W_1 \times D_1) + (W_2 \times D_2)}{\text{gross weight}} = \text{CB}$$

where W_1 = front axle weight
W_2 = rear axle weight
D_1 = distance from RDL to front axle
D_2 = distance from RDL to rear axle

See Figure 3-21 for illustrations of weight and measurement points.

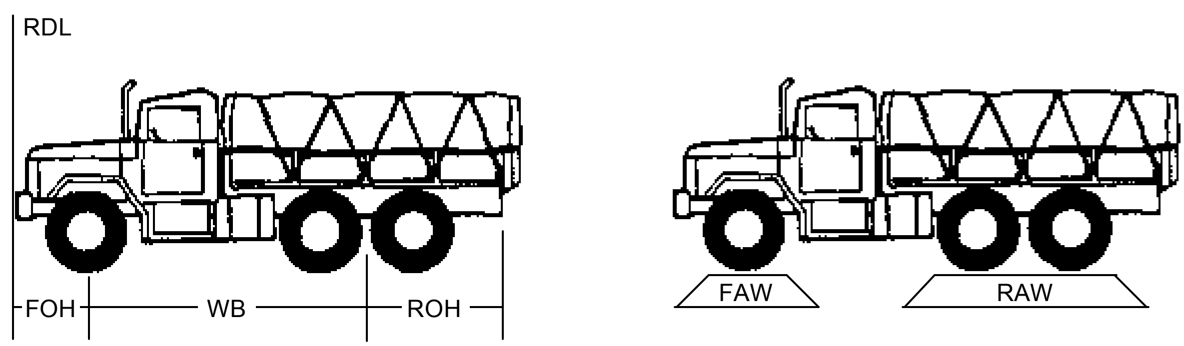


Figure 3-21. Weight and measurement points

After computing CB, mark both sides of the vehicle with masking tape to form a "T" shape. Use a grease pencil or magic marker to write the gross weight in the crossbar of the "T." Write the letters "CB" in the vertical bar to mark exact CB position. Mark axle weights above each axle. See Figure 3-22, page 3-46, for an example of a CB marker. The following examples illustrate methods to determine weight and CB of typical cargo. The examples include single-axle, multiaxle, and tracked vehicles and skid-mounted cargo.

Example 1 – vehicles:

Step 1. Determine front and rear axle weights.

Step 2. Determine distance from front and rear axles to the RDL.

Step 3. Enter the weights and distances into the CB formula:

$$\frac{(5{,}000 \times 60) + (10{,}000 \times 180)}{15{,}000} = \frac{300{,}000 + 1{,}800{,}000}{15{,}000}$$

Step 4. Divide the total moment by the gross weight.

$$= \frac{2{,}100{,}000}{15{,}000} = 140 \text{ inches}$$

The CB of the vehicle measured from the front end (RDL) is 140 inches.

Example 2 – trailers:

When using the formula to compute CB of a trailer, consider the tongue to be the front axle; consider the actual axle to be the rear axle.

Step 1. Weigh tongue and axle.

Step 2. Measure the distance from the end of the tongue to the center of the axle.

Step 3. Enter the weights and distances into the formula.

$$\frac{(150 \times 1) + (3{,}600 \times 80)}{3{,}750} =$$

$$\frac{150 + 288{,}000}{3{,}750} = \frac{288{,}150}{3{,}750} = 76.84$$

The CB of the trailer measured from the tongue (RDL) is 77 inches.

Example 3 – multiaxle vehicles:

Step 1. Determine all axle weights.

Step 2. Determine distance from each axle to the RDL.

Step 3. Enter the weights and distances into the formula.

$$\frac{(10{,}000 \times 42) + (13{,}600 \times 209) + (11{,}200 \times 463)}{34{,}800} =$$

$$\frac{420{,}000 + 2{,}842{,}000 + 5{,}185{,}600}{34{,}800} = \frac{8{,}448{,}000}{34{,}800}$$

Step 4. Divide the total moment by the gross weight.

$$\frac{8{,}448{,}000}{34{,}800} = 243 \text{ inches}$$

The CB of the vehicle measured from the front end (RDL) is 243 inches.

Example 4 – tracked vehicles:

Step 1. Weigh the vehicle on a platform scale (truck scale, coal yard scale) large enough to accommodate the entire vehicle. Record weight.

Step 2. Drive the vehicle onto a wooden beam or pole until the vehicle tilts forward. Mark the CB and gross weight on the side of the vehicle at the point of tilt.

Example 5 – skid-mounted cargo:

Step 1. If the skid-mounted cargo will fit on the scale, weigh the whole load.

Step 2. Place the load on a pipe and center it until it balances. Mark the CB at the balance point.

Example 6 – skid-mounted cargo:

If the skid-mounted cargo is too large to fit on a scale at one time, use the CB formula. Consider the support braces between the skids to be axles.

Step 1. Support the overhang at the same height as the scale with a block of wood.

Step 2. Measure the distance from the RDL to the front and rear points of support (same as axles).

Step 3. Enter the weights and distances into the formula.

$$\frac{(1{,}500 \times 50) + (2{,}050 \times 110)}{3{,}550} = \frac{75{,}000 + 225{,}500}{3{,}550} =$$

$$\frac{300{,}000}{3{,}550} = 84.6 \text{ inches}$$

The CB of the cargo measured from the RDL is 85 inches.

International Markings and Road Signs. Personnel serving in overseas locations should be able to readily identify standardized vehicle markings and road signs. For guidelines concerning NATO military vehicle markings and illustrations of various road signs prescribed by NATO and the Geneva Convention, refer to Appendix D.

Hazardous Materials. Packages, freight containers, and means of transport containing hazardous materials must be marked, labeled, and placarded IAW 49 CFR, Part 172. Refer to Appendix E of this manual for guidance and illustrations of hazardous materials marking, labeling, and placarding for all modes of transportation.

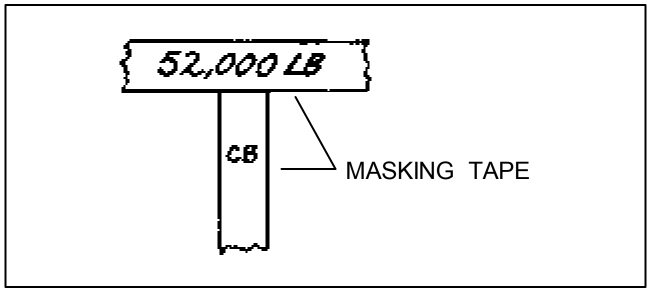


Figure 3-22. Center of balance marker

Section II
MOTOR TRANSPORT DATA

The information included here provides the motor transport planner with vehicle characteristics and capabilities. Other planning information includes statistics on safe vehicle distances, local and line-haul operations, and highway tonnage capabilities.

VEHICLE CHARACTERISTICS

Tables 3-7 through 3-22, pages 3-47 through 3-73 list mechanical data on authorized motor transport vehicles. This information includes truck performance data; CB of single-unit trucks; and axle weights, dimensions, and capacities for prime movers and towed vehicles.

PLANNING STATISTICS

Table 3-23, page 3-73, contains average vehicle stopping distances for prime movers and passenger vehicles. Use this table to determine safe vehicle gaps at various speeds on average, hard-surfaced roads. Since well trained drivers can reduce the distance traveled during the perception and reaction periods, the planner should consider the physical condition and training of drivers for a particular operation. Keep in mind that rain, snow, or ice present special conditions. Braking distances are based on the assumption that vehicles are loaded and have good brakes, tires, and traction. The average values in Table 3-23 have been determined from the standpoint of safety only; the tactical situation may require larger or smaller gaps. In the absence of definite information, the rule of thumb method may be used for certain speeds to determine the gap between vehicles in a convoy: speedometer reading (MPH) x 2 = gap in yards (or speedometer reading (KPH) x 1.2 = gap in meters). Use this method only for speeds marked with an asterisk in Table 3-23. See Figure 3-23, page 3-75, for illustrations of Army motor transport vehicles. See Appendix A for motor transport unit capabilities.

Table 3-7. Vehicle axle weights

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Truck, cargo, 2 1/2-T, 6 x 6, M35A1	6,580	7,320	13,900	5,980	7,420	13,400	7,470	16,830	24,300	6,970	16,820	23,790
Truck, cargo, 2 1/2-T, 6 x 6, M35A2, M35A2C2	6,760	6,960	13,720	6,105	7,095	13,200	6,905	11,815	18,720	6,250	11,950	18,200
Truck, cargo, 2 1/2-T, 6 x 6, M36A2	6,850	8,260	15,110	6,250	8,360	14,610	7,700	17,810	25,510	7,100	17,910	25,010
Truck, cargo, 2 1/2-T, 6 x 6, M36A2C	7,140	8,270	15,410	6,510	8,380	14,890	7,375	13,035	20,410	6,745	13,145	19,890
Truck, tk, fuel-svc, 1,200-gal, 2 1/2-T, 6 x 6, M49A2C	6,420	8,440	14,860	5,765	8,575	14,340	6,980	11,680	18,660	7,635	11,545	19,180
Truck, tk, water, 1,000-gal, 2 1/2-T, 6 x 6, M50A2	6,410	8,170	14,580	5,790	8,290	14,080	7,220	15,710	22,930	6,700	15,730	22,430
Truck, tk, water, 1,000-gal, 2 1/2-T, 6 x 6, M50A3	6,310	8,840	15,150	5,655	8,975	14,630	7,525	11,875	19,400	6,870	12,010	18,800
Truck, van, shop, 2 1/2-T, 6 x 6, M109A3	6,865	8,935	15,800	6,210	9,070	15,280	7,025	13,775	20,800	6,370	13,910	20,280
Truck, repair, shop, 2 1/2-T, 6 x 6, M185A3	6,875	10,405	17,280	6,220	10,540	16,760	7,035	15,245	22,280	6,380	15,380	21,760
Truck, van, expansible, 2 1/2-T, 6 x 6, M292A2	—	—	—	8,045	13,164	21,209	—	—	—	8,635	17,974	26,609
Truck, van, expansible, 2 1/2-T, 6 x 6, M292A5	—	—	—	7,520	15,410	22,930	—	—	—	8,110	20,220	28,330

