FM 55-30

DEPARTMENT OF THE ARMY FIELD MANUAL

ARMY MOTOR TRANSPORT OPERATIONS

HEADQUARTERS, DEPARTMENT OF THE ARMY
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CHAPTER 1
INTRODUCTION
(STANAG 2151)

1-1. Purpose and Scope

a. This manual is a reference for use in planning and executing military motor movements. It prescribed motor transport organizational and operational doctrine and presents techniques and procedures to be used in planning, executing, and controlling motor transportation operations. It discusses the organization, basis of assignment, capabilities, and employment of motor transport units.

b. This text is applicable without modification to general, limited, and cold war.

c. This manual is in consonance with certain international standardization agreements which are identified by type of agreement and number at the beginning of each appropriate chapter in the manual. Copies of these agreements are contained in appendixes E through I.

d. Linear distances in this manual are shown in both U.S. customary units of length and metric equivalents. Appendix D is a metric conversion table.

e. Users of this manual are encouraged to submit recommended changes and comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications) and forwarded direct to the Commanding Officer, U.S. Army Combat Developments Command Transportation Agency, or Fort Eustis, Virginia 23604. Originators of proposed changes which would constitute a significant modification of approved Army doctrine may send an information copy through command channels to the Commanding General, U.S. Army Combat Developments Command, Fort Belvoir, Virginia 22060, to facilitate review and followup.

1-2. Types of Motor Movements

a. Functionally, military motor movements are divided into two general classifications: tactical and administrative.

(1) In *tactical movements,* motor transport is used for timely delivery of units and supplies to their destinations in the best formation and condition for the accomplishment of the mission. Unit integrity for tactical control, combat loading for ready availability on contact, and speed of movement are of greater importance than economical use of cargo capacities.

(2) *Administrative movements* make maximum use of available transport. Tactical considerations in administrative movements are of less importance than economical use of cargo capacities and operating personnel.

b. Both tactical and administrative motor movements may use organic transportation, vehicles of attached or supporting units, or a combination of both. *Organic transportation* includes vehicles assigned to a unit by tables of organization and equipment (TOE), tables of allowances (TA), or modified tables of organization and equipment (MTOE). *Attached and supporting transportation* includes vehicles provided by the supporting motor transport units.

(1) *Attached vehicles* are provided by the transportation service and during the period of attachment to a unit are operationally controlled by the using unit. Such attachment is accomplished on order of a competent authority (commander, theater army support command (TASCOM), field army support command (FASCOM), corps support brigade) and extends for a specified time or until completion of a specific operation, at which time the vehicles revert to the operational control of the transportation service.

(2) *Supporting vehicles* are provided by the transportation service on a mission support basis and remain under operational control of the motor transport service while performing such mission.

c. Motor movements may be further classified by the degree of control exercised over them as follows:

(1) *Casual military movements* consist of individual elements proceeding more or less at will in performing routine unit functions.

(2) *Organized military movements* consist of units or supply convoys in which elements are grouped together for control.

(3) *Indigenous traffic* consists of refugee and local civilian traffic and casual non-U.S. military movements. The presence of such unorganized traffic may require control measures to maintain or restore efficient use of the road net.

1–3. Conditions Affecting Motor Movements

Military motor movements are affected by a wide variety of conditions over which planning and operating personnel have no direct control. These conditions can be anticipated to varying degrees, and provisions can be made for operations with these factors taken into consideration. All plans and operations must be sufficiently flexible to meet unpredicted weather, terrain, or tactical conditions. General provisions for operation under such conditions follow:

a. Civilian Controls. Generally, motor movements made in the territory of a friendly nation are subject to civilian traffic regulations. Coordination with civil authorities is therefore necessary for proper clearances before motor movements are executed. Coordination channels are normally prescribed in field standing operating procedures (SOP) or local regulations.

b. Terrain and Climate. Mobility of motor vehicles may be seriously restricted by terrain and climate (FM 5–36). Often, special training is required and special equipment must be issued. Adequate training and proper planning minimize adverse effects of terrain and climate.

c. Availability of Road Network. Normally, the defense plans of NATO nations designate a basic military road network which includes routes selected to meet anticipated allied and national military movements and transport requirements (STANAG No. 2151, app G). However, in some areas a road net with highways and bridges suitable for all classes of military traffic may not have been established. Under these circumstances, a route reconnaissance must be conducted to designate such a net and to determine engineer work required. This reconnaissance must be as thorough as time and the tactical situation permit. FM 5–36 may be used as a guide for route reconnaissance.

d. Tactical Conditions.

(1) In theaters of operations, particularly in the combat zone, tactical conditions must be given the highest consideration in planning and executing motor movements. Tactical conditions include all conditions imposed by the enemy, such as air, artillery, or chemical, biological, and radiological attack, raids, guerrilla action; and sabotage, as well as conditions imposed by the operational plans of our own forces. Plans and orders for movements under tactical conditions must include march or convoy organization, command structure, and assignment or designation of adequate security detachments.

(2) Standing operating procedures for defense of a column against ambush, normally based on the principle of strong and immediate retaliation against the ambushing force, must be developed and understood by all personnel (FM 31–22). Particular emphasis must be placed on defense of unescorted convoys. The introduction of chemical, biological, and nuclear weapons systems to the battlefield and the threat imposed by hostile aircraft demand thorough training in defense against such forms of attack. The techniques and procedures for employing unit non-air defense weapons against low-altitude enemy aircraft are discussed in appendix B.

1–4. Effect of Counterinsurgency Operations on Motor Transport Unit Capabilities

Several factors in counterinsurgency operations in underdeveloped areas have a detrimental effect on the capability of motor transport units to transport cargo and personnel as indicated by TOE capabilities (para 2–11 through 2–16).

a. Operations are largely confined to daylight hours, with convoys departing the point of origin after the beginning of daylight and arriving at destination before darkness. This reduces the number of trips made by vehicles in an operational day (20–hour day) and reduces the unit capabilities accordingly. However, vehicles may be spotted in secure areas at night for loading or unloading. These activities must be geared for operations to meet a specific vehicle release time so that convoys can meet operating schedules.

b. Close liaison must be maintained between motor transport organizations and shipping and receiving activities to effect timely and efficient use of motor transport resources.

c. Since motor transport units have only a limited capability to provide convoy security measures, they must rely upon support commands and tactical units to secure the road net and to provide convoy protection from hostile action. If such support is not provided, motor transport capabilities are degraded through both the use of operating personnel in a security role and the diversion of task vehicles from their primary mission of transport to fire support vehicles (gun trucks).

This Chapter is superseded by FM 55-31 (6/72)

CHAPTER 2
MOTOR TRANSPORT ORGANIZATIONS AND UNITS

Section I. GENERAL

2–1. Basic Organization

Motor transport organization is functional. Each organization consists of a headquarters element which includes personnel who control or assist in controlling operations and who provide administrative, supply, and service support; a maintenance element to supervise or provide organizational maintenance support; and appropriate task units which provide vehicles to meet operational requirements.

2–2. Characteristics of Vehicular Equipment

Vehicles authorized for motor transport task units vary in type, design, and capabilities according to unit employment and anticipated operational environment. Although tracked vehicles may be authorized under certain conditions, transportation truck units are normally equipped with wheeled vehicles (para 2–10). Task equipment and mix of vehicles by type are selected on the basis of many factors of varying importance. Selection is made to some extent at all levels of command—from assignment of units to a field force to selection of a single vehicle to do a specific task. Factors to be considered include, but are not limited to, the following:

a. Environmental factors of climate, weather, and terrain (para 1–3).

b. Operational factors such as the road net and highway surface or trafficability (para 1–3).

c. Tactical considerations, including possible hostile interference, both by type and intensity (para 1–3).

d. Tonnage requirements, type of cargo, and length of haul.

e. Vehicle availability by type.

f. Comparative manpower requirements.

g. Economical operation.

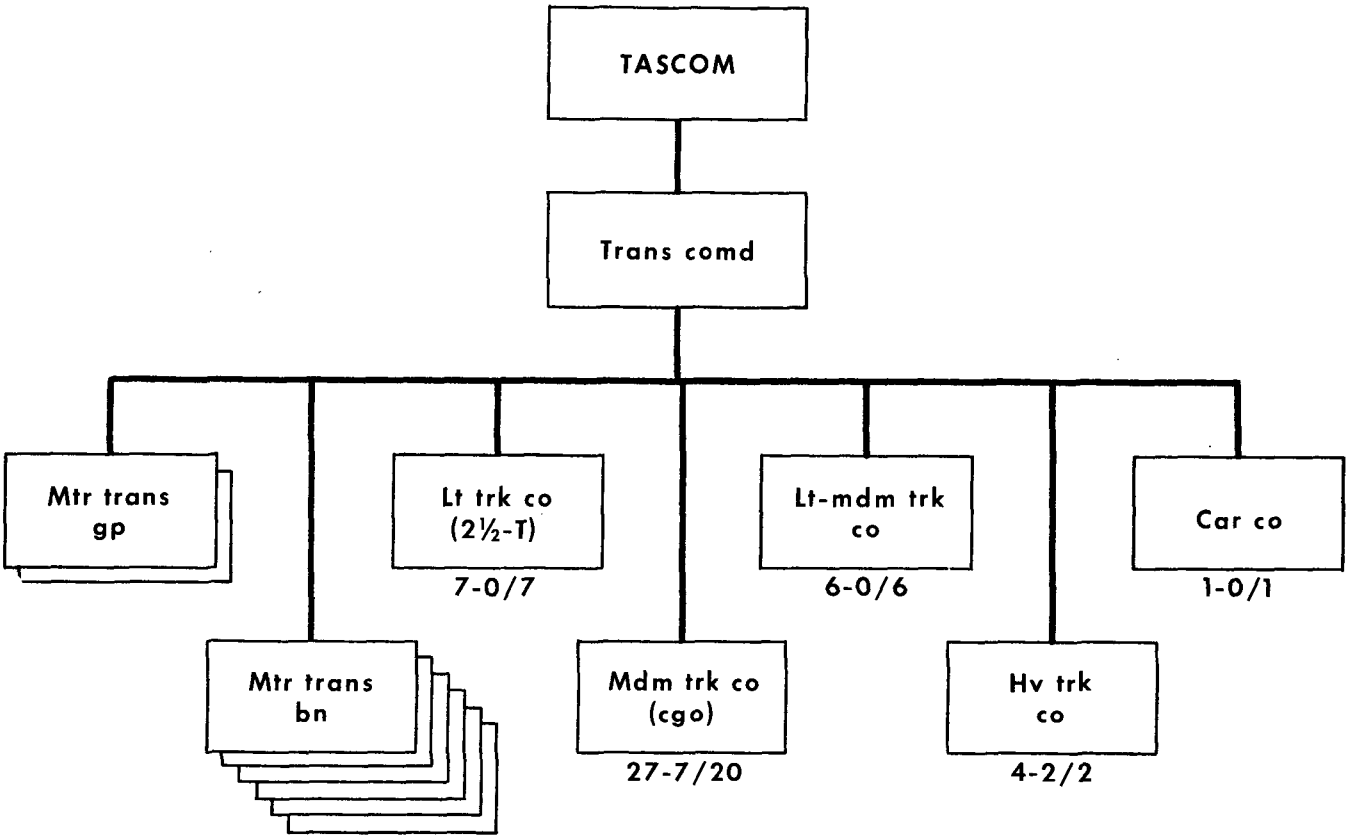
Section II. ORGANIZATION FOR MOTOR TRANSPORT SERVICE IN A THEATER

2–3. Motor Transport Service, Theater Army Support Command (TASCOM)

a. The transportation command is the major Army transportation headquarters in a theater. It is a major mission command of TASCOM and is functionalized to the extent that it includes all elements necessary to move personnel and materiel from points of arrival in the theater to the field army or to intermediate destinations. It performs this service for the Army and, as required, for other U.S. forces in support of host nation or allied forces. Whenever possible, the transportation service features throughput of supplies.

b. The motor transport service for TASCOM (8- and 12-division forces, fig 2–1 and 2–2) under command and supervision of the transportation command, TASCOM, provides for movement of personnel and equipment by motor transport from points of entry into the theater to the field army or to intermediate destinations. It provides backup support for truck elements of the area support groups, communications zone, which furnish motor transport support to meet local, routine, and recurring transport requirements within each group's area of responsibility. It establishes the interzonal motor transport service.

c. The interzonal motor transport service is organized to serve the theater as a whole and provides the necessary flexibility, diversity, concentration, and allocation of motor transport for rapid reaction to changes in strategic and tactical situations. The transportation command contributes to economical operation through centralized control, retaining operational control of its oper-



Note: (1) Number and type of truck companies attached to each battalion depend on battalion mission.

(2) Figures following each unit box indicate total number of units assigned to force model, and TOE strength level of units; for example, 7-0/7 means 7 units assigned, 0 units at strength level 1, 7 units at strength level, Type B.

Figure 2–1. Type motor transport service, TASCOM, 8-division force.

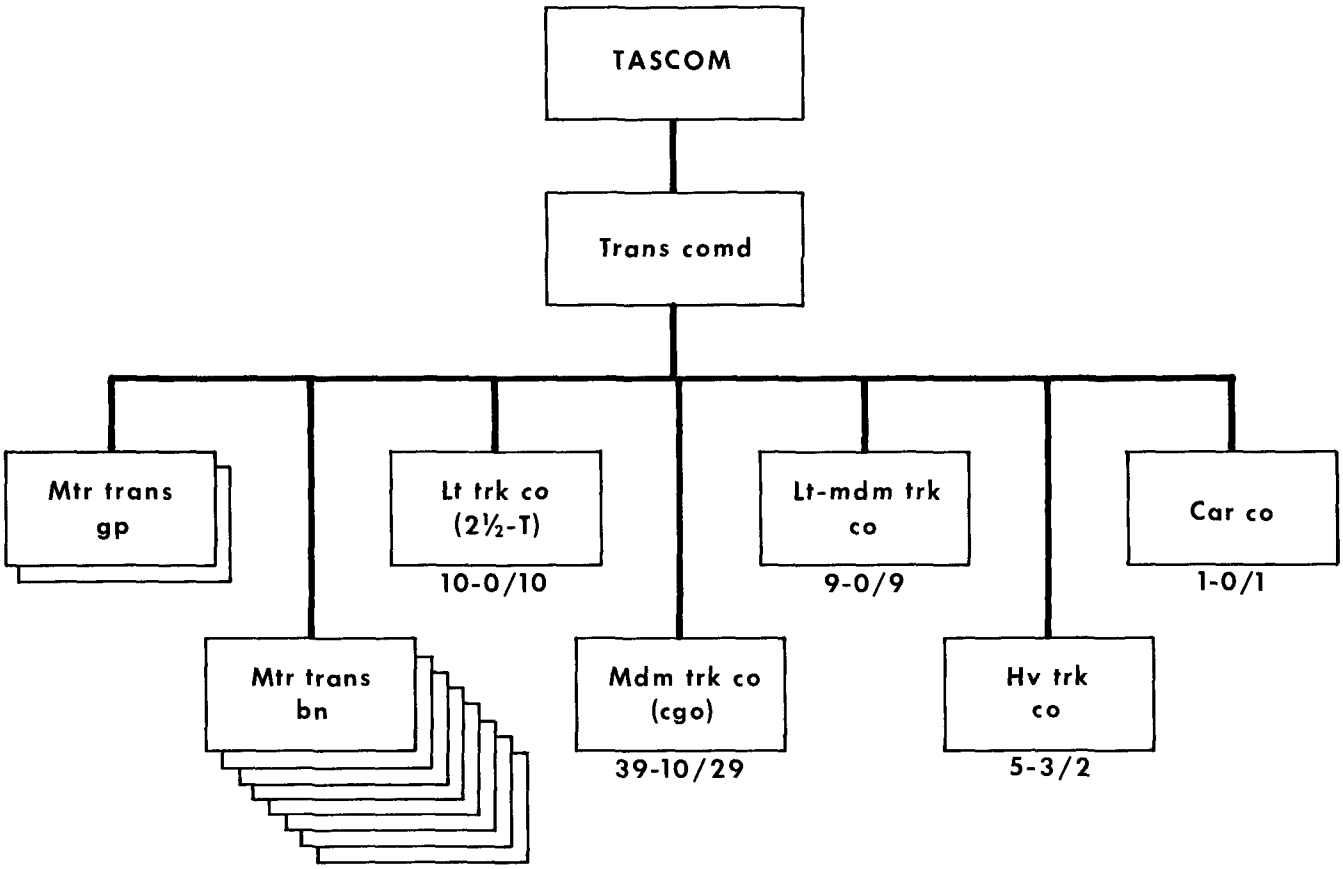
ating motor transport units to their most forward point of delivery. The interzonal motor transport operation is normally a line haul movement operated for an extended distance over main supply routes (chap 7). Planning for and carrying out the interzonal operation is the responsibility of the transportation command and its subordinate elements, in coordination with the movements control center (MCC).

(1) The MCC develops the movement plan, which outlines tonnage, class, and areas of origin and destination of cargo to be moved by motor transport. The capability of the motor transport service is committed by the appropriate transportation movements office in accordance with this movement plan. Only one requirement for each shipment is placed on the motor transport service. That requirement is placed by the transportation movements office at origin and applies until delivery of the shipment at destination, regardless of distance involved. Information on diversion and reconsignment or other in-transit services for cargo en route is relayed to the motor transport service by any transportation movements office authorized by the MCC to initiate such action.

(2) The motor transport groups plan the requirements for and the disposition of their motor transport battalions to execute the movement plan, and they assign specific missions to subordinate battalions.

(3) The motor transport battalions plan for accomplishment of their assigned missions through determining employment, responsibilities, and location of their subordinate truck companies. In accordance with their mission, they direct companies to operate trailer transfer points, truck terminals, local and shuttle movements into and out of the relay operation, and relay operations over the main supply route.

(4) The truck companies plan the allocation of personnel and equipment to do their assigned



Note: (1) Number and type of truck companies attached to each battalion depend on battalion mission.

(2) Figures following each unit box indicate total number of units assigned to force model, and TOE strength level of units; for example, 10-0/10 means 10 units assigned, 0 units at strength level 1, 10 units at strength level, Type B.

Figure 2–2. Type motor transport service, TASCOM, 12-division force.

tasks and establish control and supervision consistent with established procedures.

(5) In planning processes, all levels of the motor transport service consider operational planning factors such as—

(*a*) Current personnel and vehicular strength of unit.

(*b*) Materiel readiness posture of vehicles.

(*c*) Origin and destination of movement.

(*d*) Types and amounts of cargo or personnel to be transported.

(*e*) Geography and capabilities of routes to be used, feasible operating speeds over routes or segments of routes.

(*f*) Requirements for supporting services such as petroleum, oil, and lubricants (POL); maintenance; and communications.

d. Typical transport operations conducted by the motor transport service which may either involve short hauls or evolve into or be conducted in conjunction with an interzonal operation include the following:

(1) *Terminal and beach clearance operations.* Clearance is a major factor in successful terminal and beach operations and is particularly important during peak periods. Clearance may include throughput of cargo to destinations in the forward communications zone and field army areas, as well as movement to field depots in the communications zone rear area.

(2) *Depot-to-depot or depot-to-unit operations.* These operations involve movement from field depots in the communications zone rear area to depots in the communications zone forward area and to general support and support activities in the field army rear, corps support brigade, and divisions areas. Substantial economy of transport and time is achieved by throughput of supplies directly from communications zone rear

depots to support brigade general support and direct support units and, where feasible, directly to army supply points and users.

e. Normally, the transportation motor transport brigade (TOE 55–11) will not be employed in the motor transport organization for an 8- or a 12-division force. Operation of the transportation motor transport groups—the senior motor transport units under these concepts—is supervised and coordinated by the transportation command. If requirements dictate and if more than two motor transport groups are employed in TASCOM, the transportation motor transport brigade will be interposed in the organizational structure as a supervisory and command headquarters between the groups and the transportation command.

f. Upon direcction of the TASCOM commander, the light-medium truck companies may be detached from the motor transport service and attached for operations to communications zone depots to provide transport support in intradepot operation.

g. The medium truck companies (petroleum) are attached to the POL service for daily operations to provide transport capability for moving bulk POL products.

2–4. Motor Transport Service, Field Army Support Command (FASCOM)

a. The motor transport service for FASCOM (8- and 12-division force, fig 2–3), under command and supervision of the transportation brigade (TOE 55–62), provides line haul motor transport support and, as required, local movement of cargo and personnel to all users of the motor transport service in the field army area. For movements originating in a corps support brigade area, this service is backup in nature and is provided only when movement requirements exceed the capability of the motor transport battalion organic to the support brigade. By direction of the army commander, motor transport units of the transportation brigade may be placed in direct support of tactical units in the corps and division areas.

b. The headquarters, transportation brigade, is a planning and control organization; it coordinates the operations of its attached motor transport battalions. The subordinate motor transport battalions and truck companies perform the motor transport operations. The brigade motor transport units provide a connecting link between the TASCOM transportation command and the direct and general support units of the corps.

c. The motor transport service in the FASCOM transportation brigade is provided by two transportation motor transport battalions. These battalions command and control light (2 1/2-ton), light-medium, medium, and heavy truck companies (fig 2–3). The battalions normally retain control over the light, medium, and heavy companies; the FASCOM commander may direct attachment of light-medium truck companies to support groups in the army support brigade to provide direct transport support to supply and maintenance activities when required.

d. Battalions report the capabilities of subordinate truck units to the appropriate transportation movements office. The trasnportation movements office commits the truck capability in accordance with the FASCOM movements program or commitment authority established by local procedure. For example, the medium truck companies are normally employed in line haul operations in accordance with the FASCOM movements program prepared by the FASCOM MCC; they may be employed in extending the line hauls of the transportation service, TASCOM. The light truck companies are allocated for local transport and are committed, within established limits, by the local transportation movements offices.

e. The vehicles of the heavy truck companies are normally used to distribute heavy vehicles and cargo from railheads in the army rear to consignees in the local area. When no rail facilities are available, they may be used to transport heavy items from the army rear to the forward area.

f. The transportation car company normally remains under operational control of the transportation brigade. It is provided an augmentation of one additional platoon by modified tables of organization and equipment (MTOE), and provides local delivery of personnel and light cargo for the field army rear and FASCOM headquarters. This company may be equipped with sedans, ¼-ton trucks, ¾-ton trucks, or a combination of these vehicles.

g. The medium truck companies (petroleum) are attached to the POL service for daily operations; they provide the motor transport capability

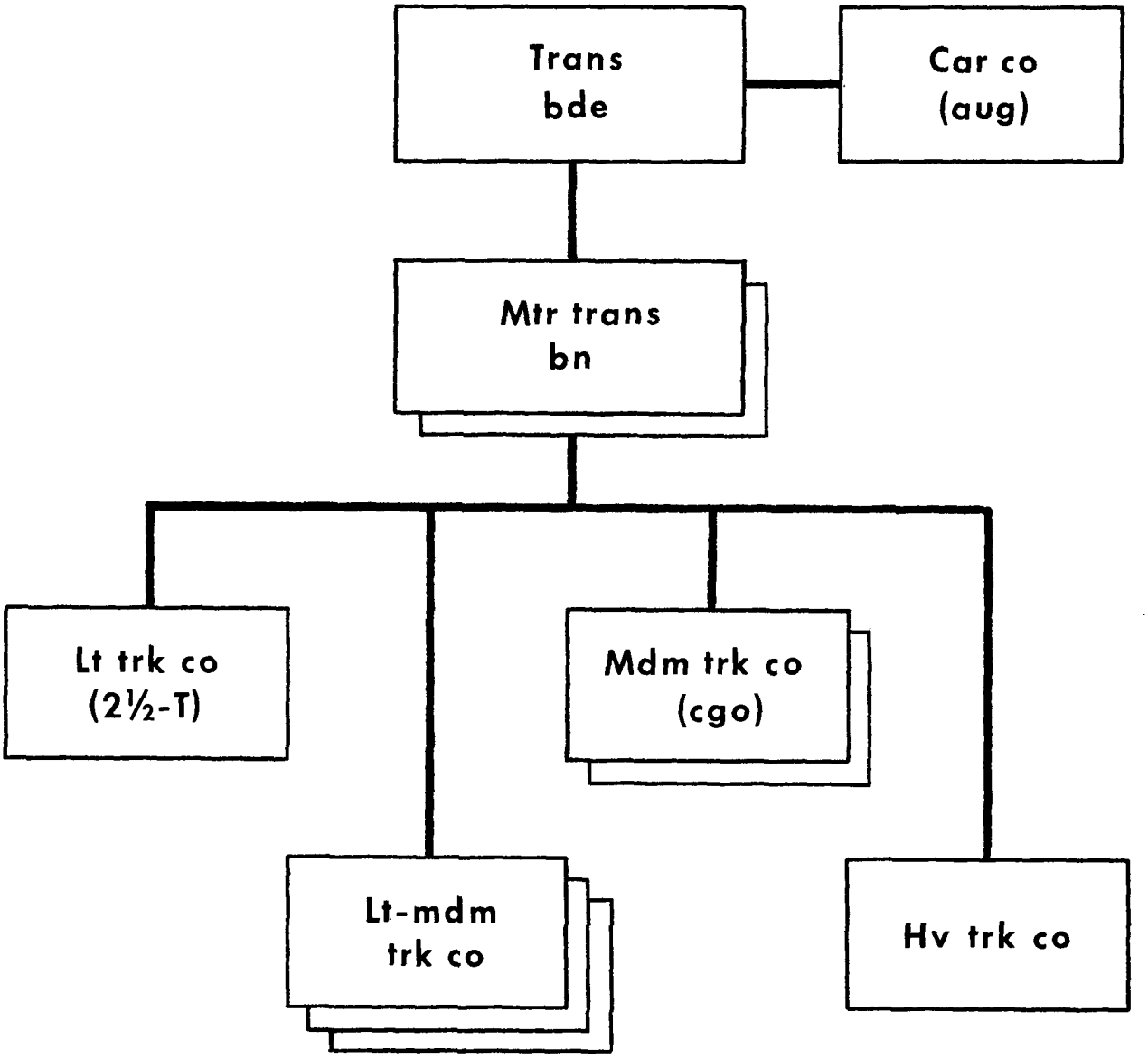


Figure 2–3. Type motor transport service, FASCOM, 8- and 12-division force.

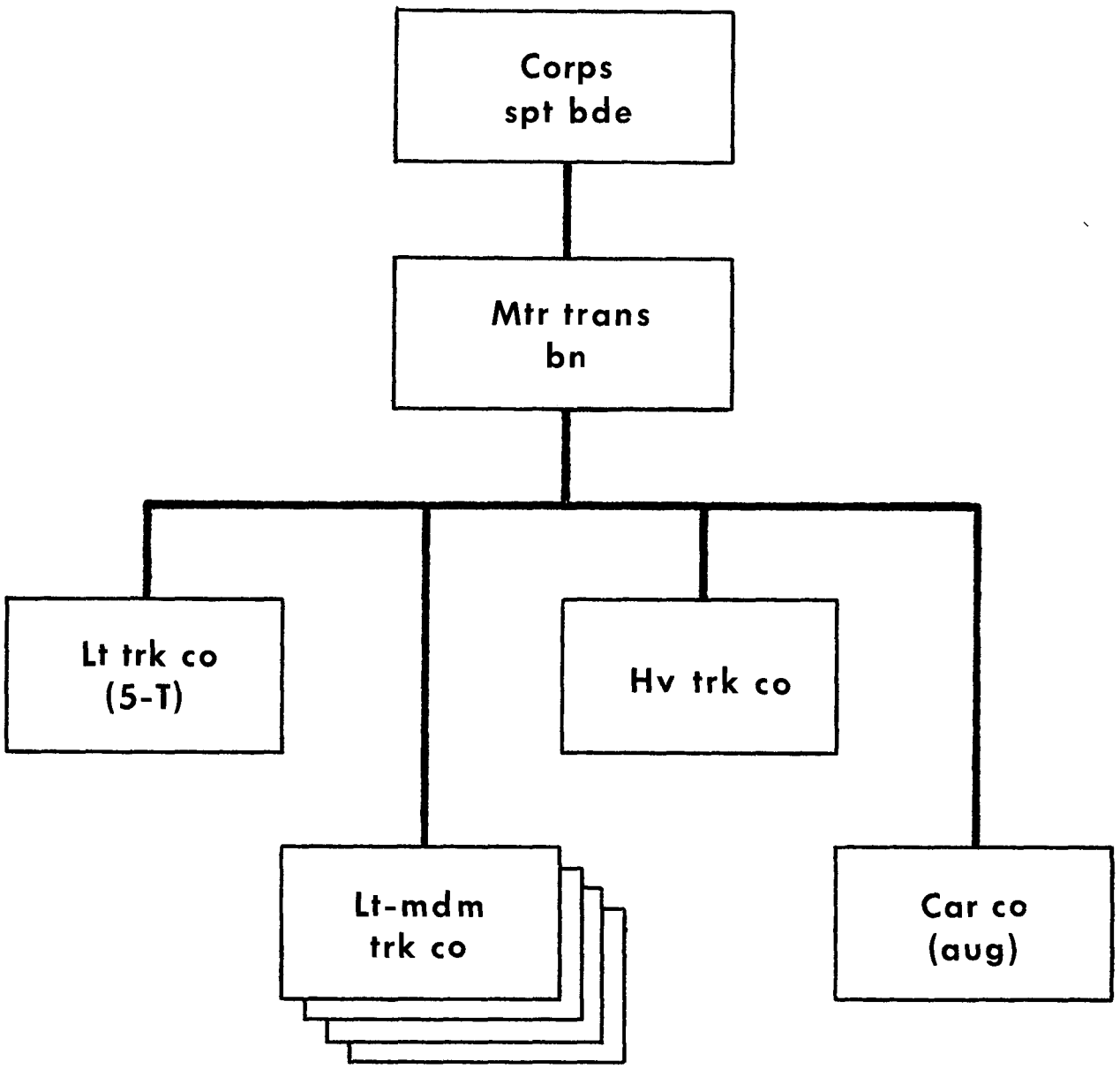
for moving bulk POL supplies in the field army service area.

2–5. Motor Transport Service, Corps Support Brigade

a. The motor transport service for corps (fig 2–4) is under command and supervision of the corps support brigade. It provides an area-wide service in support of the brigade's supply and replacement distribution mission and in support of tactical operations when required. It also provides both line haul motor transport and local delivery of personnel and cargo.

b. The corps support brigade motor transport capability is normally employed within the corps and division areas to carry out the movement requirements of the brigade. Companies of the motor transport battalion are dispersed throughout the brigade area; they are located and employed where they can best meet the requirements of the brigade.

c. The motor transport battalion normally operates on an area basis, providing motor transport service as determined by the support brigade MCC in response to transport requirements. The support brigade MCC commits the transport capa-



Note: All units at TOE strength level 1.

Figure 2–4. Type motor transport service, corps support brigade.

bility of the motor transport battalion and, when movement requirements exceed the capabilities of the battalion, requests motor transport support from FASCOM through the FASCOM MCC.

d. The motor transport battalion exercises normal command over its subordinate units. It works closely with the MCC and the highway traffic headquarters of the support brigade in committing and routing battalion task vehicles. Companies of the battalion may be attached to using organizations as determined by the corps support brigade commander. Companies not attached to other units are retained under operational control of the battalion. Their transport capability is committed by the movement control detachment for use by units having recurring, but not constant, requirements for motor transport.

e. The car company attached to the motor transport battalion provides taxi and light delivery service for corps and brigade headquarters. It is provided an augmentation of two additional platoons by MTOE; one platoon is equipped with ten

¼-ton trucks and trailers and the other is equipped with ten ¾-ton trucks.

f. The medium truck companies (petroleum) are attached to the POL service for daily operations. They provide the transport capability for movement of bulk POL requirements in support of the corps.

