

CORRESPONDENCE COURSE OF THE
U. S. ARMY
TRANSPORTATION SCHOOL

RAIL OPERATIONS, THEATER

LESSON BOOKLET
TRANS SUBCOURSE 640

March 1976

Supersedes Trans 640, Rail Operations, Theater, June 1973.

TO BE USED WITH REFERENCE TEXT 640, JUNE 1973.

TRANS SUBCOURSE 640

RAIL OPERATIONS, THEATER

INTRODUCTION

Railroads have successfully provided logistic support to our armed forces in the two World Wars and the Korean War and in Vietnam. Providing rail transportation in a theater of operations is no simple or easy job, and the success of the transportation railway service (TRS) mission is dependent upon the abilities and understanding of TRS officers and enlisted men. Those who performed the railroading jobs in the theaters mentioned were men trained on civilian railroads as well as those who learned their railroading while in the service.

The basic principles of railroading are almost the same anywhere in the world although special problems are encountered in foreign countries during wartime that are not met in commercial railroading during peacetime. A bridge is blown up, a tunnel is sabotaged, tracks are torn up, culverts are destroyed; the enemy's bombing, artillery fire, and destructive actions interrupt train movements and cause congestion in terminals and yards. Every field expedient as well as a high degree of ingenuity must be used to reopen rail lines as quickly as possible and keep trains running in spite of repeated attacks and extensive destruction. The mass evacuation of large groups of refugees from a combat area, quick lateral movements of troop units with their equipment, and the transportation of sensitive missile components and other critical items present still other problems to the commanders of rail units.

This is a one-lesson subcourse, including lesson exercises, lesson solutions, and an examination. Two credit hours are allowed for the entire subcourse. The exercises are to be completed under the concept of self-paced instruction. You will grade them yourself, using the lesson solutions attached to the examination.

Follow these steps in completing the subcourse.

(1) Study the text material assigned for the lesson.

(2) After thorough study, answer each question by marking or circling your solutions in the lesson book.

TEXT ASSIGNMENT . . . . . Reference Text 640, Rail Operations, Theater, June 1973, with annex.

LESSON OBJECTIVE . . . . . To enable you to analyze the problems of setting up a railway service; to identify the relationship of the transportation railway service with other agencies; and to specify the phases of operation and procedures used to operate trains in a theater of operations.

SUGGESTIONS . . . . . None.

EXERCISES

Weight	True-False

(Write T for true or F for false.)

7 1. The commander of the highest supervisory TRS unit is train commander of an ambulance train.

2. The TRS rehabilitates damaged facilities for immediate rather than permanent use.

3. Existing telegraph lines can be used for dispatching trains by telephone.

4. The three phases of operation make it possible to use skilled civilian railroaders in rear areas.

5. The probable objective of a military operation is unrelated to the selection of a rail line.

Weight

Matching

Match an appropriate agency or the TRS from column II to the service it provides in column I by writing the proper letter by each question. Each item in column II may be used once, more than once, or not at all.

		Column I	Column II
5	6.	Added protection of trains and freight en route.	A. Theater army area command.
5	7.	Rear area protection in COMMZ.	B. Engineer command.
5	8.	Organizational maintenance of track.	C. USASTRATCOM (theater).
5	9.	Major maintenance of track and roadbed.	D. Military police battalion.
5	10.	Rehabilitates rail facilities.	E. TRS.

Match a method of operation from column II to each descriptive phrase in column I by writing the proper letter by each question. Each item in column II may be used once, more than once, or not at all.

		Column I	Column II
5	11.	May use positive or permissive operation.	A. Fleet.
5	12.	Is used for single-track line with no sidings.	B. Manual block.
5	13.	Is the simplest method of operation.	C. Train order.
5	14.	Allows trains to clear one block at a time.	D. Timetable.
5	15.	Used when theater rail traffic is stable.	

Weight

Analytical

(Using the following key, state your reaction to each of the next three questions by writing the proper letter in the lesson book.)

A. The underscored statement is true, and the reason for it or result of it is true.

B. The underscored statement is true, but the reason or result is false.

C. The underscored statement is false.

5 16. Only one method of train operation can be used at any one time because communication lines cannot be changed quickly.

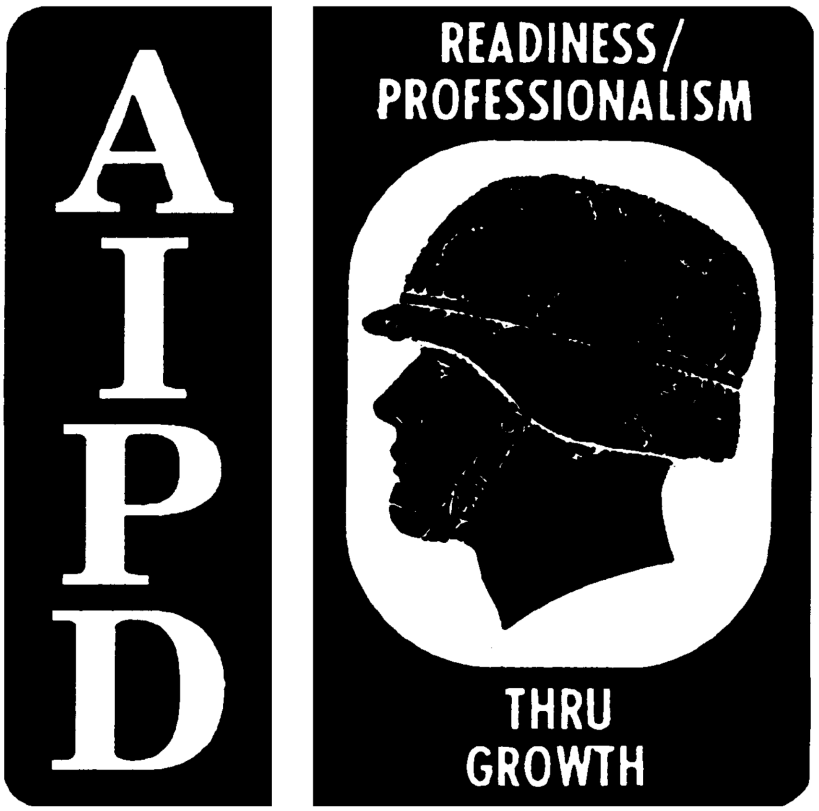
5 17. The railway battalion makes a reconnaissance of its division of the rail line to find out how extensive damage might be.

5 18. During phase I operations, the TRS hires civilians to run railroads in the combat area since the Geneva Convention does not prohibit such a practice.

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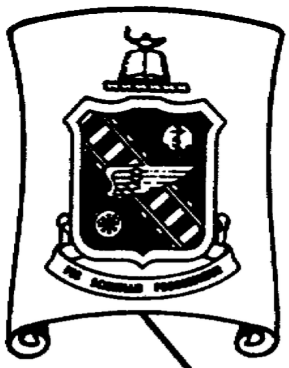
EDITION
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RAIL OPERATIONS, THEATER



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

ARMY CORRESPONDENCE COURSE PROGRAM



REFERENCE TEXT 640

RAIL OPERATIONS, THEATER

The information contained herein is provided for instructional purposes only. It reflects the current thought of this school and conforms to printed Department of the Army doctrine as closely as possible. Development and progress render such doctrine continuously subject to change.

U. S. ARMY TRANSPORTATION SCHOOL

Supersedes Reference Text 640, Rail Operations, Theater, March 1970.

NOTICE TO STUDENT

Trans Subcourse 640

16 March 1976

CORRESPONDENCE COURSE
OF
U. S. ARMY TRANSPORTATION SCHOOL

IMPORTANT

Supplement No. 1 to Reference Text 640, Rail Operations. Theater, June 1973, is published to make you aware of the field army reorganization that is taking place. DO NOT base your answers to the questions in the lesson exercises or examination on the information in the supplement. Answer all questions based on the material in the reference text.

REFERENCE TEXT
640

SUPPLEMENT NO. 1

16 March 1976

U. S. ARMY TRANSPORTATION SCHOOL

Supplement to REFERENCE TEXT 640, RAIL OPERATIONS, THEATER, June 1973

The theater Army organization is being revised under the Echelons Above Division (EAD) study. The EAD eliminates the field army support command (FASCOM) and its subordinate support brigades and replaces them with a newly formed corps support command (COSCOM). The study concentrates on merging the theater army support command (TASCOM) headquarters with the theater army (TA) headquarters; eliminating the materiel command (MATCOM), with its field depots and COMMZ depot distribution system; establishing the COSCOM in the combat zone and the theater army area command (TAACOM) in the COMMZ as the highest organizational levels of supply and maintenance support in the theater; and incorporating supply concepts relying more heavily on CONUS theater oriented depots for direct supply as close to the using unit as possible.

Department of the Army doctrine covering the new concept has not been published. When the doctrine is published this text will be revised to reflect the new concept.

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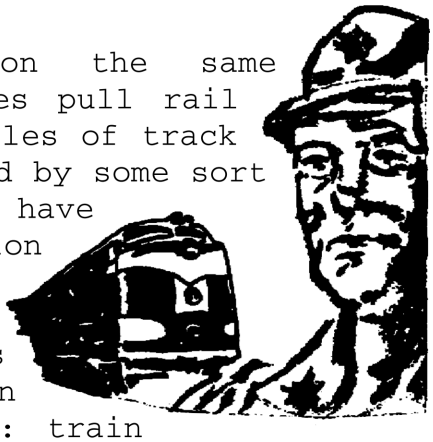
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INTRODUCTION

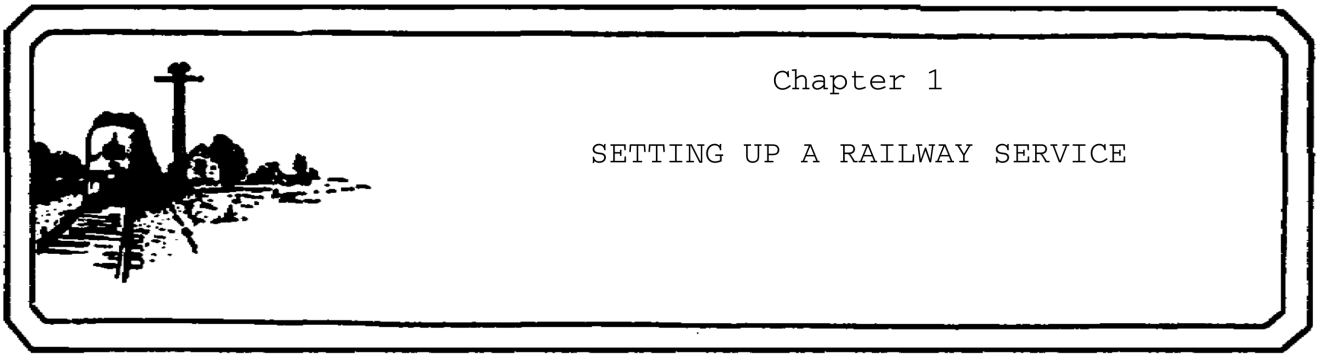


Military railroads operate basically on the same principles as commercial railroads. Locomotives pull rail cars, loaded with freight or passengers, over miles of track called a division; train movements are controlled by some sort of schedule or signal communication; some trains have superiority over others. The transportation railway service (TRS), with a mission of operating and maintaining the military railroads in a theater of operations, is organized like any of the commercial railroads in the United States to carry out four functions: train operation, maintenance of way, maintenance of equipment, and train control.