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Truck, trac, 2 1/2-T, 6 x 6, M275A2	6,570	6,075	12,645	5,905	6,220	12,125	6,665	12,880	19,645	6,100	13,025	19,125
Truck, dump, 2 1/2-T, 6 x 6, M342A2	6,910	8,865	15,775	6,255	9,000	15,255	6,975	13,800	20,775	6,320	13,935	20,255
Truck, cargo, 5-T, 6 x 6, M54, M54A1, M54A1C	8,735	11,210	19,945	7,884	11,347	19,231	9,404	20,891	30,295	8,553	21,028	29,581
Truck, cargo, 5-T, 6 x 6, M54A2	8,700	11,700	20,400	7,720	11,820	19,540	9,930	30,870	40,800	8,950	30,990	39,940
Truck, cargo, 5-T, 6 x 6, M54A2C	8,720	11,940	20,660	7,740	12,060	19,800	9,890	31,170	41,060	8,910	31,290	40,200
Truck, cargo, 5-T, 6 x 6, M55	9,000	15,060	24,060	8,150	15,200	23,350	9,180	24,880	34,060	8,327	25,022	33,349
Truck, cargo, 5-T, 6 x 6, M55A2	8,840	15,060	23,900	7,880	15,160	23,040	9,450	24,880	34,330	8,490	25,022	33,512
Truck, cargo, 5-T, 6 x 6, M813	9,850	11,170	21,020	9,065	11,290	20,355	10,175	20,845	31,020	9,390	20,965	30,355
Truck, cargo, 5-T, 6 x 6, M813A1	9,855	11,265	21,120	9,070	11,385	20,455	10,135	20,985	31,120	9,350	21,205	30,455
Truck, cargo, 5-T, 6 x 6, M814	10,000	13,540	23,540	9,235	13,640	22,875	10,000	23,495	33,495	9,280	23,595	32,875
Truck, cargo, 5-T, 6 x 6, M923	—	—	—	9,700	11,770	21,470	—	—	—	9,855	21,615	31,175

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Truck, cargo, 5-T, 6 x 6, M923A1	—	—	—	10,205	11,970	22,175	—	—	—	10,185	21,990	32,175
Truck, cargo, 5-T, 6 x 6, M923A2	—	—	—	8,930	12,000	20,930	—	—	—	8,910	22,020	30,930
Truck, cargo, 5-T, 6 x 6, M925	10,750	11,820	22,570	—	—	—	10,905	21,665	32,570	—	—	—
Truck, cargo, 5-T, 6 x 6, M925A1	11,225	12,020	23,275	—	—	—	11,235	22,040	33,275	—	—	—
Truck, cargo, 5-T, 6 x 6, M925A2	9,980	12,050	22,030	—	—	—	9,960	22,070	32,030	—	—	—
Truck, cargo, 5-T, 6 x 6, M927	—	—	—	10,200	14,100	24,300	—	—	—	10,205	24,095	34,300
Truck, cargo, 5-T, 6 x 6, M927A1	—	—	—	10,985	14,080	25,065	—	—	—	11,185	23,880	35,065
Truck, cargo, 5-T, 6 x 6, M927A2	—	—	—	9,450	14,340	23,790	—	—	—	9,430	24,360	33,790
Truck, cargo, 5-T, 6 x 6, M928	11,230	14,170	25,400	—	—	—	11,235	24,165	35,400	—	—	—
Truck, cargo, 5-T, 6 x 6, M928A1	12,045	13,920	26,165	—	—	—	12,245	23,920	36,165	—	—	—
Truck, cargo, 5-T, 6 x 6, M928A2	10,480	14,410	24,890	—	—	—	10,460	24,430	34,890	—	—	—

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Truck, dump, 5-T, 6 x 6, M51	9,305	11,580	22,665	8,460	13,250	21,980	9,503	11,580	21,083	8,658	11,661	20,319
Truck, dump, 5-T, 6 x 6, M51A2	9,150	13,550	22,700	8,260	13,660	21,920	9,503	23,160	32,663	8,658	23,322	31,980
Truck, dump, 5-T, 6 x 6, M817	10,400	13,355	23,755	9,610	13,480	23,090	10,670	23,085	33,755	9,880	23,210	33,090
Truck, dump, 5-T, 6 x 6, M929	—	—	—	10,290	13,700	23,990	—	—	—	10,495	23,495	33,990
Truck, dump, 5-T, 6 x 6, M929A1	—	—	—	10,080	13,750	23,830	—	—	—	11,185	23,880	35,065
Truck, dump, 5-T, 6 x 6, M929A2	—	—	—	9,710	14,110	23,820	—	—	—	9,910	23,910	33,820
Truck, dump, 5-T, 6 x 6, M930	11,340	13,750	25,090	—	—	—	11,545	23,545	35,090	—	—	—
Truck, dump, 5-T, 6 x 6, M930A1	10,680	13,760	22,440	—	—	—	12,245	23,920	36,165	—	—	—
Truck, dump, 5-T, 6 x 6, M930A2	10,770	14,150	24,920	—	—	—	10,970	23,950	34,920	—	—	—
Truck, trac, 5-T, 6 x 6, M52	9,008	9,998	18,996	8,163	10,150	18,313	9,384	24,612	33,996	8,539	24,774	33,313
Truck, trac, 5-T, 6 x 6, M52A1	9,220	10,230	19,450	8,500	10,560	19,060	9,510	24,940	34,450	8,730	25,330	34,060

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Truck, trac, 5-T, 6 x 6, M52A2	9,020	9,680	18,700	8,030	9,810	17,840	9,384	24,612	33,996	8,539	24,330	33,313
Truck, trac, 5-T, 6 x 6, M818	10,260	9,905	20,165	9,470	10,030	19,500	10,635	24,530	35,165	9,845	24,655	34,500
Truck, trac, 5-T, 6 x 6, M819	14,665	20,400	35,065	—	—	—	14,665	32,400	47,065	—	—	—
Truck, trac, 5-T, 6 x 6, M931	—	—	—	10,077	13,751	23,828	—	—	—	10,710	25,430	36,140
Truck, trac, 5-T, 6 x 6, M931A1	—	—	—	10,340	10,800	21,140	—	—	—	10,710	25,430	36,140
Truck, trac, 5-T, 6 x 6, M931A2	—	—	—	9,065	10,830	19,895	—	—	—	9,435	25,460	34,895
Truck, trac, 5-T, 6 x 6, M932	10,679	13,761	22,440	—	—	—	11,770	25,470	37,240	—	—	—
Truck, trac, 5-T, 6 x 6, M932A1	11,400	10,840	22,240	—	—	—	11,770	25,470	37,240	—	—	—
Truck, trac, 5-T, 6 x 6, M932A2	10,125	10,870	20,995	—	—	—	10,495	25,500	35,995	—	—	—
Truck, trac, wkr, 5-T, 6 x 6, M62	9,325	24,000	33,325	—	—	—	5,027	35,298	40,325	—	—	—
Truck, wkr, 5-T, 6 x 6, M543A1, M543A2	9,090	25,160	34,250	—	—	—	5,115	36,535	41,650	—	—	—

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Truck, wkr, 5-T, 6 x 6, M816	10,530	24,520	35,050	—	—	—	13,060	35,460	48,430	—	—	—
Truck, wkr, 5-T, 6 x 6, M936	11,630	25,970	37,600	—	—	—	7,690	36,910	44,600	—	—	—
Truck, wkr, 5-T, 6 x 6, M936A1	12,075	26,080	38,155	—	—	—	7,835	37,320	45,155	—	—	—
Truck, wkr, 5-T, 6 x 6, M936A2	10,800	26,110	36,910	—	—	—	6,560	37,350	43,910	—	—	—
Truck, van, expansible, 5-T, 6 x 6, M291A2C	—	—	—	8,900	16,900	25,800	—	—	—	9,860	31,340	41,200
Truck, van, expansible, 5-T, 6 x 6, M820	—	—	—	10,775	17,420	28,195	—	—	—	10,950	22,245	33,195
Truck, van, expansible, 5-T, 6 x 6, M820A1	—	—	—	10,750	17,145	27,895	—	—	—	10,925	21,970	32,895
Truck, van, expansible, 5-T, 6 x 6, M820A2	—	—	—	10,070	20,125	30,195	—	—	—	10,245	24,950	35,195
Truck, van, expansible, 5-T, 6 x 6, M934	—	—	—	10,590	17,850	28,440	—	—	—	10,765	22,675	33,440
Truck, van, expansible, 5-T, 6 x 6, M934A1	—	—	—	11,190	18,090	29,280	—	—	—	11,410	22,870	34,280
Truck, van, expansible, 5-T, 6 x 6, M934A2	—	—	—	9,915	18,120	28,035	—	—	—	10,135	22,900	33,035