2–6. Motor Transport Service, Corps Support Command (COSCOM), Independent Corps

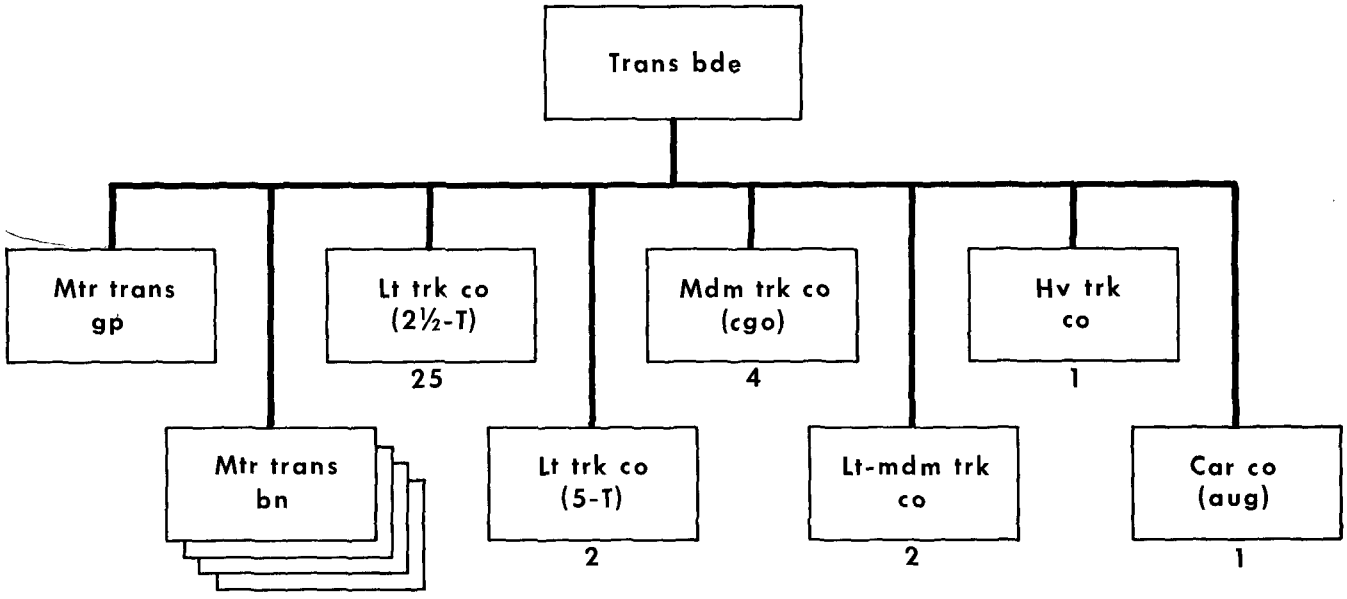
a. When a COSCOM is formed to support an independent corps operation, a transportation brigade headquarters is required to provide transportation support. Depending upon the particular theater in which the COSCOM is employed, the transpcrtation brigade will command a variety of transportation units. A type motor transport service, consisting of a motor transport group with four attached motor transport battalions and subordinate task units, is shown in figure 2–5.

b. The COSCOM motcr transport service, under command and supervision of the transportation brigade, has generally the same mission with respect to the corps that it supports that the motor transport service, FASCOM, has with respect to the army that it supports, with the following exceptions:

(1) In a COSCOM, the transportation brigade provides a single transportation system which includes elements of the three area transportation systems (TASCOM, FASCOM, and support brigade) normally found in a land mass theater.

(2) In a COSCOM, the motor tranport service includes provision for port clearance.

c. Operationally, the methods and procedures for providing motor transport support by dures for providing mototr transport support by the COSCOM motcr transport service parallel those of the FASCOM motor transport service.



Note: (1) Number and type of truck companies attached to each battalion depend on battalion mission.

(2) Figures following each truck unit indicate total number of units assigned to force model; all units at TOE strength level 1.

Figure 2–5. Type motor transport service, COSOM, independent corps.

Section III. COMMAND AND SUPERVISORY UNITS

2–7. Headquarters and Headquarters Company, Transportation Motor Transport Brigade (TOE 55–11)

a. Mission. The mission of headquarters and headquarters company, transportation motor transport brigade, is to command, plan, supervise, coordinate, and control the activities of transportation motor transport groups and other assigned or attached units.

b. Capabilities. The headquarters and headquarters company, motor transport brigade, is capable of commanding three to seven motor transport groups and assigned or attached supporting units of other administrative or technical services.

c. Functions.

(1) The command headquarters consists of the commander and a deputy commander. The staff sections of the motor transport brigade assist the commander in formulating, interpreting, and disseminating policy; in supervising and directing operations; and in other activities of the headquarters as required.

(2) Operational functions of the motor transport brigade encompass all motor activities of the headquarters served. These functions are primarily of a planning and supervisory nature.

(*a*) Planning functions include—

1. Evaluation of motor transport requirements in tactical and logistical support of the forces involved.

2. Study of existing terrain, roadway, enemy situation, and other conditions affecting road movement.

3. Preparation of recommended policies dealing with motor transport for inclusion in the standing operating procedure of the headquarters to which assigned.

4. Determination of motor transport units required to accomplish the motor transport mission.

5. Provision of military personnel and equipment, programing of training activities, and establishing of procedures for operation, maintenance, and supply.

6. Coordination with the appropriate civil affairs unit for provision of civilian personnel and commercial transport equipment, programing of training, and establishment of procedures for operation.

(*b*) Supervisory functions include directing the execution of plans and assuring that they are adequately carried out. This is accomplished through—

1. Issuance of orders and pertinent directives to subordinate commands.

2. Constant attention to the progress of movements and other mission assignments.

3. Close liaison with units and installations serving the motor transport command and being served by it.

4. Inspection of various activities by the responsible sections of the headquarters to assure that subordinate units function properly.

d. Employment. The motor transport brigade is the senior motor transport unit. It is employed in the communications zone when more than two motor transport groups are required.

2-8. Headquarters and Headquarters Detachment, Transportation Motor Transport Group (TOE 55-12)

a. Mission. The mission of headquarters and headquarters detachment, transportation motor transport group, is to provide command, staff planning, and control of operations for transportation motor transport battalions and attached units.

b. Capabilities. The headquarters and headquarters detachment, motor transport group, is capable of commanding three to seven motor transport battalions and assigned or attached units. At full strength it has the following capabilities:

(1) Supervising and assisting subordinate units in administrative and personnel matters.

(2) Planning operations for the group.

(3) Coordinating and supervising operations of subordinate units.

(4) Supervising and assisting subordinate unit supply and maintenance activities.

(5) Operating the group electrical communications system, both wire and radio to subordinate and superior echelons.

(6) Providing organizational maintenance on organic vehicles and communications equipment.

c. Functions.

(1) Group headquarters sections are organized within the headquarters detachment. These sections are under appropriate staff officers assigned to group headquarters. The group headquarters is under the group commander, who is assisted by the executive officer. The staff sections of the motor transport group assist the commander in formulating, interpreting, and disseminating policy and in supervising and directing operations.

(2) Functions of the headquarters and headquarters detachment, motor transport group, include planning, coordinating, and supervising assigned or attached units engaged in port or beach clearance, local or line hauls, and other motor transport missions.

(*a*) The group headquarters plans for the most economical and efficient use of motor transport equipment assigned to subordinate units. It plans for the most complete and effective use of the highway network. Such plans normally culminate in an operational analysis consisting of a tabulation of tasks for subordinate units, designated routings for supply hauls if necessary, and road movement tables and graphs that fit the schedules of individual units in the overall operation and

traffic plan. These procedures from the basis for orders issued to operating units.

(*b*) In fitting capabilities of assigned units to operational requirements, the group headquarters maintains close coordination with higher headquarters.Coordination is also necessary with the following:

1. The supporting direct support group in obtaining required supply and maintenance of equipment.

2. The U.S. Army Strategic Communications Command (Theater) in establishing communications.

3. The military police support unit in traffic control matters.

4. The engineer command for route information, construction, and maintenance.

5. All supporting services in regard to location of depots, supply points, pipeline terminals, access roads, to installations, and loading and unloading facilities and capabilities at supply installations.

6. Civil affairs support units for required civilian personnel, facilities, and materiel.

(*c*) The group headquarters has two responsibilities for training: assigned personnel are trained to perform their individual tasks, and the group supervises training of attached units.

d. Employment. The headquarters and headquarters detachment, motor transport group, is a command unit for motor transport operations. When three or more groups are required, they normally operate under a motor transport brigade or transportation brigade. A group headquarters may be assigned responsibility for an entire line haul or a segment thereof.

2–9. Headquarters and Headquarters Detachment, Transportation Motor Transport Battalion (TOE 55–16)

a. Mission. The mission of headquarters and headquarters detachment, transportation motor transport battalion, is to provide command and supervision to units engaged in all types of motor transport such as direct support of tactical units, port or beach clearance, depot and terminal operations, and line hauls.

b. Capabilities. The headquarters and headquarters detachment, motor transport battalion, is capable of commanding, supervising, and providing administrative support for three to seven transportation truck and/or tracked vehicle companies and attached or supporting services.

c. Functions.

(1) The battalion headquarters is the command group and includes the commander, his executive and staff, and the sergeant major. The headquarters detachment is the operations group and includes the detachment headquarters and the administration and personnel, operations, supply, maintenance, and communications sections. The headquarters detachment may be further augmented for personnel administration purposes.

(2) The headquarters and headquarters detachment, motor transport battalion, plans and schedules tasks to conform with the overall movement program and with operational requirements. It supervises, coordinates, and assists subordinate units in administration, supply, maintenance, training, and communications.

(3) A principal type of operation performed by headquarters and headquarters detachment, motor transport battalion, is operation of a truck terminal or trailer transfer point, or both; augmentation as required is provided by appropriate teams from TOE 55–540 (para 2–18).

d. Employment. The headquarters and headquarters detachment, motor transport battalion, is employed to provide centralized command, coordination, and supervision to a number of operating units in support of a single command, installation, or area. The type and number of companies attached to the battalion are varied to suit the operation.

Section IV. TASK UNITS

2–10. Task Vehicle Equipment

The type of vehicles authorized by TOE to the task units (truck companies) of the motor transport service for employment in logistical support operations are as follows:

a. Cargo Truck, 2½ Ton. The 2½-ton cargo truck is a standard military transport vehicle designed to carry cargo, personnel, or equipment. It is normally employed in local hauls for support of interrelated activities and for distribution of supplies to using units, but it is also suitable for long or line hauls when highways are poor or when off-road operation may be required. It is more rugged than commercial type vehicles of comparable capacity and has additional off-road capability provided by all-wheel drive. Its on-road rated capacity is 5 tons; for off-road operation, the

load should not exceed 2½ tons. Troop seats are provided in the cargo bed, giving the vehicle a troop carrying capability of 20 combat-equipped soldiers for a short haul. The truck is designed to tow the 1½-ton cargo trailer, which may be loaded to a maximum of 2¼ tons. However, the loaded trailer should not be towed when off-road operation is anticipated. When employed in troop movement, the 1½-ton cargo trailer is normally used to carry baggage and equipment of the transported troops. In local cargo hauls, the trailer is seldom used.

b. Cargo Truck, 5-Ton. In size, design, and purpose, the 5-ton cargo truck is similar to the 2½-ton truck, but the 5-ton truck is built with sturdier components throughout to carry heavier cargo loads and high-density cargo. It is organic to artillery and armored units to transport ammunition and is assigned to transportation light truck companies primarily to meet ammunition transportation requirements.

c. Semitrailer, Stake, 12-Ton. The 12-ton four-wheel, cargo semitrailer is designed to be towed by the 5-ton truck tractor or a similar vehicle equipped with a fifth wheel. Highway speeds and off-road capabilities are therefore almost completely dependent on the power and traction of the tractor. The semitrailer is designed to be towed over good hard-surfaced roads at speeds as high as 50 miles (80 kilometers (km)) per hour, with loads up to 18 tons; it can be towed over unimproved roads and trails or over opening rolling terrain at speeds as high as 30 miles (48 km) per hour, with loads up to 12 tons. In planning for employment of this equipment, the truck tractor and semitrailer must be considered as a combination vehicle. This vehicle provides the most economical means of motor transport for long hauls, particularly for trailer relay operations.

d. Semitrailer, Tank Transporter, 50-Ton, Eight-Wheel. The 50-ton tank transporter semitrailer is designed primarily for on-road transportation of the main battle tank and other heavy, oversize, or tracked combat vehicles. It may also be used to transport heavy engineer equipment and bulky, overweight, or outsize cargo. The 10-ton truck tractor M123 is used as the towing vehicle. Towed speeds are limited to 26 miles (42 km) per hour on improved roads; off-road operation is not recommended. Because of the large size and weight of this vehicle, careful coordination through appropriate traffic headquarters is required for highway movement.

e. Gasoline Tank Semitrailer, 5,000-Gallon. The 5,000-gallon gasoline tank semitrailer is designed for transportation of bulk fuel. Like the cargo semitrailer, it is towed by the 5-ton tractor and can be towed over improved roads at speeds up to 50 miles (80 km) per hour while carrying its full rated load. It can be towed at reduced speeds—up to 25 miles (40 km) per hour—over unimproved roads and trails of good trafficability while carrying 3,000 gallons of bulk fuel. Bulk handling of fuel saves time and manpower, and this method of transporting and dispensing fuels is used whenever the situation permits. Fuel transported in transportation motor transport gasoline tank semitrailers may be delivered to units on a trailer-exchange basis, transferred directly to user tank vehicles, or transferred to supply point tanks. The 5,000-gallon tank semitrailers may be used as mobile storage facilities to augment supply point stocks in emergencies. In addition, some models may be used as mobile filling stations.

f. Semitrailer, Refrigerator Van, 7½-Ton. The refrigerator van is designed for moving perishable cargo or cargo requiring controlled temperatures. It is towed by the 5-ton tractor and can be towed over improved roads at speeds up to 50 miles (80 km) per hour while carrying its full rated load. It can be towed at reduced speeds—up to 25 miles (40 km) per hour—over unimproved roads and trails of good trafficability while carrying a cargo load of up to 4½ tons.

2-11. Transportation Light Truck Company (2½-ton, 5-ton) (TOE 55-17)

a. Organization. The transportation light truck company consists of a company headquarters, a maintenance section, and three truck platoons. Each truck platoon is organized with a platoon headquarters and two truck squads (fig 2-6).

b. Equipment. Task equipment for the transportation light truck company consists of 60 trucks (either 2½-ton or 5-ton), six of which are equipped with winches, and sixty (60) 1½-ton trailers. Each truck squad has 10 trucks. The company is also authorized tool sets and equipment adequate for performing organizational maintenance, communications equipment for command and control, weapons for defense and security, and mess equipment and other standard items of issue for administration and operation of the unit in the field.

c. Capabilities. For planning purposes, and with the unit at full strength, the capabilities of the

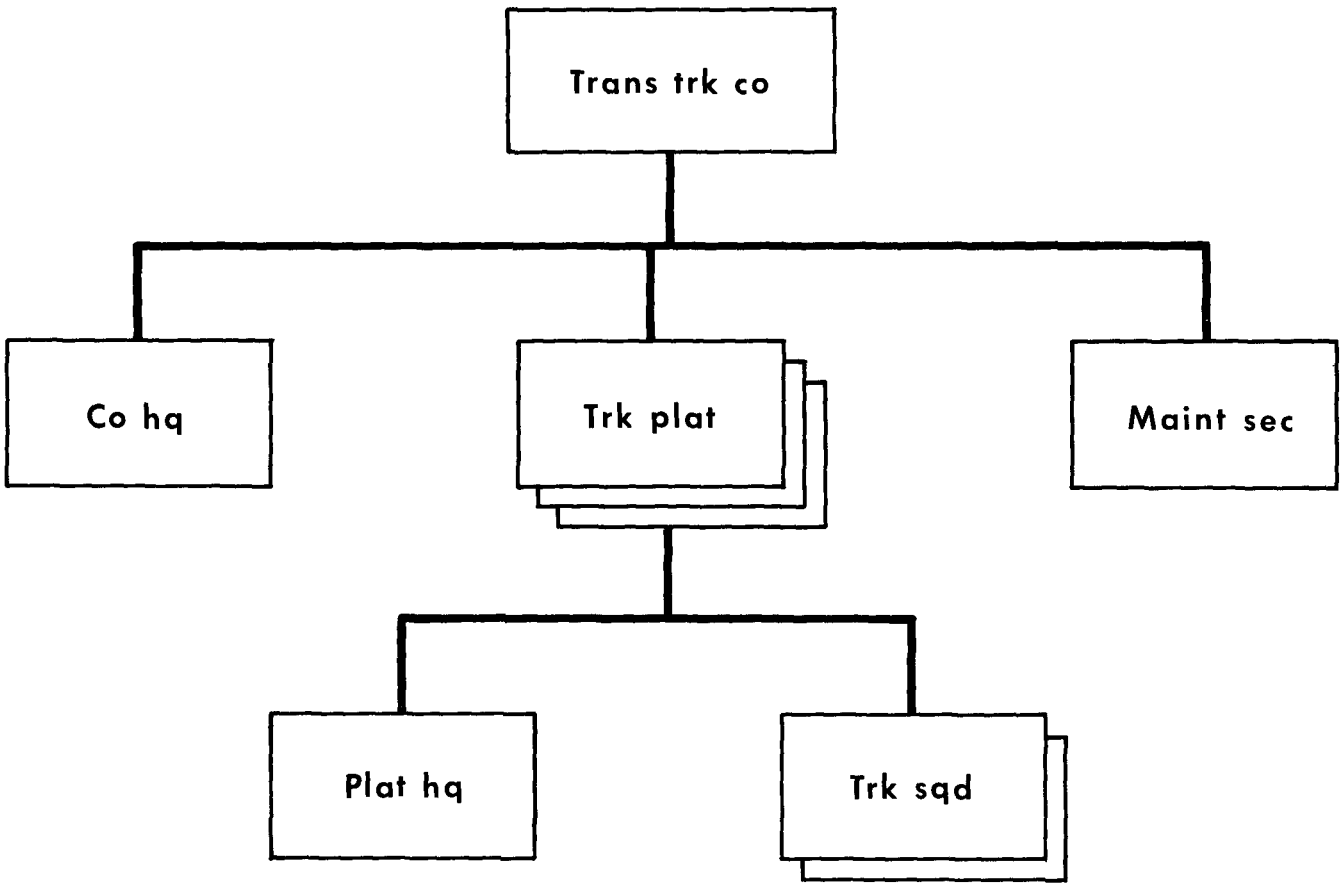


Figure 2–6. Organizational chart, transportation light truck company (TOE 55–17), transportation medium truck company (TOE 55–18), transportation heavy truck company (TOE 55–28).

transportation light truck company are figured on the basis of 75-percent vehicle availability, four round trips daily for local hauls or two round trips daily for line hauls, and 4 short tons (STON) of cargo per 2½-ton truck or 6 STON per 5-ton truck. Passenger capacities are figured at 20 per truck for both 2½ ton and 5-ton vehicles for short hauls or, for line hauls, 16 per 2½-ton truck and 18 per 5-ton truck. Actual vehicle availability varies with age and condition of assigned task vehicles, state of training of the unit, and effectiveness of the maintenance program. The number of trips daily varies with changes in the operational environment. Other factors influencing total daily lift capability of the company are average cargo density, degree of cargo space utilization, availability of materials handling equipment at loading and unloading points, and availability of vehicle fuels and lubricants.

d. Employment. In a theater of operations, light truck companies are employed to fill commitments for movement of troops within the army area and for local haul of supplies and ammunition; they also have the same missions in the communications zone. In addition, they provide a general hauling service, as required, for terminal clearance, depot operations, and installation support. Light truck companies provide flexibility in the choice of vehicles for specific tasks. Employment of 5-ton trucks is normally restricted to transporting high-density cargo such as ammunition, though personnel may be carried when necessary. The 2½-ton trucks are used in transporting rations and other low-density cargo and in carrying personnel as required. The off-road mobility of both light trucks may indicate their choice over the more economical, though less mobile, medium trucks.

2–12. Transportation Medium Truck Company (Cargo) (Refrigerator) (TOE 55–18)

The transportation medium truck company (cargo) is organized for the most economical highway movement of bulk dry cargo in theaters of operation. In an emergency, task equipment of the company can be employed for transporting personnel. Although the off-road operational mobility of the company is restricted by task vehicle

limitations, this advantage is offset by the company's one time lift capacity and its relay operation capability. The transportation medium truck company (cargo) is equipped with cargo semitrailers when it is employed in its principal role of transporting general cargo. This company may be equipped with refrigerator semitrailers to satisfy specialized requirements for moving perishable subsistence and other cargo that require maintenance of prescribed temperature levels during transport (FM 10–60).

a. Organization. Both the cargo and the refrigerator companies are organized with a company headquarters, a maintenance section, and three truck platoons. Each truck platoon consists of a platoon headquarters and two truck squads (fig 2–6).

b. Equipment

(1) The transportation medium truck company (cargo) is authorized sixty 5-ton truck tractors and sixty 12-ton cargo semitrailers. Units engaged in semitrailer relay operations may be authorized an additional 60 semitrailers by the theater commander.

(2) The transportation medium truck company (refrigerator) is authorized sixty 5-ton tractors and sixty 7½-ton refrigerator van semitrailers.

(3) Tool sets and maintenance equipment for organizational maintenance, communications equipment for command and control, weapons for security and defense, mess equipment, and other standard items necessary for administration and operation in the field are authorized by tables of organization and equipment. Additional or substitute equipment indicated by operational conditions may be authorized by the theater commander.

c. Capabilities. For planning purposes, the capabilities of the companies are figured on the basis of 75-percent vehicle availability, four round trips daily for local hauls or two round trips daily (one per 10-hour shift) for line hauls; the units are considered to be at full strength.

(1) The transportation medium truck company (cargo) has the capability, based on 12 STON of cargo per semitrailer or 50 passengers per semitrailer (emergency only), to transport 2,160 STON daily in local hauls or 1,080 STON daily in line hauls; personnel transport capabilities are 9,000 personnel daily in local hauls or 4,500 personnel daily in line hauls. Although the combination task vehicle is normally considered an economical on-road cargo carrier, its off-road capabilities may be greatly improved by substituting desert tires. This additional traction for the prime mover and the increased flotation of both tractor and semitrailer provide acceptable off-road mobility for extended desert operations and for limited cross-country operations in other areas.

(2) The transportation medium truck company (refrigerator) has the capability, based on 6 STON of cargo per refrigerator van, to transport 1,080 STON daily in local hauls or 540 STON daily in line hauls. This unit has no capability for transporting personnel.

d. Employment.

(1) The transportation medium truck company (cargo) is employed in a theater of operations for economical transportation of bulk dry cargo in line haul operations from initial points of entry into the theater as far forward into the army area as possible. In the army area, medium truck companies operate from army rear to general support and direct support activities in the corps areas as a part of the system operated by the transportation brigade. This system is coordinated with interzonal transportation elements of the communications zone and complements the motor transport capabilities of support brigades and units of other armywide services.

(2) The transportation medium truck company (refrigerator) is employed wherever required to transport perishable cargo. It may also be used to transport cargo requiring controlled temperatures (electronic devices, missile components, ADP equipment, and like items). Such employment may involve local and/or line hauls. Off-road operations of this unit are generally limited to areas of good trafficability.

2–13. Transportation Medium Truck Company (Petroleum) (TOE 55–18)

a. Organization. The transportation medium truck company (petroleum) is organized with a company headquarters, a maintenance section, and three truck platoons, each with a platoon headquarters and two truck squads (fig 2–6). In personnel assignment and strength, it is identical to the transportation medium truck company (cargo).

b. Equipment. The transportation medium truck company (petroleum) is authorized sixty 5,000-gallon gasoline tank semitrailers with sixty 5-ton truck tractors as prime movers. In addition,

the company is authorized tool sets and maintenance equipment for organizational maintenance, communications equipment for command and control, mess equipment, weapons for security and defense, and standard items necessary for administration and operation in the field.

c. Capabilities. Planning capabilities of the transportation medium truck company (petroleum), with the unit at full strength, are based on the assumption of 75-percent vehicle availability, four round trips daily for local hauls or two round trips daily (one per 10-hour shift) for line hauls, and 5,000 gallons of liquid cargo per semitrailer. On this basis, assuming the company to be at full strength, it is capable of moving 900,000 gallons of fuel per lay in local hauls and 450,000 gallons in line hauls. Extended off-road operations cannot be considered for the company unless trafficability is unusually good.

d. Employment. In normal operations, the transportation medium truck company (petroleum) is employed in the line haul transport of bulk fuel from initial points of entry into a theater to points in the communications zone and the army area, based on the overall POL distribution plan for the theater. The supply and maintenance command, theater army support command, forwards bulk POL to the farthest points practical in the field army, whether by truck, pipeline, or other means. Tankage is erected in the army area to receive and store this product. Transportation medium truck companies (petroleum) make bulk delivery from the tank storage areas to the supply points operated by general and direct support units in the corps, areas, to direct support units in the army service area, and to Division/ Separate Brigade.

2–14. Transportation Light-Medium Truck Company (TOE 55–67)

The transportation light-medium truck company is essentially a light truck company (2½-ton trucks) augmented by one medium truck squad (5-ton tractors with 12-ton semitrailers). This augmentation provides the company with an organic capability to provide transportation for all classes of supply, except bulk class III, within the army area in combat support and combat service support operations.

a. Organization. The transportation light-medium truck company is organized with a company headquarters, a maintenance section, and three truck platoons: two light truck platoons, of two light truck squads each, and one light-medium truck platoon, which is a three-squad platoon with two light truck squads and one medium truck squad (fig 2–7).

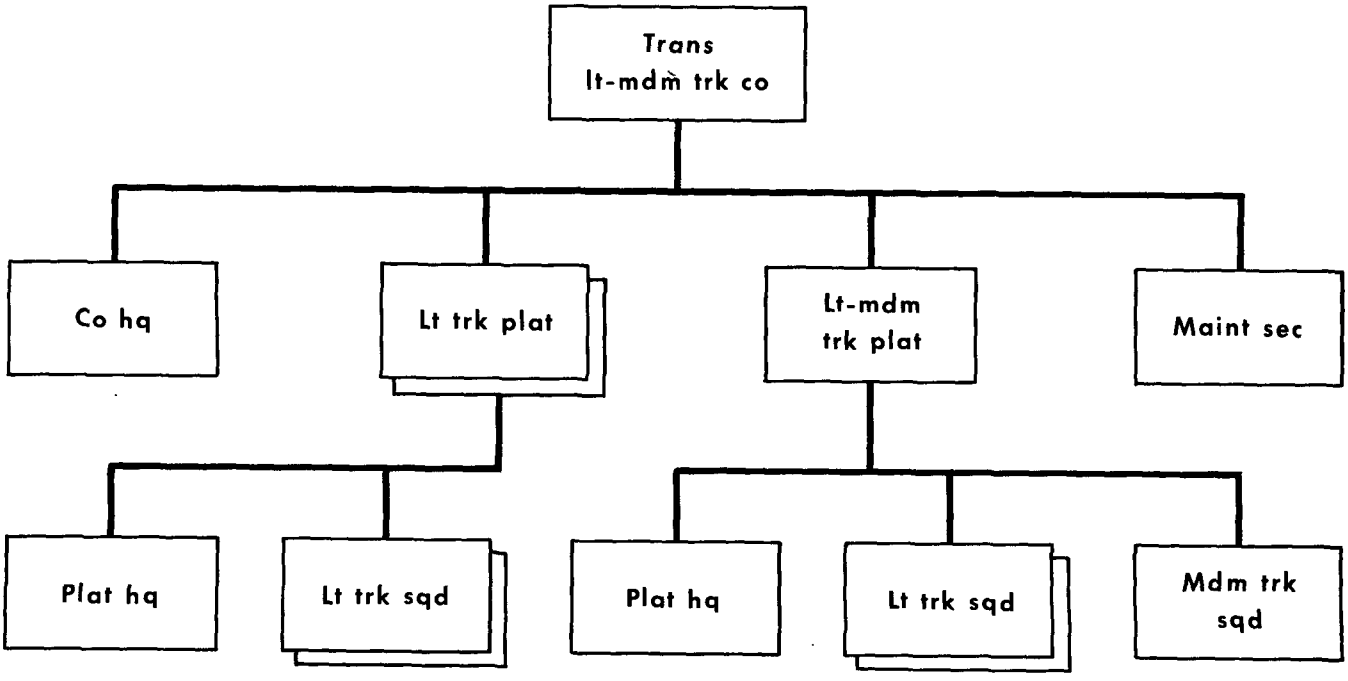


Figure 2–7. Organizational chart, transportation light-medium truck company (TOE 55–67).

b. Equipment. The transportation light-medium truck company is authorized sixty 2½ ton trucks with sixty 1½-ton cargo trailers and ten 5-ton truck tractors with twenty 12-ton semitrailers as task equipment. In addition to its task equipment, the company is authorized vehicles and equipment to carry out the functions of command, control, organizational maintenance, supply, mess, and administration.

c. Capabilities. The light-medium truck company has the total lift capability of the light truck company (2½-ton), plus that of one medium truck squad. The authorization of truck tractors and semitrailers in the ratio of 1 to 2 gives the unit a trailer relay capability or a limited capability of mobile storage. The assignment of two drivers for each task vehicle provides the unit with a capability for around-the-clock operations (two 10-hour shifts). For planning purposes, based on the assumption of 75-percent vehicle availability with the unit at full strength (eight 12-ton stake and platform semitrailers available), this company can transport 276 STON of general cargo in one lift. For local hauls based on four round trips daily transporting cargo, or six round trips daily transporting personnel, it can move 1,104 STON of cargo or 7,800 personnel. In line haul operations, based on two trips daily, it can transport 552 STON of cargo or 2,600 personnel.

d. Employment. The transportation light-medium truck company provides a flexible responsive motor transport unit used primarily to move dry cargo. This requirement is met by the six light truck (2½-ton) squads in the company. The incorporation of the medium squad with its tractor-trailer combination vehicles meets the limited requirements for line haul transport in the assigned areas of responsibility. This medium truck squad may also be employed in short hauls for economical transport of larger bulk shipments. Light-medium truck companies in the transportation brigade are employed as utility motor transport in performing the brigade mission and in reinforcing the direct support and general support group transport capability as required.