Between the two types of railroads, however, are big differences. Civilian railroads are built and operated to make money for their owners; they compete with each other; they offer many conveniences to passengers and shippers. They must meet all the legal requirements set up by the Interstate Commerce Commission, Department of Transportation Federal Railroad Administration and the Association of American Railroads as well as the agreements made with organized labor groups. Military railroads, on the other hand, must be operated economically but the foremost economy is not money. Time, material, and manpower are the principal things that must not be wasted; they bring profit to our Government in the form of success in battle. Conveniences must often be sacrificed; to get troops and supplies where they are needed on time is the first aim of the TRS in a theater of operations. Military needs come before legal requirements, and manpower is used to the maximum.

Many problems must be faced and solved before setting up a railway service in a theater of operations. After the service has been started, three phases of operation are used to obtain maximum service out of the railways and their facilities. From your study of the first chapter in this reference text, you should be able to describe the basis for selecting rail lines and the phases of operation after the lines are in use. After studying chapter 2, you should be able to explain how the transportation railway service is controlled and why it must have a close working relationship with other

agencies. From your study of chapter 3, you should be able to describe the types of trains and the procedures in operating them. Annex A is provided to help the reader understand manual block operation, described in chapter 3.



Chapter 1

SETTING UP A RAILWAY SERVICE

1.1. GENERAL

Military forces operating in a theater generally use existing railways because constructing new ones is both time-consuming and expensive. What existing rail lines are selected for use? The tactical situation naturally influences the selection; for example, those leading into or running parallel to the rear areas of battlelines are extremely valuable for rapid troop and supply movements, but how vulnerable are they to enemy penetration? The selection of a rail line also depends not only on its strategic importance to an operation but also on its technical or physical characteristics, such as its yards, shop facilities, and track.

This chapter describes why one rail line is selected before another. It ends with an explanation of how the transportation railway service (TRS) has solved the problem of finding enough skilled men to operate and maintain the trains and all the facilities required to keep them running.

1.2. STRATEGIC IMPORTANCE

If a theater of operations has a highly developed rail net, selection of certain lines over others is made on the basis of their strategic importance to the military operation. First, what is the planned strategy of attack? And what is the probable objective of the operation? The answers to these questions will certainly help the planners select the railways most important as support lines.

Second, where will the lines of advance be? Rail lines leading in the general direction of the lines of advance are selected as the primary supply route. Third, what are the enemy dispositions? Before making a decision, those responsible for selecting the best rail lines want to know the strength of enemy forces, where they are located, and what types of units they have at strategic locations. Rail lines are vulnerable to enemy penetration. For instance, if you

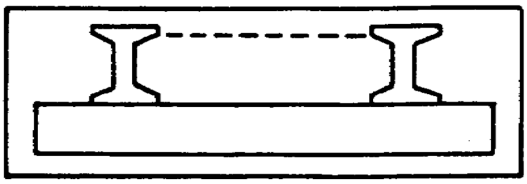
knew that a hostile unit were positioned so that it posed a threat to rail operations in a certain area, you would select, if possible, a rail line that would avoid that area.

After the primary rail lines have been selected, alternative lines should be chosen, in case the others are cut by enemy action, tied up by a railway accident, or impaired by washouts, landslides, or floods.

1.3. TECHNICAL ASPECTS

Because operating a railway is a highly technical business, a great deal of thought must be given to the technical aspects of existing rail lines and facilities if rail operations are to be successful. Some of the most important technical characteristics, both desirable and undesirable, are described in the following subparagraphs.

a. Classification of railways. Railways are classified according to their gage--the distance between the heads of the parallel rails, measured five-eighths-inch below the top of the rails. This broken line in the inserted sketch. The are standard, broad, narrow, and meter. the railway mileage in the world is s wide. Broad-gage railways are 66, 63, gage railways are 42 and 36 inches and narrower widths, and meter gage railways are 39 3/8 inches wide. For defense, some countries construct railways with a different gage from that used by neighboring countries. Rail equipment built for one gage does not operate on other gages.



Track gages vary within a country or area, from country to country, and from continent to continent; table I presents the track gages found in principal countries and regions of the world.

b. Desirable physical characteristics. The railway system in a theater of operations may be large enough and complex enough to afford a choice of the part or parts to be used. Certain physical characteristics are desirable and must be examined, because they influence the decision in selecting one railroad instead of another.

(1) Adequate yards, terminals, and shop facilities. A railway car normally spends at least 50 percent of its life in either

Table I. Track Gages of Principal Countries and Regions of the World

North Africa	From 56 1/2 to 37 3/8, including 41 1/2[a] and 37 1/16[a]	China	56 1/2
		Korea	56 1/2
		India	66, 39 3/8, and narrower[c]
Central and West Africa	56 1/2, 42, 39 3/8, 30	Ceylon	66
		Burma	39 3/8
East and South Africa	42, 39 3/8	Cambodia	39 3/8
		Thailand	39 3/8
England	56 1/2	Vietnam	39 3/8
Scotland	56 1/2	Formosa	42
Ireland	63	Philippines	42
Portugal	66	Australia	From 63 to 42
Germany	56 1/2	Tasmania	42
Spain	66	New Zealand	42
Italy	56 1/2	Mexico	56 1/2, 36[b]
Finland	60	Central America	60[d], 36, 30
France	56 1/2		
USSR	60	Argentina	66, 56 1/2, 39 3/8, 29 1/2
Hungary	60		
Saudi Arabi	56 1/2	Brazil	63, 39 3/8
Israel	56 1/2	Chile	66, 56 1/2, 39 3/8[e]
Lebanon	41 1/4[a]		
Syria	41 1/4[a]	Peru	56 1/2, 36
Jordan	41 1/4[a]	Colombia	36
Turkey	60, 56 1/2, some narrower	Ecuador	42
		Paraguay	56 1/2, 39 3/8
Iraq	56 1/2, 39 3/8[b]	Uruguay	56 1/2
Japan	42	Venezuela	56 1/2
Nepal	30		
Pakistan	Some broad, 39 3/8, 30		

a - Unique among world railways.
b - Being converted to standard 56 1/2 inches.
c - Almost evenly divided between the 66 and the 39 3/8 or narrower.
d - That trackage that parallels the Panama Canal.
e - Almost evenly divided between 66 and 39 3/8; comparatively negligible amount of 56 1/2.

yards or terminals. Without adequate yards and terminals, main lines become congested. Whenever possible, terminal yards should contain tracks for receiving trains, classifying cars, and making up trains for departure. The tracks in these yards should be long enough to hold the longest train to be operated on that rail division. Facilities are needed to spot cars, unload them, and promptly return the empties to service. A terminal should include an engine-house, car repair tracks, fuel and water stations, and buildings to house crews of the railway battalion. The heavy repair and maintenance of rail equipment require adequate shops, located at or near yards and terminals.

(2) Single, double, or multiple track. Train density and overall rail capability are greatly affected by the type and number of tracks. If there is a usable double track, trains may operate in both directions without delays in schedules. However, the transportation railway service often takes the usable parts of a damaged double track to make one single main line with good passing tracks.

(3) Seasoned roadbed, good ballast, and heavy rail. The roadbed, ballast, and weight of the rails affect the speed and weight of trains. If the railway with the most seasoned roadbed, the best ballast and the heaviest rail is selected, the number of interruptions in train operations caused by washouts and buckled rail is generally reduced.

(4) Slight grade and curve. Operating trains in mountains with steep grades requires more motive power. Steep grades usually require pusher engines at the rear of a train, two or more locomotives pulling or doubleheaded at the front of a train, or shorter trains. Strong pulling and sudden braking are hard on rail cars; they require more maintenance than those used on fairly level grade.

Running time over a railway is greatly increased if the line has sharp or long curves. A speed that can be reached on a straight run of track cannot be maintained on curving track. The ideal railway, with no grades and no curves, is never realized, but the rail lines with the slightest grade and fewest, gentlest curves should be selected.

(5) Adequate sidings and spurs. Sidings and passing tracks should be long enough to permit the longest train on the division to clear the main-line track completely. Spurs are short rail lines extending from main lines that can be used to load and unload cars or to store cars; if they are long enough, one train can be held

on them while another train passes on the main track. Although spurs are desirable, they are not a major basis in selecting rail lines.

(6) Strong bridges and tunnels of sufficient clearance. The strength of railway bridges directly affects the kind of locomotives operated over them. If bridges, must be rehabilitated or constructed, they should be made strong enough to support the locomotives to be run over them. Any tunnels on the railway should have sufficient clearance to allow passage of such wide and high loads as bulldozers and cranes.

c. Undesirable physical characteristics. The railway selected should have a minimum number of vulnerable points where traffic could possibly be interrupted. Tracks located near high banks or streams are highly susceptible to washouts or floods. Tunnels with restrictive clearances prevent moving outsize equipment. Long bridges or bridges over deep or wide streams are quite vulnerable to enemy attack. Improperly constructed terminals cause congestion. Deep cuts and high fills should be avoided whenever possible.

1.4 USING EXISTING FACILITIES

As the theater of operations expands and forces advance, existing tracks and facilities are used as much as possible. Captured track is rehabilitated when needed. Constructing new track is avoided if possible because of the manpower required for it. However, when new construction would take less time and manpower than rehabilitation, it may be advisable to construct new track and facilities.