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB) AXLE LOAD W/WINCH Front	Rear	Total	AXLE LOAD W/O WINCH Front	Rear	Total	GROSS WEIGHT, PAYLOAD & PERSONNEL (LB) AXLE LOAD W/WINCH Front	Rear	Total	AXLE LOAD W/O WINCH Front	Rear	Total
Truck, van, expansible, 10-T, 8 x 8, M977	20,930	16,935	37,865	20,430	16,535	36,965	30,000	32,000	62,000	—	—	—
Truck, van, expansible, 10-T, 8 x 8, M985	20,160	19,140	39,300	19,660	18,740	38,400	26,970	34,330	61,300	26,470	33,930	60,400
Truck, van, expansible, 10-T, 8 x 8, M983	24,220	14,750	38,970	23,730	14,340	38,070	24,220	26,750	50,970	23,730	26,340	50,070
Truck, trac, 10-T, 6 x 6, M123A1C	12,650	17,580	30,230	—	—	—	13,750	46,490	60,240	—	—	—
Truck, trac, 10-T, 6 x 6, M916	—	—	27,971	—	—	—	14,220	42,340	56,560	—	—	—
Truck, trac, 10-T, 6 x 6, M916A1	—	—	27,750	—	—	—	16,000	52,000	68,000	—	—	—
Truck, trac, 10-T, 8 x 6, M920	26,020	10,180	36,200	—	—	—	27,920	43,640	71,560	—	—	—
Truck, trac, 10-T, 8 x 8, PLS, M1074	—	—	—	30,200	24,810	55,010	—	—	—	32,110	55,890	88,000
Truck, trac, 10-T, 8 x 8, PLS, M1075	—	—	—	26,650	23,310	49,960	—	—	—	28,550	54,410	82,960
Truck, trac, 14-T, 8 x 4, M915	—	—	—	9,920	9,710	19,630	—	—	—	11,313	37,658	48,971
Truck, trac, 14-T, 8 x 4, M915A1	—	—	—	9,920	9,800	19,720	—	—	—	11,580	36,540	48,120

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Truck, trac, 14-T, 8 x 4, M915A2	—	—	—	—	—	18,700	—	—	—	12,000	38,000	50,000
Truck, trac, 22 1/2-T, 8 x 8, M911	19,954	19,998	39,952	—	—	—	21,800	58,600	80,400	—	—	—
Truck, trac, 22 1/2-T, 8 x 8, M1070	18,368	22,722	41,090	—	—	—	21,472	64,763	86,235	—	—	—
Stlr, van, elct, 6-T, 2-whl, M373A2	—	—	—	—	6,040	9,430	—	—	—	—	12,540	21,430
Stlr, van elct, 6-T, 2-whl, M348A2	—	—	—	—	5,090	9,810	—	—	—	—	12,930	21,810
Stlr, van, expansible, 6-T, 4-whl, M313	—	—	—	—	11,225	15,350	—	—	—	—	20,000	27,350
Stlr, van, stor, 6-T, 4-whl, M750	—	—	—	—	9,160	15,310	—	—	—	—	12,700	20,800
Stlr, stake, 6-T, 4-whl, M127	—	—	—	—	9,950	13,500	—	—	—	—	23,800	37,500
Stlr, stake, 12-T, 4-whl, M127A1, M127A1C	—	—	—	—	10,230	14,240	—	—	—	—	23,500	38,240
Stlr, stake, 12-T, 4-whl, M127A2C	—	—	—	—	10,080	13,840	—	—	—	—	23,930	37,840
Stlr, van, cargo, 12-T, 4-whl, M128A1C	—	—	—	—	10,830	14,695	—	—	—	—	24,600	38,695

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Stlr, van, cargo, 12-T, 4-whl, M128A2C	—	—	—	—	10,600	15,220	—	—	—	—	24,570	39,220
Stlr, van, supply, 12-T, 4-whl, M129A1C	—	—	—	—	11,170	15,245	—	—	—	—	24,860	39,245
Stlr, van, supply, 12-T,4-whl, M129A2C	—	—	—	—	10,700	15,400	—	—	—	—	24,670	39,400
Stlr, low-bed, wkr, 12-T, 4-whl, M269, M269A1	—	—	—	—	10,520	14,200	—	—	—	—	28,040	38,200
Stlr, tk, fuel, 12-T, 4-whl, M967, M967A1	—	—	—	—	9,720	14,040	—	—	—	—	29,220	39,840
Stlr, tk, fuel, 12-T, 4-whl, M969, M969A1	—	—	—	—	10,980	16,060	—	—	—	—	30,780	41,860
Stlr, tk, fuel, 12-T, 4-whl, M970, M970A1	—	—	—	—	11,490	16,810	—	—	—	—	29,220	42,610
Stlr, trk, fuel, 12-T, 4-whl, M131A2	—	—	—	—	8,900	12,400	—	—	—	—	21,020	32,744
Stlr, tk, fuel, 12-T, 4-whl, M131A4	—	—	—	—	9,470	12,900	—	—	—	—	22,640	36,165
Stlr, tk, fuel, 12-T, 4-whl, M131A4C	—	—	—	—	9,470	12,900	—	—	—	—	22,640	36,165
Stlr, tk, fuel, 12-T, 4-whl, M131A5	—	—	—	—	9,385	12,785	—	—	—	—	22,550	36,050

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Stlr, tk, fuel, 7,500-gal, 4-whl, M1062	—	—	—	—	*	10,600	—	—	—	—	33,182	64,600
Stlr, low-bed, 22 1/2-T, 4-whl, M871	—	—	—	—	10,220	15,900	—	—	—	—	35,320	60,700
Stlr, low-bed, 22 1/2-T, 4-whl, M871A1, M871A2	—	—	—	—	8,140	12,240	—	—	—	—	32,300	57,240
Stlr, low-bed, 25-T, 4-whl, M172A1	—	—	—	—	11,510	16,600	—	—	—	—	41,606	66,600
Stlr, low-bed, 25-T, 4-whl, M172	—	—	—	—	11,510	16,600	—	—	—	—	41,606	66,600
Stlr, flat-bed, 34-T, 6-whl, M872	—	—	—	—	12,840	16,800	—	—	—	—	56,400	84,000
Stlr, flat-bed, 34-T, 6-whl, M872A1, M872A2, M872A3	—	—	—	—	12,140	19,240	—	—	—	—	56,770	86,440
Stlr, low-bed, 40-T, 6-whl, M870	—	—	—	—	11,000	16,500	—	—	—	—	56,500	96,500
Stlr, HET, 60-T, 8-whl, M747	—	—	—	—	24,000	31,000	—	—	—	—	106,000	152,000
Stlr, HET, 70-T, 8-whl, M1000	—	—	—	—	41,680	50,400	—	—	—	—	146,000	190,400
Trailer, cargo, 3/4-T, 2-whl, M101	—	—	—	—	1,240	1,340	—	—	—	—	2,670	2,840

Table 3-7. Vehicle axle weights (continued)

VEHICLE	CURB WEIGHT (LB)						GROSS WEIGHT, PAYLOAD & PERSONNEL (LB)					
	AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH			AXLE LOAD W/WINCH			AXLE LOAD W/O WINCH		
	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Trailer, cargo, 3/4-T, 2-whl, M101A1	—	—	—	—	1,225	1,340	—	—	—	—	2,511	2,780
Trailer, ammo, 1 1/2-T, 2-whl, M332	—	—	—	—	2,495	2,875	—	—	—	—	5,511	5,875
Trailer, cargo, 1 1/2-T, 2-whl, M105A2	—	—	—	—	2,520	2,750	—	—	—	—	5,385	5,750
Trailer, tk, water, 1 1/2-T, 2-whl, M107A1	—	—	—	—	2,010	2,280	—	—	—	—	5,345	5,615
Trailer, tk, water, 1 1/2-T, 2-whl, M107A2	—	—	—	—	2,100	2,380	—	—	—	—	5,710	5,440
Trailer, tk, water, 1 1/2-T, 2-whl, M149	—	—	—	—	2,170	2,500	—	—	—	—	5,575	5,830
Trailer, tk, water, 1 1/2-T, 2-whl, M149A1	—	—	—	—	2,350	2,710	—	—	—	—	5,690	6,040
Trailer, tk, water, 1 1/2-T, 2-whl, M149A2	—	—	—	—	2,385	2,730	—	—	—	—	5,717	6,062
Trailer, PLS, 16.5-T, M1076	—	—	—	—	9,380	16,530	—	—	—	—	31,220	49,520

Table 3-8. Center of balance: location on single-unit vehicles

VEHICLE	CB WITHOUT PAYLOAD				CB WITH EVENLY DISTRIBUTED PAYLOAD			
	LOCATION W/WINCH		LOCATION W/O WINCH		LOCATION W/WINCH		LOCATION W/O WINCH	
	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)
Truck, amb, 1 1/4-T, 4 x 4, M1010	—	—	36.4	66.0	—	—	—	—
Truck, cargo, 1 1/4-T, 4 x 4, M1008	—	—	30.5	57.6	—	—	—	80.5
Truck, cargo, 1 1/4-T, 4 x 4, M1028	—	—	30.5	54.9	—	—	—	83.9
Truck, cargo, 2 1/2-T, 6 x 6, M35A1	38.0	81.0	38.0	85.5	46.0	110.0	46.5	113.0
Truck, cargo, 2 1/2-T, 6 x 6, M35A2, M35A2C	36.5	78.1	36.3	82.8	45.6	97.2	45.6	101.1
Truck, cargo, 2 1/2-T, 6 x 6, M36A2	36.3	102.0	36.1	106.9	45.3	121.3	45.3	125.6
Truck, tk, fuel-serv, 1,200-gal, 2 1/2-T, 6 x 6, M49A2C	41.0	87.5	41.0	92.1	46.9	92.7	46.9	96.4
Truck, tk, water, 1,000-gal, 2 1/2-T, 6 x 6, M50A2	41.0	86.0	41.0	90.7	46.9	89.4	46.9	93.3
Truck, tk, water, 1,000-gal, 2 1/2-T, 6 x 6, M50A3	41.0	89.9	41.0	94.5	47.7	94.3	47.7	98.0
Truck, van, shop, 2 1/2-T, 6 x 6, M109A3	47.4	87.1	47.6	91.4	—	102.0	—	105.6
Truck, van, repair shop, 2 1/2-T, 6 x 6, M185A3	92.7	51.3	96.8	—	105.4	—	108.8	51.0
Truck, van, expansible, 2 1/2-T, 6 x 6, M292A2	—	—	57.0	120.0	—	—	65.0	134.0
Truck, van, expansible, 2 1/2-T, 6 x 6, M292A5	—	—	58.0	125.0	—	—	65.0	143.0
Truck, trac, 2 1/2-T, 6 x 6, M275A1, M275A2	32.5	68.2	32.0	72.8	—	93.1	—	96.7