2–15. Transportation Heavy Truck Company (TOE 55–28)

The transportation heavy truck company is organized and equipped to satisfy the military requirements for highway transportation of overweight and outsize loads, primarily the main battle tank and other combat vehicles. The heavy-lift capabilities of the company are also used in moving heavy engineer equipment and overweight, bulky general cargo.

a. Organization. The company is organized with a company headquarters, a maintenance section, and tree truck platoons, each having a platoon headquarters and two truck squads (fig 2–6).

b. Equipment. Major task equipment authorized the transportation heavy truck company by TOE 55–28 consists of 24 tank transporter semitrailers and 24 truck tractors. The 10-ton truck tractor authorized is equipped with dual winches of suitable capacity to load disabled combat vehicles onto the semitrailer without the assistance of other equipment. The eight-wheel, 50-ton tank transporter semitrailer is designed to facilitate the loading and transport of either operable or inoperable main battle tanks. Axle loadings are distributed to permit movement over standard improved highways and bridges of class 80 or over. The maximum allowable towed speed for the loaded combination is 26 miles (42 km) per hour on improved roads. The size and weight of the loaded vehicle and its speed limitations restrict its normal use to the specific purposes for which it was designed. In addition to the task vehicles described, the company is authorized vehicles and equipment necessary to the functions of command, control, maintenance, supply, mess, and administration.

c. Capabilities. For planning purposes, with the unit at full strength, the capabilities of the transportation heavy truck company are figured on the basis of 75-percent vehicle availability, four round trips daily for local hauls or two round trips daily in line hauls, and 40 STON of cargo per vehicle. This provides a capability of 2,880 STON of cargo, or tanks or similar vehicles, per day for short hauls, and 1,440 STON of like cargo per day in line hauls. Highway alinement (both in curvature and grades) and usable road widths influence the performance of company task elements. The capabilities of the heavy truck squad are proportionate to its authorization of personnel and equipment.

d. Employment. The transportation heavy truck companies are employed to transport heavy equipment from general support to direct support level in the corps areas and to divisions of the corps. The heavy truck company is also used in evacuating disabled heavy equipment to the rear. Heavy truck companies in the communications zone are

employed when there is a requirement for on-road movement of heavy-lift or outsize equipment.

2–16. Transportation Car Company, Support Command, or Airborne Corps (TOE 55–19)

a. Organization. The transportation car company is provided with a highly flexible organizabion to meet a variety of requirements.

(1) The support command car company is organized with a company headquarters, a maintenance section, and three operating platoons: a sedan platoon, a ¼-ton truck platoon, and a ¾-ton truck platoon. Each platoon consists of a plaboon headquarters and two squads of the appropriate type task vehicles (fig 2–8). The company is equipped with three basic vehicle types: the sedan platoon with light five-passenger sedans; the ¼-ton truck platoon with ¼-ton trucks, 50 percent of which have ¼-ton trailers; and the ¾-ton truck platoon with ¾-ton cargo trucks. Each is capable of satisfying the requirements of a different type of situation. When all three items of equipment are represented in the company, it is capable of performing three types of missions: the sedan gives the company the capability of transporting military personnel over improved roads in an extensive area; the ¼-ton truck is a command and reconnaissance vehicle suitable for cross-country work; the ¾-ton truck has a cargo and personnel-carrying capability in addition to that of command and reconnaissance. When one bype of mission is likely to be predominant, the company may be organized and equipped accordingly.

(2) The airborne corps car company is organized with a company headquarters, a maintenance section, and three operating platcons: a parachute platoon, an airborne composite platoon, and an airborne ¾-ton truck platoon. Each platoon consists of a platoon headquarters and two squads of the apprcpriate type task vehicles (fig. 2–8. The task vehicles of the parachute platoon are ¼-ton trucks, each with a ¼-ton trailer. Those of the airborne composite platoon are 50 percent ¼-ton trucks with ¼-ton trailers and 50 percent ¾-ton cargo trucks, and those of the airborne ¾-ton truck platoon are ¾-ton cargo trucks. In support of airborne operations, the parachute platoon is normally employed with the drop elements and landed by parachute; the other two platoons are moved to the airhead with the follow-up elements and are air landed. All personnel in the parachute platoon are jump-qualified.

b. Equipment. The task vehicles authorized the transportation car company are commercial type sedans, ¼-ton trucks and trailers, and ¾-ton trucks. The vehicle mix, by either company or platoon, may vary to meet a specific operational environment; for example, tactical vehicles for a tactical headquarters in an area of poor highway trafficability or sedans for a headquarters in a better developed and less vulnerable area. The company is also authorized tool sets and equipment adequate for performing organizational maintenance, communications equipment for command and control, weapons for defense and security, and mess equipment and other standard items of issue for administration and operation of the unit in the field.

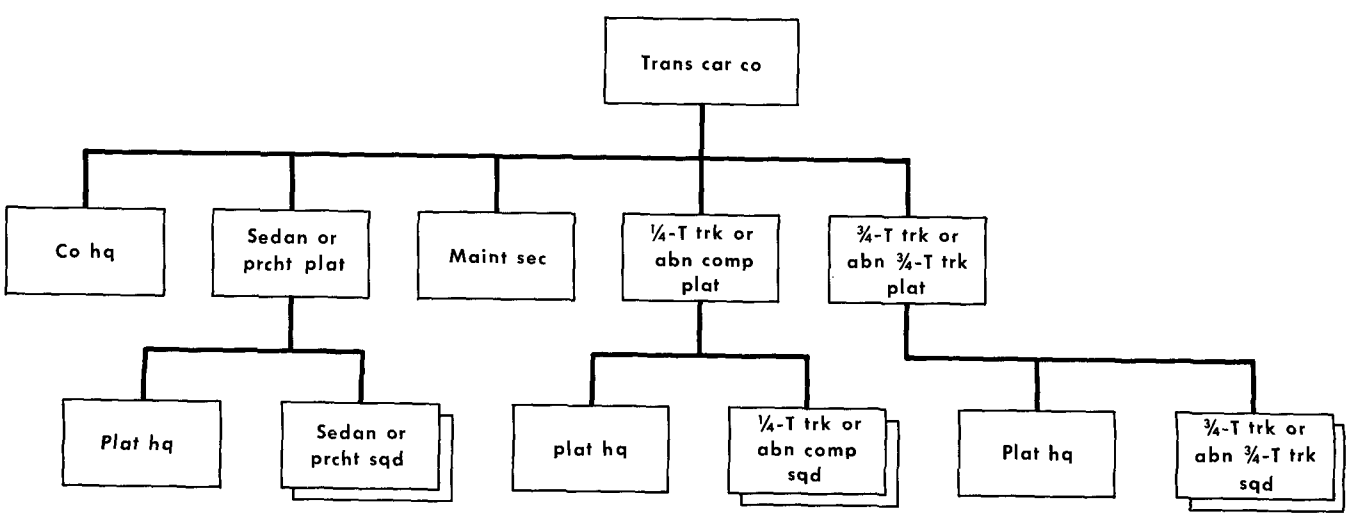


Figure 2–8. Organizational chart, transportation car company (TOE 55–19).

c. Capabilities. A sedan platoon of the transportation car company can transport 75 people in one lift. A platoon equipped with ¼-ton trucks and trailers can transport 45 personnel and 2½ tons of baggage or small-size supplies, or 6¼ tons of small-size supplies and cargo, mail, or light commodities, in one lift. A platoon equipped with ¾-ton trucks can transport 11¼ tons of cargo or 120 people in one lift. A composite platoon composed of ten ¼-ton trucks and trailers and ten ¾-ton trucks (designated the airborne platoon in the airborne organization) can transport 82 personnel and 7½ tons of baggage or small-size supplies, or 10 tons of small-size supplies and cargo, mail, or light commodities, in one lift. With the unit at full strength, all capabilities are computed on a 75-percent availability of vehicles with all the vehicles carrying their rated capacity. When the transportation car company is organized for an airborne corps, the parachute platoon has the capability of being landed by parachute or aircraft.

d. Employment. The transportation car company is employed to transport personnel and light cargo by motor vehicles. The unit is employed in both the communications zone and the field army area. When employed in the communications zone, in addition to being attached to the transportation command, one is also attached to each area support command. When employed in the field army area, car companies are attached to the transportation brigades and the corps support brigades. In a corps support command, independent corps, the unit is attached to a motor transport battalion.

Section V. ASSOCIATED UNITS

2–17. Headquarters and Headquarters Company, Transportation Brigade (TOE 55–62)

a. Mission. The mission of headquarters and headquarters company, transportation brigade, is to command and control air transport, motor transport, terminal transfer, and transportation movement units.

b. Capabilities. The headquarters and headquarters company, transportation brigade, is capable of—

(1) Commanding, planning, and supervising the activities of two to seven transport groups or the equivalent in transport battalions and companies.

(2) Providing highway regulation service within the field army area.

c. Reference. For a detailed discussion of the transportation brigade, see FM 55–6–1 (Test).

2–18. Transportation Motor Transport Divisional Units

Transportation motor transport companies are employed in supply and transport missions in divisional units. These motor transport companies are organized and equipped to provide transportation for unit distribution of all classes of supply except class V, to transport division reserve supplies for which the unit is responsible, to furnish vehicles required for displacing division headquarters and the division administration company, and to supplement transport means available to other elements of the division.

2–19. Cellular Units

a. Transportation Motor Transport Teams (TOE 55–540). Motor transport teams as listed are contained in TOE 55–540: GA, car squad; GB, bus squad; GC, heavy truck squad; GD, light truck squad; GE medium truck squad; GF, trailer transfer point operations; GG, highway regulating point. These teams may be attached to higher echelon units or may operate independently.

b. Composite Service Organization (TOE 29–500). Composite service organization teams with varying capabilities and personnel strengths are contained in TOE 29–500. Mess detachments and automotive maintenance detachments are used to augment a motor transport unit, as required, when the unit is engaged in round-the-clock operations.

CHAPTER 3

ORGANIZATION OF MILITARY MOTOR MOVEMENTS

(STANAGs 2041, 2154)

3–1. General

a. To exploit the increased ground mobility of military units and to make effective use of the road network, adequate control must be maintained over military motor movements; such control is provided through organization of motor movements columns.

b. An appropriate degree of standardization must be provided to permit effective centralization of control when necessary. Details of motor movement organizations and corrective actions for recurring problems are provided for in instructions from higher headquarters and unit standing operating procedures. For a detailed discussion of organization and operation of military motor movements, see TM 55–310.

c. Organization for highway regulation to provide for allocating, scheduling, and controlling motor movements over the highway net is discussed in FM 55–10.

3–2. March Organization

A march column includes all elements using the same route for a single movement under the centralized control of a single commander. A large column may be composed of a number of organized subdivisions, each under the control of a subordinate commander.

a. Serial. A serial is a major subdivision of a march column; it is organized as a single unit under one commander for purposes of planning, regulation, and control.

b. March unit. The march unit is the smallest subdivision of the column, normally corresponding to the smaller troop units such as squad, section, platoon, company, or battery. It moves and halts under the direct control of a single commander.

3–3. Control Personnel

a. Column Commander. The officer or noncommissioned officer in command of a column is responsible for its actions during a movement. He issues the orders to initiate the march and insures that instructions contained in standing operating procedures and march orders are complied with during the preparation for and conduct of the march. He must be free to supervise the movement of the column, and selects his position in the column on the basis of anticipated problems. When conditions and availability permit, the commander may use light aircraft to facilitate column control. From the air, any deviations from the prescribed formation, changes in traffic conditions, and divergence from the prescribed route can be easily noted and immediate corrective action taken. Aerial reconnaissance, concurrent with aerial column control, may also enable the commander to make timely adjustments to meet changes in the situation.

b. Control Officers and Noncommissioned Officers. Column control is maintained by command and staff personnel at all echelons within the column. Commanders of serials and march units are responsible for operating their elements of the column, each using his staff or representatives to assist as he may direct (TM 55–310).

c. Other Control Personnel. Depending on the size of the column and the requirements of the situation, control personnel may include the following:

(1) *Guides.* Signing and guide teams direct a unit or vehicles over a specified route or to a selected locality. These teams are normally provided by the moving unit. Route signing and placing of guides on controlled routes must be under the responsibility of the authority in charge of movements or traffic in the area concerned (STANAG 2154, app H). Signs must conform to accepted specification and design (STANAG 2154, app H).

(2) *Escorts.* Escorts may be provided to accompany a column or convoy to assist its movement and to protect it from interference. Escorts may consist of military police (FM 19–25), civilian police, or other personnel assigned to accompany the column through congested areas or areas of possible traffic conflict; of armed guards, ground troops, or armed aircraft to protect the movement from sabotage, guerrilla activity, or enemy action; or of any required combination of the foregoing.

(3) *Patrols.* Under organization control (para 4–1), patrol duties are performed by personnel detailed from the unit making the move. Under area control (para 4–1), patrol duties are usually performed by area military police. Patrols facilitate movements in accordance with the traffic plan and the schedules prescribed by higher authority or by the traffic headquarters having area jurisdiction.

3–4. Control Identification of Vehicles

It is desirable to mark or otherwise designate vehicles of the column for control purposes. Such identification is subject to local conditions and is usually specified in standing operating procedures. Marking should be kept to a minimum consistent with its need in column control. Temporary markings should be easily removable.

a. Cloth Control Indicators. Command and control vehicles of each element of a column are indicated by flags approximately 12 by 18 inches (30 by 45.7 centimeters) in size. The leading vehicle carries a blue flag; the rear vehicle, a green flag; and the vehicle of the commander, a white and black flag (STANAG 2154, app H). Flags are mounted on the left side of the vehicle except where vehicles are driven on the left side of the road, in which case flags are mounted on the right side.

b. Numbering of Vehicles.

(1) The number assigned to a movement serial (STANAG 2154, app H) is marked on the front and on both sides of each vehicle in the serial. The marking must be clearly visible from the ground and must not conceal other prescribed markings.

(2) When aircraft are used for column control, approximately every fourth vehicle in the column should have the movement number marked on the hood for visibility from the air.

c. Special Markings on Vehicles. In addition to the markings described in *b* above, standard markings are prescribed for vehicles that require easy identification.

(1) Vehicles carrying general officers may be marked with the appropriate conventional symbol on a plate attached to the right end of the front bumper (AR 746–5). Flags indicating the rank of general officers may also be flown.

(2) Armed Forces police vehicles and military police vehicles are marked prominently in accordance with the provisions of AR 746–5.

(3) Ambulances and other vehicles provided exclusively for medical purposes are marked in conformity with AR 746–5.

(4) Vehicles of bomb disposal units have all mudguards (fenders) painted red.

(5) A plain red flag flown from any vehicle indicates danger.

(6) Any commander having area responsibility may prescribe a marking to be displayed on the front and rear of a vehicle which shows that it has priority over other vehicles. This marking is valid only in the area of the commander authorizing it. It is an equilateral triangle of red border lines on a white background; a red symbol inside the triangle indicates the commander authorizing the priority.

3–5. Column Communication

Adequate communications within a column is essential to effective command and control. Unit standing operating procedure may designate the various means of communication and their use under specific circumstances. The operation order (STANAG 2041, app E) specifies security limitations. Methods of intracolumn communication include the following:

a. Visual Signals. Visual signals (FM 21–60) are most commonly used for column control. These may be arm-and-hand, flashlight, or flag signals. They may be given directly by the commander to the entire march unit or may be relayed from vehicle to vehicle as in the case of standard driver's signals.

b. Audio Signals. Audio signaling is used mainly in conjunction with other means of signaling for column control. Whistles or horns are used to attract attention, to warn personnel of further transmission of commands, and to spread alarms. Voice commands and verbal messages are classed as audio signals and are used when the

situation permits. Aircraft equipped with loudspeakers may be used in audio signaling.

c. Radio communication. When communication security permits and when vehicles are adequately equipped, radio is the principal means of communication during a march. Radio provides the most rapid transmission of orders and messages between widely separated elements of a column. Its use is generally specified in orders, in the unit standing operating procedures, and in signal operations instructions. Aircraft may be used to relay messages between FM radios on the ground in terrain that restricts direct communication.

d. Other Methods. Sign messages, written on a board and posted along the route or displayed by a guide in view of oncoming vehicles, are often used to pass instructions to the moving column. Written messages may be delivered by guides along the route or by messengers. The use of aircraft is practical and effective for delivering messages and for transporting control personnel to locations along a congested route.

CHAPTER 4

CONTROL OF MOTOR MOVEMENT (STANAGs 2113, 2151, 2154)

4–1. Types of Control

a. Organizational Control. Organizational control is always exercised during motor movements. This control is the responsibility of the commander of the organization or unit using the road. Organizational control insures observance of rules of the road, traffic laws and regulations, speeds, spacing, routing, schedules, discipline en route and at halts, and local security measures.

b. Area Control. Area control is a responsibility of the commander having area jurisdiction. This function is normally planned, implemented, and supervised by the appropriate traffic headquarters for highway regulation and by the area military police for traffic control. Area control is superimposed on organizational control. It is employed only to the extent necessary to assure orderly and effective movement of vehicles over the highway system.

4–2. Control Classification of Highway Routes

a. Highway routes are classified according to the degree of control demanded. The following classification of highway routes has been made for military operations.

(1) An open route is one over which minimum control is exercised. No movement credit (STANAG 2154, app H) is required for the use of an open route. Supervision is normally limited to military police traffic control at critical intersections, enforcement of standard traffic laws and regulations, and provision of necessary sign and highway markings.

(2) A supervised route requires limited control by a central traffic authority (highway traffic headquarters). Traffic control is provided by military police traffic control posts and patrols. A movement credit is required for any column of 10 or more vehicles or for any vehicle of exceptional size or weight. Usually, no prior correlation of individual march schedules is necessary for use of the route by small units, although access to the route may be regulated as necessitated by the traffic situation.

(3) A dispatch route is a route over which full control, both as to priorities of use and regulated movement of traffic in time and space, is exercised. A movement credit is required for the movement of any vehicle or group of vehicles. Normally, a high degree of area control is required in addition to organizational control.

(4) A reserved route is a controlled route set aside for the exclusive use of a designated unit or a specified type of traffic. When a route is reserved for a designated unit, the commander of the unit decides the degree of regulation and control that will be exercised. In addition to organizational control, military police traffic control may be required to deny the use of the route to unauthorized traffic.

(5) A prohibited route or a prohibited section of route is one over which traffic is prohibited.

b. Classifications in addition to those outlined above used in NATO operations are contained in STANAG 2151 (app G).

4–3. Methods of Movement

A fundamental for column command and control is the selection of a method of movement suitable to the situation and the degree of control necessary. In many instances, the formation of columns or convoys may be impractical owing to the need for dispersion or for avoiding interference with other traffic over a specific route. In other cases, individual dispatch may not provide the security, control, or unit integrity required to perform the assigned military mission. The commander must decide which method is best for the mission and situation. The three basic methods of movement are as follows:

a. Close Column.

(1) In close column operations, each vehicle in a march unit follows the vehicle ahead at a

distance sufficient only to ensure against accident. This distance is usually governed by a speedometer multiplier, but the casual "follow me" method is sometimes used. When this is done, drivers are instructed to follow the vehicle ahead as closely as safe driving practices allow (TM 21–305). The minimum distance between vehicles (gap), is specified and a maximum speed is prescribed for vehicles regaining lost distances. The head of the column maintains its position en route by means of a time schedule or a minimum gap from the rear of the preceding unit. The at-halt gap between vehicles and elements is determined by the tactical situation and traffic conditions and may be prescribed in the operation order.

(2) Close column formation facilitates column control and intra-column communication, and during daylight hours fewer guides, escorts, and route markers are needed. Close column is generally used in blackout operations and in operations over poorly marked routes when visual contact between vehicles is essential.

(3) Close column formations do not provide dispersion for passive defense against enemy observation and attack. The strength and type of organization are readily apparent to hostile observation. Careful scheduling and rigid control of traffic are necessary to assure that vehicles do not arrive at destinations more rapidly than they can be handled without congestion and to avoid blocking of intersections. In close column operations, the use of the route by other traffic is severely limited.

b. Open Column. In open column operations, distances between vehicles are increased to effect dispersion. In areas vulnerable to enemy action or under difficult operating conditions, adequate dispersion may be ensured by prescribing traffic density in orders. An open column formation increases the degree of passive protection against hostile observation and attack. It permits greater highway speeds with safety. The open column permits greater flexibility in highway use, both in planning movements and in making adjustments to meet changes in the tactical situation. It permits concurrent use of highways by traffic moving at various speeds.

c. Infiltration. In infiltration operations, vehicles are usually dispatched individually, in small groups, or at irregular intervals, at a rate that will keep the average traffic density down and prevent undue massing of vehicles. Average distance between vehicles in the overall plan is determined initially by the rate at which the vehicles are dispatched. Thereafter, speeds and distances are regulated by individual drivers in conformity with operating instructions. Deception for the purpose of preventing disclosure of a movement to enemy observers may be provided by intermingling various types of vehicles and by permitting passing within the column. When more than one movement is taking place over the same route at the same time, it is desirable to coordinate the rate of dispatch to achieve dispersion. Movements are supervised by regulation and control personnel stationed along the route.

(1) Infiltration provides the best possible passive defense against hostile observation and attack. Under light traffic conditions, movement of individual vehicles is not materially affected by other vehicles on the road. Individual vehicles may travel at higher speeds. Cross traffic may move with less interference since traffic density is light. The use of this method permits movement of a unit over a route on which traffic is too heavy for the entire unit to move at one time.

(2) Time length (para 8–3) of the infiltration march is greater than that of any other type of movement. Because of extended distances between vehicles, internal control is difficult. If other units are moving simultaneously over the same route, vehicles may become bunched, thus preventing dispersion. Because of minimum control, tactical employment of a unit moved by infiltration may be difficult or impossible until the movement is completed.

4–4. March Discipline

a. The responsibility for good march discipline begins with the vehicle driver. Each driver is responsible for observing the proper vehicle distance and speed, for safety precautions, for performance of prescribed at-halt maintenance, and for strict compliance with standing operating procedures and specific orders governing the march.

b. Serial and march unit commanders exercise general supervision over their units. They are responsible for maintaining the proper position of their elements within a larger column and for carrying out the orders of the column commander.

c. Commanders in a convoy or column are responsible for their units. This responsibility be-

comes broader and more general at each higher level of command.

4–5. Start Point (SP)

a. A start point is a well-defined point on a route at which a movement of vehicles begins to be under the control of the commander of the movement. It is at this point that the column is formed by the successive passing, at the appointed time, of each element composing the column. In addition to the principal start point of a column, there may be a secondary start points for its different elements (STANAG 2154, app H).

b. Scheduling of the movement is based on the start point. Necessary adjustments to compensate for unforeseen delays or changes are made at this point. On dispatch routes, the start point is used as the position to check various convoys onto the route.

4–6. Release Point (RP)

A release point is a clearly defined point on a route at which specified elements of a column or convoy of vehicles revert to the control of their respective commanders. In addition to the principal release point of a column, there may be secondary release points for the various elements (STANAG 2154, app H). Although release points are generally considered to be located at or near the end of a route, they may be established at any point along an established convoy route where vehicles will leave the route. Release points should be so located that vehicles leaving the established convoy route have easy access to existing road nets and may clear the convoy route without delay or congestion. Where applicable, reconnaissance and organization of the area, allocation of areas to specific elements, selection and preparation of routes, and posting of guides or signing of roads must be made before arrival of the column or convoy.

4–7. Halts

This paragraph is superseded by FM 55-31, 6/72

a. Halts are made for rest, personnel comfort and relief, messing, refueling, maintenance and inspection of equipment, allowing other traffic to pass, and adjustment of operational schedules. The time and duration of halts are usually prescribed in orders from higher headquarters, especially if there is radio silence of if intracolumn kommunication is inadequate.

(1) A halt of 15 minutes is made at the end of the first hour; thereafter, halts of 10 minutes are normally made after each 2 hours of running time. During extreme cold weather on marches of more than 4 hours, halts should be made every hour.

(2) Mess and refueling halts are generally ½ to 1 hour. When there is a requirement to permit others to pass, a mess and refueling halt should be scheduled to coincide with the passing, thus using necessary delay to advantage.

(3) To maintain proper gaps between serials, it is desirable that all elements halt at the same time. In implementation of this principle, STANAG 2154 (app H) states that all columns following the same itinerary will stop at the same time, following orders given by the authority responsible for regulating traffic in the area.

b. Locations for scheduled halts should be selected in advance, specifically ordered, and plotted on road movement graphs. These selections may be prescribed by higher authority, made tentatively by map reference, or made by the reconnaissance party. On dispatch routes, rest halt areas or highway regulation points (FM 55–10) may include facilities for messing, refueling, and maintenance if warranted by the situation.

c. To maintain traffic flow that takes maximum advantage of the road capacity of a route, provision is made for the safe passing of halted columns by individual vehicles or other columns under certain conditions as indicated in STANAG 2154 (app H).

4–8. Accident Procedures

This paragraph is superseded by FM 55-31, 6/72

a. If an accident occurs, the main part of the column does not stop to assist. Immediate assistance required for injured personnel is rendered by personnel of the next following vehicle. Other vehicles to the rear pull around the accident. If the accident blocks the route, every effort is made to clear the route and to continue the march. The first officer or noncommissioned officer to arrive at the scene takes charge, supervising emergency aid and directing traffic until the trail officer, medical officer, or other competent assistance arrives. The trail officer, aided by medical and maintenance personnel, normally supervises and directs care of the injured, salvage or disposition of vehicles, and clearance of the route.

b. Normally, all accidents resulting in injury to an individual or animal or in damage to property are reported without delay to the column commander or designated staff officer and to the military police of the nearest military installation.

c. Most civil governments require that police be summoned in cases of motor vehicle accidents. The Army cooperates with civil authorities in the United States and friendly countries in such matters.

d. Accident investigation agencies are summoned according to current instructions. Policies on investigation of accidents may be modified by the tactical situation, the area standing operating procedure, or applicable agreements between military and civil authorities. For further information, see FM 19–25.

e. If disabled vehicles are abandoned, destruct procedures (STANAG 2113, app F) as established in local standing operating procedures or directives, will be implemented to deny use of the abandoned equipment to hostile forces.

CHAPTER 5

MOVEMENT OF PERSONNEL

5–1. General

Since it is normally desirable that troop units be kept together and that their supplies and equipment move with them, motor columns transporting personnel are often larger than supply convoys, which may more readily operate as small march units or serials. However, for control, columns of a troop movement are easily separated into march units corresponding to the smaller units making up the troop organization. For a further discussion of movement of personnel, see TM 55–310.

5–2. Command

a. Personnel movements by motor vehicle include those made in vehicles organic to the unit being transported, those made by truck units of the motor transport service which are attached to the unit being transported, and those made by truck units operating as part of the general hauling service provided by the motor transport service in direct support of the unit being transported.

b. It is essential that the functions and restrictions applicable to each unit involved in a troop movement—the unit being transported and the truck unit furnishing the transportation—be clearly delineated and that command responsibilities for conduct of the movement be understood and observed.

(1) When a unit is being transported in its organic vehicles, the troop commander has full command of both the personnel being transported and those operating the vehicles.

(2) The commanding officer of a unit to which a truck unit has been attached by proper authority exercises command over the truck unit through its commanding officer.

(3) When a truck unit is not attached to the unit that it is transporting but is providing the direct support required, command of the convoy and of each serial or march unit remains with the truck unit commander and his representatives at their respective levels. The commanding officer of the troops being transported (troop commander) retains full command of his troops and issues any orders necessary to conform to and implement those issued by the convoy commander concerning schedules, march discipline, and operation of the convoy. When combat troops are being transported and a tactical emergency arises, the commander of troops being transported, regardless of rank, assumes command of the convoy and issues such orders as may be necessary to meet the emergency. He controls actions of the convoy operating personnel through the convoy commander, who acts as his technical adviser in such matters.

(4) Since tactical movements are, in general, movements to contact and since the success of the operation may depend upon the rapid and efficient tactical deployment of troops, the commander of combat troops commands the tactical movement regardless of whether it is made in organic vehicles or in direct support vehicles. If a transportation unit is supporting the operation, the commander of this unit acts as a subordinate commander and transportation adviser to the tactical commander.

(5) The senior officer or noncommissioned officer of the troops in each truck commands the personnel transported in that truck. He is responsible for their discipline and for their compliance with existing convoy regulations and other standing operating procedures.

(6) The driver of a vehicle, or the senior officer or noncommissioned officer of the operating personnel, is responsible for safe operation of that vehicle and compliance with operating instructions.

(7) In individually dispatched vehicles, the senior passenger is responsible for insuring that the driver obeys laws, regulations, and instructions.

c. When casual troops are being transported and a tactical emergency arises, the senior officer present and eligible will, in the absence of any other instructions, assume command of the convoy and the troops being transported and issue any orders necessary to meet the emergency.

5–3. Methods of Movement

There are four methods by which personnel may be transported by motor transport:

a. Full Lift. When sufficient truck units are available or when the troop unit is completely motorized, the entire movement may be made in one lift.

b. Point-to-Point Shuttle. If sufficient vehicles are not available to move a unit in one lift, truck units may shuttle back and forth from point to point, taking a portion of the troops on each trip until the movement is complete. This method is not recommended in tactical movements when additional transportation is available from higher headquarters.

c. Leapfrog Shuttle. Leapfrog shuttle is best adaptable to tactical troops making advance or retrograde movements in combat or in close support of combat operations. This method may be illustrated by the movement of two units of a single command holding one position. One unit moves from this position and establishes and holds a second position. When this position has been established, the vehicles return for the second unit. Instead of taking these troops to the position established by the first unit, the vehicles carry them past to a selected area where this second unit establishes a third position. This operation is repeated until the troops arrive at their final destination. This method allows the movement to continue while adequate positions are maintained.

d. Part-Ride, Part-Walk Shuttle. In a part-ride, part-walk shuttle, a limited number of vehicles are used to speed a continuous movement of foot troops. A part of the unit entrucks at the start of the march and is carried to a selected point along the route where troops dismount and move to destination on foot. The trucks return for the balance of the unit, which meanwhile has started the march on foot; these marching troops are then entrucked and transported to destination. This method enables all elements of the unit to arrive at the destination at the same time, each having performed an equal portion of the march on foot.

5–4. Entrucking Procedure

An entrucking point is selected that requires minimum marching by foot troops and minimum movement of supplies and equipment, that affords adequate space for entrucking, that presents no undue obstacles to movement of vehicles, and that offers ready access to the selected route of march.

This paragraph is superseded by FM 55-31 (6/72)

5–5. Detrucking Procedure

a. A detrucking point should provide for reassembly of units, prompt unloading of troops and equipment, clearing of unloading areas, and staging and reuniting of troops and their equipment. Except in an emergency, the order to detruck should not be given by the commander until drivers have lowered tailgates. This decreases the possibility of injuries.

b. Emergency detrucking practice should be included in the training of troops since the speed and safety with which troops can leave their vehicles and be prepared for action may be a deciding factor if the enemy attacks.

c. In normal detrucking, troops should not be permitted to dismount until vehicles have come to a full stop—and then only upon the command or signal of the commander or his authorized representative.

5–6. Tactical Loading

This paragraph is superseded by FM 55-31 6/72

Loading personnel for a tactical motor movement is normally done in the manner best suited to the speedy employment of troops according to their normal methods of combat. Full use of transport space is subordinated to tactical considerations. However, techniques and procedures of entrucking and detrucking used in administrative movements may be modified to fit the tactical situation. Adequate security must be provided since troops are particulary vulnerable in entrucking and detrucking areas. Security must include cover and concealment, dispersion in conformity with tactical considerations, and the highest standards of troop discipline to meet requirements for defense against nuclear weapons.

5–7. Reconnaissance and Security

This paragraph is superseded by FM 55-31 6/72

Reconnaissance and security are vital to any tactical movement of troops. Timely and accurate information on the enemy and the terrain is of primary interest to the commander in making decisions as to movement and formation of his command. Security elements assure continued advance of the command, protect it from surprise ground attack, deny observation by the enemy, and give warning in case of air attack. Reconnaissance and security measures may include the following:

a. Covering Force. Operating well forward of the main force, the covering force performs the

mission of early development of the situation; crushing enemy resistance when possible; and deceiving, delaying, and disorganizing enemy forces until the main force can prepare for action. The covering force precedes the advance guard of the column and provides its own security.

b. Advance Guard. The advance guard prevents delay of the main body and protects it against surprise attack. Its size, composition, and disposition vary with the mission, terrain, and tactical situation.

c. Flank Guards. Flank guards cover routes of approach that might be used by hostile forces to attack the flanks of a column. The flank guards drive off harassing forces and give timely warning of approaching larger enemy forces.

d. Rear Guard. The rear guard follows and protects the main body on the march, defeating or delaying hostile forces attacking from the rear, protecting the trains, and collecting stragglers.

e. Defense from Air Attack.