Those facilities that may require rehabilitation or new construction are yards, sidings, fuel and water stations, signal systems, telephone and telegraph lines, and engine houses. Whether to rehabilitate existing facilities or to construct new ones is dependent upon their being ready for immediate rather than permanent use. The following are general regulations governing the construction or rehabilitation of facilities.

a. Main lines, yards, and sidings. When new construction is required, planning for the location and layout of tracks is of great importance, to take care of not only current needs but also future requirements. For rehabilitation, the general track surface must be good enough to meet immediate requirements. Track

improvement is undertaken only when necessary to meet minimum requirements for safe operation.

b. Water and fuel stations. Any suitable facilities are used for fuel and water stations. However, where no water and oil stations exist, they may be improvised by placing filled rail tank cars at strategic points along the line. Here are two of the many ways to improvise coal stations needed when steam locomotives are in use. Loaded coal cars may be placed on a ramp and the coal emptied into the locomotive tenders; or hopper cars containing coal may be placed on a siding and coal shoveled by hand into the tenders, or unloaded through openings in cars equipped with doors to discharge lading.

c. Signal systems. On newly constructed or rehabilitated lines, signals of the simplest kind are installed. Automatic block signals and interlocking switches are used and maintained only when already in existence; if used, however, they require tight security since they are highly vulnerable to sabotage.

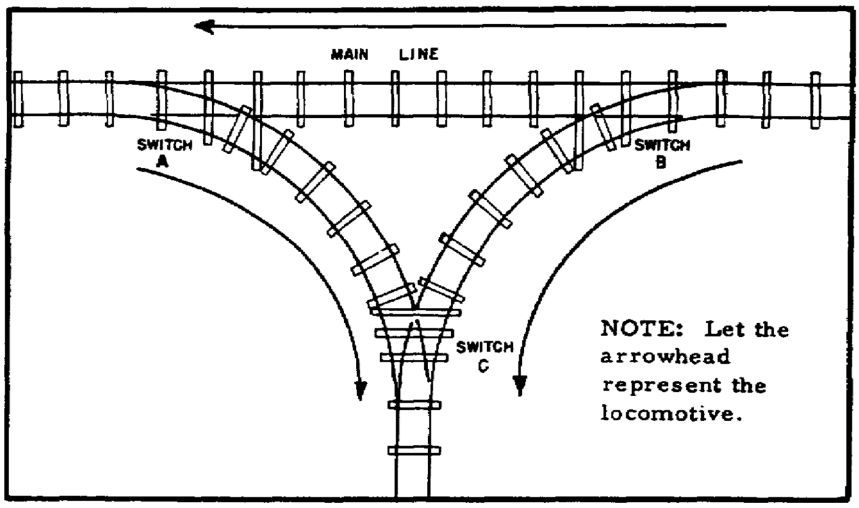
d. Telephone and telegraph lines. The most dependable and expedient method of dispatching trains is by telephone. Any existing telegraph lines are easily converted for telephone operations. When sidings are equipped with telephone boxes, train crews can aid the train dispatcher in moving trains in emergencies.

e. Engine-houses. Roundhouses and turntables are easily recognizable from the air. In an area subject to enemy aerial bombardment, such engine-house facilities may have to be avoided. If roundhouses and turntables do exist, all precautions should be taken to insure that locomotives will not become useless if the facilities are disabled. Newly constructed engine-houses should be simple frame structures without complicated windows and doors.

Wyes like the one sketched are needed to change the direction of engines. With a pencil, trace the route that an engine or an entire train takes as it leaves the main line through switch A, continues down the wye until it clears switch C, and then backs past switches C and B. Now it is on the main line again and ready to run in the opposite direction.

1.5. PHASES OF OPERATION

As theater territorial limits expand, the problem of supplying skilled people for rail operations becomes acute. To cope with this problem, the TRS sets up rail operations in three phases to allow employment of skilled civilians in rear areas and to release military



men for use in forward areas. Since the phase used depends upon the existing situation, the order in which the phases are put into effect does not follow a set pattern. They are discussed in paragraphs 1.6, 1.7, and 1.8.

1.6. PHASE I

Carried on exclusively by the military, phase I operation is normally used in combat areas or immediately following the successful establishment of a lodgment. In a military sense, lodgment means occupying and holding a position in hostile territory; for example, gaining a beachhead. Phase I operation is used more often in or near the combat zone when effective control and operation of existing lines can be insured only by having railroad troops under a unified command. Using phase I operation in forward areas and at the beginning of an operation is required, because under the Geneva Convention civilians cannot work in combat zones, and the use of civilians poses language difficulties. Also, using only military railroaders insures the security of railways in forward areas. Security demands that military men be used because they are trained and disciplined; they obey and respond to orders immediately. Phase I operation may be continued indefinitely in areas critical to military operation, such as ports, key terminals, or lines with limited capacity.

Normally, phase I operation is in effect for all the geographical area of a theater subject to enemy action. Look at figure 1.1;

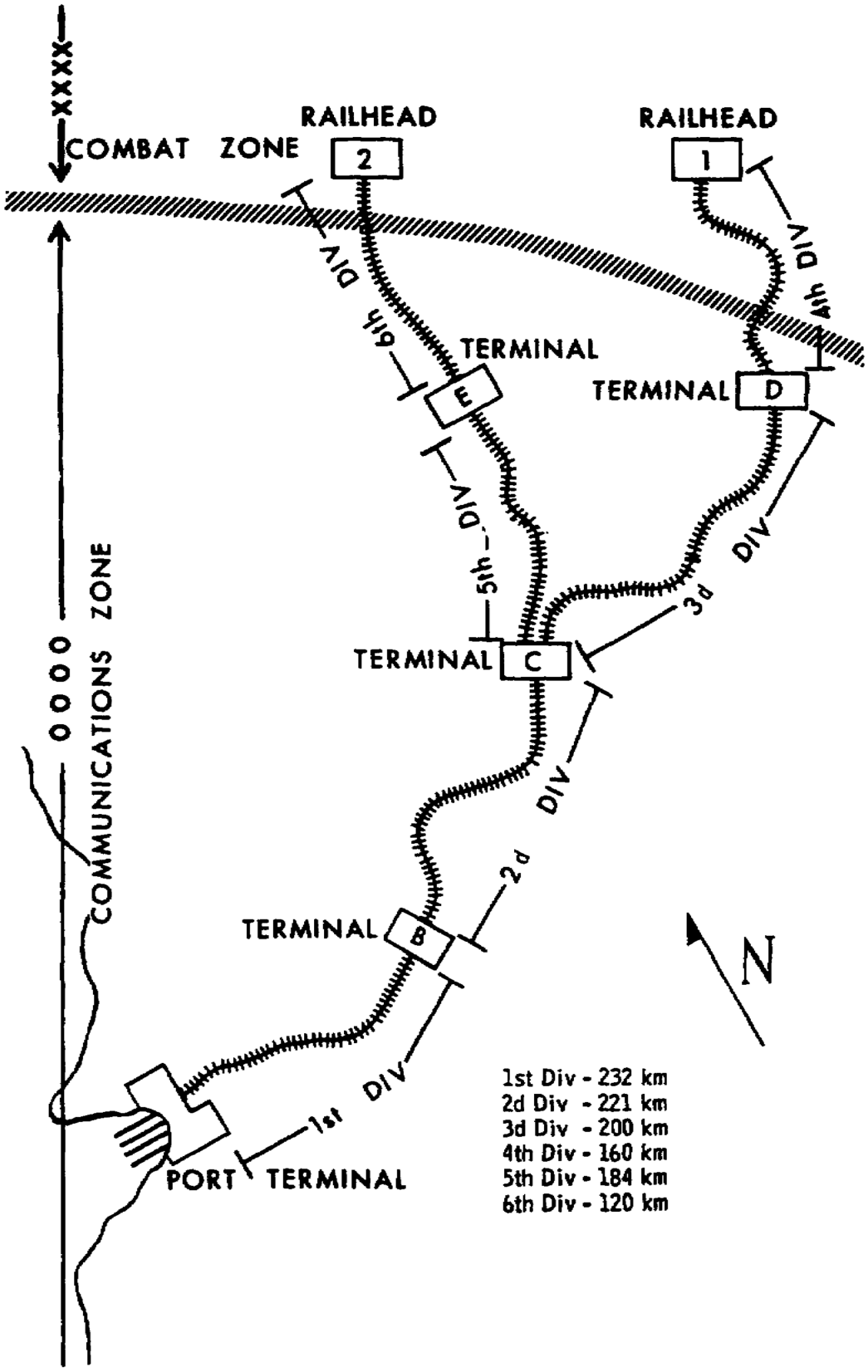


Figure 1.1. Military Railroad in an Expanded Theater.

assume that the theater extends inland only from the port terminal to a point halfway between terminals B and C. Phase I would be used because the whole area is in the combat zone. However, figure 1.1 actually shows an expanded theater with the combat zone far enough forward to permit a communications zone (COMMZ) to be established. Phase I could be in effect for the 4th and 6th rail divisions only. As you read on, you will see how phase II or a combination of phase II and phase III operations could be used for the other divisions.

1.7. PHASE II

Phase II is a joint civilian-military railway operation with the military retaining control. When combat forces move forward and communications zones become relatively stable and secure, the phase II operation is quickly begun. It has several important advantages. Local economy is aided by restoring civilian railroaders to their jobs. If the rail transport capability is increased by this type of operation, some civilian trains may be allowed to operate. Although military trains have priority, civilian traffic can be permitted insofar as it does not interfere with military operations.

Look again at figure 1.1. Picture the theater as having advanced far enough inland from the port terminal to take in terminals D and E; suppose, too, that the rear limit of the combat zone is located midway between terminals C and B. If this were true, phase I operation would be used for the 3d and 5th and the 4th and 6th divisions and phase II for the 1st and 2d divisions. Phase II also provides an efficient, accelerated transition from phase I to phase III. In the next paragraph, you will see how phase III is begun in the theater.

1.8. PHASE III

Phase III operations are conducted by civilians under military supervision. Usually employed in the rear area of the communications zone, phase III releases most of the military railroaders for duties in forward areas. In this phase, more civilian employees are restored to their jobs, helping the local economy, and additional civilian trains may be operated because of increased rail transport capabilities. Although phase III may be set up immediately upon entry into a theater, this is highly improbable. However, when phase III operations are in effect, the method of train movement best understood by the civilians should be adopted. Careful planning is necessary by officers of the transportation railway service when putting military trains in civilian train schedules. Civilians should be thoroughly instructed in military rail transportation procedures

and requirements. Before operations start, necessary bilingual documents should be prepared using both English and the local language.