Table 3-8. Center of balance: location on single-unit vehicles (continued)

VEHICLE	CB WITHOUT PAYLOAD				CB WITH EVENLY DISTRIBUTED PAYLOAD			
	LOCATION W/WINCH		LOCATION W/O WINCH		LOCATION W/WINCH		LOCATION W/O WINCH	
	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)
Truck, dump, 2 1/2-T, 6 x 6, M342A2	39.4	86.5	39.9	90.0	44.2	102.3	44.2	105.9
Truck, cargo, 5-T, 6 x 6, M54	39.9	99.8	40.1	105.9	54.1	124.4	54.7	128.8
Truck, cargo, 5-T, 6 x 6, M54A2	40.0	103.0	40.5	108.0	54.0	135.0	54.5	139.0
Truck, cargo, 5-T, 6 x 6, M54A2C	40.0	104.0	40.5	109.0	54.0	136.0	54.5	140.0
Truck, cargo, 5-T, 6 x 6, M55	40.3	134.8	—	—	49.1	157.1	—	—
Truck, cargo, 5-T, 6 x 6, M55A2	40.5	135.5	40.0	141.5	55.0	170.2	54.5	173.0
Truck, cargo, 5-T, 6 x 6, M813	40.5	95.1	40.0	99.0	50.3	120.5	49.8	123.9
Truck, cargo, 5-T, 6 x 6, M813A1	40.5	95.2	40.0	99.0	50.3	120.7	49.8	124.0
Truck, cargo, 5-T, 6 x 6, M814	38.6	123.7	38.2	128.2	61.6	150.7	61.2	154.3
Truck, cargo, 5-T, 6 x 6, M923	—	—	40.1	98.0	—	—	51.0	123.0
Truck, cargo, 5-T, 6 x 6, M923A1	—	—	42.8	96.6	—	—	54.6	122.4
Truck, cargo, 5-T, 6 x 6, M925	40.1	93.7	—	—	51.1	120.0	—	—
Truck, cargo, 5-T, 6 x 6, M925A1	43.3	92.4	—	—	55.1	118.6	—	—
Truck, cargo, 5-T, 6 x 6, M927	—	—	39.2	125.6	—	—	49.4	151.0
Truck, cargo, 5-T, 6 x 6, M927A1	—	—	41.8	122.9	—	—	56.0	149.7

Table 3-8. Center of balance: location on single-unit vehicles (continued)

VEHICLE	CB WITHOUT PAYLOAD				CB WITH EVENLY DISTRIBUTED PAYLOAD			
	LOCATION W/WINCH		LOCATION W/O WINCH		LOCATION W/WINCH		LOCATION W/O WINCH	
	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)
Truck, cargo, 5-T, 6 x 6, M928	39.5	120.0	—	—	49.3	147.0	—	—
Truck, cargo, 5-T, 6 x 6, M928A1	42.1	118.3	—	—	56.3	145.2	—	—
Truck, dump, 5-T, 6 x 6, M51	38.7	98.3	38.9	102.7	47.4	118.4	47.7	121.7
Truck, dump, 5-T, 6 x 6, M51A2	38.7	99.7	38.7	104.0	58.0	130.0	58.0	133.0
Truck, dump, 5-T, 6 x 6, M817	42.3	94.6	41.7	98.2	49.8	114.2	49.2	117.1
Truck, dump, 5-T, 6 x 6, M929	—	—	44.1	95.2	—	—	50.5	116.0
Truck, dump, 5-T, 6 x 6, M929A1	—	—	46.8	93.8	—	—	49.7	113.7
Truck, dump, 5-T, 6 x 6, M930	41.4	91.4	—	—	50.5	113.0	—	—
Truck, dump, 5-T, 6 x 6, M930A1	47.1	90.1	—	—	50.0	110.4	—	—
Truck, trac, 5-T, 6 x 6, M52	34.5	87.8	34.0	92.6	46.2	120.7	45.7	124.0
Truck, trac, 5-T, 6 x 6, M52A2	34.0	88.5	34.5	94.0	—	131.0	—	134.0
Truck, trac, 5-T, 6 x 6, M818	38.0	82.7	38.5	86.2	—	116.4	—	119.2
Truck, trac, wkr, 5-T, 6 x 6, M819	56.6	125.2	—	—	—	148.2	—	—
Truck, wkr, 5-T, 6 x 6, M62	—	124.5	—	—	—	156.4	—	—
Truck, wkr, 5-T, 6 x 6, M543A2	47.0	131.0	—	—	—	—	—	—

Table 3-8. Center of balance: location on single-unit vehicles (continued)

	CB WITHOUT PAYLOAD				CB WITH EVENLY DISTRIBUTED PAYLOAD			
	LOCATION W/WINCH		LOCATION W/O WINCH		LOCATION W/WINCH		LOCATION W/O WINCH	
VEHICLE	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)
Truck, wkr, 5-T, 6 x 6, M816	47.9	134.9	—	—	43.0	150.9	—	—
Truck, wkr, 5-T, 6 x 6, M936	43.2	125.1	—	—	—	165.1	—	—
Truck, wkr, 5-T, 6 x 6, M936A1	52.9	122.4	—	—	—	148.0	—	—
Truck, van, expansible, 5-T, 6 x 6, M291A2C	—	—	56.0	141.0	—	—	64.0	163.0
Truck, van, expansible, 5-T, 6 x 6, M820	—	—	54.3	133.3	—	—	—	144.4
Truck, van, expansible, 5-T, 6 x 6, M820A1	—	—	54.3	132.7	—	—	—	143.9
Truck, van, expansible, 5-T, 6 x 6, M820A2	—	—	56.1	143.5	—	—	—	152.5
Truck, van, expansible, 5-T, 6 x 6, M934	—	—	54.3	138.0	—	—	—	161.2
Truck, van, expansible, 5-T, 6 x 6, M934A1	—	—	57.5	132.8	—	—	—	143.4
Truck, van, expansible, 5-T, 6 x 6, M935	—	—	56.9	146.9	—	—	—	155.5
Truck, cargo, 10-T, 8 x 8, M977	44.7	95.0	—	—	62.4	113.2	—	—
Truck, cargo, 10-T, 8 x 8, M985	45.3	100.7	—	—	67.4	117.6	—	—
Truck, trac, 10-T, 8 x 8, M983	43.0	59.7	—	—	—	—	—	—
Truck, wkr, 10-T, 8 x 8, M984	45.5	101.0	—	—	—	—	—	—
Truck, fuel, svc, 10-T, 8 x 8, M983	49.0	65.6	—	—	—	—	—	—

Table 3-8. Center of balance: location on single-unit vehicles (continued)

VEHICLE	CB WITHOUT PAYLOAD				CB WITH EVENLY DISTRIBUTED PAYLOAD			
	LOCATION W/WINCH		LOCATION W/O WINCH		LOCATION W/WINCH		LOCATION W/O WINCH	
	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)	Above Ground (In)	Behind Front Axle CL (In)
Truck, trac, 16.5-T, 10 x 10, PLS, M1074	—	—	55.0	101.0	—	—	65.0	144.0
Truck, trac, 16.5-T, 10 x 10, PLS w/crane, M1075	—	—	55.0	105.0	—	—	65.0	148.0
Truck, trac, 22 1/2-T, 8 x 8, M1070	43.67	118.68	—	—	—	—	—	—
Truck, utility, 3/4-T, 4 x 4, M1009	—	—	30.8	48.5	—	—	—	80.5