(1) Air guards are placed on all vehicles to warn of approaching enemy aircraft. Defense against air attack may be achieved actively by employment of both crew-served and individual weapons against hostile aircraft (app B). Passive defense measures include such actions as—

(*a*) Movement of vehicles off the road into cover on either or both sides of the road or, where no cover is available, into a widely dispersed, irregular pattern to offer a minimum target.

(*b*) Increase of convoy speed and vehicle gap.

(2) Operating instructions and unit and higher headquarters' standing operating procedures and directives will dictate the action to be taken in a given situation.

f. Communication Security. Normally prescribed in standing signal instructions, communication security assures adequate protection against enemy communication intelligence activities such as radio interception, position finding, traffic analysis, and cryptoanalysis.

g. Army Aviation. Army aviation when available, may be used in reconnaissance, selection of alternate routes, movement of security forces, and highway regulation and control.

CHAPTER 6

SERVICE SUPPORT MOVEMENTS

6–1. Distinctive Characteristics

Service support movements include the movement of all elements engaged in supply, evacuation, maintenance, and administration of a combat force. Such movements may be made by organic vehicles of the service element of a command under organizational control, by attached units, or by truck units operating under centralized transportation movements commitment procedures. The majority of equipment involved in service support movements will be carrying supplies. Traffic with the primary mission of evacuation, maintenance, or administration is seldom organized and may generally be considered as casual traffic under area control.

a. Supply movements in forward areas are generally made by motor transport units. Supply convoy personnel and equipment may be used to provide reconnaissance and security for the convoy. However, this capability is limited, and its use reduces the unit's ability to accomplish its mission. When supply convoys require substantial reconnaissance and security, these functions may be performed by troops assigned to the convoy organization for that specific purpose. Passive security measures, including use of cover and concealment and camouflage discipline, are taken as appropriate.

b. Supply convoys should be of a size and formation that assure most effective traffic flow over the routes involved. Since experience indicates that the best results are obtained with small groups of vehicles, march units of a supply movement should not normally exceed one truck platoon and serials should not exceed one truck company. Small serials require more staff planning and involve more work in recording the progress of the movement, but more detailed information is possible concerning their progress, closer supervision may be exercised, and orders may be changed more easily.

6–2. Classes of Operation

Military motor transportation may be employed in various ways to execute specific transportation missions. These operations may be classified by either the type of haul or the task assigned.

a. Hauls may be described as local or short hauls and line or long hauls.

(1) Local hauls are characterized by short running time in relation to loading and unloading time. They normally involve a number of trips per day and are evaluated on the basis of tons moved during the operational period.

(2) Line hauls are characterized by long running time in relation to loading and unloading time. They normally involve one trip or a portion of a trip per day and are evaluated on the basis of time consumed, distance traveled, and tonnage hauled during the operation period. This may be expressed in ton-miles forward. Line hauls may be either intrazonal or interzonal operations. An intrazonal line haul is one confined within the territorial boundaries of a headquarters (TASCOM or FASCOM). The headquarters directing the move formulates policies and is responsible for an intrazonal line haul. For a discussion of interzonal line haul operations, see chapter 7.

b. Tasks in which motor transport is employed are as follows:

(1) Terminal (beach, port, and air) clearance (para 6–5).

(2) Truck terminal operations (para 6–6).

(3) Installation support operations (para 6–7).

(4) Transfer operations (para 6–8).

(5) Driveaway operations (para 6–9).

(6) Combat support operation (para 6–10).

(7) Combat service support operations (para 6–11).

6–3. Methods of Operation

Three general methods are employed in hauling supplies by highway: direct haul, shuttle, and relay.

a. Direct Haul. A direct haul carries out a single transport mission in one trip and involves no transfer of supplies or exchange of equipment. It is normally limited to local hauls during the initial stages of an operation before transfer or exchange points have been set up and when it may be desirable to expedite forward movements. In line haul operations, direct hauls of extended duration greatly tax drivers and equipment and often result in loss of control by the unit.

b. Shuttle. The simple shuttle is accomplished by repeated trips made by the same vehicles between two specified points.

c. Relay. Relay hauling is the continuous movement of supplies or troops over successive segments of a route without transfer of load. It is accomplished by change of drivers, powered vehicles (tractors), or both, for each segment. This method is most commonly employed in line hauls. The relay system, employing tractor-semitrailer combinations, is the most efficient method of line haul motor transport operation in areas with a well-developed road network not subject to hostile interference and when a one-way haul cannot be completed in one day. Unitization of cargo increases the effectiveness of this system and exploits the capacities and tonnage capabilities of the task equipment. In addition to rapid through movement of loads, the system provides command supervision and supporting services for segments of the route. (For detailed discussion of relay operation, see para 7–6).

6–4. Combined Operations

Motor transport may be combined with other modes—rail, water, and air—to reduce the handling of cargo and thus reduce the time en route from origin to destination.

a. Piggyback or Trailer on Flatcar. Semitrailers are loaded and sealed at the point of origin, placed on rail cars, and moved forward as far as possible. At this point they are unloaded from the rail cars, coupled to suitable towing vehicles, and delivered to their destinations over the highway.

b. Roll-On, Roll-Off. Loaded semitrailers are towed aboard specially constructed vessels at the port of embarkation and transported to an oversea port. There they are coupled to towing vehicles while still aboard ship and are then moved by highway to their destination.

c. Lift-On, Lift-Off. In a lift-on, lift-off operation, loaded trailers are moved to a port, uncoupled from their prime movers, and loaded aboard ship. Upon arrival at an oversea area, these trailers are unloaded from the ship and moved to destination by highway.

d. Air. With the increased use of air transport for both tactical and strategic mobility of troops and supplies and the concurrent development of aircraft of greater capacity, the movement by air of motor vehicles loaded with high-priority cargo has become possible. This allows immediate distribution of these critical supplies on landing.

6–5. Terminal (Beach, Port, and Air) Clearance

Water terminals used by oversea command may be existing commercial ports, or they may be undeveloped beaches. Terminal clearance is a major factor in successful terminal operation. As it pertains to motor transport operations, terminal clearance is the clearing of cargo from the immediate vicinity of a port or beach area to permit continuous unloading of ships otherwise hampered by backlogs of supplies within the area. Moving cargo away from the terminal is most important during peak periods of operation. The operations section of the terminal battalion or terminal group operating the terminal is responsible for cargo clearance. A motor transportation officer assists in planning and coordinating the use of motor transportation in support of terminal clearance (FM 55–55–1 (Test)). He assists in planning and setting up the circulation net and regulates the flow of vehicles throughout the terminal area.

a. Beach Clearance. Beach clearance operations are characterized by the necessity to use poor roads and temporary facilities and by the need to move cargo from discharge points with minimum delay to prevent congestion on the beach. Effective control is essential to success in beach clearance operations. Effective control and smooth, rapid clearance are promoted by establishing efficient truck parks for rapid assignment and dispatch of task vehicles, providing adequate communications, and carefully planning traffic circulation to give maximum use of access and exit routes. Engineer effort (construction command) may be required to build and/or maintain roads and to provide pierced planking in soft or sandy areas.

(1) A truck park is a central receiving and dispatching point established to control and route motor vehicles. It may be set up in addition to the regular company motor parks and dispatching

points but lacks the maintenance, storage, and refueling facilities normally found in a motor park. In beach operation, a truck park is provided at a centrally located point to receive and dispatch vehicles either individually or in small groups. This reduces delays in loading, permits consolidation of supplies of the same class; and allows trucks to move cargo to destination, unload, and return to the beach without interruption.

(2) A traffic circulation plan for the area and adequate signs and markers are responsibilities of the appropriate transportation officer.

(3) The types of vehicles employed in a beach clearance operation may determine the success of the mission. Selection depends on trafficability of the beach and immediate area and on availability of suitable vehicles. In general, those vehicles with highest flotation have primary consideration. Light cargo trucks are normally most suitable for beach clearance operations; under average conditions, it is seldom advisable to use tractor-semitrailer combinations.

b. Port Clearance. Motor transport clearance operations in the vicinity of an established port are normally facilitated by improved access routes and permanent facilities for administration, communication, and control. However, these advantages may be offset by the increased tonnages involved and the intricate traffic patterns common to port areas. Control of highway operations is maintained by using a truck park and traffic circulation plan as described for beach clearance. The use of control and information charts is recommended.

c. Air Terminal Clearance.

(1) The increasing use of air lines of communication places emphasis on clearance of air terminals. Basically, air terminal clearance parallels the general pattern of port and beach clearance, with delivery of cargo into the terminal being made by air transport, and movements of cargo from the terminal being primarily a motor transport mission.

(2) Since the turnaround time of aircraft is of critical importance and because of the vulnerability of aircraft to hostile action while on the ground and while landing or taking off, particularly in forward areas; speed in unloading the aircraft and in clearing the terminal to provide for uninterrupted operations is a prime factor. This requirement not only demands that air terminal operations be well-planned, coordinated, and supervised, but also usurps the practice of maximum use of motor vehicles engaged in terminal clearance. Capacity loads are disregarded in the effort to expeditiously unload cargo from the aircraft and to clear the terminal area, with the result that more vehicles than normal are required to accomplish the clearance mission. This must be recognized and considered by planners and operators.

6–6. Truck Terminal Operations

Truck terminal operations involve establishing and operating truck terminals in conjunction with line haul or relay operations. This includes provisions for assembly and dispatch of motor transport equipment, maintenance and servicing of equipment, and such other facilities as may be required. (For a detailed discussion of truck terminal operations, see para 7–7.)

6–7. Installation Support Operations

a. Administrative Operations. Transportation truck and car companies may be given the mission of providing transportation for headquarters and installations that do not have sufficient transportation to meet their requirements. Tasks not included in line or local hauls may be classed as administrative or utility operations. These include messenger service, ration deliveries, casual movement of personnel, support to local construction activities, and other demands for motor transportation. Normally, motor pools are established for such operations and vehicles are dispatched on a mission basis.

b. Intradepot Operations.

(1) In a theater of operations, especially in the communications zone, there is a great demand for motor transportation in administration and operation of depots. Requirements are constantly changing for local movement of cargo and for rewarehousing of supplies not needed for immediate use. In addition, major construction efforts at these installations often require truck support for units engaged in construction.

(2) The depot commander is responsible for employing vehicles in operations within the depot. Use of roving patrols of the motor transport service to check the situation at various depots is a primary means of assuring effective control and utilization of vehicles. Transportation movements personnel may assist in planning vehicle utilization. In operations requiring considerable transportation, a representative of the parent transpor-

tation unit may be detailed to supervise the use of vehicles.

(3) Intradepot operations normally require frequent movement of small loads to a number of destinations. Utility vehicles and light trucks are most suitable; the selection of vehicles for specific missions is based on maximum use of cargo space and carrying capacity.

6–8. Transfer Operations

a. Transfer operations are conducted by means of transfer points which are established where conditions require transfer of cargo from one transportation mode or conveyance to another. Motor transport units, because of their mobility and flexibility, are most often employed to transport cargo from the transfer point to destination which, in line with the concept of throughput of supplies, should be as far forward as practicable. These units may have the additional responsibility of setting up and operating the transfer points. They may be assisted by assigned or attached transportation terminal transfer companies or detachments when trained personnel are required for unloading cargo from incoming carriers, operating temporary holding areas, and loading cargo for forward movement. The transfer point commander and the senior officer or noncommissioned officer of the terminal transfer unit select and plan the use of areas and facilities to expedite the continuous forward movement of cargo. The terminal transfer unit commander acts in the capacity of a special staff officer to the transfer point commander. Operations and required facilities for motor transport service at a transfer point are similar to those of a truck terminal (para 6–6 and 7–7).

b. Transfer points may be established at railheads, truckheads, pipeheads, air terminals, or small inland waterway terminals.

6–9. Driveaway Operations

a. Driveaway operations entail over-the-road movement of vehicles other than the assigned task vehicles of the motor transport service by operating personnel of the motor transport service. These operatiosn include such over-the-road movements as: driving pipeline and maintenance float stock vehicles coming into a theater from points of entry to either general or direct support activities or directly to receiving units; driving such vehicles from one location to another during relocation of general and direct support activities within the theater; or driving such vehicles to point of exit from the theater for redeployment.

b. Driveaway operations may range in scope from a one-time movement requiring driver support of truck company strength or less to an extended operation requiring support by one or more motor transport battalions; they may involve either local or line hauls. The method of carrying out a driveaway movement involves the normal practices of convoy operations.

c. When required, additional driver personnel may be obtained through the use of teams established in TOE 55–540. For driveaway operations, such teams are activated without authorized task vehicle equipment.

d. To reduce driver requirements, semitrailers moved in a driveaway operation may be double-stacked (sideboards removed and one semitrailer loaded onto another to permit one tractor to tow two units) and smaller vehicles may be loaded onto larger vehicles. Towbars will be used or semitrailers will be operated in tandem only when authorized by the headquarters directing the move.

6–10. Combat Support Operations

Motor transport units may be employed in direct support of tactical operations. Armies, corps, or divisions may use organic or attached motor transport as a pooled service to be allocated where and when needed to meet the current situation. Motor transport missions in combat support include, but are not limited to, transporting supplies and equipment to combat units, moving troops to attack or counterattack positions, and providing essential mobility for headquarters, for nonmobile equipment, and for supplies. Combat support motor transport units should be equipped with task vehicle having mobility comparable to tactical vehicles of the supported unit.

6–11. Combat Service Support Operations

a. Most of the missions assigned to transportation motor transport units under current concepts are in combat service support operations. The transportation interzonal service is organized to serve the theater as a whole, providing necessary flexibility, diversion, concentration, and allocation of transportation to rapidly reflect changes in the strategic and tactical situation. This organization contributes to economical operation through centralized control. The transportation interzonal service retains operational control of its operating motor transport units to their most forward point of delivery. Combat service support operations include the following:

(1) *Depot to depot.* Depot-to-depot transport involves movement between depots within a communications zone or from depots in the communications zone to depots in the field army area. When the requirement is regular and sufficient tonnage is involved, a transportation motor transport unit may be assigned the depot-to-depot transport mission. Otherwise, vehicles are dispatched daily by number and type to meet specific requirements.

(2) *Depot to army supply point.* Supplies are normally moved to army supply points from depots in the communications zone. Substantial transportation economy is achieved by throughput of supplies direct from communications zone depots to army supply points and, where feasible, direct to users.

b. For a detailed discussion of the transportation interzonal service, see chapter 7.

CHAPTER 7

TRANSPORTATION INTERZONAL MOTOR TRANSPORT SERVICE

7–1. General

a. Transportation interzonal motor transport operations are line haul movements operated for extended distances over main supply routes. They provide for the throughput of supplies as far forward as possible. They originate in the communications zone (COMMZ) and extend through the COMMZ into the army service area and, when feasible, into corps and division areas. Line hauls may assume the proportions of a major logistical task in support of a field army or other large unit and be the assigned mission of a motor transport brigade. These hauls may be operated with such precision that tonnages move at a predetermined rate. Additional transportation economy is gained when requirements for tonnage are made routine and regular operations are established. Policies for interzonal line hauls are determined by the transportation command, theater army support command (TASCOM).

b. At times, motor transport express operations may be required as part of line hauls. Express operations are expedited movements of high-priority cargo in which established line haul procedures are modified in the interest of a more rapid delivery than regular line haul. Scheduling must be precise and control highly centralized. Express operations may have the specific mission of supporting a field army or other large unit or of moving a specified tonnage or type of supply within a given time. Express operations should be established only when there is a need for expeditious movement of tonnage over considerable distances and when regular line haul operations or other modes of transportation cannot meet the requirement.

7–2. Command

The commander of a motor transport unit is responsible for operating the line haul. Depending upon the size of the operation, a battalion or group headquarters may be used. In a large-scale operation requiring units from three or more motor transport groups, a motor transport brigade may be assigned this mission.

7–3. Organization

a. The precise organization for a line haul depends largely on the distance involved, the tonnage to be moved, and the type of cargo to be transported. These factors affect the number, type, and composition of units assigned. Over long distances, a motor transport brigade may be the highest headquarters and group or battalion headquarters may be assigned responsibility for operating truck terminals and specific segments of the route. Over short distances, the group or battalion headquarters may operate the entire route.

b. Truck companies and other supporting units are attached to command units of the motor transport service according to unit capabilities, the geographical area, and time and distance factors of the route.

7–4. Equipment

Tractor trailer equipment is ordinarily the most efficient equipment for line hauls. Medium truck companies should serve as the nucleus around which the operation is established. Heavy-lift equipment organic to the heavy truck company can be used for line haul of heavy and outsize equipment.

7–5. Operational Planning

a. When operational plans are made for a line haul, the following factors must be considered:

(1) Capabilties of the routes to be used.

(2) Feasible maximum operating speeds over various segments of the route.

(3) Current personnel and vehicular strengths of assigned truck units to include readiness posture of vehicles.

(4) Specific locations for units, truck terminals, and trailer transfer points.

(5) Specific amounts and types of tonnages to be transported, locations of depots and supply points for cargo pickup and delivery, and capabilities of equipment and units to perform the required tasks.

(6) Definite requirements for any supporting services, such as POL service, maintenance, and communications.

b. The operational planner must develop road movement graphs, convoy schedules, route maps, and support plans for the operation.

c. Programed movement requirements are allocated to each transport mode through the command movements program, which is distributed to all interested agencies. This allocation is expressed as an average daily short ton requirement by class and service of supply. The mode planner must translate these bulk allocations into anticipated equipment requirements and adjust his capabilities to assure that the programed requirements are met. However, the program is not self-implementing. Shippers must initiate a request for movement through the transportation movements field organization in advance of the shipping date as prescribed by command standing operating procedures (SOP). If daily requirements exceed available truck capacity, adjustments are made by the transportation movements organization according to established priorities. Information on actual or anticipated shipments is relayed to motor transport headquarters and to intermediate and destination truck terminals. This permits prior planning by all agencies.

d. The programed movements procedure may be varied when shipping installations are overburdened or priority is given to specific classes of supplies or to personnel movements.

(1) If a shipper is unable to fulfill commitments, he informs his own special staff section and the local transportation movements officers of anticipated difficulties. Tonnages may be allocated to other shippers, or additional loading capability may be given the overburdened shipper. Motor transport headquarters is informed of the action and informs the origin truck terminal. Since this terminal has integrated dispatch facilities, trucks engaged in shuttle operations can be quickly shifted to new pickup points or adjustments made to meet new loading capabilities. The same system is used at destination points.

(2) In an emergency, in-transit storage may be required at origin or destination terminals, at intermediate terminals, or at trailer transfer points. However, in-transit storage is discouraged as it reduces the capability and flexibility of motor transport equipment. Since the ratio of over-the-road vehicles to line haul semitrailer equipment is carefully proportioned, mobile storage can disrupt the operation. Continuation of storage without a proportionate decrease in tonnage allocation necessitates additional transport equipment if allocated tonnages are to be delivered.

(3) Changes in supply movements programs are relayed to subordinate command units by motor transport headquarters. All units take action to adjust operations to the changing situation.

e. Large personnel movements are expedited. If motor transport units in addition to those assigned to the unit or organization being moved are used, motor transport headquarters is responsible for integrating the move over the roadway. Priorities are established for personnel convoys and are coordinated at truck terminals and highway regulation points.

f. For additional planning procedures, see chapter 8.

7–6. Route Selection and Reconnaissance

a. Routes selected for motor transport line hauls should, if possible, be primary-type, paved highways with good connecting and access roads. If a two way route is not available, parallel one-way routes with regular points of convergence should be selected. The points of convergence should coincide with the desired locations of truck terminals or trailer transfer points.

b. A complete and detailed analysis of the route must be made from available information or from maps and aerial photographs; if practicable, a ground reconnaissance should be conducted. The analysis should include location of critical points, bottlenecks, and hazards; a full evaluation of the traffic potential, and estimates of average speeds over every segment and of approximate time distances (para 8–3) between trailer transfer points. When a ground reconnaissance is made, the following information will be obtained: average traveltime, desired speeds, ability of vehicles to negotiate difficult grades, defiles, bridges, or terrain and initial repairs to roadway or structures required before operation.

c. As a result of this analysis, the route can be segmented to provide approximately equal time distances between trailer transfer points or termi-

nals. Routings and regulations to be established for vehicular movements over various segments are determined. The location of depots, supply points, and supporting facilities must be considered. The method of operation and the schedule of movement have a definite bearing on all these factors.

7–7. Methods of Operation

The equipment available, the road conditions, and the logistical mission or military situation governing line hauls may vary in each situation. Since line haul operations may be adapted in many ways to suit particular situations, successful operations depend in a large measure on the ingenuity and initiative of individual commanders and on the ability of planning staffs to foresee needs and to provide the types of equipment required. The semitrailer relay method is normally used in line haul operations.

a. A single relay operation is established with a truck terminal at origin and destination and, depending upon the distance involved, one or more trailer transfer points at intermediate sites along the route. At the origin terminal, shuttle (terminal) tractors move empty semitrailers from the terminal to surrounding depots and support agencies for loading and return loaded semitrailers to the terminal where they are documented, assembled, and prepared for forward movement. Line, or line haul, tractors of the unit responsible for operating the first segment of the journey pick up these loaded semitrailers and move them forward to the first trailer transfer point. Here the forward-moving loaded semitrailers are exchanged for empty or return loaded semitrailers, which are then returned to the origin terminal for rehandling and subsequent forward movement. Line tractors of the unit assigned the mission of operating the second segment of the trip transport the forward-moving semitrailers to the next trailer transfer point, where similar exchanges are made. The relay is continued until the forward-moving semitrailers arrive at the destination terminal. Shuttle tractors then move the loaded semitrailers to ultimate destinations for unloading and return empty or return-loaded semitrailers to the terminal, where they are documented, assembled, and prepared for retrograde movement. Thus there is a continuous flow of loaded semitrailers moving from depots and support agencies to forward areas and of empty or return-loaded semitrailers moving rearward for subsequent rehandling and forward movement. To provide for the best customer service and for the most efficient and economical service, return-load capability should be exploited and every effort made to obtain loads for retrograde movement semitrailers.

b. The relay system should be designed to provide the necessary command, supervision, and support services required by the operation. This may necessitate establishment of facilities for messing, vehicle service and repair, quartering, administrative support, and logistical services.

c. The accountability, control, and maintenance of semitrailer equipment employed in relay operations are discussed in detail in paragraphs 7–12 through 7–14.

7–8. Truck Terminals

a. General. Truck terminals (fig 7–1) are normally located in or near centers of concentrated trucking activities at both extremities of a line haul, where they form the connecting link between local hauls and the line haul service. They constitute assembly points and dispatch centers for motor transport equipment employed in line haul operations. Although they may be used for in-transit storage or freight sorting, this use should be held to an absolute minimum. Truck terminals may, depending upon the situation, be located at intermediate points along the route of a line haul operation and function not only as terminals but also as trailer transfer points.

b. Facilities at Terminals. The truck terminal is a consolidated facility, normally commanded and operated by a motor transport battalion. It includes a marshaling area and such other activities and services as are required to support the operation: normally a dispatch office, a consolidated mess for operational personnel, and consolidated maintenance and servicing facilities. Truck unit bivouacs or temporary quarters for drivers may also be located within or near terminal areas.

c. Operation of Terminals.

(1) For the purpose of assembling semitrailers for further movement, truck terminals use tractor-semitrailer equipment to operate a shuttle service to surrounding depots or support agencies, where the shuttle tractors exchange empty semitrailers for loaded ones. The loaded semitrailers are moved to the marshaling yard within the terminal, where they are spotted and prepared for further movement. Incoming line

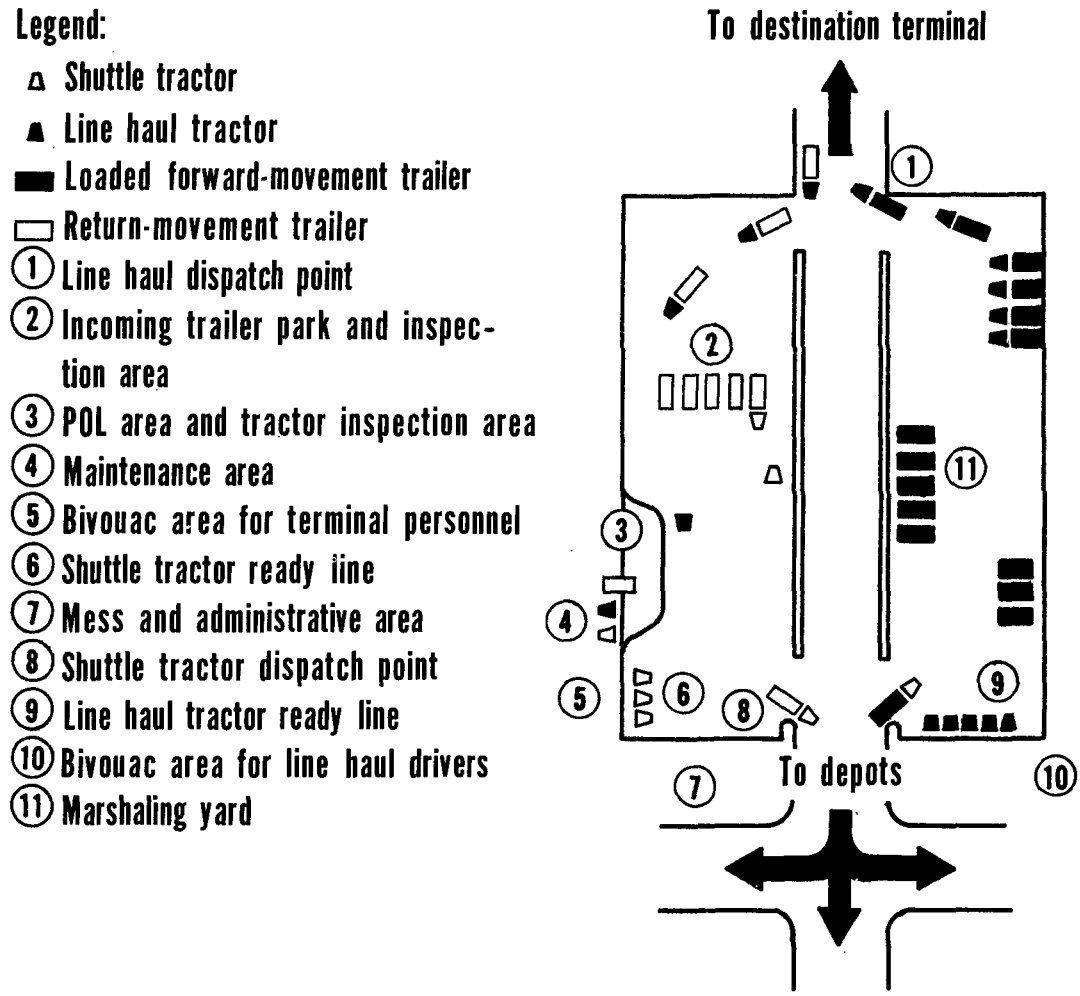


Figure 7–1. Typical truck terminal.

haul tractors drop their return-movement semitrailers and, after required driver messing and vehicles servicing, are coupled onto loaded semitrailers for line haul movement. At the destination terminal the process is reversed, incoming loaded equipment being exchanged for return-loaded equipment. Thus, by operating a shuttle service for local hauls and by marshaling convoys in advance, delay to over-the-road tractors at either end of the line hauls is reduced. This operation may also be carried out with straight trucks, but it then involves changing drivers or loading, unloading, or transferring cargo.

(2) Every unit operating a truck terminal must keep a careful check on the location and use of its semitrailers, which are spotted at various depots and support units awaiting loading or unloading. A close accounting of these vehicles is absolutely necessary, and the terminal commander must work out suitable receipting arrangements with the supply facility (para 7–12 through 7–13).

7–9. Trailer Transfer Points

Trailer transfer points normally are located at predetermined locations along the route of a line haul operation. They form the connecting links between those segments of a route designated as the areas of responsibility for various operating units, and they tie the overall operation into a continuous, efficient one.

a. Minimum facilities required for operations are a dispatch point and a marshaling area to facilitate semitrailer exchange. Other facilities, such as a troop mess, a mintenance and service area, and a bivouac area, are established as warranted by the operational situation.

b. Basically, a trailer transfer point offers facilities for exchanging semitrailers between line tractors operating over adjoining segments of a lines haul route and for controlling and reporting upon equipment engaged in the operation. Line tractors arriving from rear areas drop their

loaded semitrailers at a transfer point and pick up empty or return-loaded semitrailers for retrograde movement. Line tractors coming in from forward areas drop their empty or return-loaded semitrailers and couple onto forward-moving loaded semitrailers for further movement toward ultimate destinations. Shuttle tractors may be employed within the trailer transfer point to spot and prepare semitrailers for subsequent movement. This action reduces layover time of line tractors and expedites the overall operation.

c. Figure 7–2 illustrates a type express operation (line haul) incorporating origin and destination terminals and one trailer transfer point located at an intermediate point along the route of travel.

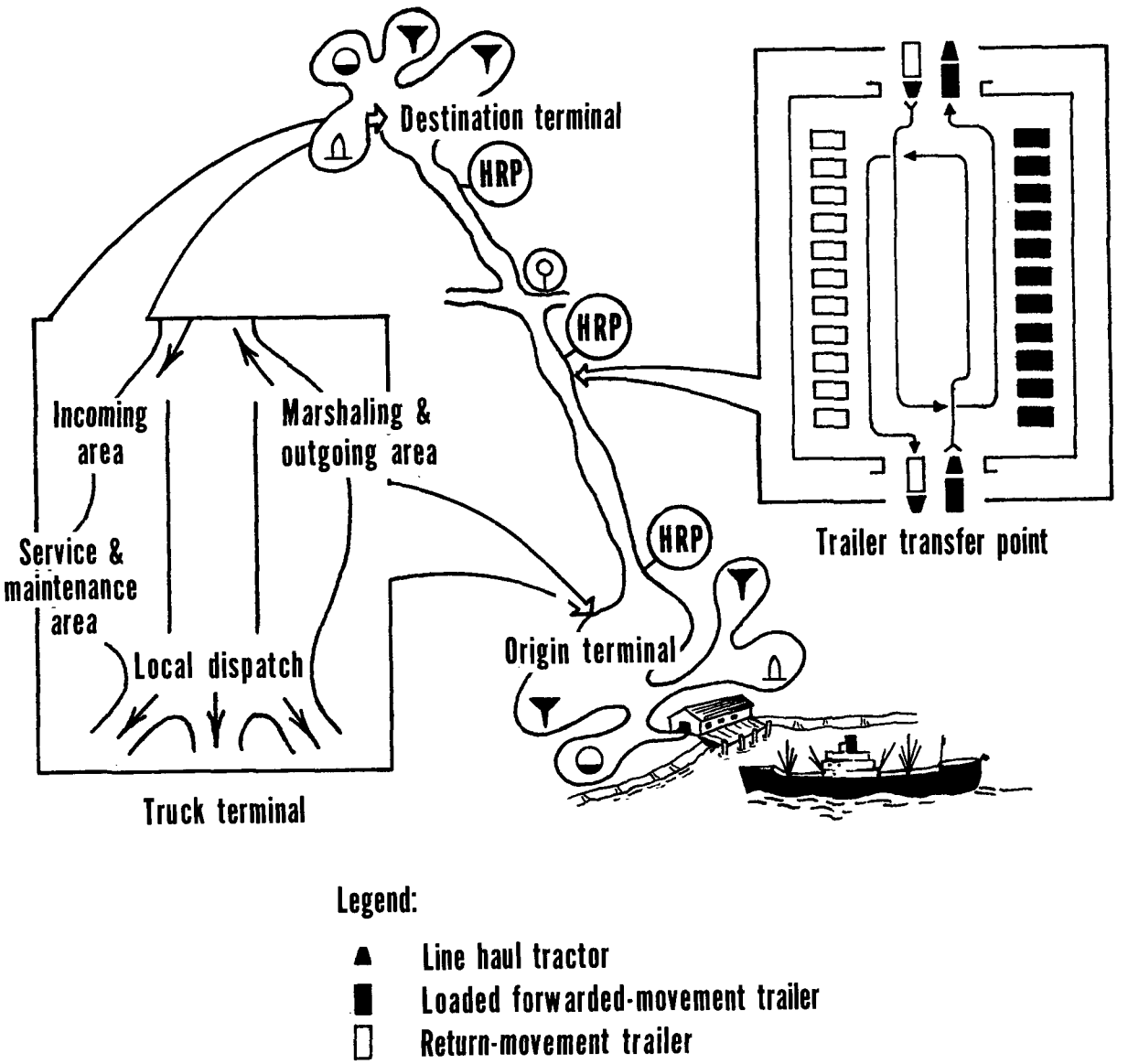


Figure 7–2. Type express operation (line haul).