Look at figure 1.1 again. Here is a military railroad net in an expanded theater. The theater has been developed with phase I and phase II as explained in paragraphs 1.6 and 1.7; now phase III operation for part of the theater becomes possible. When trained civilian railroaders have been oriented in military procedures and the necessary materials and documents have been prepared, phase III can be used. The 1st and 2d divisions, located entirely within the communications zone, could use phase III operation. Divisions 3 and 5, also located entirely in the communications zone but further forward than the 1st and 2d divisions, could use phase II. Because the 4th and 6th rail divisions are partly within the communications zone and partly within the combat zone, phase I would undoubtedly be used for them to have strict military control. Here is an example, then, of a situation that permits the maximum use of civilian railroaders in the rear areas and releases military men for duty in the forward areas. Keep in mind that both phase II and phase III may be suspended and replaced by phase I at any time should military necessity require it.

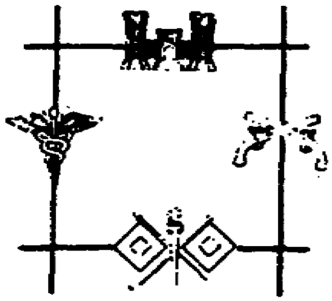
1.9. SUMMARY

A great deal of planning is required before the transportation railway service can begin operations in a theater. The first big task is to find out what rail lines exist and then to choose those most valuable for supporting the military operation. Selections are made on the basis of our forces' probable objective and planned lines of advance and the enemy's strength and location.

Although in all probability it will be necessary to use any existing rail lines, if there is a choice, those with the most favorable technical characteristics are selected. Adequate yards, terminals, and shop facilities are required so that main lines can be kept open; rail cars can be unloaded, loaded, and then made up into a train and readied for departure; and rail equipment can receive the heavy repair and maintenance it needs. Double track allows trains to operate in two directions; if partly damaged, at least one track can be repaired for use as a main line with adequate passing tracks. Since roadbed, ballast, and weight of track determine the weight and speed of trains, a line with seasoned roadbed, good ballast, and heavy rail is selected. Rail lines with slight grades and few curves require less motive power, allow for higher train speeds, and are not as hard on equipment as those with steep grades and sharp or

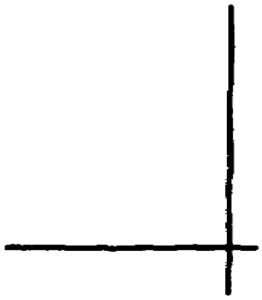
long curves. Bridges must be strong enough to hold up under the heavy weight of locomotives; tunnels must be high and wide enough to allow the passage of military equipment.

As a theater of operations expands, captured rail lines and their facilities are rehabilitated if needed and if possible. Only when they are not adequate for military needs are new ones constructed. To increase rail transport capabilities in an expanding theater, three phases of operation are used. Phase I, employing only the military, is used in combat areas or immediately after gaining a lodgment, such as a beachhead. Phase II, using civilians and military with the latter in supervisory positions, is normally established in the forward areas of the communications zone. Phase III, set up in rear areas of the communications zone, uses mostly civilians under military supervision, thereby releasing military railroaders for duties in forward areas. In both phases II and III, the local economy is helped because some civilians are restored to their jobs and some civilian trains may be operated.



Chapter 2

THE TRS AND ITS RELATIONSHIP WITH OTHER AGENCIES

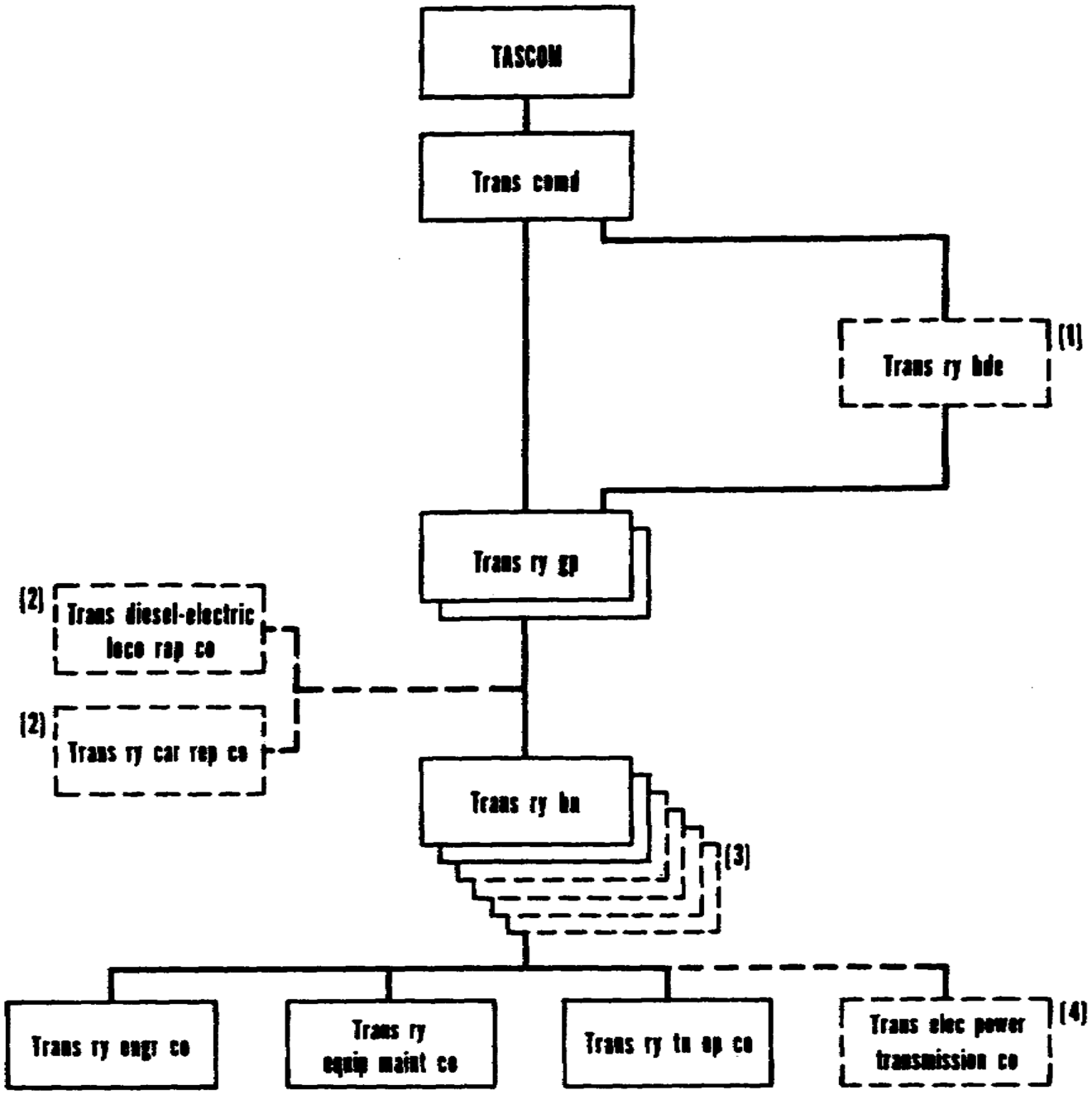


2.1. GENERAL

The transportation railway service consists of the command and supervisory, operating, maintenance, and service units needed to operate railway trains, maintain rail lines of communications, and perform organizational and direct support maintenance of locomotives and rolling stock in a theater of operations. Normally, the TRS is an interzonal service and may operate over long distances throughout the theater. To insure that the capabilities of the TRS are exploited to the fullest extent possible, all supervisory and subordinate rail units in a theater are assigned to and operate under the command and supervision of a senior transportation organization, normally the transportation command of the theater army support command (TASCOM). Regardless of the extension of the railway service through other commands or territorial jurisdictions in the communications or combat zones, commanders of area support commands or areas within the combat zone influence rail operations only by coordination through command and technical channels.

The senior railway unit in a theater is responsible for planning the organization of the railway service and the employment of all TRS units. In a theater, the senior railway unit may be a transportation railway group. Where there are three or more groups, a railway brigade is the senior railway unit; where there are fewer than three groups, they are under TASCOM's transportation command. A railway group can command from two to six railway battalions and normally supervises up to 960 kilometers of main rail line. Each battalion commands attached operating and maintenance units and normally controls the operation of 145 to 241 kilometers of rail line--a rail division. Rail engineering, equipment maintenance, and train operating companies, as required, are attached to the battalion. Figure 2.1 illustrates the transportation railway service organization.

What is the relationship between the transportation railway service and other agencies? For the overall military effort in a



Notes:

1. The brigade is interposed in this organization above group if three or more groups are assigned to TASCOM.
2. May be attached from the materiel command.
3. Number of battalions (two to six per group) is dependent upon the scope of the railway operation.
4. When required for electrified operations.

Figure 2.1. Transportation Railway Service Organization.

theater of operations to be successful, a maximum degree of cooperation must be maintained constantly among all agencies. The TRS often assists other agencies in carrying out their missions. For example, it locates rail sidings for the medical command to loan and unload the wounded, helps in locating dump and depot sites, assists in handling heavy lifts with locomotive cranes, and may even help to make emergency repairs of equipment belonging to other agencies. To draw a picture of how the services of the TRS and other agencies in a theater of operations fit together, the remaining paragraphs of this chapter point out the relationship of the TRS to the theater army support command and its personnel, medical, engineer, transportation, materiel, and area support commands; the strategic communications command; the military police; and civilian agencies.

2.2. THEATER ARMY SUPPORT COMMAND

A major subordinate command of theater army, the theater army support command (TASCOM) provides combat service support to all U. S. Army forces in the theater and to other forces as directed. Thus, the TASCOM commander directs combat service support operations both within the COMMZ and between it and the combat zone. As the major commander operating in the COMMZ, he is usually responsible for its territory.

Five mission commands and one operating command carry out TASCOM's mission. Directly supporting the combat operations are these five mission commands: personnel, medical, engineer, transportation, and materiel. Providing combat service support and rear area protection (RAP) for units in the COMMZ is the one operating command: theater army area command (TAACOM).