Table 3-9. Dimensions and loading capacity for cargo truck bodies

VEHICLE TYPE	CARGO DECK DIMENSIONS			CARGO BODY LOADING MEASUREMENTS					
	Length (in)	Width (in)	Height Above Ground (in)	Under Bows (in)	Under Bows (cu ft)	Top of Side Racks (in)	Top of Side Racks (cu ft)	Top of Steering Wheel (in)	Top of Steering Wheel (cu ft)
1 1/4-ton:									
M880, M881	98.6	69.9	34.0	NA	NA	NA	NA	39.5	151.9 [1, 2]
M882	98.6	69.9	34.0	NA	NA	NA	NA	39.5	124.6 [1, 2, 3]
M883, M884	98.6	69.9	34.0	NA	NA	NA	NA	39.5	151.9 [1, 2]
M885	98.6	69.9	34.0	NA	NA	NA	NA	39.5	151.9 [1, 2, 4]
M890, M891	98.6	69.9	31.0	NA	NA	NA	NA	39.5	151.9 [1, 2]
M892	98.6	69.9	31.0	NA	NA	NA	NA	39.5	151.9 [1, 2, 5]
2 1/2-ton:									
M35AI, M35A2	146.8	88.0	51.9	60.0	441.9 [6]	36.5	272.8	28.9	216.0
M35A2C	147.0	87.6	52.5	60.0	440.5 [6]	36.5	272.0	28.8	214.6
M36A2	210.0	88.0	51.8	71.8	759.3 [8]	38.0	406.4	30.0	320.8
5-ton:									
M54, M54A1	168.0	88.0	56.5	60.0	480.2 [10, 11]	36.5	286.1 [10]	29.0	222.0 [10]
M54A1C	168.0	88.0	55.5	60.0	482.5 [10, 11]	36.5	287.5 [10]	30.0	231.7 [10]
M54A2	168.0	88.0	55.5	61.0	480.2 [10, 11]	36.5	286.1 [10]	29.0	222.0 [10]
M54A2C	168.0	88.4	55.5	60.0	482.5 [10, 11]	36.5	287.5 [10]	30.0	231.7 [10]
M55, M55A2	244.0	88.0	57.2	61.3	751.5 [12]	36.5	453.5	28.0	360.3
M813	168.0	88.3	56.8	57.2	468.0 [12, 15]	36.5	298.8 [15]	29.3	237.0 [15]
M813A1	168.0	88.3	56.8	57.4	468.0 [12, 15]	36.5	298.8 [15]	29.3	237.0 [15]
M814	243.8	87.8	57.3	60.0	733.0 [12]	36.3	449.6	31.3	387.5
M821	218.8	97.8	64.0	48.8	604.3 [13]	(13)	(13)	(13)	(13)
M923, M925	168.0	88.3	56.8	57.4	468.0 [12, 15]	36.5	298.8 [15]	29.3	237.0 [15]
M923A1, M923A2,									

Table 3-9. Dimensions and loading capacity for cargo truck bodies (continued)

VEHICLE TYPE	CARGO DECK DIMENSIONS Length (in)	Width (in)	Height Above Ground (in)	CARGO BODY LOADING MEASUREMENTS Under Bows (in)	Under Bows (cu ft)	Top of Side Racks (in)	Top of Side Racks (cu ft)	Top of Steering Wheel (in)	Top of Steering Wheel (cu ft)
M925A1, M925A2	168.0	88.3	59.8	57.4	468.0 [12]	36.5	298.8 [15]	32.3	277.3
M927, M928	244.0	88.3	56.8	57.4	468.0 [12, 15]	36.5	298.8 [18]	29.3	237.0 [18]
M927A1, M928A1	244.0	88.3	59.8	57.4	468.0 [12, 15]	36.5	298.8 [18]	32.3	402.7
10-ton:									
M977	216.0	90.0	65.0	48.0 [9]	540.0 [18]	(16)	(17)	38.0 [2]	427.5 [2]
M985	216.0	90.0	65.0	48.0 [14]	540.0 [18]	(17)	(7)	38.0 [2]	427.5 [2]

1 Cubic capacity reduced 5.6 cubic feet for wheel wells.
2 Height and cube measured to top of cab.
3 Cubic capacity reduced 27.3 feet for communications kit.
4 Cubic capacity reduced 0.8 cubic feet for communications tie-down brackets.
5 Cubic capacity reduced 40.1 cubic feet for communications kit.
6 Cubic capacity reduced 6.6 cubic feet for curve of bows.
7 See Top of Steering Wheel column for cube.
8 Cubic capacity reduced 8.5 cubic feet for curve of bows.
9 Cubic capacity reduced 27.0 cubic feet for spare tire and carrier in cargo body.
10 Cubic capacity reduced 26.1 cubic feet for spare tire and carrier in cargo body.
11 Cubic capacity reduced 7.0 cubic feet for curve of bows.
12 Cubic capacity reduced 10.2 cubic feet for curve of bows.
13 Height and cube measured to top of bulkhead.
14 Height over spare tire.
15 Cubic capacity reduced 14.5 cubic feet for spare tire and carrier in cargo body.
16 Cubic capacity reduced 93.8 cubic feet for wheel wells.
17 See Top of Steering Wheel column for height. Steering wheel is higher than side racks.
18 Cube measured to top of spare tire.

Table 3-10. Dimensions and loading capacity for dump truck bodies

	CARGO DECK DIMENSIONS			CARGO BODY LOADING MEASUREMENTS					
				Top of Panels		Top of Steering Wheel		Top of Shield	
VEHICLE TYPE	Length (in)	Width (in)	Height Above Ground (in)	(in)	(cu ft)	(in)	(cu ft)	(in)	(cu ft)
2 1/2-ton:									
M342A2	130.0	70.0	53.0	24.5	(1)	26.5	(1)	52.0	273.8
5-ton:									
M51	123.0	82.0	59.0	25.0	(1)	27.0	(1)	51.0	297.6
M51A2	123.0	82.0	59.0	25.0	(1)	27.0	(1)	51.0	297.6
M817	124.8	81.9	59.0	25.0	(1)	27.1	(1)	51.8	306.3
M929	124.8	81.9	59.0	28.0	(1)	27.1	(1)	51.8	306.3
M930	124.8	81.9	59.0	25.0	(1)	27.1	(1)	51.8	306.3
20-ton:									
F5070	191.5	85.1	66.5	34.3	(2)	NA	(2)	58.8	537.0 [3, 4]
M917	216.0	84.0	68.0	31.0	(2)	NA	(2)	(2)	753.6 [3]

[1] Removed cab shield stowed in dump body. See Top of Cab Shield column for cube.

[2] Cab shield cannot be removed. See Top of Cab Shield column for cube.

[3] Cube capacity reduced 12.9 cubic feet for hoist doghouse in dump body.

[4] Cube capacity reduced 1.8 cubic feet for ribs in dump body.

Table 3-11. Dimensions and loading capacity for cargo trailer bodies

VEHICLE TYPE	CARGO DECK DIMENSIONS			CARGO BODY LOADING MEASUREMENTS					
	Length (in)	Width (in)	Height Above Ground (in)	Under Bows (in)	Under Bows (cu ft)	Top of Side Racks (in)	Top of Side Racks (cu ft)	Top of Side Panels (in)	Top of Side Panels (cu ft)
1/4-ton:									
M100	71.5	37.8	24.5	NA	NA	NA	NA	18.0	29.7 [1]
3/4-ton:									
M101	94.8	65.3	31.7	49.0	170.5 [2,3]	33.3	114.6 [2]	18.3	60.9 [2]
M101A1	94.3	66.0	34.0	49.0	170.5 [2,3]	33.3	114.6 [2]	18.3	60.9 [2]
1 1/2-ton:									
M104, M104A1	110.0	74.0	38.3	59.3	273.2 [4,5]	45.3	207.7 [4]	18.0	79.1 [4]
M105	109.8	74.0	37.0	60.0	276.0 [4,5]	45.0	205.0 [4]	18.0	70.0 [4]
M105A1, M105A2	109.8	74.0	37.0	60.0	276.0 [4,5]	45.0	205.9 [4]	18.0	79.0 [4]

[1] Cubic capacity increased because top 4.5 inches of side panels are 46.0 inches wide.

[2] Cubic capacity reduced 4.6 cubic feet for wheel wells.

[3] Cubic capacity reduced 0.4 cubic feet for curve of bows.

[4] Cubic capacity reduced 5.6 cubic feet for wheel wells.

[5] Cubic capacity reduced 0.5 cubic feet for curve of bows.

Table 3-12. Dimensions and loading capacity for stake and platform semitrailer cargo bodies

VEHICLE TYPE	CARGO DECK DIMENSIONS Length (in)	Width (in)	CARGO BODY LOADING MEASUREMENTS Height Above Ground (in)	Height (in)	Capacity (cu ft)
12-ton:					
M127	335.8	88.8	60.6	47.8	824.8
M127A1	335.8	88.8	60.5	47.8	824.8
M127A1C	335.8	88.8	60.5	48.0	828.3
M237A2C	335.8	88.8	59.8	48.0	828.3
M270A1	459.8	84.0	51.8	48.8	1,090.7
22 1/2-ton:					
M871	349.3	87.3	55.4	48.0	847.1
M871A1, M871A2	372.0	87.3	55.0	48.0	902.1
34-ton:					
M872, M872A2	484.8	93.0	60.0	52.0	1,356.8
M872A1, M872A3	484.8	93.0	55.0	52.0	1,356.8

Table 3-13. Dimensions and loading capacity for van semitrailer cargo bodies

VEHICLE TYPE	CARGO DECK DIMENSIONS Length (in)	Width (in)	CARGO BODY LOADING MEASUREMENTS Height Above Ground (in)	Height (in)	Capacity (cu ft)
12-ton:					
M128, M128A1	335.5	89.0	57.0	78.5	1,356.4
M128A1C	336.0	89.0	57.0	78.5	1,358.4
M128A2C	337.5	89.5	60.0	78.5	1,372.2