7–10. Highway Regulation and Other En Route Services

a. Line haul operations require a closely supervised system of highway regulation and traffic control. Route should be planned so that there will be as little interference as possible from other traffic. They should normally be reserved for express hauls or other priority movements cleared through the command having jurisdiction over the entire route. Routes must be well marked so that drivers can follow them easily.

b. Highway regulation points should be provided at convenient locations along the routes. Reports from highway regulation points enable the

motor transport staff to maintain constant control of movements, to effect priorities, to make adjustments in routing, and to coordinate travel over the route in adapting operations to the ever-changing tactical situation. Highway regulation points may be established at communications zone sectional boundaries, truck terminals, trailer transfer points, and any other point as required. See FM 55–10 for detailed information concerning highway regulation.

c. Military police traffic control personnel should be provided at busy intersections and other congested areas to assist express traffic. In areas where local police are retained as a functional organization, they may supplement military police, particularly in control of civilian vehicle and pedestrian traffic.

d. Wrecker service and mobile maintenance teams should be provided at strategic points for repair and recovery of disabled vehicles.

7–11. Assignment of Semitrailer Equipment

The use of motor transportation permits employment of company-size units in a wide variety of tasks under many different circumstances. Since one or more units must often operate independently, it is essential that each truck unit be assigned semitrailers to meet specific requirements.

a. The medium truck company may be assigned stake and platform, refrigerator, fuel transporting, or other types of semitrailers to perform its assigned mission. This variety of semitrailers enables the company to provide suitable transportation without a change in basic organization or operating procedure.

b. The ratio of semitrailers to truck tractors depends on the ratio of traveltime to loading and unloading time. The number of semitrailers assigned is based on maximum operating time for the tractor.

7–12. Accountability for Semitrailer Equipment

a. The commanding officer of the motor transport unit responsible for the operation may solve his semitrailer supply problem in a number of ways. If relay operations are to be of short duration, he may leave the semitrailers assigned to companies and impose stringent measures for maintaining responsibility over semitrailers away from parent units. However, it may be preferable to transfer informal accountability for semitrailers to either his unit or subordinate command units and to maintain property books and control records at those levels.

b. AR 735–31 authorizes the motor transport brigade, group, or battalion to assume informal accountability for semitrailer equipment of assigned companies when a relay operation is established. This provision may be implemented by direction of the theater commander or on order of the commanding officer of the motor transport brigade, group, or battalion. At the discretion of the appropriate supply agency, equipment modification lists and other records may be used to simplify accountability and to fix direct responsibility.

c. When the provisions of AR 735–31 are put into effect, the truck company commander is relieved of informal accountability for semitrailer equipment assigned to his unit. He is, however, charged with direct responsibility for the semitrailers with which he is operating and must assure that adequate care is given all semitrailers in his custody.

d. The appropriate motor transport headquarters must establish informal accountability for semitrailers used in the relay operation and must provide for maintaining property records in its supply section. The headquarters must also establish, through its operations section, reporting and control procedures that can pinpoint the location of semitrailers wherever they are within the system and must specify and hold responsible that unit or person having custody of the equipment at a particular time.

e. Upon entry into the operational phase of a relay system, the appropriate headquarters establishes a trailer accounting office within the supply section. Individual truck units are relieved of informal accountability for trailers and semitrailers, the information is recorded in a consolidated trailer property book maintained by the headquarters. Upon completion of the operation, return of the units to routine operations, or transfer of a unit to another command, the consolidated property book is adjusted to reflect the current status of on-hand semitrailer equipment and hand receipts are made, reassigning equipment to the companies.

7–13. Control of Semitrailer Equipment

In this centralized operation, accountability and control of semitrailer equipment are vested at the same level of command. The supply section of the headquarters unit assumes property responsibility

for the equipment, and the operations section of the headquarters unit assumes responsibility for operational control. Control is effected through reports from units and the maintenance of records. Maximum use of high-speed communications, confirmed by written reports, is imperative to maintaining control.

a. The reports forwarded to the operations section place responsibility for equipment on the unit having the equipment at a particular time. They also provide the operations section with a daily check on the location of all semitrailer equipment in the system and on the status and condition of such equipment. For a detailed discussion of records and reports, see TM 55-310.

b. Information received from operating units on their daily reports should be posted on a control board in the operations office. This control board, in addition to indicating the status of semitrailer equipment throughout the system, is an invaluable aid to the commander in controlling the operation, assessing responsibility for semitrailers needing repair, locating lost or delayed semitrailers, and rerouting cargo loads en route. The simplest form of control board is one on which semitrailers are listed by registration numbers and terminals and trailer transfer points are listed in sequence according to route of travel. Locations of semitrailers may be indicated by tabs and loads and destinations by various colors or notations on the tabs. Semitrailers loading or unloading at supply installations may be charged to the appropriate terminals, or separate columns may be provided on the board to indicate these locations.

7-14. Maintenance

a. General. Maintenance and repair services for vehicles used in relay operations are the same as for all military vehicles. However, modifications in usual procedure may be required. Normally, military vehicles may operate 4 to 6 hours a day, but in relay operations equipment may operate 20 hours a day, thereby increasing maintenance requirements. In addition to the normal mechanic augmentation provided to truck units in round-the-clock operations, it is often necessary to assign nondriver personnel as mechanic's helpers.

b. Consolidated Maintenance. Consolidated maintenance permits maximum use of maintenance skills and facilities. To provide a service section at a truck terminal, the battalion headquarters draws from its assigned companies the required mechanic personnel, tools, and equipment. Consolidated maintenance may be provided in three ways, depending on the conditions:

(1) Grouping all company maintenance personnel into one centralized area or pool.

(2) Drawing only the mechanics required to do those consolidated maintenance tasks under battalion supervision.

(3) Detailing company mechanics to the battalion maintenance service and rotating them on a day-to-day shift basis.

c. Maintenance Records. When semitrailers are employed in relay operations, they are away from the parent unit much of the time and individual units cannot retain maintenance records and individual vehicle files for semitrailers used throughout the system. These files may be maintained at the central accounting office, and all other necessary papers may accompany the semitrailer; in such an operation, a watertight compartment may be built in the semitrailer to hold necessary papers. If no papers accompany the semitrailer, a maintenance schedule board may be stenciled on the tarp box for recording scheduled maintenance services.

7-15. Relationship with Consignor and Consignee

The productivity of motor transport equipment is, to a great extent, a function of its turnaround time. Of the major factors affecting turnaround time—distance, rate of march, and delays—the delays incurred at loading and unloading sites offer the greatest potential for improvement through management.

a. To the extent that the motor transport unit commander is required to maintain or improve turnaround time to accomplish a mission or to achieve a desired or established level of unit performance, he depends on users of motor transport —the shippers and receivers—over whom he has no direct control, for the expeditious handling and release of motor transport equipment. This problem is often further complicated in that consignees are in the forward areas under tactical commanders.

b. To reduce or eliminate undue delays in loading, unloading, and/or releasing motor transport equipment, the normal contacts at the operating level (between truck unit personnel and shipping and receiving agency personnel) must be backed up by close liaison between commanders

and staffs of the motor transport organization and the using agencies.

c. Publication of command directives and standing operating procedures, which establish coordination policies and provide criteria by which to control delay of motor transport equipment by using agencies, may be required.

CHAPTER 8

MOTOR MOVEMENT PLANNING

(STANAG 2041, 2154)

Section I. GENERAL PLANNING

8–1. General

This section provides guidance for planning motor transport operations by Army units. The techniques and procedures discussed are applicable to both tactical and administrative moves and may be adapted to meet the needs of any situation. See also chapter 4.

8–2. Preliminary March Data

a. The march planner, having certain basic data, may determine by simple arithmetic additional information about a movement. He normally knows the number and types of vehicles in the column, the origin and destination of the convoy, and the time of arrival at destination. From his map he can determine the number of miles or kilometers that the convoy must travel and from his schedule the number of hours that the move should require. By dividing miles or kilometers by hours, he can determine the rate of march that vehicles must maintain to meet the schedule. With his knowledge of road conditions and of the skill of the drivers, he can establish safe driving distances, determine positions of vehicles in the column, and form march units.

b. Road movements for small units may be planned with a minimum of preliminary data. The commander must first know the assigned task or mission, the destination, the time of completion, and the equipment required. In addition to this basic information, he determines the departure time, the road distance, the time distance, and the required rate of march. On the basis of this information, an adequate road movement plan can be produced that may be easily implemented by an operation order.

c. The larger and more complex the movement, the more complete and detailed the planning must be. If the movement is scheduled over a dispatch route, exact data are needed as to road space allocated, time space allowed, and other factors of lead, gap, and length in time and space. The rate of movement necessary to meet the schedules must be determined. In consideration of the mission, the planner determines the tactical or administrative purpose of the move, special measures of arrangements necessary to make the move, and the load to be transported. In regard to the march formation, the planner considers the number and types of vehicles or units required; the method of dispatch or grouping for movement and relative positions in the column; and the time required for the move based on maximum allowable speeds of the vehicles, their average running times, and the effect of the rate of march on march organization. In selecting the route to be traveled, the march planner considers loading points for elements of the convoy, start point(s) for the movement, critical points along the route, scheduling of halts probable traffic and road conditions, and release point(s).

d. To facilitate planning for road movement and timely dissemination of pertinent information to the troops concerned, planners normally use such planning aids as march formulas, road movement graphs, and road movement tables. Checklists compiled by the personnel concerned are also helpful to assure that all information necessary to efficient operation is included. In addition to the planning aids discussed in this chapter, a type time-distance table for selected vehicle speeds is shown in appendix C.

8–3. Distance, Time, and Rate Factors

The relationship between distance and time is the basis for all march planning (fig 8–1). Distance factors and their corresponding time factors pertaining generally to columns or elements within columns are as follows:

Length ---------- Time length
Gap ---------- Time gap (time interval)
Lead ---------- Time lead (headway)

Road space ---------- Time space
Road distance ---------- Time distance
Road clearance distance -- Road clearance time

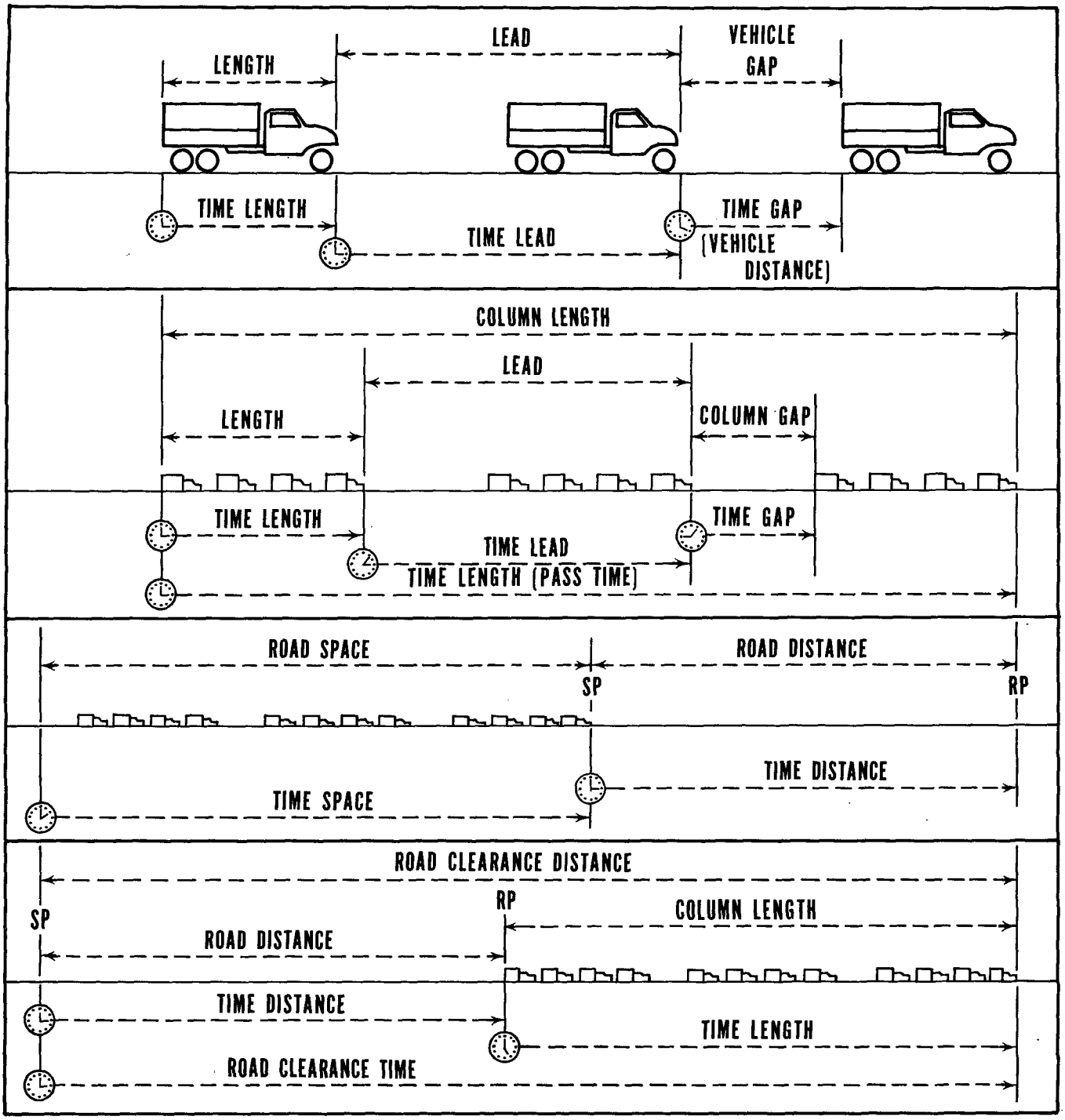


Figure 8–1. Distance and time factors.

a. Distance Factors. The distance factors of a march may be expressed in miles, yards, and feet or in kilometers and meters. The metric system is used in military and foreign maps. However, in the United States, nonmilitary maps show distances in miles. Distance factors are defined below:

(1) The length of any column or element of a column is the length of roadway it occupies, measured from front to rear.

(2) Gap is the distance between successive vehicles or elements in a column or between

successive columns as measured from the rear of one element to the front of the following element. Vehicle gap is the space between consecutive vehicles in a column, and column gap is the space between the elements of a column (STANAG 2154, app H).

(3) Lead is the linear spacing between the heads of elements in a column or between heads of successive vehicles, serials, march units, or columns.

(4) Road space is the total length of roadway occupied by a column or an element thereof. It may include any additional space that may be required as a safety factor or to maintain flexibility. When no safety factor is applied, road space is synonymous with column length.

(5) Road distance is the distance from one given point to another on a road, expressed in miles or kilometers.

(6) Road clearance distance is the total distance that the head of the column must travel for the entire column to clear a given section of road. Road clearance distance equals road distance plus column length.

b. Time Factors. Time factors are used to clock the relative positions and passage of elements of a march and are expressed in seconds, minutes, or hours. Each of the following time factors is related to a corresponding distance factor as indicated in *a* above:

(1) Time length, or pass time (STANAG 2154, app H), is the time required for a column or element thereof to pass a given point.

(2) Time gap (time interval) is the time between the tail of one element or vehicle and the head of the next as they move past any given point.

(3) Time lead (headway) is the time between the head of one element or vehicle and the head of the next. (For individual vehicles, there is little difference between time gap and time lead.)

(4) Time space is the time consumed while a column or element thereof proceeds past any point en route. It includes time gaps between subordinate elements and may include any additional time added for safety and flexibility.

(5) Time distance is the time required to move from one point to another at a given rate of speed.

(6) Road clearance time is the time a column or element thereof requires to travel over and clear a section of road. Road clearance time equals time distance plus the time length of the column.

c. Rate of Movement. Rate of movement is the ratio of distance to time. Although no exact distinction is made between terms expressing rate of movement, the following distinctions are helpful to march planners:

(1) Speed is the actual rate at which a vehicle is moving at a given time as registered on the speedometer. It is usually expressed in miles or kilometers per hour (mph or kmph).

(2) Pace is the regulated speed of a column or element as set by the pace setter. It undergoes constant adjustment, owing to terrain and road conditions along the route of march.

(3) Rate of march is the average distance traveled in any given time, including periodic halts and other short delays. It is expressed in miles or kilometers in the hour (mih or kih).

8–4. March Formulas

March formulas are the basic arithmetic of march planning. By means of these simple formulas, the planner may solve for the unknown factor necessary for completing his movement plan. When two of the basic march factors of distance (D), time (T), and rate (R) are known, the third may be found by simple arithmetic equation:

$D = R \times T$ (distance equals rate multiplied by time)

$T = \frac{D}{R}$ (time equals distance divided by rate)

$R = \frac{D}{T}$ (rate equals distance divided by time)

Any of the distance factors may be substituted in the equation if the corresponding time factors are also substituted. For example—

a. Determining Distance Factors.

(1) Gap (yards or meters) equals rate (yards or meters per minute) multiplied by time gap (minutes).

(2) Lead (yards or meters) equals rate (yards or meters per minute) multiplied by the time lead (minutes).

(3) Distance (miles or kilometers) equals rate (miles or kilometers in the hour) multiplied by time distance.

b. Determining Time Factors.

(1) Time length, or pass time (minutes), equals the length (yards or kilometers) divided by rate (yards or meters per minute).

(2) Time lead (minutes) equals lead (yards or meters) divided by rate (yards or meters per minute).

(3) Time space (hours) equals road space (miles or kilometers) divided by rate (miles or kilometers in the hour).

(4) Time distance (hours) equals road distance (miles or kilometers) divided by rate (miles or kilometers in the hour).

c. Determining Rate Factors. Rate (miles or kilometers per hour) equals road distance (miles or kilometers) divided by time distance (hours).

d. Converting Factors into Others of the Same Class.

(1) Length plus gap equals lead.

(2) Time length (pass time) plus time gap equals time lead.

(3) Distance in miles multiplied by 1,760 equals distance in yards.

(4) Distance in kilometers multiplied by 1,000 equals distance in meters.

(5) Distance in kilometers multiplied by .621 equals distance in miles (approximately).

(6) Distance in miles multiplied by 1.6093 equals distance in kilometers (approximately).

(7) Time in hours multiplied by 60 equals time in minutes.

8–5. Road Movement Graphs

Road movement graphs are time-space diagrams for visually presenting movements so that conflicts and discrepancies can be prevented in the planning stage before congestion occurs on the route. In addition to their use by planning staffs, road movement graphs are used, when applicable, in supervising or regulating complicated movements. They are also used in preparing and checking road movement tables, and they provide a convenient means of recording actual moves of units over a period of time. The unit of measure used (miles or kilometers) depends on the requirements of the authorities concerned. (An example of a road movement graph is contained in STANAG 2041, app E. Detailed instructions on preparing a road movement graph are contained in FM 55–10 and TM 55–310.)

8–6. Road Movement Tables

Road movement tables are a convenient means of transmitting to subordinates their schedules and other essential details pertaining to a road move. This is particularly true in cases where inclusion of such details in the body of the operation order would tend to complicate it or to make it unduly long. Road movement tables consist of two parts: the first being data paragraphs reflecting general information or information common to two or more serials; the second, a list of serials, along with all other necessary information, arranged in tabular form. The security classification given road movement tables is in accordance with their contents and is not necessarily the same as that given the operation order. (An example of a road movement table is contained in STANAG 2041, app E.)

8–7. Unit Standing Operating Procedures (SOP)

Standing operating procedures are prepared by units, usually down to and including those of company size, to simplify the preparation and transmission of orders; to simplify and perfect the training of troops, to promote understanding and teamwork between commander, staff troops, and installations; to facilitate operations; and to minimize confusion and errors.

a. Requirements. The requirements for, and the scope of, unit SOP vary with the size of the unit, its organization, and its normal missions. Certain prerequisites, however, are common to all units. These include conformity with the SOP of the next higher unit, sufficient flexibility to allow addition or deletion without demanding major revision, sufficient detail to avoid ambiguity, and avoidance of repetition of material contained in field manuals available to the unit.

b. Items Covered in Motor Movement SOP. The following items may be included in a unit movement SOP:

(1) Standard organization of columns for movement, including grouping of vehicles and specification of group commanders as applicable.

(2) Composition and duties of the advance party or reconnaissance echelon.

(3) Priorities of movement of columns or elements.

(4) Responsibility for manning start point and release point.

(5) Discipline en route, use of lights, and procedures at halts.

(6) Traffic densities and speeds.

(7) Posting of guides and markers and traffic control measures.

(8) Normal vehicle loads, including personnel.

(9) Action in the event of enemy attack and passive defense methods.

(10) Supply, maintenance, and evacuation procedures.

(11) Communications, required reports and liaison methods.

(12) Location of medical facilities along route of march.

c. Form of Publication. A unit SOP may be prepared in the form most convenient for the purpose of the unit. Small units normally prepare an SOP covering all functions of the unit in either pamphlet or looseleaf form. Large units may prepare separate pamphlets for diverse functions, issuing only those applicable to specific subordinate units.

Section II. PLANNING FOR LINE HAUL OPERATIONS

8–8. General

The information contained in this section provides for planning and establishing a line haul move involving the operation of truck terminals and trailer transfer points. It discusses the establishment of such facilities and the computations necessary to determine the number of transportation units required to operate the line haul. Section I is used in conjunction with this section to provide general operational planning. (See also para 6–6, 6–8, and chap 7.)

8–9. Location of Truck Terminals

If the tasks for a particular operation include line haul and the semitrailer relay method is to be used, truck terminal location must be planned at points of cargo ingress and egress on the routes selected. Truck terminals are normally located slightly forward of points where cargo is to be picked up and slightly to the rear of points where cargo is to be delivered.

8–10. Location of Trailer Transfer Points

When required trailer transfer points are established along the line haul system. These points provide facilities for exchanging semitrailers or trucks and may provide for mess, maintenance, and miscellaneous administration. Trailer transfer points are not used for pickup and delivery of cargo; they divide the line haul into legs for operational efficiency. The length of a leg is selected on the basis of time distance. For advance planning, the most desirable time distance is 4 hours. In operational planning, the desirable time distance of a leg is determined by deducting relay time and all other delays from a 10-hour work shift and halving the remaining time to determine one-way running time between trailer transfer points. This permits each driver to complete one round trip per shift, it precludes the requirement for billeting drivers away from their assigned unit, and it simplifies provision of rested drivers for each trip and maintenance of vehicles. The actual length of legs between trailer transfer points may vary slightly from desirable time distance because of the necessity for placing such installations at physically suitable sites. Moreover a line haul can seldom be divided into legs of equal length. The uneven leg, long or short, should be positioned on the forward end of the haul; thus fewer facilities will have to be relocated in the event of expansion.

8–11. Location of Motor Transport Units

a. In selecting sites for motor transport operating units and activities, factors that affect ability to perform the mission must be considered. The location should be on ground that will support sustained occupation by vehicles, on a road net capable of supporting the operation, and in the vicinity of supported activities. The size and complexity of the operation, number and type of vehicles employed, facilities to be located at the terminal, type of dispatch to be used, anticipated backlog of semitrailers in the terminal, and other operational factors govern the size of the area required for the terminal.

b. Defensibility of the area must also be considered. Local defense and security may be attained by locating on favorable terrain in the vicinity of built-up areas where security may be provided. Concealment and cover may be important considerations. Defense plans must be coordinated with those of other friendly units in the vicinity.

c. The capability of the enemy will indicate the degree of dispersion required. However, the ability of motor transport units to disperse will be limited by the nature of the terrain, the availability of personnel, and the degree of operating efficiency maintainable while dispersed. A balance must be obtained between the dispersion necessary for passive defense and that which will allow the unit to accomplish its mission efficiently.

8–12. General Planning Factors

a. Motor transport planning, particularly in its earliest stages, must often be based on broad planning factors and assumptions. However, because of the varied services performed, the type of loads carried, and the varied terrain features over which motor transport operations are conducted, planning factors should be used with caution and applied only in the absence of specific data on the local situation.

b. In the absence of specific data, the following factors are used in motor transport planning to compute truck and truck company requirements:

(1) The average number of assigned task vehicles not in maintenance and therefore available for daily operations:

Operational short range—83 percent (maximum sustained effort; used only for all-out effort, and then only for periods of less than 30 days).

Long-range planning—75 percent.

(2) The anticipated payload per vehicle:

Offroad—rated capacity of vehicle.

Highway—rated capacity plus 50 percent for trailers or semitrailers and 100 percent for tactical wheeled vehicles.

(3) The daily round trips that a vehicle averages (these vary with running time and time for delays):

Line haul—one per operating shift (10 hr).

Local haul—four per day.

(4) The one-way distance cargo is to be hauled, from which round trip mileage may be computed:

Line haul—100 miles one way.

Local haul—15 miles one way.

(5) The average number of miles covered in an hour, including short halts during the period of movement.

Poor roads—10 miles in the hour.

Good roads—20 miles in the hour.

(6) Turnaround time—time consumed in round-trip movement, including delays.

(7) Delay—time consumed in loading and unloading and relay time in line haul relay operations. (Time for halts and delays en route, such as mess halts, ferrying operations, etc., which can be anticipated but are not included in the rate of march, must be included in delay time.)

Straight trucks—2.5 hours loading and unloading time per round trip.

Semitrailers in relay operation—1 hour per relay; 2.5 hours loading and unloading time per round trip.

Truck tractors in relay operations—1 hour per relay.

(8) The number of hours per day in which vehicles with drivers are normally employed:

One shift (peacetime)—10 hours.

Round-the-clock (wartime)—20 hours.

(9) Unit lift and daily lift—unit lift is the amount of cargo a truck company can move at one time; daily lift is that which it can move in a day, making a number of trips.

(10) Ton-miles and passenger-miles—the product of the number of tons or passengers times the number of miles moved.

8–13. Unit and Vehicle Capability Estimates

a. For planning purposes and in the absence of other specific operational data, motor transport unit capability estimates, based on tables of organization and equipment (TOE) capabilities, are shown in tables 8–1 through 8–4.

Table 8–1. Unit Tonnage Capability Estimates—Local Hauls

(Vehicle availability × average tons per vehicle × trips per day = short ton capability per day.)

Lt trk co (2½-ton trk)	45×4×4=720
Lt trk co (5-ton trk)	45×6×4=1,080
Mdm trk co (cgo) (12-ton stake and platform)	45×12×4=2,160
Mdm trk co (petrl) (5,000-gal tanker)	45×5,000 gal×4 =900,000 gal
Mdm trk co (reefer) (7½-ton reefer van)	45×6×4=1,080
Hvy trk co (50-ton strlr)	18×40×4=2,880
Lt-mdm trk co:	
(2½-ton trk)	45×4×4=720
(12-ton stake and platform)	8×12×4=384
Total	1,104

Table 8–2. Unit Passenger Capability Estimates—Local Hauls

(Vehicle availability × passengers per vehicle × trips per day = passenger capability per day.)

Lt trk co (2½-ton trk)	45×20×4=3,600
Lt trk co (5-ton trk)	45×20×4=3,600
Mdm trk co (cgo)[a]	45×50×4=9,000
Lt-mdm trk co:	
(2½-ton trk)	45×20×6[b]=5,400
(12-ton stake and platform)[a]	8×50×6[b]= 2,400
Total	7,800

[a] Recommended for emergency use only; no troop seats provided.

[b] Number of trips based on employment of unit in tactical situation (short turnaround times); for general troop movements, planner may recompute based on four trips per day.

Table 8–3. Unit Tonnage Capability Estimates—Line Hauls

(Vehicle availability × average tons per vehicle × trips per day = short ton capability per day.)

Lt trk co (2½-ton trk)	45×4×2=360
Lt trk co (5-ton trk)	45×6×2=540
Mdm trk co (cgo) (12-ton stake and platform)	45×12×2=1,080
Mdm trk co (petrl) (5,000 gal tanker)	45×5,000 gal×2 =450,000 gal
Mdm trk co (reefer) (7½-ton reefer van)	45×6×2 =540
Hvy trk co (50-ton strlr)	18×40×2=1,440
Lt-mdm trk co:	
(2½-ton trk)	45×4×2=360
(12-ton stake and platform)	8×12×2=192
Total	552

Table 8–4. Unit Passenger Capability Estimates—Line Hauls

(Vehicle availability × passengers per vehicle × trips per day = passenger capability per day.)

Lt trk co (2½-ton trk)	45×16×2=1,440
Lt trk co (5-ton trk)	45×18×2=1,620
Mdm trk co (cgo)[a]	45×50×2=4,500
Lt-mdm trk co:	
(2½-ton trk)	45×20×2=1,800
(12-ton stake and platform)[a]	8×50×2=800
Total	2,600

[a] Recommended for emergency use only; no troop seats provided.

b. Vehicle Capabilities. As indicated in tables 8–5 and 8–6, vehicle capabilities may be used in conjunction with other planning factors. Additional vehicle and unit capability data are contained in FM 55–15.

Table 8–5. Vehicle Payload Capacities for General Planning

Nomenclature	Off-road (tons)	Highway average (tons)	Highway maximum (tons)	Towing capacity (tons)		Passengers [a]	Cargo space
				Highway	Cross country		
Automobile, sedan, lt						4 [b]	
Bus, convertible, 37-passenger						37 or 18 litters	
Carrier, lt wpn, inf, ½-ton, 4 x 4	½		½				25 sq ft
Carrier, pers, full-tracked, armd, M59	1½	1½	1½			10	
Carrier, pers, full-tracked, armd, M113E2						11	
Stlr, cgo van, 6-ton, 2-wheel, M119	6	9	9			24 [c]	1,020 cu ft
Stlr, shop, van, 6-ton 2-wheel, M146	6	8	8				1,675 cu ft
Stlr, stake, 6-ton, 2-wheel, M118	6	9	9			24 [c]	1,130 cu ft
Stlr, reefer, 7½-ton, 2-wheel	6 [d]	6	7½				790 cu ft
Stlr, stake, 10-ton, 2-wheel	10	12	12			50 [c]	1,014 cu ft
Stlr, van, 10-ton, 4-wheel		8	10			50 [c]	1,355 cu ft
Stlr, cgo, 12-ton, 4-wheel, M127A1	12	12	18			50 [c]	384 sq ft
Stlr, low-bed, 12-ton, 25-ft	12	16	18				200 sq ft
Stlr, sup van, 12-ton, 4-wheel M129	12 [d]	18	18			50 [c]	1,342 cu ft
Stlr, low-bed, 15-ton, 4-wheel, M172	25	16	25				320 sq ft
Stlr, stake, 20-ton, 34-ft	20	18	24			65 [c]	1,400 cu ft
Stlr, van, 20-ton, 34-ft	20	182	24			65 [c]	1,349 cu ft
Stlr, low-bed, 25-ton, 4 wheel	25	25	30				
Stlr, tk transporter, 50-ton, 8-wheel, M15A2	50 [d]	40	50				
Stlr, low-bed, 60-ton, 8-wheel, M162	60	60	60				204 sq ft
Stlr, tk, gas, 5,000-gal, 4-wheel M131A2	3,000 gal [d]	5,000 gal	5,000 gal				
Tlr, amph, cgo, ¼-ton, 2-wheel	¼	⅜	⅜				60 cu ft
Tlr, cgo, ¾-ton, 2-wheel	¾	1⅛	1⅛				175 cu ft
Tlr, cgo, 1½-ton, 2-wheel	1½	2¼	2¼				283 cu ft
Tlr, ammo, 2-ton, 2-wheel	2	2	3				
Trk, amb, frontline, ¼-ton, 4 x 4, M170						4 [b] or 3 litters	
Trk, util, ¼-ton, 4 x 4	0.4	0.4	0.6	1	¾	2	66 cu ft

See notes below table.