2.3. PERSONNEL COMMAND

The personnel command provides general support personnel, administrative, finance, replacement, chaplain, postal, special services, military police, stockade and rehabilitation, crime laboratory, and graves registration services to the theater. It operates the personnel administration center (PAC) that controls data processing actions and handles reports control, personnel management, and records management for the theater.

2.4. MEDICAL COMMAND

The medical command owns and operates ambulance trains to evacuate patients from hospitals or holding units of the combat zone to the COMMZ, between hospitals of the COMMZ, and from hospitals to aerial or water ports of embarkation. The train commander is a Medical Corps officer; he is responsible for the command, administration, coordination, and operation of the ambulance train unit. The TRS, however, furnishes the motive power and is responsible for scheduling, operating, and maintaining the train. Running repairs and direct support maintenance are provided by TRS ambulance train maintenance units which are attached to the senior transportation railway unit in the theater.

2.5. ENGINEER COMMAND

The engineer command (ENCOM) constructs, rehabilitates, and performs major maintenance on military rail lines and rail facilities, including structures, bridges, tunnels, and roadbeds. The ENCOM stocks construction equipment and materials, such as rails, spikes, ties, and ballast, as planned for and requested by the TRS. The ENCOM is also responsible for constructing and rehabilitating primary electric power sources, third-rail or overhead systems, and lines needed to transmit electric current from these sources for operating electrified railways and railway signaling systems. The overall view of how the ENCOM fits into the maintenance and supply picture is discussed in paragraph 2.7.

The transportation railway service is responsible for planning and recommending to the transportation command (TRANSCOM) the rail facilities that must be constructed or rehabilitated. The plans are coordinated with the engineer command and, when necessary, the TRS furnishes technical advice and assistance and cooperates closely with engineer units. When directed, the railway service aids engineer units to accomplish their tasks.

The TRS rehabilitates within its capabilities, but when major repairs--maintenance requiring major items of construction equipment--must be made, it requests the engineer command to make the repairs and do any necessary construction. Such requests are forwarded through command channels to the transportation command for coordination with the engineer command and for establishment of the work priority.

2.6. TRANSPORTATION COMMAND

The major army transportation headquarters in a theater is the transportation command (TRANSCOM). Its organizational structure consists of a headquarters and headquarters company; an automatic data processing unit (ADPU); a movements control group; a terminal transfer company; and motor, air, water, and rail groups, enabling the command to provide complete transportation and movement services in a theater of operations.

The transportation command exercises centralized control over TASCOM's transportation resources. It commands and controls the transportation groups and operating units assigned or attached to it, coordinates the employment of airlift and sealift allocated to TASCOM, and supervises the operation of the transportation interzonal services. The TRANSCOM's major subordinates include group and battalion level headquarters to command the units performing terminal services, movements management services, and mode operations. In the field army, transportation support is provided by a transportation brigade, which is directly subordinate to the field army support command (FASCOM), and by corps support brigades, which control motor transport and movement units. Air and motor transport are the primary transport modes used in the field army. Rail transport is used if available, but the length of time and the construction effort required to repair combat-damaged rail lines usually make rail operations impossible while the field army commander controls the area. Rail operations in the field army area are part of the interzonal service and are controlled by the TRANSCOM though a portion of the rail capability may be allocated by field army.

2.7. MATERIEL COMMAND

Supply and maintenance are vital to the transportation railway service in a theater of operations. Transportation railway supply may be relatively complex since it could include the support of not only standard U.S. Army equipment but also foreign equipment used in support of military operations. Included in transportation railway maintenance in a theater is that of rail lines and facilities and of locomotives and rolling stock. Such maintenance ranges from rehabilitation of rail systems and major repairs on locomotives and rolling stock to minor repairs accomplished in the units during daily inspections and services. Supply and maintenance for the TRS in a theater are responsibilities held jointly by the TRS, the engineer command (ENCOM), and the Materiel Command (MATCOM). The subparagraphs following explain the responsibilities

of each as they relate to railway supply, maintenance of way, and maintenance of motive power and rolling stock.

a. Railway supply. The supplies needed for operation and maintenance of railways are designated technical supplies. They are classified as follows: class III, operating fuels; class IV, roadway maintenance items; class VII, rolling stock end items; and class IX, rolling stock repair parts. The supply section of the senior railway unit in the theater is responsible for all classes of supply, including end items. The unit obtains the supplies from the appropriate MATCOM depot. The railway car repair company of MATCOM is responsible for issuing repair parts for organizational and direct support maintenance of railway equipment. The engineer command is responsible for stocking material and equipment needed to construct or rehabilitate the railway net.

b. Maintenance of way. Although construction and rehabilitation of a railway's fixed facilities are the responsibility of the engineer command, the TRS is responsible for maintaining both the right-of-way and the equipment used by railway battalions in performing their daily duties. Normally, the transportation railway battalion makes the necessary reconnaissance and develops information for new construction and major maintenance projects. The battalion commander, the maintenance-of-way superintendent, and all TRS railroaders cooperate fully with the engineer command in any new construction or major maintenance projects for the military railroad. At times, by prearrangement, such work is done jointly by the TRS and the engineer command.

Organizational and direct support maintenance are the responsibility of the TRS after the railway is turned over to it. The battalion commander has overall responsibility to see that his division of the railway is maintained properly. The battalion maintenance-of-way superintendent, however, is directly responsible for maintenance of track and structures, for proper supervision of all maintenance work and procedures, and for all necessary inspection of track and structures on the division.

c. Maintenance of motive power and rolling stock. Performing organizational and direct support maintenance on locomotives, rolling stock, and special and captured equipment are TRS responsibilities. The MATCOM, however, has some maintenance responsibilities for this equipment.

(1) Motive power. Organizational and direct support maintenance as well as daily or trip, monthly, quarterly, and

semiannual inspections are taken care of by the TRS. Units of the MATCOM make the annual inspection of motive power; however, the TRS makes the annual inspection if there is no MATCOM in the theater.

(2) Maintenance of rolling stock. Organizational and direct support maintenance are responsibilities of the TRS. Organizational maintenance is performed by operating units and by car inspectors at the train's originating point and at en route inspection points to insure safe movement. Airbrakes, running gear, and other parts are inspected; journal boxes are examined and lubricated. For ambulance trains and cars, the ambulance train maintenance sections and crews take care of those items just mentioned; in addition, their responsibilities include stocking of other than medical supplies--fuel, water, ice, etc.; placing cars on and removing cars from pre-cooling or heating facilities; and operating and controlling heating, air-conditioning, and car-lighting equipment. Direct support maintenance is done by the railway equipment maintenance company and the mobile workshop. Such maintenance consists of providing safe operation of freight equipment and comfortable operation of passenger and hospital cars. General support (GS) maintenance is taken care of by the diesel-electric locomotive repair company and by the car repair company of the materiel command. Not only does this GS maintenance activity support the maintenance overflow from direct support but also takes care of the heavy maintenance involved in stripping, assembling, erecting, and painting railway cars and in assembling and inspecting knocked-down new equipment brought into the theater.

(3) Maintenance of special and captured equipment. The TRS is responsible for maintaining such special equipment as that used on wreck trains as well as wreck and other cranes, heavy roadway equipment, tools add engine-house machinery, and other similar equipment. Captured railway equipment that may have been taken over for operation is repaired and serviced by the TRS before being sent out on the line.

2.8. THEATER ARMY AREA COMMAND

The mission of the theater army area command (TAACOM) is to provide direct support, except medical, communications security (COMSEC), map supply, and ammunition, to the theater army support command, to units passing through or located in the COMMZ, and to other forces as directed by the TASCOM commander. The TAACOM is also responsible for rear area protection (RAP) within the COMMZ.

Assigned to the TAACOM are area support groups. Through them, the TAACOM accomplishes its combat service support and RAP missions. Based on densities of military units and materiel to be supported, political boundaries, and identifiable terrain features, the groups are assigned areas of responsibility within the COMMZ and are deployed throughout it. Each group provides direct support to approximately 15,000 troops; with additional units attached or assigned, it can support up to 30,000 troops. Since the group has no organic rail transport capability, the transportation command provides rail transport whenever the group requires it.

2.9. UNITED STATES ARMY STRATEGIC COMMUNICATIONS COMMAND (THEATER)

Construction and rehabilitation of wire circuits for dispatching trains and administering military railroads, as well as maintaining certain communications, are the responsibility of the United States Army strategic communications command (theater) (USASTRATCOM (theater)). The TRS plans this work and coordinates with USASTRATCOM (theater) in getting the job done. The USASTRATCOM (theater) supplies any communications and signaling equipment not organic to the TRS and is responsible for stocking signal and communications supplies and equipment. It is also responsible for maintaining communications systems for military railways; however, when all circuits along the line are turned over to the TRS for its exclusive use, they are then maintained by the TRS. When communications circuits are used jointly by the TRS and other agencies, maintenance is the responsibility of the USASTRATCOM (theater). Such joint use is allowed only by directive from higher command.

When land lines are damaged and inoperable, the USASTRATCOM (theater) provides an automatic radio communications system, when approved by the theater commander, until land communications can be reestablished. A radio repair team is provided and attached to the railway battalion to supervise the installation of this radio equipment and to maintain and repair it while it is in use. However, the railway battalion operates the equipment.

2.10. MILITARY POLICE

A military police battalion, railway guard, is attached to the transportation command on the basis of one battalion for each transportation railway group. Assigned to the military police (MP) battalion are MP companies--one company for each transportation railway battalion. Normally, the companies remain under the command of the MP battalion while providing guard service to the railway battalion.

Military police units are assigned to the TRS for one specific purpose: the protection and security of trains and their lading. The MP's guard trains and freight en route, and guard cars or trains in rail yards. Traincrews and guards work closely together; maximum cooperation between them is necessary to provide adequate railway security.

2.11. CIVILIAN AGENCIES

The transportation railway service coordinates its rail operations with civilian railway agencies. Coordination normally begins with the start of military railroad operations and ends only when United States forces leave the theater. During the planning stage of a phase II operation, this coordination is particularly important since civilians will be used in running the railroad and a good relationship must be established for the later phase III operation.

Those working with civilian railroaders should have been instructed in personnel management. Sound management principles are the same anywhere in the world; praise and fair treatment get the same reaction from people everywhere. Before assuming supervisory duties, those in the TRS who will work with local civilians should become familiar with their habits, customs, laws, language, religion, and economic and political views. Supervisors will then better understand why the civilians work the way they do. For example, if men don't appear for work on a particular day, it may be a religious holiday; if they take time out at a definite period each day, it may be the customary tea or siesta time. These breaks must be known and, if possible, allowed for even if the volume of work is reduced because of them.