Table 3-14. Shipping dimensions and cube for cargo trucks

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	TOP OF SIDE RACKS Height (in)	TOP OF SIDE RACKS Cube (cu ft)	TOP OF STEERING WHEEL Height (in)	TOP OF STEERING WHEEL Cube (cu ft)
1 1/4-ton:						
M880, M881	219	80	NA	NA	74 [3]	751 [3]
M882	219	82	NA	NA	74 [3]	769 [3]
M883, M884, M885	219	80	NA	NA	74 [3]	751 [3]
M890, M891	219	80	NA	NA	71 [3]	720 [3]
M892	219	82	NA	NA	71 [3]	738 [3]
2 1/2-ton:						
M35A1, M35A2	265	96	89 [1]	1,311 [2]	81 [1]	1,193 [2]
M35A1 WWN, M35A2 WWN	279	96	89 [1]	1,380 [1]	81 [1]	1,256 [2]
M35A2C	265	98	89 [1]	1,338 [2]	82 [1]	1,233 [2]
M35A2C WWN	279	98	89 [1]	1,409 [2]	82 [1]	1,298 [2]
M36A2	329	96	89 [1]	1,597 [2]	81 [1]	1,458 [2]
M36A2 WWN	344	96	89 [1]	1,701 [2]	81 [1]	1,548 [2]
5-ton:						
M54, M54A1	297	98	93 [1]	1,566 [2]	86 [1]	1,449 [2]
M54 WWN, M54A1 WWN	314	98	93 [1]	1,657 [2]	86 [1]	1,532 [2]
M54A1C, M54A2C	298	99	92 [1]	1,571 [2]	86 [1]	1,469 [2]
M54A1C WWN	315	99	92 [1]	1,661 [2]	86 [1]	1,552 [2]
M54A2	297	98	93 [1]	1,566 [2]	86 [1]	1,449 [2]
M54A2 WWN	314	98	93 [1]	1,657 [2]	86 [1]	1,532 [2]
M54A2C WWN	314	99	92 [1]	1,655 [2]	86 [1]	1,547 [2]
5-ton:						
M55, M55A2	377	98	93 [1]	1,989 [2]	86 [1]	1,839 [2]
M55 WWN, M55A2 WWN	389	98	93 [1]	2,052 [2]	86 [1]	1,898 [2]
M812	399	124	139 [6]	3,980 [6]	(7)	(6)
M813	304	98	94 [1]	1,621 [2]	87 [1]	1,500 [2]
M813 WWN	320	98	94 [1]	1,706 [2]	87 [1]	1,579 [2]
M813A1	307	99	94 [1]	1,654 [2]	87 [1]	1,531 [2]

Table 3-14. Shipping dimensions and cube for cargo trucks (continued)

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	TOP OF SIDE RACKS Height (in)	TOP OF SIDE RACKS Cube (cu ft)	TOP OF STEERING WHEEL Height (in)	TOP OF STEERING WHEEL Cube (cu ft)
M813A1 WWN	323	99	94 [1]	1,740 [2]	87 [1]	1,620 [2]
M814	378	98	94 [1]	2,016 [2]	89 [1]	1908 [2]
M814 WWN	396	98	94 [1]	2,111 [2]	89 [1]	1,999 [2]
M821 WWN	379	115	113 [1,5]	2,851 [2,5]	(1, 5)	(2, 5)
M923	314	98	94 [1]	1,674 [2]	87	1,550
M923A1, M923A2	311	97	97 [1]	1,694 [2]	94	1,641
M925 WWN	327	98	94 [1]	1,744 [2]	87	1,614
M925A1, M925A2 WWN	332	98	97 [1]	1,827 [2]	94	1,770
M927	389	98	94 [1]	2,074 [2]	91	2,008
M927A1, M925A2	386	98	97 [1]	2,124 [2]	94	2,058
M928 WWN	402	98	94 [1]	2,143 [2]	91	2,075
M928A1, M928A1 WWN	408	98	97 [1]	2,245 [2]	94	2,175
Bridge Transporter	373	116	116 [1,5]	1,905 [2,5]	(1, 5)	(2, 5)
10-ton:						
M977 WOWN, M977 WWN	401	96	(8)	(4)	101 [3]	2,268 [3]
M985 WOWN, M985 WWN	401	101	(8)	(4)	101 [3]	2,268 [3]

[1] For height over bows or top of cab shield, use operational height of vehicle listed in TB 55-46-1.
[2] For shipping cube over side rack/bows and/or top of cab shield, use operational cube of vehicle listed in TB 55-46-1.
[3] Height and cube measured to top of cab.
[4] See Top of Steering Wheel column for cube.
[5] Height and cube measured to top of bulkhead.
[6] Cube capacity over materials-handling crane mounted in body.
[7] Height over spare tire.
[8] Steering wheel is higher than side panels. See Top of Steering Wheel column for height.

Table 3-15. Shipping dimensions and cube for dump trucks

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	TOP OF STEERING WHEEL Height (in)	TOP OF STEERING WHEEL Cube (cu ft)	TOP OF SIDE PANELS Height (in)	TOP OF SIDE PANELS Cube (cu ft)
2 1/2-ton:						
M342A2	261	96	(1, 2)	(3, 4)	83 [5]	1,204 [4,6]
M342A2 WWN	273	96	(1, 2)	(3, 4)	83 [5]	1,259 [4,6]
5-ton:						
M51, M51A1, M51A2	266	98	(1, 2)	(3, 4)	89 [5]	1,337 [4,6]
M51 WWN, M51A1 WWN, M51A2 WWN	282	98	(1, 2)	(3, 4)	89 [5]	1,415 [4,6]
M817	274	98	(1, 2)	(3, 4)	91 [5]	1,411 [4,6]
M817 WWN	289	98	(1, 2)	(3, 4)	91 [5]	1,488 [4,6]
M929	275	98	(1, 2)	(3, 4)	91 [5]	1,420 [4,6]
M930 WWN	289	98	(1, 2)	(3, 4)	91 [5]	1,492 [4,6]
20-ton:						
F5070	313	103	(2)	(3, 4)	125 [5]	2,333 [4,6]
M917	351	98	(2)	(3, 4)	141 [2]	2,807 [4]

[1] Side panels stowed in cargo body are higher than steering wheel. See Top of Side Panels column for height.
[2] For height over bows or top of cab shield, use operational height of vehicle listed in TB 55-46-1.
[3] See Top of Side Panels column for cube.
[4] For shipping cube over side racks/bows and/or top of cab shield, use operational cube of vehicle listed in TB 55-46-1.
[5] Height of cab shield stowed in dump body.
[6] Cube with cab shield stowed in dump body.

Table 3-16. Shipping dimensions and cube for cargo trailers

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	TOP OF SIDE RACKS Height (in)	TOP OF SIDE RACKS Cube (cu ft)	TOP OF SIDE PANELS Height (in)	TOP OF SIDE PANELS Cube (cu ft)
1/4-ton:						
M100	108	57	NA	NA	43[1]	154[2]
3/4-ton:						
M101A1, M101A2	147	74	65[1]	410[2]	50[1]	315[2]
1 1/2-ton:						
M104A1	166	84	84[1]	678[2]	57[1]	460[2]
M105, M105A1, M105A2	166	83	82[1]	654[2]	55[1]	439[2]

[1] For height over top of cab, use operational height of vehicle listed in TB 55-46-1.
[2] For shipping cube over side racks/bows and/or top of cab shield, use operational cube of vehicle listed in TB 55-46-1.

Table 3-17. Shipping dimensions and cube for stake and platform semitrailers

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	TOP OF SIDE RACKS Height (in)	TOP OF SIDE RACKS Cube (cu ft)	TOP OF SIDE PANELS Height (in)	TOP OF SIDE PANELS Cube (cu ft)
12-ton:						
M127, M127A1	346	98	109	2,107	61	NA
M127A1C	349	98	109	2,144	61	NA
M127A2C	352	98	108	2,145	60	NA
22 1/2-ton:						
M871	358	96	103	2,049	55	NA
M871A2	377	96	103	2,129	55	NA
34-ton:						
M872, M872A1, M872A2	492	96	106	2,898	58	NA
M872A3	493	96	106	2,904	58	NA
40-ton:						
M870	510	96	70	1,984	40	NA
M870A1	505	96	70	1,964	40	NA

Table 3-18. Shipping dimensions and cube for van semitrailers

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	TOP OF VAN Height (in)	TOP OF VAN Cube (cu ft)
12-ton:				
M128	344	97	140	2,712
M128A1	346	97	140	2,720
M128A1C	350	99	143	2,868
M128A2C	347	99	146	2,903

Table 3-19. Shipping dimensions and cube for fuel tankers

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	HEIGHT TOP OF SIDE PANELS (in)	SHIPPING CUBE (cu ft)
M131A4C	374	96	107	2,265
M131A5C	376	96	107	2,236
M967, M969	368	96	105	2,147
M1062	433	97	123	2,990

Table 3-20. Shipping dimensions and cube for heavy equipment transport trailers

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	HEIGHT TOP OF SIDE PANELS (in)	SHIPPING CUBE (cu ft)
M747	513	137	105	4,208
M1000	622	144	144	7,464

Table 3-21. Shipping dimensions and cube for PLS

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	HEIGHT TOP OF SIDE PANELS (in)	SHIPPING CUBE (cu ft)
M1074	431	96	127	3,050
M1075	431	96	128	3,065
M1076	299	96	117	1944

Table 3-22. Shipping dimensions and cube for FMTV trailers

VEHICLE TYPE	LENGTH (in)	WIDTH (in)	HEIGHT TOP OF SIDE PANELS (in)	SHIPPING CUBE (cu ft)
2 1/2-ton:				
M1082	209	96	58	674
5-ton:				
M1095	220	96	58	709