Table 8–5. Vehicle Payload Capacities for General Planning—Continued

Nomenclature	Off-road (tons)	Highway average (tons)	Highway maximum (tons)	Towing capacity (tons)		Passengers [a]	Cargo space
				Highway	Cross country		
Trk, amb, ¾-ton, 4 x 4, M43	----------	----------	----------	----------	----------	8 [b] or 5 litters	----------
Trk, cgo, ¾-ton, 4 x 4	¾	1	1½	2	----------	8	160 cu ft
Trk, cgo, 2½-ton, 6 x 6	2½	4	5	5	3	20	408 cu ft
Trk, dump, 2-ton, 6 x 6	2½	4	5	5	3	20 [c]	67.5 sq ft
Trk, shop, van, 2-ton, 6 x 6, M220	2½	3½	3½	4	3	----------	----------
Trk, shop, van, 2½-ton, 6 x 6, M292	2½	2½	2½	4	3	----------	----------
Trk, tk, gas, 2½-ton, 6 x 6, M217	2½	2½	2½	----------	----------	----------	----------
Trk, tk, water, 2½-ton, 6 x 6, M222	1¾	4¼	4¼	----------	----------	----------	----------
Trk, cgo, 5-ton, 6 x 6 (single tires)	5	6	7½	15	7½	20	513 cu ft
Trk, cgo, 5-ton, 6 x 6 (dual tires)	5	6	10	15	7½	20	513 cu ft
Trk, dump, 5-ton, 6 x 6	5	7½	7½	15	7½	15 [c]	135 cu ft
Trk, cgo, prime mover, 10-ton, 6 x 6, M125	10	10	15	25	15	----------	496 cu ft

[a] Based on 18 inches per man. Does not include driver or assistant.
[b] Less individual field equipment.
[c] Recommended for emergency use only. No troop seats provided.
[d] Not generally used for this type of operation.

Table 8–6. Vehicle Unitized-Load Capacities

Load	Vehicle			
	2½-ton cargo truck [a]		10-ton stake and platform semitrailer	
	Sides in place, crane-loaded	Sides removed forklift-loaded	Sides in place, crane-loaded	Sides removed, forklift-loaded
Cargo net	3	Not recommended	6	Not recommended
Cargo transporter, type 2	1 lengthwise	1 lengthwise	3 lengthwise	4 crosswise [b]
Stevedore pallet	2 crosswise	4 lengthwise	6 crosswise	8 lengthwise: 2 rows of 4 [c]
Unitized pallet	3 crosswise	5: 4 lengthwise and 1 crosswise	7 crosswise	10 lengthwise: 2 rows of 5 [c]
Warehouse 4 x 4 pallet	3	3	6	12: 2 rows of 6

[a] Some 2½-ton, 6 x 6 cargo trucks have fender wells which project into the cargo space. In such cases, a level platform for the storage of a unitized cargo can be obtained by fitting a frame of 2 x 4 or 4 x 4 timbers flat in the cargo bed between the fender wells.
[b] May be loaded by crane.
[c] For 12-ton stake and platform semitrailer, increase by one in each row.

8–14. Highway Tonnage Capabilities

a. In selecting routes over which cargo is to be transported, consideration must be given to capabilities of roads and bridges to sustain the operation. The gross weight of the heaviest loaded vehicle should not exceed the rated tonnage capacity of the weakest bridge unless the bridge will be strengthened before the operation begins. It is difficult to determine exact tonnage capabilities of highways for sustained operations because of varying conditions. The volume of tactical, administrative, and indigenous traffic to be accommodated on supply routes further restricts the capabilities of motor transport.

b. Highway capabilities contained in table 8–7 are used as a guide for estimating supply support tonnage capabilities of highways under varied conditions, assuming that operations are sustained, that road maintenance is adequate, that bridges are capable of sustaining anticipated vehicle load weights, and that each road bears two-way traffic. although reduction factors may be considered in any sequence, a typical application involving all limiting factors is as follows: first apply the narrow roadway degradation factor to determine the adjusted highway capability; to that adjusted capability, apply the limiting terrain factor; finally, to the latter adjusted capability, apply the weather factor. The following guidelines must be considered:

(1) When more than one terrain factor is present, only the *one most restrictive* factor is used to compute capability reduction.

Table 8–7. Highway Capability

Highway type	Daily tonnage forward (short tons)			Reductions applicable to various conditions (percentages)[1]				
	Optimum dispatch route only	Supply traffic		Narrow roadway	Rolling terrain	Hilly with curves	Mountainous	Seasonal bad weather
		Communications zone	Combat zone					
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
Earth	4,900	2,940	1,600	25	25	60	80	90

[1] Factors are maximum under extreme conditions.

(2) The weather factor is considered when such conditions are expected to exist for a sustained period. However, this "sustained period" must be considered in relationship to the road surface. For instance, a several-day rainfall may have no effect on operations over a concrete-surfaced road; however, this same rainfall could seriously disrupt operations over a gravel or earth road.

c. Planned tonnage movement should not exceed the capability of any portion of the road net to be used or of any bridge on the road net unless reconstruction or heavy maintenance is provided to increase the capability of that section of highway or of the bridge to meet the demands. Otherwise, alternate routes must be selected to distribute the load. If no alternate routes are available and the indicated tonnage is not reduced, the highway or bridge can be expected to deteriorate rapidly and operations cannot be sustained. (It should be kept in mind that maintenance vehicles and personnel on a road may also interfere with the flow of traffic and thereby limit capability.) For more detailed information on highway capability estimation, see FM 55–15.

8–15. Formulas for Determining Unit and Vehicle Requirements

a. The following formulas are applied in computing unit or vehicle requirements on the basis of planning data discussed in paragraphs 8–12 through 8–14, actual operational data, or a combination of both. The number of units or vehicles required for workloads expressed in gallons, persons, or other unit of measure can be determined by substituting that unit of measure for tons in the formulas.

(1) *One-time lifts.* To determine the number of truck companies or vehicles required to move a given number of tons in one lift, substitute appropriate figures in the following formula:

$$\text{Companies required} = \frac{\text{tons to be lifted}}{\text{tons per vehicle} \times \text{vehicles available per company}}$$

$$\text{Vehicles required} = \frac{\text{tons to be lifted}}{\text{tons per vehicle}}$$

(2) *Turnaround time.* To determine turnaround time, use the following formula. (Caution must be exercised to make sure that the delay factor is accurate. Turnaround time should be rounded off to the nearest tenth for use in further computations.)

$$\text{Turnaround time} = \frac{2 \times \text{distance}}{\text{rate of march (mih)}} + \text{delays}$$

(3) *Distance between truck terminals or trailer transfer points.* When locating truck terminals or trailer transfer points, the following formula is used to determine the appropriate distance between these installations in order to obtain a specific turnaround time:

$$\text{Distance} = \frac{(\text{turnaround time} - \text{delays}) \times \text{rate (mih)}}{2}$$

(4) *Sustained operations.* The following formula is used to determine the number of truck companies required to move a given daily tonnage in sustained operations. (This formula is applicable to both local and line haul operations. The number of vehicles required can be determined by omitting vehicles available per company from the formula.)

$$\text{Companies required} = \frac{\text{daily tonnage} \times \text{turnaround time}}{\text{tons per vehicle} \times \text{vehicles available per company} \times \text{operational day}}$$

b. The following process illustrates the method of determining the number of units required for an operation. Locations of routes and facilities in the area for which the operation is being planned are shown in figure 8–2.

(1) *Planning factors.* The following planning factors are noted:

(*a*) 20-hour-per-day operations for all equipment.

(*b*) 45 vehicles available per unit.

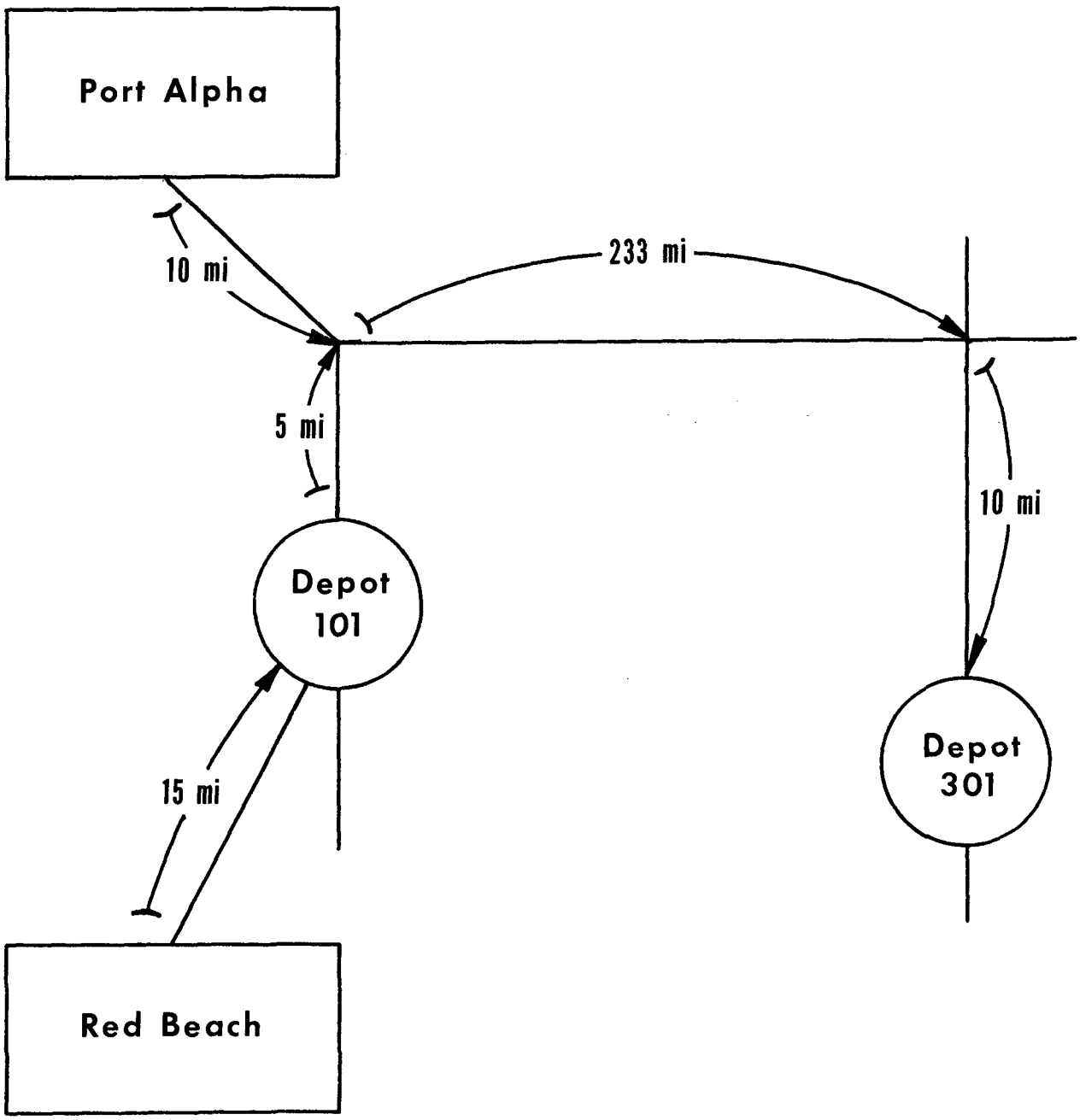


Figure 8–2. Route and facility diagram.

(*c*) 4 tons per 2-1/2-ton truck.

(*d*) 12 tons per 12-ton cargo semitrailer.

(*e*) 20-mih rate of march on all routes.

(*f*) Delay time:

2.5 hours per round trip for loading and unloading straight trucks (1.25 hours for loading and 1.25 hours for unloading).

2.5 hours per round trip for loading and unloading semitrailers (1.25 hours for loading and 1.25 hours for unloading).

1 hour relay time per each relay for truck tractors and semitrailers.

Tonnage to be moved by highway.

(*a*) Information provided by the staff movements officer establishes tonnage to be moved by highway as follows:

3,600 short tons daily from Port Alpha to depot 301.

2,400 short tons daily from Red Beach to depot 101.

1,500 short tons daily from depot 101 to depot 301.

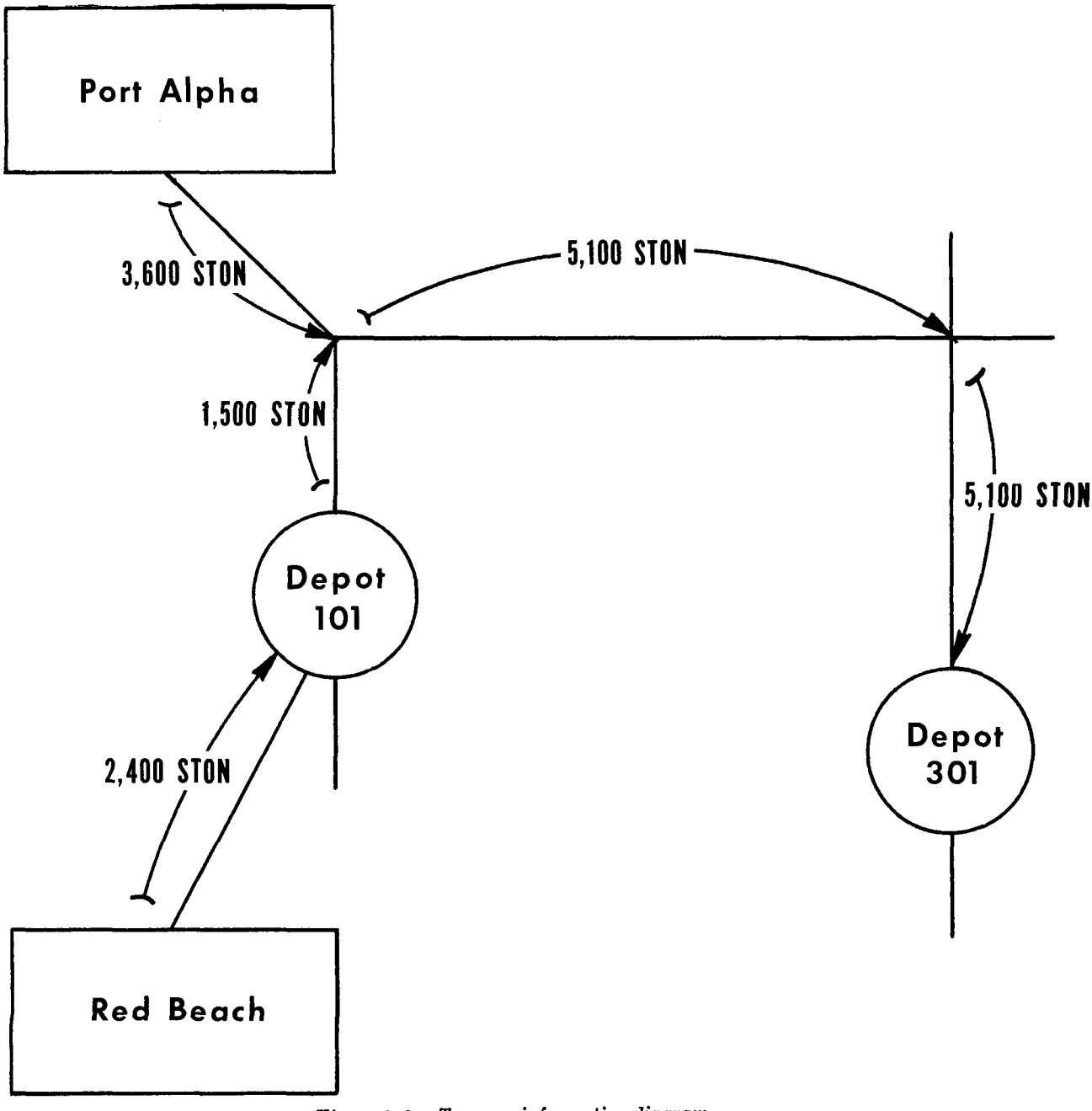


Figure 8–3. Tonnage information diagram.

(*b*) The tonnage information and known or assumed information regarding routes and location of facilities are graphically portrayed in figure 8–3.

(3) *Types of units required.* Based on the preceding information, specific tasks, workloads, and types of units required can now be determined. Since the operation involves a line haul, it is necessary to determine the approximate locations of the origin and destination truck terminals for the line haul task in order to separate line from local hauls and to identify specific workloads and tasks. The origin truck terminal should be centrally located near the road intersection between Port Alpha and depot 101, provided a suitable site is available. The destination truck terminal should be located near the intersection north of depot 301 to be near the cargo's destination and to be on the main route to allow for expansion forward without relocation (fig 8–4). Types of units required to do the work are as follows:

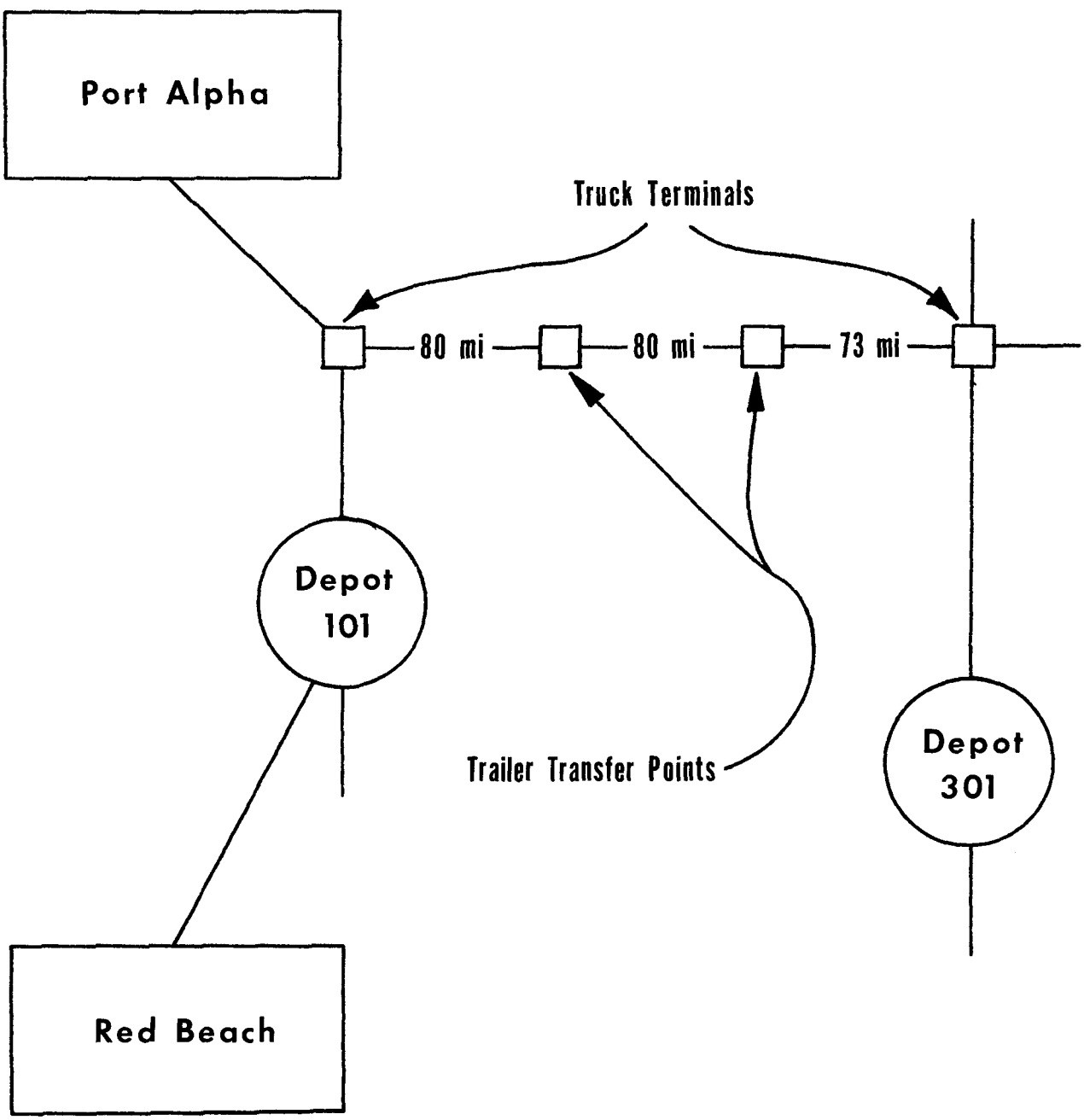


Figure 8–4. Location of truck terminals and trailer transfer points.

(*a*) Line haul from origin truck terminal to depot 301: 5,100 short tons, medium truck companies.

(*b*) Port clearance from Port Alpha to origin truck terminal: 3,600 short tons, medium truck companies.

(*c*) Beach clearance from Red Beach to depot 101: 2,400 short tons, light truck companies.

(*d*) Delivery of cargo from depot 101 to origin truck terminal: 1,500 short tons, medium truck companies.

(*e*) Delivery of cargo from destination truck terminal to depot 301: 5,100 short tons, medium truck companies.

(4) *Location of trailer transfer points.* Before computing the number of units required for each task for the line haul, the location of trailer transfer points to divide the line haul into legs must be determined so that the total delays and the total turnaround time for the entire line haul can be computed. The distance to allow between trailer transfer points to obtain a turnaround time of 10 hours (one shift in the operational day) is obtained as follows (the 2-hour delay in the formula results from 1-hour relay time at each trailer transfer point):

$$\text{Distance} = \frac{(10 \text{ tours turnaround time} - 2 \text{ hours delay}) \times 20 \text{ mih}}{2}$$

$$= \frac{(10 - 2) \times 20}{2}$$

$$= 80 \text{ miles between trailer transfer points}$$

Trailer transfer points are then located as shown in figure 8–4. In addition to the consideration of distance to allow for the most desirable turnaround time, the planner must consider suitable sites for locating these facilities (paras 8–9 to 8–11). Note that the short leg (73 miles) has been placed forward. This is to avoid relocating any but the most forward trailer transfer point in the event of expansion of the operation.

(5) *Medium truck companies required for the line haul task.*

Daily tonnage = 5,100 STON

$$\text{Turnaround time} = \frac{2 \times 233 \text{ miles}}{20 \text{ mih}} + \text{6 hours delay (1 hour for each relay, 2 relays for each leg of the line haul)}$$

$$= 29.3 \text{ hours}$$

Tons per vehicle (12-ton semitrailer) = 12 STON
Vehicles available per company = 45
Operational day = 20 hours

Thus:

$$\text{Companies required} = \frac{5{,}100 \text{ STON} \times 29.3 \text{ hours}}{12 \text{ STON} \times 45 \text{ vehicles} \times 20 \text{ hours}}$$

$$= 13.8 \text{ medium truck companies required}$$

(6) *Medium truck companies required for local hauls.*

(*a*) Movement of 5,100 short tons from destination truck terminal to depot 301:

Daily tonnage = 5,100 STON

$$\text{Turnaround time} = \frac{2 \times 10 \text{ miles}}{20 \text{ mih}} + \text{1.25 hours delay (1.25 hours per round trip required for unloading semitrailers)}$$

$$= 2.25 \text{ hours}$$

Tons per vehicle (12-ton semitrailer) = 12 STON
Vehicles available per company = 45
Operational day = 20 hours

Thus:

$$\text{Companies required} = \frac{5{,}100 \text{ STON} \times 2.25 \text{ hours}}{12 \text{ STON} \times 45 \text{ vehicles} \times 20 \text{ hours}}$$

$$= 1.06 \text{ or } 1.1 \text{ medium truck companies required}$$

(*b*) Movement of 3,600 short tons from Port Alpha to the origin truck terminal:

Daily tonnage = 3,600 STON

$$\text{Turnaround time} = \frac{2 \times 10 \text{ miles}}{20 \text{ mih}} + 1.25 \text{ hours delay (1.25 hours per round trip required for loading semitrailers)}$$

$$= 2.24 \text{ hours}$$

Tons per vehicle (12-ton semitrailer) = 12 STON
Vehicles available per company = 45
Operational day = 20 hours

Thus:

$$\text{Companies required} = \frac{3{,}600 \text{ STON} \times 2.25 \text{ hours}}{12 \text{ STON} \times 45 \text{ vehicles} \times 20 \text{ hours}}$$

$$= .75 \text{ or } .8 \text{ medium truck company required}$$

(*c*) Movement of 1,500 short tons from depot 101 to the origin truck terminal:

Daily tonnage = 1,500 STON

$$\text{Turnaround time} = \frac{2 \times 5 \text{ miles}}{20 \text{ mih}} + 1.25 \text{ hours delay (1.25 hours per round trip required for loading semitrailers)}$$

$$= 1.75 \text{ hours}$$

Tons per vehicle (12-ton semitrailer) = 12 STON
Vehicles available per company = 45
Operational day = 20 hours

Thus:

$$\text{Companies required} = \frac{1{,}500 \text{ STON} \times 1.75 \text{ hours}}{12 \text{ STON} \times 45 \text{ vehicles} \times 20 \text{ hours}}$$

$$= .24 \text{ or } .3 \text{ medium truck company required}$$

(7) *Total medium truck companies required.*

(*a*) The total medium truck companies required for local and line haul tasks are as follows:

13.8 line haul
1.1 destination truck terminal to depot 301
.8 Port Alpha to origin truck terminal
.3 depot 101 to origin truck terminal

16.0

(*b*) Thus 16 medium truck companies are required to accomplish all tasks for which medium truck companies have been selected. In this operation, the workload is shared among 16 medium truck companies, since all are connected with the semitrailer relay operation. Therefore, the fractional part of the unit requirement for each task is retained and included in the total, and the total is then rounded off to the next higher number of units. However, where the workload cannot be shared among units doing varied tasks, the unit requirement for each task must be rounded off to the next higher whole number. (Each of the medium truck companies requires two semi-

trailers per tractor since all units will be involved in semitrailer relay operations.)

(8) *Light truck companies required.* Computation of the number of light truck companies required for moving 2,400 short tons daily from Red Beach to depot 101 is as follows:

$$\text{Daily tonnage} = 2{,}400 \text{ STON}$$

$$\text{Turnaround time} = \frac{2 \times 15 \text{ miles}}{20 \text{ mih}} + 2.5 \text{ hours delay (2.5 hours per round trip for loading and unloading straight trucks)}$$

$$= 4 \text{ hours}$$

Tons per vehicle (2½-ton truck) = 4 STON
Vehicles available per company = 45
Operational day = 20 hours

Thus:

$$\text{Companies required} = \frac{2{,}400 \text{ STON} \times 4}{4 \text{ STON} \times 45 \text{ vehicles} \times 20 \text{ hours}}$$

$$= 2.7 \text{ or } 3 \text{ light truck companies required}$$

(9) *Control units required.* Based on the preceding computations, 16 medium truck companies and 3 light truck companies are required for the operation. In addition, four teams (team GF, TOE 55–540) are required to man the two trailer transfer points and the transfer operations in the truck terminals. For command and control of these units, four motor transport battalions and one motor transport group are required. (See FM 101–10–2, for basis of allocation.) The group commander has overall responsibility for the operation and assigns a specific geographic area to each battalion. The responsibility for operating each truck terminal is assigned to a specific battalion.

8–16. Collection of Operational Data

In planning for an operation, reliance must be placed on limited facts, broad planning factors, and assumptions. Planning can be refined by applying data gathered once the operation has begun. Therefore, operating units must immediately begin to collect such data. A uniform system for collecting and reporting data should be established for motor transport operating units and any other units that may have arrived in the area earlier. Data to be collected can be divided into two areas: unit operating data and highway and terrain data.

a. Unit operating data to be collected include, but are not limited to, the following information:

(1) A verage load per vehicle by type and the tonnage moved by units in specific periods.

(2) Time required to move between specific points, delay time, including loading, unloading, relay, transfer, and servicing, and time required for administrative and logistical support.

(3) Average rate of march attainable (by type of vehicle) on specific routes and sections of routes.

(4) Maintenance data, to include vehicle downtime, vehicle availability, component life, fuel and lubricant consumption, and problems peculiar to the area.

(5) Percentags of utilization for units and vehicles.

(6) The incidence and causative factors of accidents and losses sustained from accidents.

b. Highway and terrain data to be collected include the following information:

(1) General route characteristics. (Much of this information may be provided by engineer route reconnaissance reports. However, motor transport operating units can collect and develop other supplemental data that directly affect operations, such as distances between points, feasible loads per vehicle, types of vehicles suitable, and width of the roadway as it permits or prohibits two-way traffic.)

(2) Effect of weather and enemy action on the road net.

(3) Information regarding the impact of civilian traffic and other military traffic on the road net.

(4) General characteristics of terrain, including trafficability, gradients, natural obstacles, and the effect of weather on trafficability.

APPENDIX A

REFERENCES

A–1. Field Manuals (FM)

5–20	Camouflage.
5–34	Engineer Field Data.
5–35	Engineers' Reference and Logistical Data.
5–36	Route Reconnaissance and Classification.
8–35	Transportation of the Sick and Wounded.
10–60	Supply of Subsistence in a Theater of Operations.
19–2	Military Police Support in the Field Army.
19–2–1 (Test)	Military Police Support, Field Army Support Command (FASCOM).
19–3	Military Police Support in the Communications Zone.
19–3–1 (Test)	Military Police Support (TASCOM).
19–25	Military Police Traffic Control.
19–30	Physical Security.
20–22	Vehicle Recovery Operations.
21–5	Military Training Management.
21–6	Techniques of Military Instruction.
21–26	Map Reading.
21–30	Military Symbols.
21–40	Chemical, Biological, Radiological, and Nuclear Defense.
21–41	Soldier's Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare.
21–48	Chemical, Biological, and Radiological (CBR) and Nuclear Defense Training Exercises.
21–60	Visual Signals.
23–65	Browning Machinegun, Caliber .50 HB, M2.
27–10	The Law of Land Warfare.
29–50	Supply and Services in Divisions and Separate Brigades.
30–5	Combat Intelligence.
30–10	Terrain Intelligence.
31–16	Counterguerrilla Operations.
31–22	U.S. Army Counterinsurgency Forces.
31–25	Desert Operations.
31–70	Basic Cold Weather Manual.
44–1	U.S. Army Air Defense Artillery Employment.
55–6–1 (Test)	Transportation Services in Theaters of Operations.
55–8	Transportation Intelligence.
55–9	Transportation Services and the Transportation Brigade in the Field Army.
55–10	Army Transportation Movements Management.
55–15	Transportation Reference Data.
55–55–1 (Test)	Transportation Terminal Operations.
100–5	Operations of Army Forces in the Field.
100–10	Combat Service Support.
101–5	Staff Officers' Field Manual; Staff Organization and Procedure.
101–10–1	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data —Unclassified Data.