2.12. SUMMARY

A good working relationship must be maintained between the transportation railway service and other military agencies and commands. Each assists the other. The theater army support command is a major subordinate command of theater army that has six commands to carry out its mission. The personnel command provides general support personnel, administrative, and other such services to the theater. The medical command's ambulance trains are pulled by TRS motive power. The TRS schedules, operates, and maintains the trains. Such maintenance is taken care of by ambulance train maintenance units. The TRS depends on the engineer command to construct, rehabilitate, and perform major maintenance on military rail lines and such facilities as bridges, tunnels, and roadbeds. After making a reconnaissance of rail lines, the TRS develops plans

for the work needed on them; these plans are then coordinated with the engineers who do the work.

The transportation command provides complete transportation and movement services in a theater of operation through its motor, air, water, rail, and other organizations; the TRANSCOM also operates the transportation interzonal service.

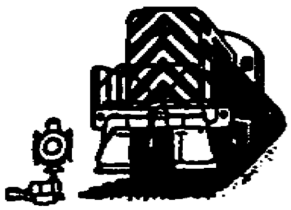
The materiel command works closely with the TRS in rehabilitating rail systems, and in making major and minor repairs on locomotives and rolling stock. The senior railway unit in the theater is responsible for furnishing all supplies, and obtains them from the appropriate MATCOM depot. The theater army area command provides direct support, except medical and ammunition, to TASCOM, to units passing through or located in the COMMZ, and to other forces as directed. Rear area protection in the COMMZ is also TAACOM's responsibility. The command accomplishes its mission through area support groups.

The United States Army strategic communications command (theater) is responsible for constructing and rehabilitating wire circuits needed for train dispatching and the administration of military railroads, and also for maintaining certain communications. The TRS plans this work and then coordinates with the USASTRATCOM (theater). If land communications have been damaged and are inoperable, the USASTRATCOM (theater) provides a radio communications system, supervising its installation and repairing the radio equipment while in use; however, the TRS operates the equipment.

Military police provide protection and security for trains and freight while en route and in rail yards. Close coordination is maintained between the transportation railway service and civilian railway agencies as along as our forces are in foreign territory.

Chapter 3

PROCEDURES FOR TRAIN OPERATION



3.1. GENERAL

When it has been determined that the transportation railway service will operate trains in support of military activities in a theater, many things must happen and any officer involved in the planning must know how to make them happen efficiently and in proper order. If you were involved with the rail transport effort, you would need to know the scope and purpose of the military mission. You would collect and evaluate all the data you have on the rail net in the area of operation. From it, you would determine which lines and what facilities you would use, what TRS units would be required to conduct train operations over the selected rail net, and how much rehabilitation and construction effort would be necessary to make it operational as quickly as possible. You would also have to determine what kind of equipment you would need, how much of it was already on hand in the theater, and how much more you would have to bring in to get the job done. After the rail net is selected, the TRS units are phased into the area, and the lines are opened for operation, you must be able to decide which method of train operation would be the most efficient.

This chapter discusses the types of trains normally found in a theater of operations, the establishing of rail operations, and the methods of train operations. The rules given are not rigid but are, of necessity, flexible enough to meet the ever-changing requirements that combat imposes. However, they have proved effective in the past and may be expected to be effective in future military operations.

3.2. TYPES OF TRAINS

Trains operating over military railroads are designated according to the freight they carry or according to the equipment on the train. The primary types of trains found in a theater are freight, passenger, work, wreck, and ambulance.

a. Freight trains. Through freight trains make long hauls at relatively fast speeds; they handle the bulk of supplies needed for military operations in a theater. When necessary, freight cars may be used for large troop movements; in such a haul, the trains are classed as passenger trains. In contrast with through freights, local freight trains operate at much slower speeds and make frequent stops at small stations.

b. Passenger trains. Through passenger trains are used to move passengers, express, and mail over long runs. Local passenger trains may operate at a relatively slow speed and make frequent stops at small stations.

c. Work trains and wreck trains. Work trains carry equipment and workmen to maintain railways and rail facilities. Wreck trains carry heavy equipment to remove disabled trains or wrecks from the rail lines so that train operations may continue. Work and wreck trains do not carry passengers or freight.

d. Ambulance trains. Normally, most patients removed from the combat zone by surface transportation are evacuated by ambulance trains. Through TRANSCOM's movements control center (MCC), the TRS furnishes the medical command (MEDCOM) the motive power, operating crews, and maintenance for ambulance trains. The responsibility for the movement priority of such trains lies with the TRS. They have priority over all other trains except those necessary to meet emergencies affecting combat forces, for example, an ammunition train. The TRS also performs running repairs on ambulance trains; one direct support ambulance train maintenance crew is assigned to each ambulance train. Red Cross markings are displayed on all ambulance trains, as provided for in the Geneva Conventions. Normally, these trains operate from railheads in or near the combat zone to ports, airports, or terminals at the rear of the theater. The MCC furnishes the MEDCOM with a train schedule regarding pickup and destination stations.

3.3. ESTABLISHING RAIL OPERATIONS

In the initial phase of military operations in a theater, establishing rail transportation is a difficult task; however, certain procedures have been set up for use in starting rail service. The exact order does not matter greatly since many of the functions, discussed in the following subparagraphs, may be accomplished concurrently.

a. Phasing in of rail units. Naturally, the first step is moving rail units into the objective area. This is accomplished in

three echelons: the advance party, the main body, and the rear echelon. Limited rail operations may be started within a few hours after the military railroaders have arrived.

b. Reconnaissance. The second step is the reconnaissance of the railway net and rail facilities. Although the highest TRS command unit is responsible for reconnaissance of captured or liberated railway lines, the railway battalion makes the actual reconnaissance. During the planning stages of theater operations, the transportation railway service is normally provided with aerial reconnaissance photographs and intelligence data of the objective area. Command decisions are made on the railways which would be most advantageous for rail transportation in support of the military effort. Although general information about the railways is normally known before entering the theater, it is impossible to predict what they will actually be like ahead of time.

Railways, rail facilities, and communications nets are more often than not destroyed or damaged by previous combat. Therefore, when the railway battalions are deployed to tentative locations in the objective area, the first task of their commanders is to find out how much damage has been done to their rail divisions. If necessary, they may get help from higher TRS command units in doing this. This reconnaissance should determine the characteristics of the rail line, usefulness of existing facilities and equipment, and availability of civilian railroaders. Collected information is forwarded to the highest transportation railway service supervisory unit in the theater.

c. Evaluation and deployment. The highest TRS command in the theater makes final judgments on the capabilities and limitations of the railway lines and facilities to be used. After determining the method of operation to be used, it issues the necessary instructions for rail operations. Subordinate rail units are oriented on the characteristics of the rail lines and the operation to be undertaken; after they are deployed, rail operations begin.

3.4. METHODS OF OPERATION.

The transportation railway service uses any and all railway facilities found in a theater of operations. Although railway signals and communication lines are important for safe and efficient operation, it is not reasonable to expect to find them ready for use. Any form of centralized traffic control, interlocking plants, and automatic block signaling devices are usually damaged or destroyed.

Such devices are easily sabotaged, and damage to them can pose a serious hazard to moving trains safely.

Four methods of train operation aid in overcoming the difficulties encountered immediately upon entry into a theater. Careful plans should be made in determining the proper method for early railway operations; any one or a combination of methods may be used. The four methods of train operation are fleet, manual block, train order, and timetable. They are discussed in that order in the four main paragraphs that follow; important points about the four methods are summarized in table II which follows paragraph 3.8.

3.5. FLEET OPERATION

During the early stages of theater development, before communications are established and before railway sidings are rehabilitated or constructed, the fleet operation is used. The primary advantage of this method is its simplicity. Loaded trains move forward for specific periods, normally 4, 8, 12, or 24 hours. At the end of the designated period, empty trains return toward rear areas for a corresponding period.

Figure 3.1 shows a railway as it might appear in an undeveloped theater. Imagine that the forward area of the combat zone is just forward of railhead A, and the remainder of the railway north of it is in enemy hands. The theater has not yet expanded far enough to establish a communications zone, and the sidings at stations X and Y are not usable. A single-track railway runs from the port terminal to the railhead. Locomotives and railway cars are ready to begin fleet operation. Railhead A can accommodate four trains at one time.

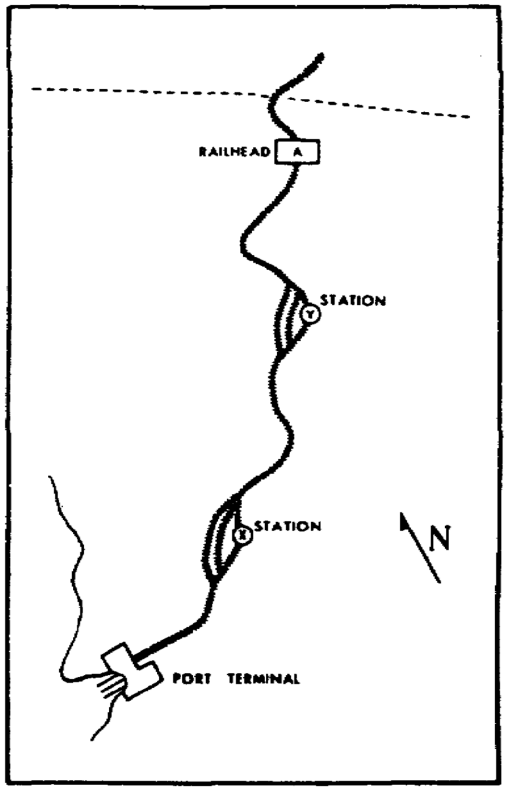


Figure 3.1. Railway Net in Unexpanded Theater.

Four trains are sent out at 1-hour intervals from the port terminal to the railhead. It takes 10 hours running time for each train and 10 hours to unload each train at the railhead. Therefore,

the forward-movement time of the four trains is 24 hours--10 hours running time, 10 hours unloading time, 1 hour between trains, and 1 extra hour for any unexpected delay. The rear-movement time is also 24 hours, assuming that loading time at the port terminal is 10 hours; again, 1 extra hour is allowed for unforeseen delays.