Table 3-23. Average vehicle stopping distances

SPEED			AVERAGE DISTANCE							
MPH	KPH	ft/sec	Perception (ft)	Perception (m)	Reaction (ft)	Reaction (m)	Braking (ft)	Braking (m)	Total[1] (ft)	Total[1] (m)
Passenger vehicles[2]:										
20*	32.2	29.3	22	6.7	22	6.7	25	7.6	69	21.0
25*	40.3	36.7	28	8.5	28	8.5	35	10.7	91	27.7
30*	48.3	44.0	33	10.0	33	10.0	48	14.6	114	34.6
35*	56.3	51.3	39	11.9	39	11.9	67	20.4	145	44.2
40*	64.4	58.7	44	13.4	44	13.4	90	27.4	178	54.2
45*	72.4	66.0	50	15.3	50	15.3	117	35.7	217	66.3
50*	80.5	73.4	55	16.8	55	16.8	148	45.2	258	78.8
55	88.5	80.7	61	18.6	61	18.6	185	56.4	307	93.6
60	96.6	88.0	66	20.1	66	20.1	228	69.6	360	109.8
65	104.6	95.4	72	21.9	72	21.9	275	83.9	419	127.7
70	112.6	102.7	77	23.5	77	23.5	332	102.5	486	149.5

Table 3-23. Average vehicle stopping distances (continued)

SPEED			AVERAGE DISTANCE							
MPH	KPH	ft/sec	Perception (ft)	Perception (m)	Reaction (ft)	Reaction (m)	Braking (ft)	Braking (m)	Total[1] (ft)	Total[1] (m)
Single-unit vehicles (gross weight less than 10,000 pounds):										
20*	32.2	29.3	22	6.7	22	6.7	30	9.2	74	22.6
25*	40.3	36.7	28	8.5	28	8.5	42	12.8	98	29.8
30*	43.3	44.0	33	10.0	33	10.0	58	17.7	124	37.7
35*	56.3	51.3	39	11.9	39	11.9	80	24.4	158	48.2
40*	64.4	58.7	44	13.4	44	13.4	106	31.4	194	58.2
45*	72.4	66.0	50	15.3	50	15.3	138	42.1	238	72.7
50	80.5	73.4	55	16.8	55	16.8	177	54.0	287	87.6
55	88.5	80.7	61	18.6	61	18.6	222	67.5	344	104.7
60	96.6	88.0	66	20.1	66	20.1	273	83.3	405	123.5
Single-unit, two-axle vehicles (gross weight of 10,000 pounds or more):										
20*	32.2	29.3	22	6.7	22	6.7	40	12.2	84	25.6
25*	40.3	36.7	28	8.5	28	8.5	64	19.5	120	36.5
30	48.3	44.0	33	10.0	33	10.0	92	28.0	158	48.0
35	56.3	51.3	39	11.9	39	11.9	126	38.4	204	62.2
40	64.4	58.7	44	13.4	44	13.4	165	50.3	253	77.1
45	72.4	66.0	50	15.3	50	15.3	208	63.4	308	94.0
50	80.5	73.4	55	16.8	55	16.8	256	78.1	366	111.7
55	88.5	80.7	61	18.6	61	18.6	310	94.5	432	131.7
60	96.6	88.0	66	20.1	66	20.1	372	113.5	504	153.7
Single-unit, multiaxle vehicles and combination vehicles[3] (gross weight of 10,000 pounds or more):										
20*	32.2	29.3	22	6.7	22	6.7	50	15.3	94	28.7
25	40.3	36.7	28	8.5	28	8.5	80	24.4	136	41.1
30	48.3	44.0	33	10.0	33	10.0	115	35.1	181	55.1
35	56.3	51.3	39	11.9	39	11.9	157	47.9	235	71.7
40	64.4	58.7	44	13.4	44	13.4	205	62.5	293	89.3
45	72.4	66.0	50	15.3	50	15.3	260	79.3	360	109.9
50	80.5	73.4	55	16.8	55	16.8	320	97.6	430	131.2
55	88.5	80.7	61	18.6	61	18.6	388	118.3	510	155.5
60	96.6	88.0	66	20.1	66	20.1	465	141.9	597	182.1

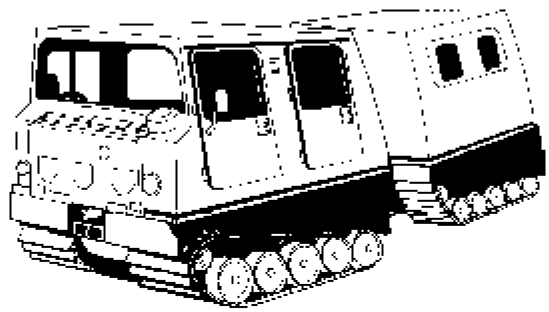
[1] Add 30 feet or 9 meters to each total stopping distance shown to determine actual gap to use between vehicles.

[2] Does not include buses. Refer to section with weights and axles corresponding to buses.

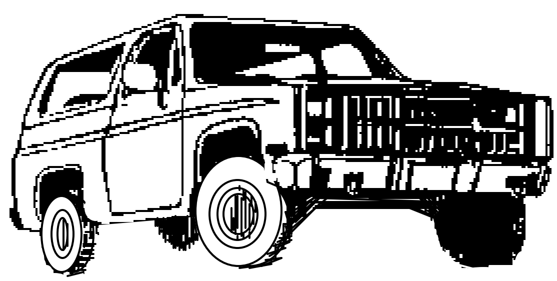
[3] Tractor trucks, semitrailers, and trailers.

* Rule of thumb method may be used at this speed.

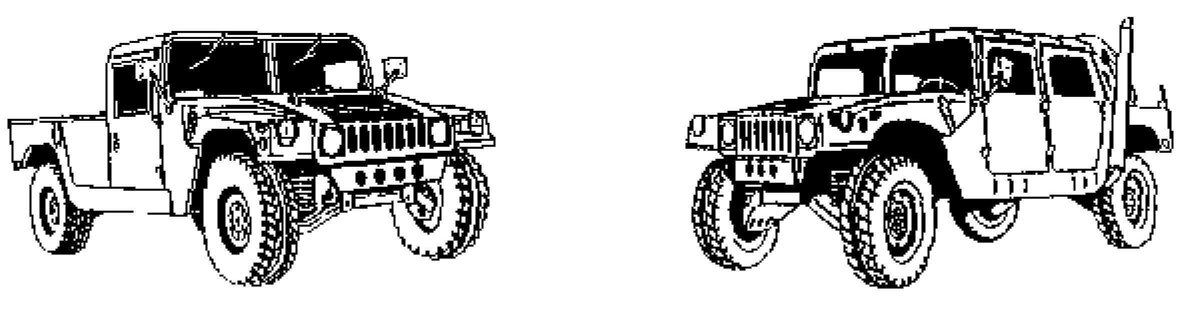
LIGHT FLEET



M973, 1 1/2-TON, SUSV



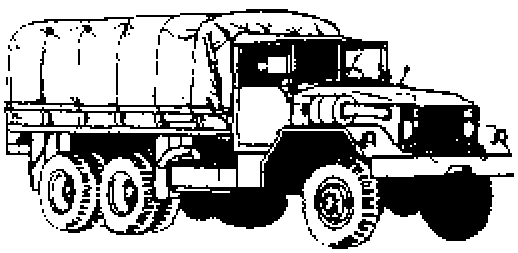
M1009, 4 X 4, 3/4-TON, CUCV



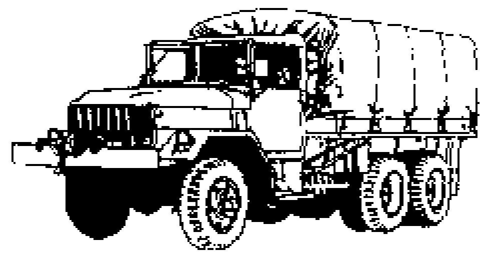
M1038, 1 1/2-TON, HMMWV

Figure 3-23. Army motor transport vehicles

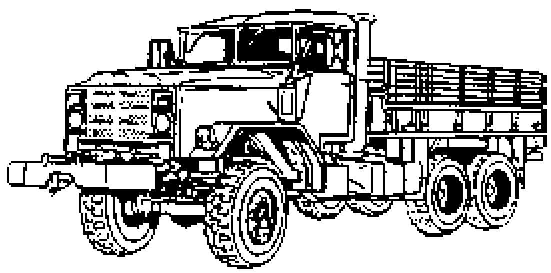
MEDIUM FLEET



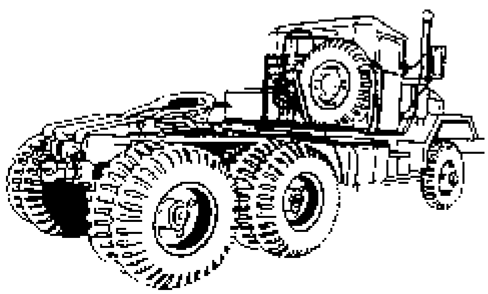
M813, 5-TON, TRUCK-CARGO



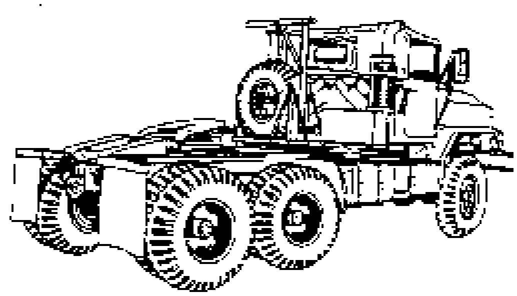
M35A2, 2 1/2-TON, TRUCK-CARGO



M923A2, 5-TON, TRUCK-CARGO



M818, 5-TON, TRUCK-TRACTOR



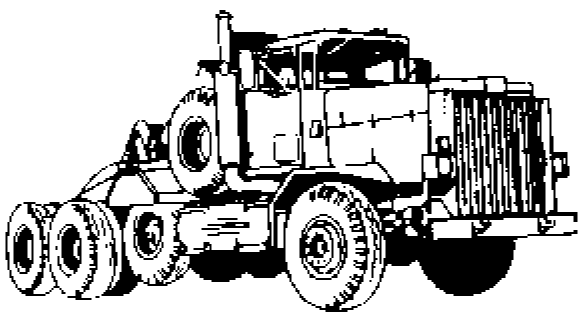
M931, 5-TON, TRUCK-TRACTOR

M1078, 2 1/2-TON, TRUCK-CARGO
(LMTV)