101–20–2	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data—Extracts of Tables of Organization and Equipment.

A–2. Technical Manuals (TM)

3–220	Chemical, Biological, and Radiological (CBR) Decontamination.
9–500	Data Sheets for Ordnance Type Materiel.
9–1900	Ammunition, General.
21–300	Driver election and Training (Wheeled Vehicles).
21–301	Driver Selection, Training, and Supervision, Tracked Vehicles.
21–305	Manual for the Wheeled Vehicle Driver.
21–306	Manual for the Tracked Combat Vehicle Driver.
38–750	Army Equipment Record Procedures.
55–310	Motor Transport Operations.

A–3. Army Regulations (AR)

55–26	Transportation Movements.
55–162	Permits for Oversize, Overweight, or Other Special Military Movements on Public Highways in the Contiguous States and the District of Columbia.
55–355	Military Traffic Management Regulation.
58–1	Joint Procedures for Management of Administrative Use Motor Vehicles.
190–5	Motor Vehicle Traffic Supervision.
190–15	Traffic Accident Investigation.
310–3	Department of the Army Publications: Preparation, Coordination, and Approval.
320–5	Dictionary of United States Army Terms.
320–50	Authorized Abbreviations and Brevity Codes.
345–210	Records Management, Files Systems and Standards.
380–5	Safeguarding Defense Information.
380–55	Safeguarding Defense Information in Movement of Persons and Things.
385–55	Prevention of Motor Vehicle Accidents.
600–20	Army Command Policy and Procedure.
600–55	Motor Vehicle Driver—Selection, Testing, and Licensing.
700–10	Registration of Motor Vehicles.
725–50	Requisitioning, Receipt, and Issue System.
735–31	Accountability for Vehicles in Relay Operations.
735–35	Supply Procedures for TOE and TDA Units and Activities.
746–5	Color and Marking of Army Materiel.
750–1	Maintenance Concepts.

A–4. Department of the Army Pamphlets (DA Pam)

108–1	Index of Army Files, Transparencies, GTA Charts, and Recordings.
310–series	Military Publication Indexes.
690–80	Administration of Foreign Labor During Hostilities.

A5. Tables of Organization and Equipment (TOE)

29–500	Composite Service Organization.
55–11	Headquarters and Headquarters Company, Transportation Motor Transport Brigade.
55–12	Headquarters and Headquarters Detachment, Transportation Motor Transport Group.
55–16	Headquarters and Headquarters Detachment, Transportation Motor Transport Battalion.

55–17	Transportation Light Truck Company.
55–18	Transportation Medium Truck Company.
55–19	Transportation Car Company, Army, Logistical Command, or Airborne Corps.
55–28	Transportation Heavy Truck Company.
55–62	Headquarters and Headquarters Company, Transportation Composite Group.
55–67	Transportation Light-Medium Truck Company.
55–87	Transportation Motor Transport Company, Supply and Transport Battalion, Armored Division, or Transportation Motor Transport Company, Supply and Transport Battalion, Infantry Division (Mechanized).
55–88	Transportation Motor Transport Company, Supply and Transport Battalion, Infantry Division.
55–540	Transportation Motor Transport Teams.

This appendix is superseded by FM 55-31 6/72

APPENDIX B

EMPLOYMENT OF NON-AIR DEFENSE WEAPONS AGAINST HOSTILE AIRCRAFT

B–1. General

Commanders at all levels must recognize that not only do the vehicles, equipment, and operational facilities of the transportation motor transport service offer favorable targets for hostile aircraft, but also that there exists the threat of air-mobile operations, enemy close air support, interdiction, and reconnaissance against any unit in a theater of operations. They must further recognize the potential effect of the large volume of small arms fire that can be furnished by organic weapons against low slow-flying hostile aircraft and the fact that the low altitude air threat faced by units in the combat theater may be partially countered by aggressive use of the large volume of fire which non-air defense weapons can place against this threat.

a. Exercise of the individual and collective right of self-defense against hostile aircraft, which include all attacking aircraft and those positively identified enemy aircraft which pose a threat to the unit, will be emphasized. Exercise of this right does not demand specialized use of communications and is independent of theater air defense rules for engagement and air defense control procedures.

b. Indiscriminate use of non-air defense weapons must be prevented due to the resulting danger to friendly aircraft and trocps and the requirement to place in proper perspective the technique of withholding fire to preclude disclosure of positions.

c. Situations may arise wherein the exercise of the right of self-defense should be temporarily suppressed or when the freer use of non-air defense weapons against aircraft should be encouraged. The former case involves a local decision that prevention of position disclosure is paramount, notice of such restriction is disseminated through command channels. The latter case should be based on a theater-level decision.

d. Use of a single rule for engagement, "Engage hostile aircraft," is based on common sense interpretation of the rule. For example, all aircraft attacking a unit and enemy aircraft performing operations, such as forward air control, reconnaissance, surveillance, or dropping or landing troops, are clearly hostile aircraft.

B–2. Rule for Engagement

In the absence of orders to the contrary, individual weapon operators will engage attacking aircraft; engagement of all other hostile aircraft will be on orders issued through the unit chain of command and will be supervised by unit leaders. Nothing in this rule is to be interpreted as requiring actions prejudicial to accomplishment of the primary mission of the unit.

B–3. Aircraft Categories

To simplify engagement procedures, aircraft may be considered in two categories:

a. Low Slow-Speed Aircraft. Includes helicopters and liaison, reconnaissance, and observation fixed-wing propeller aircraft.

b. High-Speed Aircraft. Includes all other propeller aircraft and all jet fixed-wing aircraft.

B–4. Techniques of Fire

The following techniques will maximize the destructive and/or deterrent effect against aircraft:

a. Engagement of Low Slow-Speed Aircraft. In accordance with the rule for engagement, engage low slow-speed enemy aircraft with aimed fire, employing the maximum weapon rate of fire. Aerial gunnery techniques (less lead) generally applicable to all small arms and automatic weapons are contained in FM 23–65.

b. Engagement of High-Speed Aircraft. In accordance with the rules for engagement, engage high-speed enemy aircraft with maximum fire aimed well in front of the aircraft and above its flight path to force it to fly through a pattern of fire. This technique is not unaimed barrage fire, it does require a degree of aimed fire but does not

call for careful estimation of aircraft speed and required lead.

c. Use of Tracer Ammunition. Automatic weapons should utilize the highest practical proportion of tracer ammunition to enhance the deterrent or disruptive effect of the fire.

d. Massed Fire. Units should employ a massed fire technique when using small arms and automatic weapons in an air defense role.

B–5. Preparation of Standing Operating Procedures (SOP)

Command and supervisory headquarters will prepare detailed SOP for the identification of aircraft and engagement of aircraft, to include how identification is accomplished, weapons to be employed, techniques of fire to be used, rule for engagement, and controls to be used. Company level SOP will include, but is not limited to, the following:

a. Applicability. Operators of designated EAPONS.

b. Relation to Primary Mission. Primary mission is never prejudiced.

c. Relation to Passive Air Defense. The necessity for agreessively engaging hostile aircraft is balanced against the requirement to place in proper perspective the tactic of withholding fire to preclude disclosure of position.

d. Authority to Engage. Authority to engage attacking aircraft delegated to individual weapon operators, and to engage all other hostile aircraft on orders through unit change of command, subject to the rule for engagement and rules for withholding fire.

e. Rule for Engagement. Normally self-defense only against all attacking aircraft and those positively identified aircraft which pose a threat to the unit.

f. Rules for Withholding Fire. When ordered; when not positive that aircraft are actually attacking or otherwise hostile; when friendly aircraft or troops are endangered.

g. Position Selection. See FM 44–1. Applicable only to weapons specifically assigned an air defense role, for example, designated single barrel, caliber .50 machineguns.

h. Firing Techniques. Lead and superelevation; massed fire; maximum rate of fire; maximum use of tracer ammunition

i. Unit Training Requirements. Mctivation and discipline; gunnery; aircraft recognition.

B–6. Training

Individual training will stress aircraft recognition, techniques of firing at aerial targets, and response to control methods. Application of employment of non-air defense weapons against hostile aircraft will be incorporated into unit training phase, field problems, maneuvers, and other training media.

APPENDIX C

TYPE TIME-DISTANCE TABLE

The table below may serve as a guide in planning motor transport movements. A tabular listing is given of the time required for vehicle(s) to move a specified distance at specific speeds and rates of march. Planners can modify the table to suit their specific needs.

Time-Distance Table for Selected Vehicle Speeds

Distance		Traveltime[1]					
		Rate		Rate		Rate	
		10 mph (7.5 mih) 16 kmph (12 kih)		20 mph (15 mih) 32 kmph (24 kih)		30 mph (25 mih) 48 kmph (40 kih)	
Km	*Mi*	*Hr*	*Min*	*Hr*	*Min*	*Hr*	*Min*
1		0	5	0	2.5	0	1.5
	1	0	8	0	4	0	2.4
2		0	10	0	5	0	3
3		0	15	0	7.5	0	4.5
	2	0	16	0	8	0	4.8
4		0	20	0	10	0	6
	3	0	24	0	12	0	7.2
5		0	25	0	12.5	0	7.5
6		0	30	0	15	0	9
	4	0	32	0	16	0	9.6
7		0	35	0	17.5	0	10.5
8		0	40	0	20	0	12
	5	0	40	0	20	0	12
9		0	45	0	22.5	0	13.5
	6	0	48	0	24	0	14.4
10		0	50	0	25	0	15
	7	0	56	0	28	0	16.8
	8	1	4	0	32	0	19.2
	9	1	12	0	36	0	21.6
	10	1	20	0	40	0	24
20		1	40	0	50	0	30
30		2	30	1	15	0	45
	20	2	40	1	20	0	48
40		3	20	1	40	1	0
	30	4	0	2	0	1	12
50		4	10	2	5	1	15
	40	5	20	2	40	1	36
	50	6	40	3	20	2	0

[1] The mph/kmph figures indicate vehicle speed (miles/kilometers per hour), and the mih/kih figures indicate the rate of march (miles/kilometers in the hour) for that speed.

APPENDIX D

METRIC CONVERSION TABLE

Kilometers to miles (km ×.621 = mi) (km ÷1.609 = mi)	Miles to kilometers (mi ×1.609 = km) (mi ÷.621 = km)
1 = .62	1 = 1.60
2 = 1.24	2 = 3.21
3 = 1.86	3 = 4.82
4 = 2.48	4 = 6.43
5 = 3.10	5 = 8.04
6 = 3.72	6 = 9.65
7 = 4.34	7 = 11.26
8 = 4.96	8 = 12.87
9 = 5.58	9 = 14.48
10 = 6.21	10 = 16.09
20 = 12.42	20 = 32.18
30 = 18.63	30 = 48.27
40 = 24.84	40 = 64.36
50 = 31.05	50 = 80.45

APPENDIX E

STANAG 2041, OPERATIONAL ROAD MOVEMENT ORDERS, TABLES, AND GRAPHS

STANAG 2041
(Edition No. 2)

DETAILS OF AGREEMENT (DofA)
OPERATIONAL ROAD MOVEMENT ORDERS,
TABLES, AND GRAPHS

Annexes: A (DofA). Example of an Operational Road Movement Order.
B (DofA). Specimen Road Movement Table.
C (DofA). Example of a Road Movement Graph.

AGREEMENT

1. The NATO Armed Forces agree to use the standard layouts for operational road movement orders, road movement tables and graphs as given in Annexes A to C (DofA). The instructions given in subsequent paragraphs are in amplification of these layouts.

ORDERS

2. Warning orders and operational road movement orders are of primary concern to those responsible for movement by motor transport. However, standing operating procedure/standing orders may also contain information vital to the conduct of movements by motor transport.

a. **Warning Orders.**

(1) A warning order is a preliminary notice of an order or action which is to follow. It is designed to give subordinates time to make necessary plans and preparations.

(2) A warning order is of value in alerting troops and preparing them for movement, before receipt of the detailed operation order for the movement. A warning order may be issued orally or in message form. The fact that it is only a warning order will always be indicated.

(3) A warning order should be as brief as possible but should include the following items when applicable:

(a) Probable tasks or movements.

(b) Earliest time of movement or degree of notice.

(c) Rendezvous and time of order group, if any.

(d) Orders for movement of reconnaissance or advance parties.

(e) Administrative instructions affecting the resting or feeding of troops, regrouping of transport and preliminary movements.

(4) Timeliness is the essence of warning orders.

b. **Operational Road Movement Orders (See Annex A (DofA)).**

(1) An operation order for road movement is an order issued covering the details for the movement of a formation/unit by road.

(2) The order should be issued in sufficient time to allow subordinates to make their plans, issue their orders, and complete their preparations for the movement. The amount of detail given in such orders depends on the tactical and traffic situation, the state of training of the formation/unit, and the extent to which standing operating procedure/standing orders have been completed.

(3) Fragmentary orders may be used, but when time permits, a detailed order is issued in the form of the five-paragraph Operation Order (STANAG 2014). Annexes to the order may include a road movement table, administrative/logistic annex, etc. When administrative/logistic details are too voluminous for convenient inclusion in the order, an administrative/logistic order or an administrative/logistic annex to the Operation Order will be issued (STANAG 2032).

c. **Standing Operation Procedure/Standing Orders.**
The following are some headings that may be used as a guide in drafting standing operating procedure/standing orders for a formation headquarters. This list is not complete and will vary with circumstances, particularly in different theatres of war:

(1) Composition and duties of advance party.
(2) Vehicle loads, including personnel.
(3) Grouping of vehicles and group commanders.
(4) Organization of columns.
(5) Sign-posting and traffic control.
(6) Responsibility for manning start point and release point.
(7) Discipline; halts; lighting.
(8) Action in the event of enemy attack.
(9) Drill for establishing headquarters on arrival.
(10) Responsibility for issue of Operation Orders for movements for headquarters.
(11) Inspection of vacated office sites for security purposes.

ROAD MOVEMENT TABLES (See Annex B (DofA)).

3. a. Road movement tables will consist of two parts. One giving 'data' paragraphs reflecting general information or information common to two or more columns (or elements of columns). The other listing the columns (or elements of columns) together with all other information, arranged in tabular form.

b. These afford a convenient means of transmitting to subordinates their schedules and other essential detail pertaining to road movement. This is particularly so in cases where the inclusion of such detail in the body of the operation order would tend to complicate it or make it unduly long.

c. They will frequently require a wider distribution than a normal operation order so that copies can be issued to movement control personnel, traffic posts, etc.

d. They will be given security classifications in accordance with their contents, which will not necessarily be the same as that of the operation order.

ROAD MOVEMENT GRAPHS (See Annex C (DofA)).

4. a. Road movement graphs are used by staffs in planning and, when applicable, in supervising and/or regulating complicated movements, and

for providing a convenient means of recording actual moves of units over a period.

b. The unit of measure to be used, i.e., kilometers or miles, will depend on the requirements of the authorities concerned. However, the resulting orders and instructions should reflect only one unit of measure.

5. **Extra Time Allowance.**

a. Within a column, moving under one identification serial number, an extra time allowance of one minute per 25 vehicles is always allotted above the calculated pass time.

b. If in a column the number of vehicles is over 600, the extra time allowance allotted will be two minutes per 25 vehicles.

GAPS

6. Between columns having different serial numbers, no standard gaps are prescribed, these gaps are allotted by the staff ordering the movement.

IMPLEMENTATION

7. This STANAG will be considered to have been implemented when the necessary orders/instructions putting the procedures detailed in this Agreement into effect have been issued to the forces concerned.

ANNEX A TO THE DETAILS OF AGREEMENT OF

STANAG 2041
(Edition No. 2)

EXAMPLE OF AN OPERATIONAL ROAD MOVEMENT ORDER

(intended as a guide only)

(SECURITY CLASSIFICATION)

Copy No. 4
21st Inf. Div.
YREVA, BLOKSKY,
011030Z January 1965
OPS 27

Operation Order 14:

Map: BLOKSKY, 1/250,000 NOTKLOTS-DRAKCIR

Task Organization/Grouping: Annex A—

Task Organization/Grouping (NOT attached to this example).
Time Zone Z.

1. SITUATION

a. Enemy Forces: BLOKSKY 42nd Infantry Division (reinforced) is delaying advance of V Corps.

b. Friendly Forces: V Corps attacks early 2nd January.

c. Attachments and Detachments: None.

2. MISSION

21st Infantry Division to move from YREVA at 012030Z January into NAEJ.

3. EXECUTION

a. 121 Brigade is to move RED route to DRAKCIR and WHITE route to vicinity of NAEJ.

b. 221 Brigade is to move BLUE route to NOTKLOTS and GREEN route to vicinity of NAEJ.

c. 321 Brigade follows 121 Brigade.

d. Division Artillery follows 221 Brigade.

e. Division Troops follow 321 Brigade.

f. Miscellaneous.

g. Coordinating instructions.

(1) Annex B—Movement Table.
(2) First short halt 012150Z January 1965.
(3) No weapon will be fired at aircraft unless attacked.

(SECURITY CLASSIFICATION)

(SECURITY CLASSIFICATION)

4. ADMINISTRATION AND LOGISTICS
Administrative/Logistic Order 19 follows.

5. COMMAND AND SIGNAL

a. Continue radio silence.

b. Division Headquarters. Head of Division Troops during move.

AVERS
Major-General

ACKNOWLEDGE

Annex A—Task Organization/Grouping (NOT attached to this example)

Annex B—Movement Table

Distribution:

Authentication:

ANNEX B TO THE DETAILS OF AGREEMENT OF STANAG 2041
(Edition No. 2)

SPECIMEN ROAD MOVEMENT TABLE
(A guide only, will need adjustment to suit individual cases)

(SECURITY CLASSIFICATION)

Annex "B" - "Movement Table" to Operation Order 14
Map: BLOKSKY, 1/250,000 NOTKLOTS - DRAKCIR

Copy No. 4
21st Inf. Div.
YREVA, BLOKSKY
011030Z January 1965
OPS 27

General Data:
1. Average Speed
2. Traffic Density
3. Halts
4. Routes (i.e. between Start Points and Release Points))
5. Critical Points (See NOTE 4))
   (a) Start Points)
   (b) Release Points)
   (c) Other Critical Points)
6. Main Routes to Start Points (See NOTE 7))
7. Main Routes from Release Points (See NOTE 7))

Connect with paragraph 3.a. of Details of Agreement. These routes and points are here described by grid references, codewords, etc., and, if necessary, numbered or lettered for ease of reference in the column below.

Movement Number or Identification Serial Number	Date	Unit/Formation	No. of Vehicles	Load Class of Heaviest Vehicles	From	To	Route	Route to Start Point (See Note 7)	Critical Points			Route from Release Point (See NOTE 7)	Remarks
									Ref.	Due (hrs)	Clear (hrs)		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	(l)	(m)	(n)	(o)
See NOTE 5													

Acknowledge

Distribution :-

Authentication :-

(SECURITY CLASSIFICATION)

NOTES:- 1. Only the minimum number of headings above should be used. Any information which is common to two or more movement numbers or identification serial numbers should be included under the 'data' paragraphs.
2. As the table may be issued to personnel concerned with control of traffic, the security aspect must be remembered. It may not be desirable to include dates or locations.
3. If the table is issued by itself, and not as an annex to a more detailed order, the table must be signed or authenticated in the normal way.
4. 'Critical Point' is defined as 'a selected point along a route used for reference in giving instructions. It includes start points, release points and other points along a route where interference with movement may occur or where timings are critical'.
5. This will be the number which is used to identify a column (or element of column) during the whole of the movement (see STANAG 2154, paras. 8 & 9).
6. In the case of an annex having the same distribution as an operation order it will not be necessary to include the headings and ending as shown on this page.
7. Definitions of these terms will be found in STANAG 2154 (paras. 17 and 18).

Figure E-1. Annex B to STANAG 2041 (Edition No. 2)

EXAMPLE OF A ROAD MOVEMENT GRAPH
MODELE DE GRAPHIQUE DE MOUVEMENTS PAR VOIE ROUTIERE

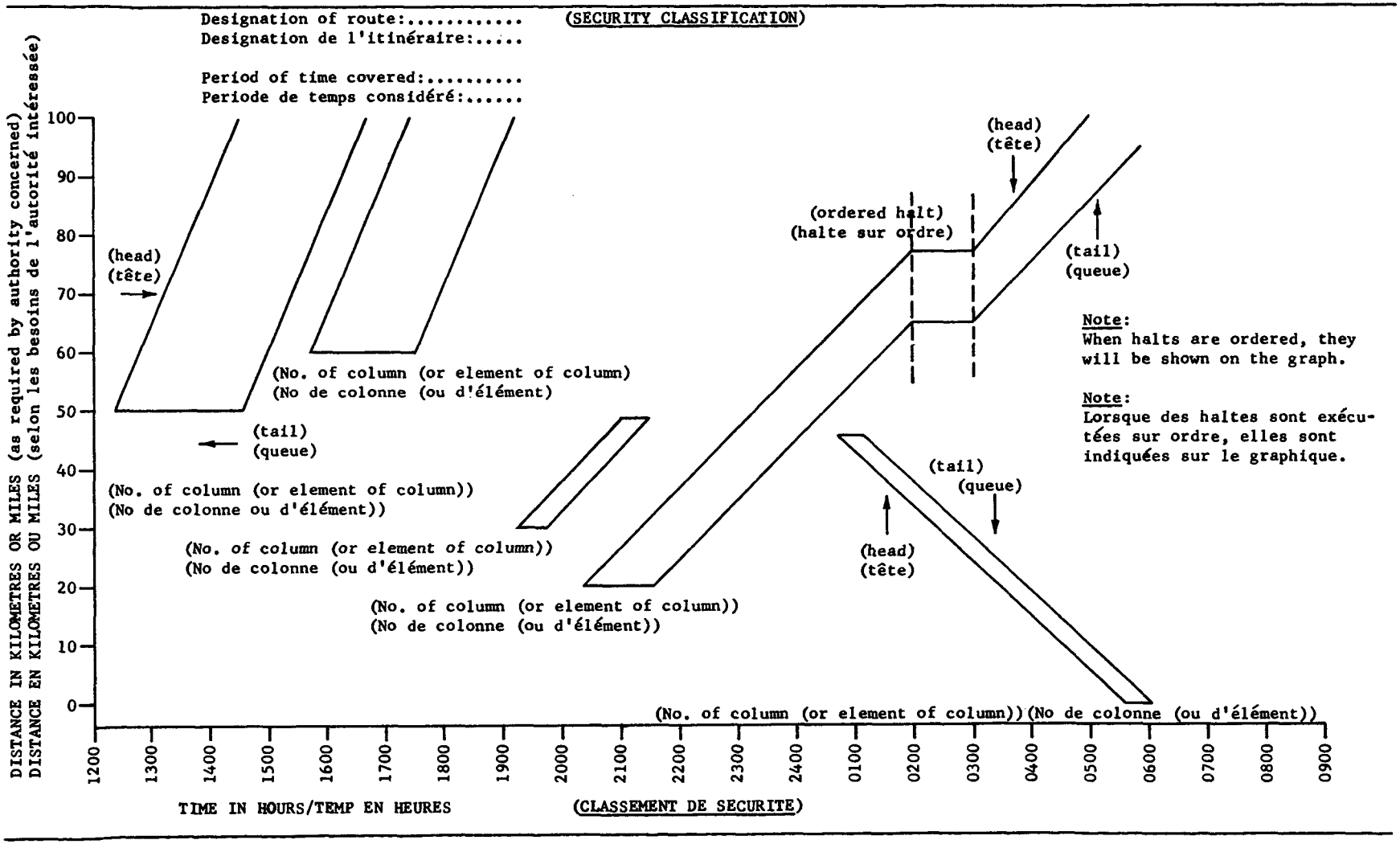


Figure E-2. Annex C to STANAG 2041 (Edition No. 2)

This Appendix is superseded by FM 55-31 6/72

APPENDIX F

STANAG 2113, DESTRUCTION OF MILITARY TECHNICAL EQUIPMENT

DETAILS OF AGREEMENT (DofA)

DESTRUCTION OF MILITARY TECHNICAL EQUIPMENT

Annex: A (DofA). Priorities for Destruction of Parts of Military Technical Equipment.

AGREEMENT

1. The NATO Army Forces agree:

a. That it is essential to destroy to the maximum degree possible military technical equipment, abandoned in wartime operations, to prevent its eventual repair and use by the enemy.

b. To follow the principles and priorities, set forth in this Agreement, in the destruction of their own equipment, when required.

PRINCIPLES AND PRIORITIES

2. **Detailed Methods.** Detailed methods of destroying individual items of equipment are to be included in the applicable technical publications, user handbooks and drill manuals.

3. **Means of Destruction.** Nations are to provide for the means of destruction for their own equipment.

4. **Degree of Damage.**

a. **General.** Methods of destruction should achieve such damage to equipment and essential spare parts that it will not be possible to restore the equipment to a usable condition in the combat zone either by repair or cannibalization.

b. **Classified Equipment.** Classified equipment must be destroyed in such degree as to prevent duplication by, or revealing means of operation or function, whenever possible, to the enemy.

c. **Associated Classified Documents.** Any classified documents, notes, instructions, or other written material pertaining to function, operation, maintenance, or employment, including drawings or part lists, must be destroyed in a manner to render them useless to the enemy.

5. **Priorities for Destruction.**

a. Priority must always be given to the destruction of classified equipment and associated documents.

b. When lack of time and/or stores prevents complete destruction of equipment, priority is to be given to the destruction of essential parts, and the same parts are to be destroyed on all like equipment.

c. A guide to priorities for destruction of parts for various groups of equipment is contained in Annex A (DofA) to this STANAG.

6. **Equipment Installed in Vehicles.** Equipment installed in vehicles should be destroyed in accordance with the priorities for the equipment itself, taking into account the relative importance of the installed equipment and the vehicle itself.

7. **Spare Parts.** The same priority, for destruction of component parts of a major item necessary to render that item inoperable, must be given to the destruction of similar components in spare parts storage areas.

8. **Cryptographic Equipment and Material.** The detailed destruction procedure to be followed in order to insure the rapid and effective destruction of all types of cryptographic equipment and material is to be specified in instructions issued by the appropriate communication security authority.

9. **Authorization.** The authority for ordering the destruction of equipment is to be vested in the divisional and higher commanders, who may delegate authority to subordinate commanders when the situation requires.

10. **Reporting.** The reporting of the destruction of equipment is to be done through command channels.

IMPLEMENTATION OF THE AGREEMENT

11. This STANAG will be considered to have been implemented when the priorities indicated therein have been incorporated in national documents detailing the method required for destroying the equipment concerned.

ANNEX A (DofA) TO
STANAG 2113

PRIORITIES FOR DESTRUCTION OF PARTS OF MILITARY TECHNICAL EQUIPMENT

EQUIPMENT	PRIORITY	PARTS
1. VEHICLES (INCLUDING TANKS AND ENGINEER EQUIPMENT)	1	Carburetor/fuel pump/injector distributor.
	2	Engine block and cooling system.
	3	Tires/tracks and suspensions.
	4	Mechanical or hydraulic systems (where applicable).
	5	Differentials.
	6	Frame.
2. GUNS	1	Breech, breech mechanism, and spares.
	2	Recoil mechanism.
	3	Tube.
	4	Sighting and fire control equipment (Priority 1 for Anti-Aircraft guns).
3. SMALL ARMS	1	Breech mechanism.
	2	Barrel.
	3	Sighting equipment (including Infra Red).
	4	Mounts.
4. OPTICAL EQUIPMENT	1	Optical parts.
	2	Mechanical components.
5. RADIO	1	Transmitter (oscillators and frequency generators).
	2	Receiver.
	3	Remote control units or switchboards (exchanges) and operating terminals.
	4	Power supply and/or generator set.
	5	Antennae.
	6	Tuning heads.
6. RADAR AND OTHER ELECTRONIC EQUIPMENT	1	Frequency determining components, records, operating instructions, which are subject to security regulations, and identification material (Identification Friend or Foe (IFF)).
	2	Antennae and associated components such as radiators, reflectors and optics.
	3	Transmission lines and wave guides.
	4	Transmitter high voltage components.

EQUIPMENT	PRIORITY	PARTS
	5	Control consoles, displays, plotting boards.
	6	Cable systems.
	7	Automatic devices.
	8	Other control panels and generators.
	9	Carriage and tires.
7. GUIDED MISSILE SYSTEMS	1	Battery control centers.
	2	Missile guidance equipment (including homing systems).
	3	Launchers including control circuits.
	4	Missiles.
	5	Measuring and test equipment.
	6	Generators and cable systems.
8. AIRCRAFT AND SURVEILLANCE DRONES	1	Identification (IFF) equipment, other classified electronic equipment, publications and documents pertaining thereto, and other materiel as defined by the national government concerned.
	2	Installed armament (Use subpriorities for Group 2, Guns, or Group 3, Small Arms, as appropriate).
	3	Engine Assembly (Priorities for destruction of magnetos, carburetors, compressors, turbines and other engine subassemblies to be determined by national governments, depending on type of aircraft involved and time available for destruction).
	4	Airframe/control surfaces/ undercarriage (Priorities for destruction of propellers, hub-rotor blades, gear boxes, drive shafts, transmissions, and other subassemblies (not already destroyed in priority 3) to be determined by national governments, depending on type of aircraft involved and time available for destruction).
	5	Instruments, radios, and electronic equipment (not included in priority 1).
	6	Electrical, fuel, and hydraulic systems.
9. ROCKETS	1	Launcher.
	2	Rocket.
	3	Sights and fire control equipment.

APPENDIX G

STANAG 2151, ROAD NETWORK—DEFINITIONS AND CHARACTERISTICS

DETAILS OF AGREEMENT

ROAD NETWORK—DEFINITIONS AND CHARACTERISTICS

GENERAL

1. The NATO Armed Forces agree to adopt the following definitions in connection with the use of the road network and to evaluate the potential of this network in accordance with the characteristics indicated below.

DEFINITIONS

2. a. **The basic military road network** includes all routes designated in peacetime by the host nations to meet the anticipated military movements and transport requirements, both allied and national.

b. The basic network should already, in peacetime, have sufficient capacity and be equipped with the necessary facilities. NOTE (for information): There is a basic CENTRAL EUROPE military road network formed from national networks.

3. a. **A military road maneuver network** is the road system required by a commander for the conduct of a specific operation and for the required logistical support for that operation.

b. It is built up from the corresponding basic military road network the routes of which form the framework of the military maneuver nets, taking into consideration such addition or alternatives as may be required by circumstances and the needs of the Command. This network is defined and controlled (allotment of move credits) by the military authorities, national or allied, according to the breakdown of responsibilities in the theatre of operations (Communication Zone, Rear and Forward Combat Zone).

4. **Axial routes** ("pénétrante" or "axiales"). This term denotes the routes running through the rear area and into the forward area. They are identified by odd numbers and shown on overlays by unbroken lines.

5. **Lateral routes** ("latérales" or "rocades"). This term denotes the routes, the general direction of which is roughly parallel to the frontline, which feed into or cross axial routes. They are identified by even numbers and shown on overlays by broken lines.

6. **Traffic flow** ("débit d'un itinéraire") is the total number of vehicles passing a given point in a given time. Traffic flow is expressed as vehicles per hour (V.P.H.).