This is how the schedule might work out. Train No. 1 would leave the port terminal at midnight and arrive at railhead A at 1000 hours; train No. 2 would leave at 0100 hours and arrive at 1100 hours; train No. 3 would leave at 0200 hours and arrive at 1200 hours; and train No. 4 would leave at 0300 hours and arrive at 1300 hours. Since unloading would begin on each train as it arrived at the railhead, all four trains would be unloaded by 2300 hours. Leaving 1 hour for unforeseen delays, train No. 4 would be the first to leave the railhead at midnight and begin the empty run back to the port terminal. It would be followed at 1-hour intervals by the other three trains in reverse order from their forward movement. When they arrive at the port terminal, they would be loaded and ready to begin a return trip at midnight on the following day. This completes the first cycle of fleet operation; it is tabulated below.

Fleet Operation from Port Terminal to Railhead A

Forward Movement		Rearward Movement	
Leave (PT)	Arrive (RA)	Leave (RA)	Arrive (PT)
Train 1 Midnight	Train 1 1000	Train 4 Midnight	Train 4 1000
2 0100	2 1100	3 0100	3 1100
3 0200	3 1200	2 0200	2 1200
4 0300	4 1300	1 0300	1 1300

With extra locomotives and rail cars at the port terminal, four other trains could already have been made up and be ready to depart when the last empty train arrived. Thus, a new cycle could be started immediately after the last empty train arrived at the port terminal, eliminating the delay of 11 hours.

The fleet method is limited by the capacity of forward terminals or railheads to receive and unload cars; this lowers the number of locomotives and cars that can be used. For instance, since railhead A can accommodate only four trains at one time, many locomotives and cars may be standing idle that might otherwise

be in operation, supporting combat forces and strengthening the military effort.

3.6. MANUAL BLOCK OPERATION

Before a dependable railway communications net is established, the manual block operation method may be used if there are passing tracks or sidings. The railway line is divided into blocks running from station to station. Trains operate from one station to the next, and at each they are either cleared to proceed to the next or held until the track to the next station is clear. The train moves from one block to the next only when the station agent at one station gets permission from both the station agent at the next station ahead and the train dispatcher. Thus, the station agents are always aware whether another train is in the block.

The two kinds of manual block operation are permissive and positive. In permissive block operation, more than one train may occupy a block of rail at one time if all the trains are moving in the same direction. In positive block operation, only one train is allowed in a rail block at any one time. This method is normally used when the railway line is subject to guerrilla attack, enemy action, or sabotage. If the track is blocked, this method allows the train to back up to the nearest station. Positive block operation would normally be used in forward areas.

With the aid of annex A, follow the moves on a railway net where manual block operation is being used. Printed down the left side of the annex are cutout blocks representing the six trains involved in the operation. Cut out the blocks, and place them on the railway net as tabulated below and as shown in figure 3.2. Now set the annex to one side and as the text describes each train's move, change the train to its new position.

Train No.	Position
Extra 551 South	**At railhead A**
Extra 77 North	**On curve below railhead A**
Extra 91 North	**Opposite station Y**
Extra 533 South	**South of station Y**
Extra 109 South	**North of station X**
Extra 44 North	**Outside port terminal**

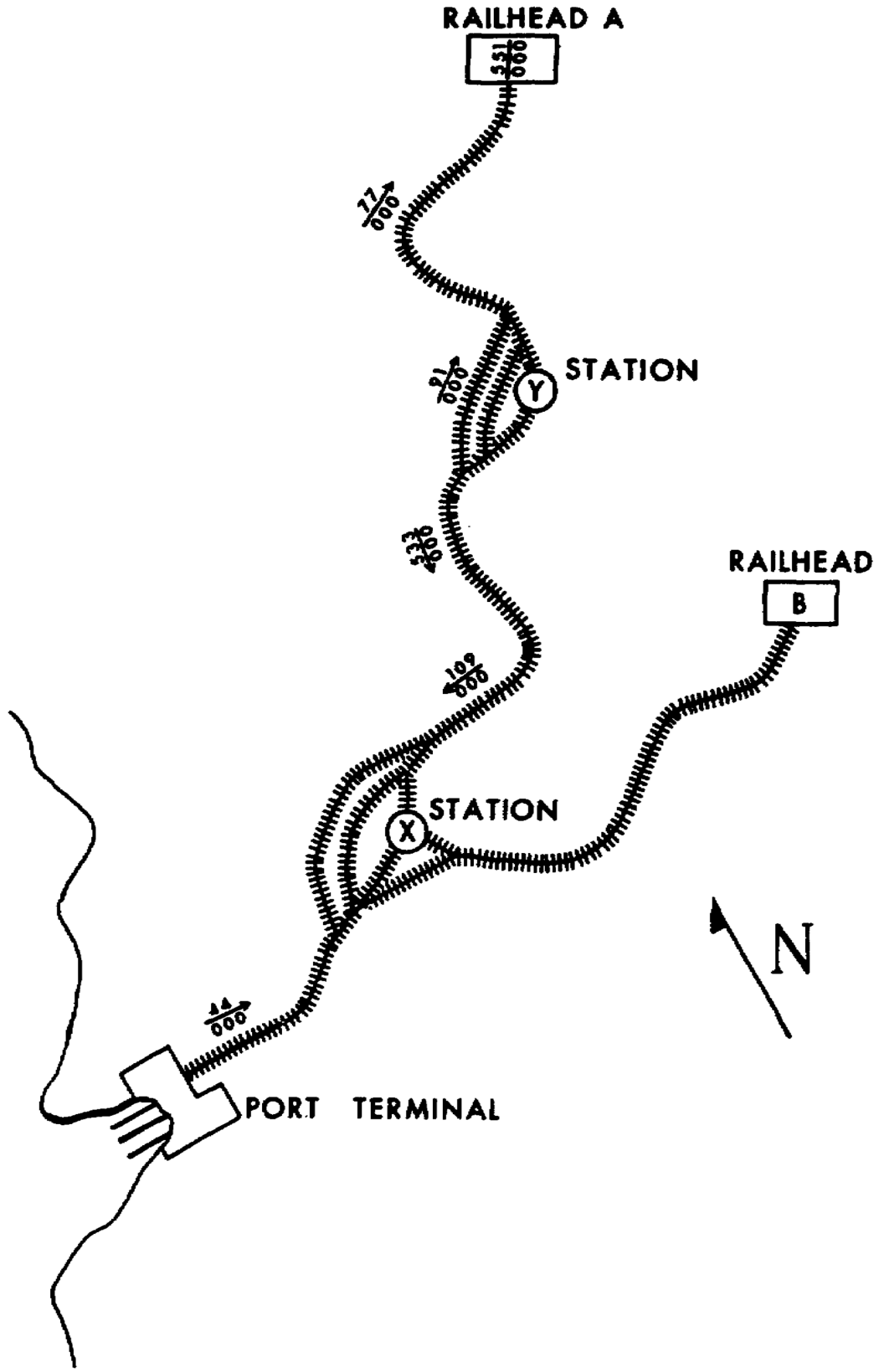


Figure 3.2. Initial Positions of Trains on Railway System Using Manual Block Operation.

Note that this railway net is a single-track line that connects the port terminal with railhead A and passes through stations X and Y. Both X and Y have adequate sidings. Because the track and facilities from Y to A are subject to guerrilla action, positive block operation is used for this segment of line. However, since the line from port terminal to Y is reasonably secure from enemy attack, permissive block operation is being used for that segment. Our problem is to move train No. 44 from its position at the port terminal to A.

Normally, any train moving toward the forward area has priority over trains headed to the rear. So, No. 44 leaves for X and is the only train on that block of line. Trains 109 and 533 have both departed Y for X. This is allowed in permissive block operation. Train 91 is on a siding at Y and cannot proceed toward A until No. 77 has reached A because positive block operation allows only one train within any block at one time. Since train 551 is rear-bound, it must wait at A until both 77 and 91 reach that terminal because they have priority over 551.

Now for the next move, as depicted in figure 3.3. Number 109, reaching station X, takes the siding there; No. 44 reaches X and waits there for the arrival of 533. Meanwhile, No. 77 reaches railhead A and No. 91 departs Y for A. Number 533 is delayed getting to X because of a temporary breakdown.

In the next move, is shown in figure 3.4, No. 91 arrives at A and No. 551 leaves A for Y. Number 533 arrives at X and takes a siding. Number 44 leaves X and arrives at Y where it must wait the arrival of No. 551. The stationmaster at Y learns that No. 77 is ready to depart railhead A on an empty run to the rear. He orders 77 to hold at A because No. 44 is headed toward the forward area and has priority over No. 77. When No. 551 arrives at Y, No. 44 proceeds to A. Our problem is now complete.

Although manual block operation is less efficient than train order and timetable, it provides a relatively safe method for early train operations in a theater. Many foreign countries use manual block operation.

3.7. TRAIN ORDER OPERATION

A more efficient and flexible method is train order operation. It is started after dependable communications have been established, and adequate railway sidings have been provided. Trains operate on orders from the train dispatcher at the railway battalion's