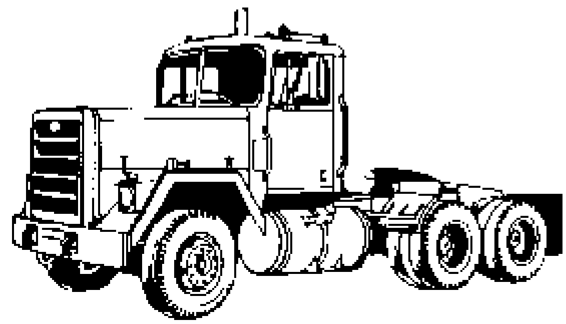
M1084, 5-TON, TRUCK-CARGO
(MEDIUM TACTICAL VEHICLE)

Figure 3-23. Army motor transport vehicles (continued)

HEAVY FLEET



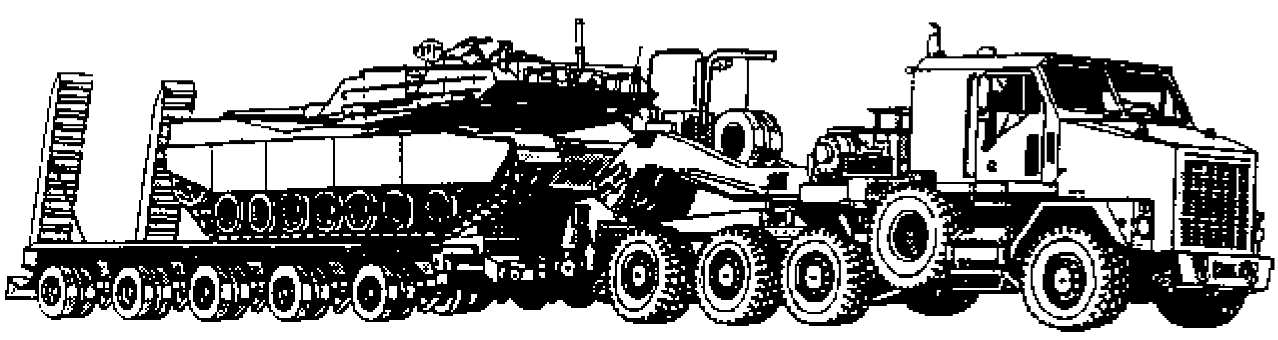
M911, 8 X 6, 60-TON, TRUCK-TRACTOR (CHET)



M915, 6 X 4, TRACTOR-LINE-HAUL

M977, 8 X 8, 10-TON, TRUCK-CARGO (HEMTT)

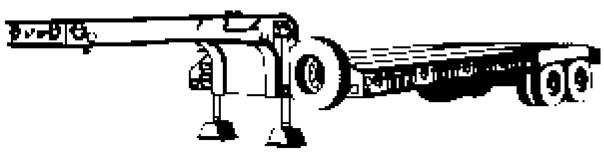
M1070, 8 X 8, 22 1/2-TON, TRUCK-TRACTOR (HET)



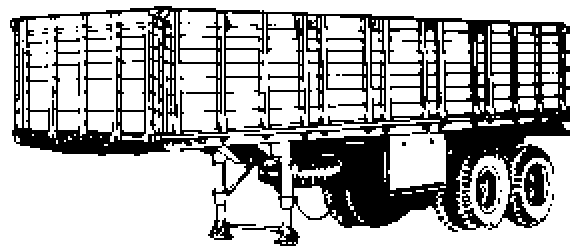
M1070, TRUCK-TRACTOR/M-1000, 70-TON, SEMITRAILER (HET)

Figure 3-23. Army motor transport vehicles (continued)

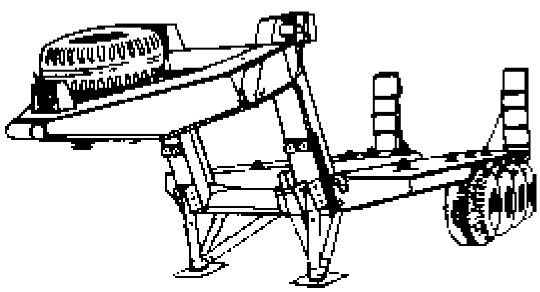
TRAILERS



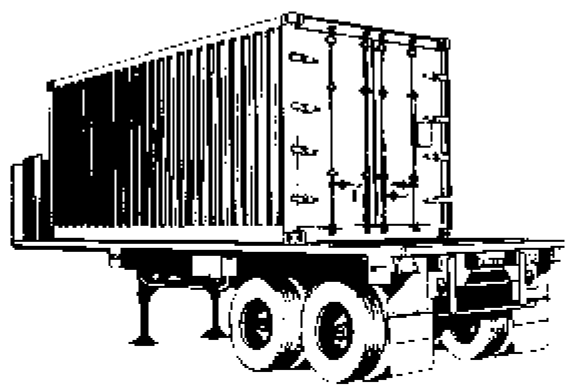
M172A1, 4 X 4, 25-TON, SEMITRAILER, LOW-BED



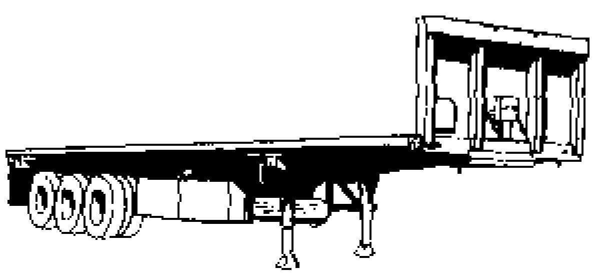
M127A2, 4 X 4, 12-TON, SEMITRAILER, STAKE



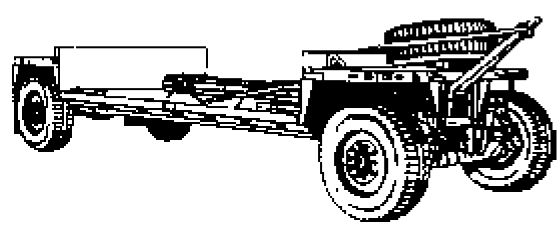
M747, 8 X 8, 60-TON, SEMITRAILER (HET)



M871, 4 X 4, 22 1/2-TON, SEMITRAILER, LOW-BED, BREAK-BULK/CONTAINER TRANSPORTER



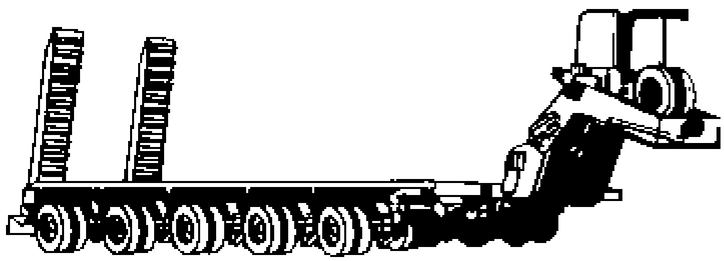
M872, 6 X 6, 34-TON, SEMITRAILER, FLAT-BED, DUAL-PURPOSE BREAK-BULK/CONTAINER TRANSPORTER



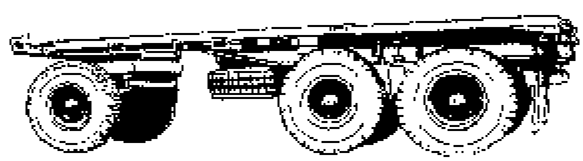
M989A1, 11-TON, TRAILER, FLATBED (HEMAT)

Figure 3-23. Army motor transport vehicles (continued)

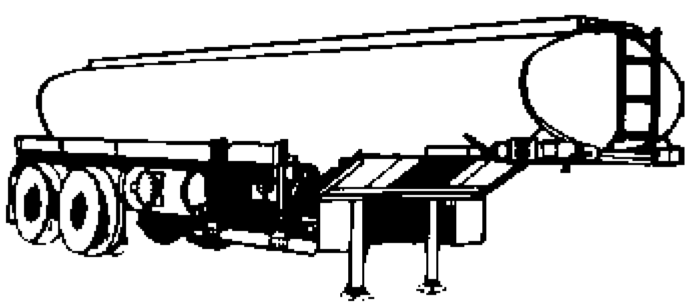
TRAILERS



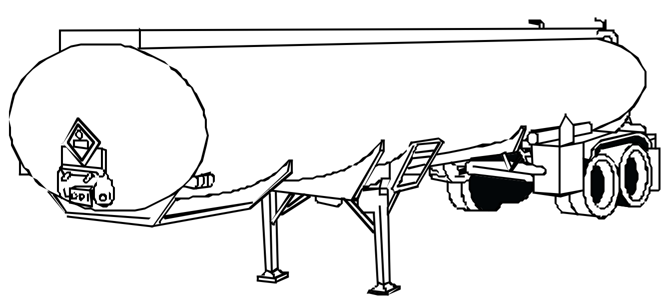
M1000, 8 X 8, 70-TON, SEMITRAILER (HET)



M1076, 16.5-TON, TRAILER (PLS)



M131A5C, 4 X 4, 5,000-GALLON, SEMITRAILER, TANK, FUEL



M1062, 4 X 4, 7,500-GALLON, SEMITRAILER, TANK, FUEL

Figure 3-23. Army motor transport vehicles (continued)