7. **Road capacity in vehicles or tons** ("capacités routières en véhicules ou en tonnes"). The road traffic which may use a road, is variable. The maximum capacity either for the flow of vehicles or for the tonnages carried are important data for transportation planning. These maxima are defined below.

a. **The road capacity in vehicles** ("capacité en véhicules ou le débit maximum") is the maximum number of vehicles that can pass over a particular road or route in the same direction within a given time. It is generally expressed in vehicles per hour (V.P.H.) ("Véhicules par heure"). The road capacity cannot be greater than the maximum traffic flow at its most restricted point ("point critique").

b. **The road capacity in tons** ("capacité en tonnes") is the maximum number of tons which can be moved over a particular road or route in the same direction within a given time. It is generally expressed in tons per hour and is the product of V.P.H. and the average payload of the vehicles using the route (e.g., 200 V.P.H. x 3T. = 600 Tons per hour).

c. **Complementary remarks.** Estimates of traffic flows and/or tonnage capacity should take into account the existing conditions. They may include:

(1) road characteristics (terrain, type of roadway, number of lanes available, road maintenance, rated tonnage capacity of weakest bridge),

(2) military traffic regulations (density, speed limits, direction of traffic),

(3) types of vehicles employed,

(4) movement conditions (by day, by night, lighting and/or weather conditions).

8. **A controlled route** (itinéraire réglementé") denotes a route the use of which is subject to traffic or movement restrictions. ("Movement Credit" mentioned below is defined in STANAG 2154.)

a. **A supervised route** ("itinéraire surveillé") is a roadway over which control is exercised by a traffic control authority by means of traffic control posts, traffic patrols or both. A "Movement Credit" is required for its use by a column of 10 or more vehicles or by any vehicle of exceptional size or weight.

b. **A dispatch route** (UK: "regulated route" FR: "itinéraire gardé") is a roadway over which full control, both as to priorities of use and the regulation of movement of traffic in time and space is exercised. A "Movement Credit" is required for its use by any independent vehicle or group of vehicles regardless of number or type.

c. **A reserved route** (itinéraire réservé ou spécialisé,") is a controlled route the use of which is:

(1) Allocated exclusively to a particular authority or formation ("itinéraire réservé") e.g., route reserved for the 10 Division, or—

(2) intended to meet a particular requirement ("itinéraire spécialisé) e.g., route reserved for evacuation.

9. **An open route** (itinéraire libré") is a route for the use of which no "Movement Credit" is required.

10. A one-way road ("itinéraire à sens uniqué") is a road on which vehicles may move in one direction only at a particular time.

11. **A signed route** (itinéraire fléché") is a route of one of the above categories along which a unit has placed, on its own initiative, for its exclusive use, and under the conditions prescribed by the Command or the manoeuvre regulations, directional signs which include the identification symbol of the unit concerned.

12. **Route where guides are provided** ("itinéraire jalonné"). This term denotes a route included in one of the above categories on which a unit has placed, under its own initiative and for its exclusive use and under the conditions prescribed by the Command or the manoeuvre regulations, guides responsible for showing the vehicles of that unit the direction they are to follow: these guides direct the personnel and vehicles of their own formation but do not give any indication to personnel and vehicles of other units who must respect the common signing and regulations.

13. **Prohibited route** ("itinéraire interdit") or prohibited section of route is a route or section of route over which traffic is prohibited, whatever its nature.

CHARACTERISTICS

14. The characteristics of a route are in particular.

a. the width of the travelled way (UK: "carriage way").

b. the clearance of obstacles (e.g., tunnels, bridges, etc.),

c. the class of loads which can be accepted in accordance with STANAG 2021 (Edition No. 2).

WIDTHS

15. a. The various widths of a road are illustrated in the drawing on next page:

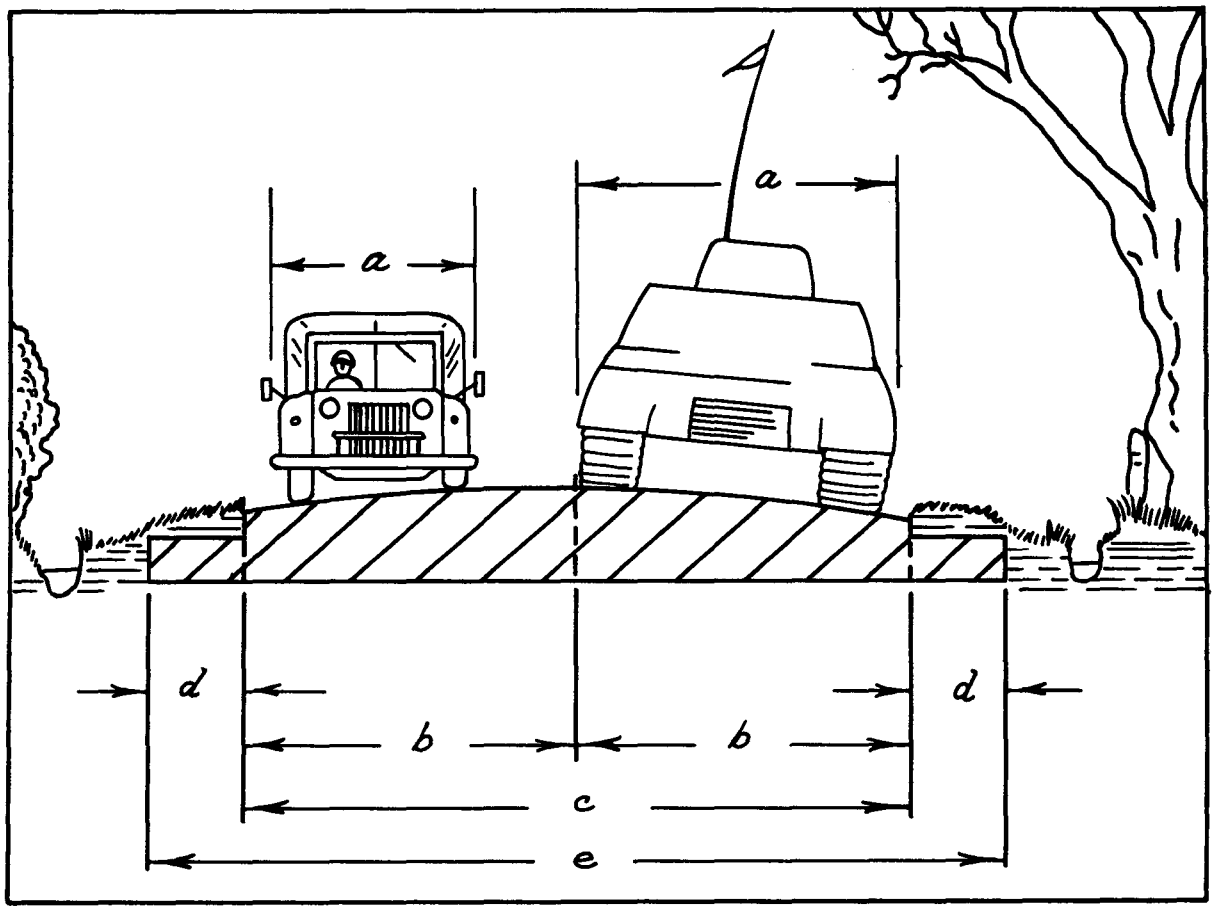
b. The number of lanes is determined by the width of the travelled way; i.e., the subdivision of the travelled way to allow the movement of a single line of vehicles. Taking into account the width of a normal vehicle and the space required on either side of that vehicle, the width of the lane required for the movement of one column is normally estimated at 11½feet (3.50m) and 13 feet (4m), for a tracked combat vehicle. A single lane road can only be used in one direction at any one time.

c. The traffic flow is determined by the number of lanes.

(1) A route or road is single flow ("simple courant") when it allows a column of vehicles to proceed and, in addition, isolated vehicles to overtake or to pass in the opposite direction, at predetermined points. It is desirable that the width of a single flow road be equal to at least 1½ lanes.

(2) A route or road is double flow ("double courant") when it allows two columns of vehicles to proceed simultaneously. It is essential that the width of a double flow road be equal at least to 2 lanes.

d. In the light of the above definition, the traffic possibilities can be shown in the following table:



LEGEND

a. Width of vehicle
b. " " lane
c. " " travelled way (UK: "carriage way")
d. " " hard shoulder
e. " " grading

Figure G-1. Various widths of a road.

Traffic flow possibilities	Road widths for normal vehicles only	Road widths for tracked combat vehicles
Isolated vehicles of appropriate width only and in one direction only.	At least 11½ ft., (3.50m)	At least 13 ft., (4m)
Generally one way only no overtaking or passing in opposite direction.	Between 11½ ft., and 18 ft. (3.50m and 5.50m)	Between 13 ft., and 19½ ft., (4m and 6m).
Single flow	Between 18 ft., and 23 ft. (5.50 m and 7m).	Between 19½ ft., and 26 ft., (6m and 8m).
Double flow	Over 23 feet (7m)	Over 26 ft., (8m).

HEIGHT:

16. The height allowed for clearing overhead obstacles is that which separates the travelled way from a line drawn horizontally under the summit of the overhead obstacle. It is a definite limit prohibiting the use of a route to all vehicles which exceed that height, with or without a load.

CLASS

17. a. Route. The class of a route is fixed in relation to the heaviest gross weight vehicle the route will accept. In such a case the choice of the route is limited (see STANAG 2021 (Edition No. 2)).

b. Network. The class of a network is fixed in relation to the minimum route classification in that network.

18. To facilitate movement those routes included in a low class network but over which heavier equipment can be moved are regrouped in broad categories:

Average traffic routes	Class 50
Heavy traffic routes	Class 80
Very heavy traffic routes	Class 120

19. Whenever possible, the basic military road network is composed of average routes (Class 50) and includes a certain number of heavy traffic routes and a few very heavy traffic routes.

APPENDIX H

STANAG 2154, DEFINITIONS AND REGULATIONS FOR MILITARY MOTOR MOVEMENTS BY ROAD

STANAG 2154
(Edition No. 2)

DETAILS OF AGREEMENT (DofA)

DEFINITIONS AND REGULATIONS FOR MILITARY MOTOR MOVEMENTS BY ROAD

Annex: A (DofA). Direction Arrow.

AGREEMENT

1. It is agreed that the NATO Armed Forces are to use the definitions and regulations applying to military motor movements by road, defined in the following paragraphs.

ORGANIZATION OF COLUMNS

2. A column of vehicles is a group of at least ten vehicles moving under a single commander, over the same route, in the same direction.

3. A large column may be composed of a number of organized elements (sub-units, march units, sections of vehicles, etc.).

4. Each column and each organized element of the column must include:

a. A commander whose place may vary.

b. In the first vehicle: a subordinate commander known as the 'pace setter' (in French: guide).

c. In the last vehicle: a subordinate commander known as the 'trail officer' (in French: serré-file).

5. The pace setter of the first element of a column leads it and regulates its speed. The trail officer of the last element deals with such problems as ocurr at the trail of the column.

6. In addition, each vehicle is to have a 'vehicle commander' (who may be the driver).

IDENTIFICATION OF COLUMNS—MOVEMENT CREDIT

7. Each column is to be identified by a number and by flags.

8. Each column is to be identified by a number known as 'movement number' which is allocated at the same time as the 'movement credit' (Annex B(DofA) to STANAG 2155) by the authority organizing the movement (see paragraph 12 below). This number identifies the column during the whole of the movement.

9. The movement number is to be placed on both sides and, if possible, on the front of at least the leading vehicle and the last vehicle of each organized element of the column. It is to be composed of:

a. Two figures indicating the day of the month on which the movement is due to commence.

b. Three or more letters indicating the authority organizing the movement, the first two letters being the national symbols indicated in STANAG 1059.

c. The figure indicating the serial number allocated by the authority responsible for the movement.

Example: identification 03–BEA–08 will indicate that Column No. 8 will be moved by the Belgian authority (A) on the 3rd day of the current month.

d. The elements of a column may be identified by adding a letter behind the movement number.

10. Additionally, each column is to be identified by flags, or, for night movement, by lights, security permitting, as described below:

a. The leading vehicle of the 'column' is to carry a blue flag (and a blue light at night).

b. The last vehicle of the 'column' is to carry a green flag (and a green light at night.)

c. The vehicle of the column commander is to display a white and black flag as indicated below:

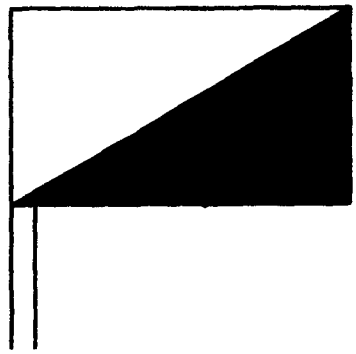


Figure H–1. Vehicle flag for column commander.

d. A vehicle that cannot maintain its position in a column may indicate this condition by displaying a yellow flag.

e. Flags shall be approximately 12″ (30 cm) × 18″ (45 cm) in size.

f. Flags are to be mounted on the left side of vehicles except where vehicles drive on the left, in which case the flags are to be mounted on the right side of the vehicles.

11. **Headlights.** In peacetime, all vehicles driving in a routine march column are to use their dipped headlights, even in daylight.

12. **Movement Credit—Time Allocation.** (in French: Crédit de mouvement.)

a. A movement credit is the allocation granted to one or more vehicles in order to move over a controlled route in a fixed time according to movement instruction (see STANAG 2151, paragraph 5 of the Details of Agreement).

b. Besides the allocation of a 'movement number' (see paragraph 8 above), a movement credit includes the indication of times at which the first and the last vehicle of the column are scheduled to pass.

(1) The entry point, that is to say the point where the column enters the controlled route.

(2) The exit point, that is to say the point where the column leaves the controlled route.

(3) At critical points, and, if necessary at traffic control posts.

TIME AND DISTANCE FACTORS IN MOTOR COLUMNS

13. **Vehicle Distance.** 'Vehicle distance' (in French: distance) is the space between two consecutive vehicles of a organized element of a column.

14. **Column Gap.** 'Column gap' (in French: créneau) is the space between two organized elements following each other on the same route. It can be calculated in units of length or in units of time as measured from the rear of one element to the front of the following element.

15. **Traffic Density.** 'Traffic density' (in French: densité de la circulation) is the average number of vehicles that occupy one mile or one kilometre of road space, expressed in vehicles per mile (VPM) or per kilometre (VPK).

16. **Length of a Column.** 'Length of a column' (in French: longeur d'encombrement) is the length of roadway occupied by a column in movement including the gaps inside the column from the front of the leading vehicle to the rear of the last vehicle.

17. **Pass Time.** 'Pass time' (in French: durée d'ecoulement) of a column is the actual time between the moment when the first vehicle passes a given point and the moment when the last vehicle passes the same point.

18. **Road Clearance Time.** 'Road clearance time' (in French: durée d'encombrement) is the total time a column requires to travel over and clear a section of road.

FORMATION AND DISPERSAL OF COLUMNS

19. **Start Point.** 'Start point' (in French: point initial) is a well defined point on a route at which a movement of vehicles begins to be under the control of the Commander of this movement. It is at this point that the column is formed by the successive passing, at an appointed time, of each of the elements composing the column. In addition to the principal start point of a column there may be secondary start points for its different elements.

20. **Release Point.** 'Release point' (in French: point de dislocation) is a well defined point on a route at which the elements composing a column

return under the authority of their respective commanders, each one of these elements continuing its movement towards its own appropriate destination. In addition to the principal release point of a column, there may be several secondary release points for the various elements.

SPEED AND FLOW OF COLUMNS

21. **Average Speed.** 'Average speed' (in French: vitesse de croisière) is the number of miles or kilometres travelled in an hour excluding all ordered halts. It is expressed in miles or kilometres per hour.

22. **Speed.** 'Speed' (in French: vitesse instantanée) indicates the actual rate of speed of a vehicle at a given moment, as shown on the speedometer (in kilometres/hour or miles/hour).

23. **'Pace'** (in French: vitesse de marche) is the regulated speed of a column or element as set by the pace setter in order to maintain the average speed prescribed.

24. **Rate of March.** 'Rate of march' (in French: vitesse moyenne) is the average number of miles or kilometres to be travelled in a given period of time including all ordered halts. It is expressed in miles or kilometres in the hour. The rate of march is a general planning factor used by staffs.

ROUTE SIGNING AND ROAD GUIDES.

25. STANAG 2151 gives the definition of a 'signed route' and of a 'route where guides are provided.'

26. Signing and guide teams are normally provided by the moving unit (see paragraph 29 below). Members of these teams must not, under any circumstances, wear the armbands and cuffs specified in STANAGs 2025 and 2159. They may wear coloured armbands.

27. Direction arrows used should preferably be black on white background and bear the identification symbol of the unit in question (distinctive sign or identification number). They may be of a similar type to those shown in Annex A (DofA). Before crossroads leading to several directions, a warning arrow can be used (type similar to that shown in Annex C to the Details of Agreement of STANAG 2012).

MILITARY ROUTE SIGNING

28. Unit route signs and unit guides are to be put out a short time in advance of the column and picked up as soon as possible after the tail of the column has passed.

29. Route signing and the placing of guides on controlled routes must be under the responsibility of the authority in charge of movements or traffic in the area concerned.

30. Outside these itineraries, the tasks above are to be the responsibility of the column commander.

SPECIAL REGULATIONS FOR THE EXECUTION OF MOVEMENTS.

31. All personnel exercising a command in the column and all drivers must strictly obey the instructions of traffic control and regulating personnel.

32. When approaching a traffic control or a regulating post indicated by prescribed signs (STANAGs 2025 and 2012) the column commander or his representative must advance ahead of his column and report to the regulating post commander to:

a. Give the required information concerning his organized elements and their movements.

b. Receive information and possibly instructions.

33. Through this post, he can so arrange for the transmission of his own instructions, or information, to the various elements of his column as they pass the post, where however they must not stop unless ordered to do so.

HALTS

34. Short Halts.

a. Short halts made by columns or elements of columns on the controlled routes normally are to last 10 minutes and take place, in principle, every 2 hours, 10 minutes before the full hour, even or odd (this detail to be specified in orders). All columns following the same route are to stop at the same time.

b. However, the characteristics of the road may make it necessary for the halt to take place in one particular part of the route rather than simutaneously at a fixed time. In such cases, the necessary instructions are to be given in the orders relating to the movement.

35. **Long Halts.** No standard rules for the observance of long halts are laid down. They must always be specifically plotted on movement graphs in order to avoid possible conflict.

36. Particular attention is to be paid to the following aspects of traffic discipline:

a. When making a long halt, isolated vehicles or vehicles forming part of a column, should move off the roads as much as possible.

b. If this practice cannot be observed, the commander of a column which is halted on an itinerary must take all necessary measures to facilitate circulation for other road users and avoid accidents or traffic jams. The measures to be taken will vary according to the road conditions and width of the route:

(1) Warning, at a sufficient distance from the front and rear of the column (guards, warning flags, lights or flares, security permitting).

(2) If required, organize (direct) a system of one-way traffic alternately along the columns, etc.

c. When a halted column resumes movement it has the right of way while moving back on to the road, unless otherwise prescribed.

OVERTAKING OF COLUMNS

37. By Isolated Vehicles.

a. An isolated vehicle is only authorized to overtake a moving column when:

(1) Its maximum authorized speed is appreciably higher than the speed at which the column is moving, thus enabling it to overtake each vehicle rapidly.

(2) There is sufficient distance between the vehicle of the column to allow the overtaking vehicle to regain its position in the proper lane after overtaking each vehicle.

(3) The trail officer of the column gives a clear signal that overtaking is possible.

b. In all other cases, an isolated vehicle is to overtake the column when the latter is halted.

38. **By Other Columns.**

a. On a controlled route a column may only overtake another column on the orders of the movements authorities and as arranged by the traffic regulating personnel.

b. On an open route no column may overtake another moving column, except in special cases, e.g., on a one-way road wide enough. In these cases, the commander of the column desiring to pass is to contact the commander of the column to be passed prior to effecting passage.

c. Outside these special cases, the overtaking of a column by another column is only authorized if the former is halted and providing the moving column has the time to overtake the whole of the halted column before the latter is ready to move on. In this case, the commander of the column desiring to pass is to contact the commander of the column to be passed prior to effecting passage. The commander of the halted column after giving his agreement must facilitate the overtaking.

MOVING BY NIGHT (Reference: STANAG 2024)

39. By night, road movements are carried out according to traffic regulations as follows:

a. With normal lighting
OR
b. Reduced lighting
OR
c. Blackout lighting
OR
d. Without lights
OR
e. Possible with 'balisage' [1]

From a certain line or on certain routes specified by orders.

40. When columns are moving under blackout conditions, traffic normally will be one-way.

IMPLEMENTATION OF THE AGREEMENT

41. This STANAG will be considered to have been implemented when the necessary orders/instructions to use the definitions and regulations contained in this Agreement have been issued to the forces concerned.

[1] 'Balisage' is a method by which a route is outlined by a system of dim beacon lights enabling vehicles to be driven at near daytime speed, under blackout conditions.

ANNEX A (DofA) TO STANAG 2154
(Edition No. 2)

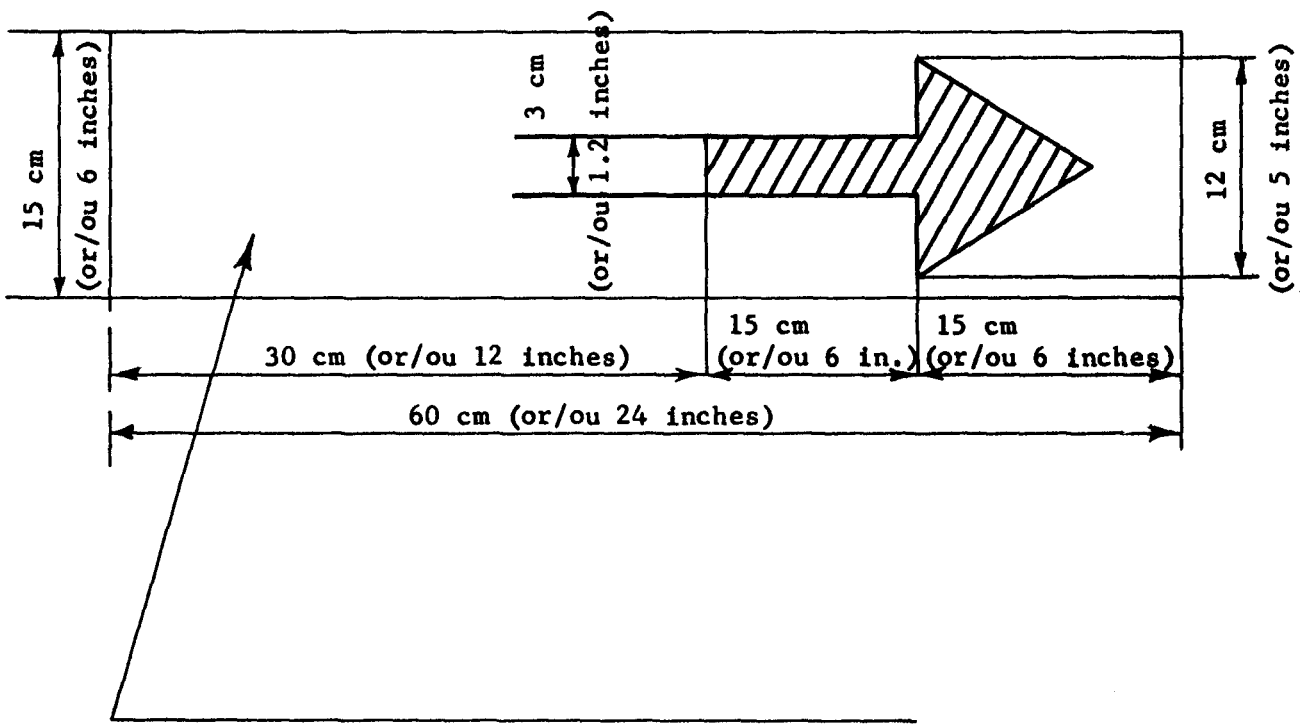
ANNEXE A (MdeA) AU STANAG 2154
(Edition No. 2)

DIRECTION ARROW

(made of paper, synthetic matter or wood.....)

FLECHE DE DIRECTION

(réalisée en papier, en matière synthétique ou en bois.....)



SPACE FOR PRINTING THE SYMBOLS

ESPACE DISPONIBLE POUR LES SYMBOLES

Figure H-2. Annex A to STANAG 2154 (Edition No. 2).

APPENDIX I

ANNEX A TO STANAG 2805-E, ROAD MOVEMENTS

ANNEX A (DofA) TO STANAG 2805-E

ROAD MOVEMENTS

Appendix: 1 to Annex A (DofA)

INTRODUCTION

1. The expression "Road Movement of Special Vehicles" means movement of vehicles with or without load which because of their class and/or dimensions require special routing arrangement.

LIMITATIONS AFFECTING THE ROAD MOVEMENT OF MOTOR VEHICLES

2. The conditions for the road movement of military equipment and vehicles are governed by the capabilities of existing road networks as defined in STANAG 2151. Further, the special regulations in force in the different countries place certain limitations on ordinary road movements of:

a. Individual wheeled or tracked vehicles, whether loaded or not.

b. Articulated vehicles consisting of a prime mover and semi-trailer.

c. Articulated trains of vehicles consisting of a tractor and one or more trailers.

d. Passenger transport vehicles (motor coaches).

3. These limitations, details of which are given at Appendix 1 to this Annex for each country concerned with this Agreement, relate to some or all of the following characteristics of the equipment referred to in paragraph 2 above.

a. Width measured on any cross section, including all projections.

b. Length (of vehicle or train of vehicles), including all projections and, where applicable, length of each part of the train: tractor + trailers(s).

c. Total height of the vehicle, including load, if any.

d. Turning radius.

e. Class of vehicle (or train of vehicles), calculated according to the method laid down in STANAG 2021.

RULES GOVERNING ROAD MOVEMENT OF SPECIAL VEHICLES

4. Any road movement of military equipment and vehicles of which one or more of the characteristics listed in paragraph 3 above exceeds the corresponding limitation(s) imposed by regulations in force in one of the countries it will have to cross (See Appendix 1 to this Annex) constitutes

a movement of a special vehicle in the country concerned. It is then subject to the rules given below.

5. Any movment of special vehicles except those exempted by bilateral agreement supplementing the NATO status of the Forces Agreement, should be requested on a Movement Credit Request as laid down in STANAG 2155. The request is forwarded through the normal movements channels by the originating military authority to the territorial military authority of the country in which the movement becomes a movement of a special vehicle.

6. The territorial military authority concerned will implement the Road Movement Credit Request for special vehicles in accordance with the procedure in force in the country concerned and will notify the authority originating the movement of its decision. Such notification may include in addition to the normal headings of a standard Road Movement Credit Request (c.f. STANAG 2155) the following instructions or information.

a. Special safety and/or traffic regulations imposed by day and, where applicable, by night (c.f. STANAG 2024) and the facilities to be provided to this end. This facility may be provided by the host nation.

b. Military or civilian authority or authorities of the Host Nation which the head of the "road movement of a special vehicle" may contact in case of need.

NOTE. To simplify the execution of road movements of special vehicles, Nations are recommended to prepare a documentation (in map or any other form) showing the route and any special characteristics of the itineraries suitable for such movements.

APPENDIX 1 TO ANNEX A (DofA) TO STANAG 2805-E
CLASSIFICATION OF LIMITATIONS AFFECTING THE ROAD MOVEMENT OF MOTOR VEHICLES
REGULATIONS IN FORCE IN NATO COUNTRIES

COUNTRY	Width including all projections	LENGTH OF VEHICLES				Motor Coach	Total Height (including load)	Turning Radius	Class (STANAG 2021)
		Single Vehicles	Articulated Vehicle (prime vehicle and semi-trailer)	Articulated train of vehicles (tractor & trailer(s))					
				Total length of train	Length of one UNIT				
1	2	3	4	5	6	7	8	9	10
BELGIUM	2m50	12m	14m	18m	11m (1)	12m	4m	----------	L50
CANADA	2m438 (8')	10m058 (33')	15m240 (50')	15m240 (50')	----------	10m058 (33')	3m81 (12'6")	----------	----------
DENMARK	2m50	10m or 12m (2)	14m	18m	10m	12m	3m60	----------	L35
FRANCE	2m50	11m	14m	18m	11m (1)	12m	----------	----------	L50
Fed. Rep. of GERMANY	2m50	11m or 12m(9)	15m	16m50	----------	12m	4m	----------	L50 (10)
GREECE	2m50	10m or 11m(3)	14m	18m	----------	11m	3m80	----------	----------
ITALY	2m50	11m(3)	14m	18m (11)	11m (5)	11m	4m	10m (12)	L50(7)(8)
LUXEMBOURG	2m50	Note (6)	15m	20m	11m (3)	12m	4m	----------	L40
NETHERLANDS	2m50	11m (3)	15m	18m	----------	12m	3m80	----------	L50 (4)
NORWAY	2m50	----------	----------	16m	----------	----------	3m	----------	L16
PORTUGAL	2m50	10m35	14m	18m288	10m668	12m192	3m81	----------	L50
TURKEY	2m50	11m	14m	18m	----------	11m	3m80	----------	----------
UNITED KINGDOM	2m50 (8'2½")	11m (36'1¼")	13m (42' 7⅞")	18m (59' 0⅝")	9m144 (30')	11m (36' 1⅛")	No Limit (13)	----------	L50
UNITED STATES	2m438 (8')	10m668 (35')	15m240 (50')	18m288 (60')	10m668 (35')(1)	12m192 (40')	3m81 (12'6")	----------	L50

NOTES

(1) Exclusive of coupling device on trailer.

(2) Lorry with 2 axles: 10m.; other vehicle: 12m.

(3) Motor vehicle with 3 or more axles: 11m.
Motor vehicles with only 2 axles: 10m (ITALY—motor coaches excluded).

(4) Maximum tyre-load: 5000kg.

(5) This figure concerns the tractor only: the length of the trailer cannot exceed 6m for 1 axle trailer, 7m50 for 2 axle trailer, 8m for 3 or more axle trailer.

(6) Vehicle with one axle: 7m.
Vehicle with 2 axles: 10m.
Vehicle with 3 axles or more: 12m.

(7) Maximum load:

(a) Motor vehicles and trailers—with ground pressure 8kg/cm²: 14,000 kg (2 axles); 18,000 kg (3 axles*); 22,000 kg (4 or more axles*).
*With a distance of 1m between 2 axles.

(b) Busses: 15,000 kg (2 axles); 19,000 kg (3 axles).

(c) Tractors and semi-trailers: 14,500 kg. Under the conditions indicated in (a) above: 18,000 kg (3 axles); 28,000 kg (4 axles); 32,000 kg (5 or more axles).

(d) In any case, maximum load on each single axle 10,000 kg; on 2 axles (at a distance of 2m) 14,500 kg.

(8) Highways only can be considered very heavy traffic routes (Class 120) but they cannot be used in peacetime by tracked vehicles.

(9) Motor vehicles with two axles: 11m.
Motor vehicles with more than two axles: 12m.

(10) Maximum load per single axle: 8 tonnes.
Load on driving axle of vehicle: 10 tonnes.
Load per double axle: 14.5, and providing there is a minimum wheelbase of 1.3m, 16.0 tonnes.

(11) The total length should be less, if conditions of columns n.9 cannot be satisfied.

(12) Each vehicle (single, articulated or train) should be included in a 4 m. 50 wide circular crown of turning way. The internal radius of this circular crown cannot be longer than 10m.

(13) No limit is imposed on height in the UK but on some secondary roads bridges may give only 3m 962 (13′) headroom, on main roads 4m 572 (15′) is general.

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By Order of the Secretary of the Army:

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