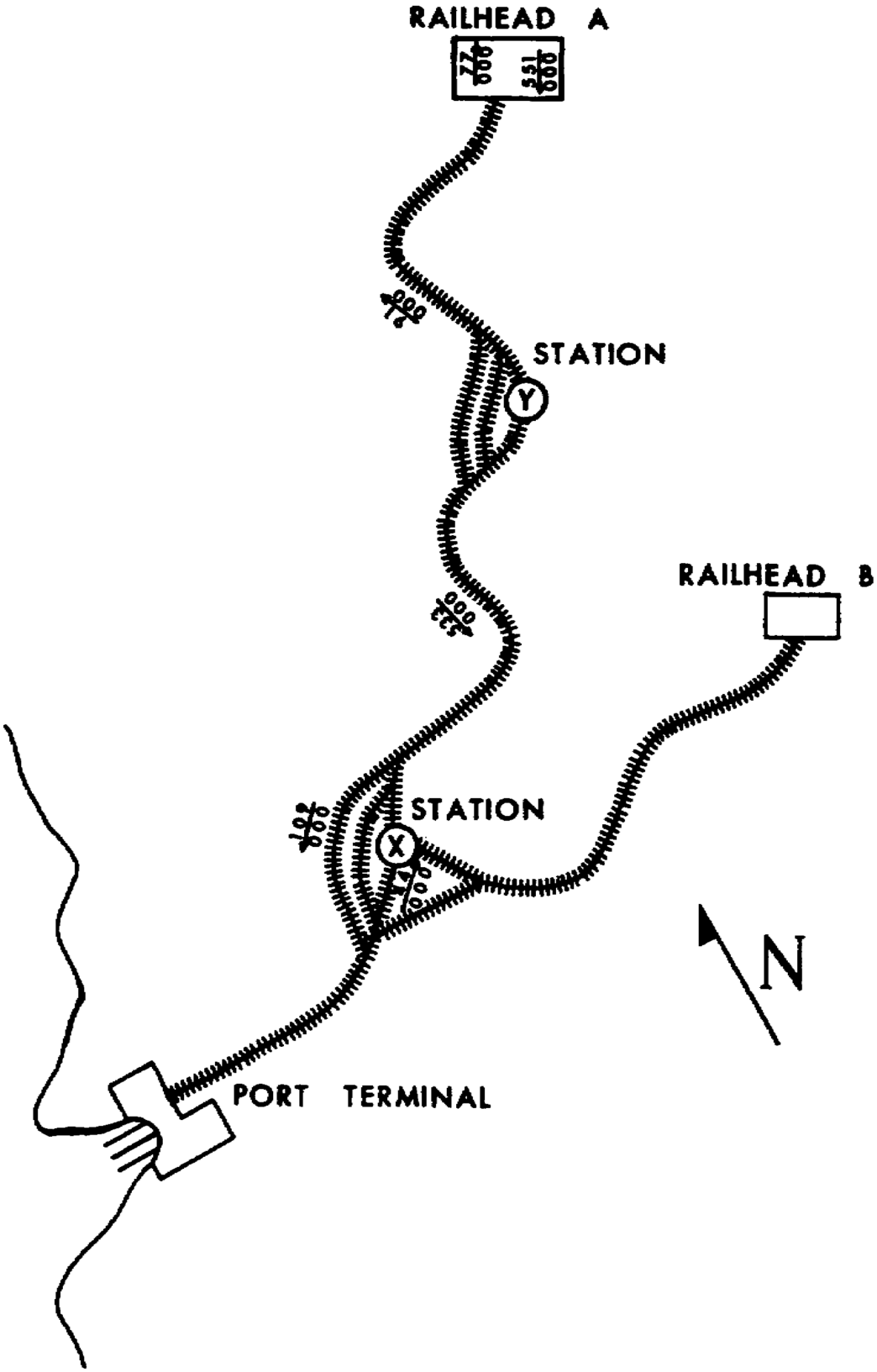


Figure 3.3. Second Positions of Trains on Railway System Using Manual Block Operation.

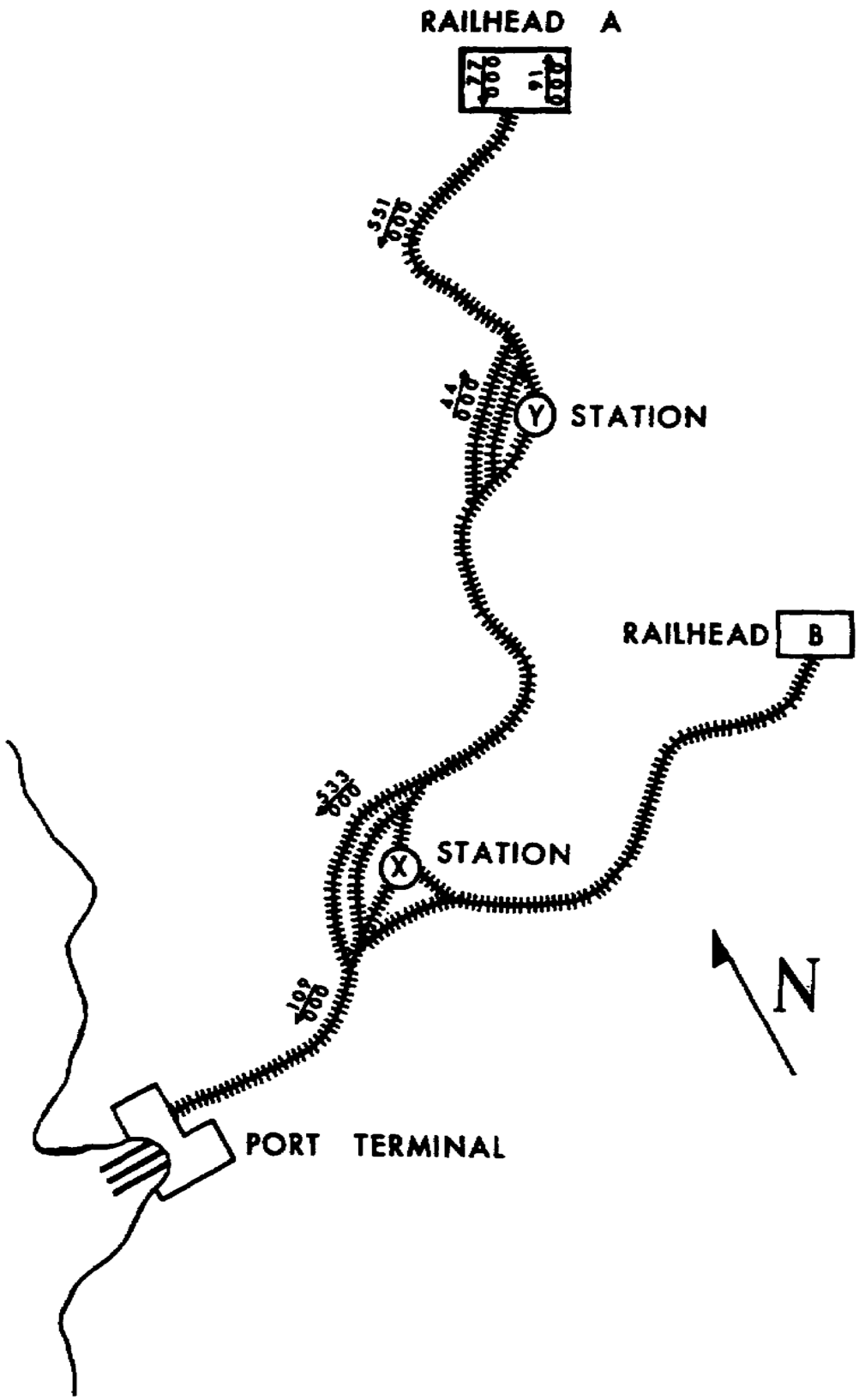


Figure 3.4. Final Positions of Trains on Railway System Using Manual Block Operation.

headquarters to station agents at rail stations. The order is issued by telephone to the station agent who writes it down and repeats it orally to the dispatcher as a check for accuracy. The station agent gives one copy to the engineman and one to the conductor.

Suppose that train order operation were in effect for the railway net illustrated in figure 3.2. The train dispatcher at battalion headquarters at the port terminal wants to dispatch train No. 44 to railhead B and give that train priority over all other trains operating on the division. He would call the station agent at X and tell him to hold train No. 109 there until No. 44 clears that station. This method is superior to manual block operation because it is more efficient and flexible. It accelerates train movements by allowing the meeting and passing of trains on single tracks to be arranged and changed, and train superiority can be conferred or reversed. In train order operation, all trains are extra; none are run on a schedule.

3.8. TIMETABLE OPERATION

The timetable method is not used until rail traffic in a theater has been stabilized. As the title suggests, a timetable is provided that contains a schedule of regular train movements and any special instructions on the characteristics of that particular railway. It gives each listed train the right to occupy a portion of track at a given time; it tells who must wait for whom, who must take the siding, and where. Each member of the traincrew must have a copy of the timetable on his person at all times while on duty. Extra trains may be run on train order from the dispatcher; they are not listed in the timetable. An extra train must clear the main line without interfering with trains on the timetable unless the extra is given right by a train order over the scheduled trains. Although it is possible that rail operations in a theater would consist entirely of extra trains, timetable operation is normally used with train order and manual block operation to provide more flexibility.

3.9. SUMMARY

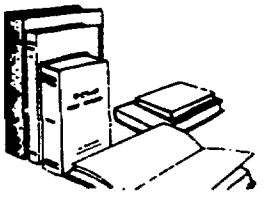
Freight, passenger, work, wreck, and ambulance trains are all normally operated in a theater of operations. After the rail net is selected, the TRS units are phased into the area, and the lines are opened for operation, the most efficient method of train operation must be decided upon. The four methods of operation are fleet, manual block, train order, and timetable. Fleet operation, normally conducted in forward areas, is used before communications are established and before railway sidings are usable. It is simply a

Table II. Methods of Train Operation

Method	When Used	Advantages	Remarks
Fleet Operation--loaded trains move forward for a specific period: 4, 8, 12, or 24 hours; empty trains return to rear for a similar period.	In early stages of theater development before communications are established and before sidings become usable.	Simplicity.	Limited by forward terminal or railhead capacity to receive and unload cars, thereby lowering the number of locomotives and cars that can be used.
Manual Block Operation--trains operate from block station to block station on authority of TRS block station agents or on dispatcher's train orders. In permissive-block operations, more than one train traveling in the same direction may occupy the same block; therefore, rear end protection is essential. In positive-block operations, use of the block is limited to one train.	Before a dependable railway communications net is established if there are passing tracks or sidings.	Simplicity. Safety.	Normally used in forward areas. Less efficient than train order and timetable methods.
Train Order Operation--trains operate on telephonic orders issued by train dispatcher to block station agents at rail stations who write down the orders, repeat them orally to the dispatcher, and then issue a copy of each to the conductor and to the engineman of each train affected by the order.	After dependable communications have been established and adequate sidings have been provided.	Accelerates train movements. Train superiority can be conferred or reversed.	Superior to manual block operation because of its greater efficiency and flexibility.
Timetable Operation--trains move on basis of regularly scheduled printed timetable which lists trains by number, superiority, class, etc., and contains their schedules and any special instructions relating to their operation.	After rail traffic in theater has fully stabilized.	Most efficient of the four methods.	Used with manual block and train order operations to afford maximum flexibility because military train operations normally consist of extra trains not shown in timetables.

method where loaded trains run forward for a given period and then the empty trains return toward the rear for an equal period. Manual block operation is also used before a railway communications net is established. Trains run from one block station to the next, having permission from the train dispatcher and the block station agent. In permissive block, more than one train may occupy a block at the same time, providing they are moving in the same direction. In positive block, only one train may occupy a block at any one time; this allows the train to back up to the station in the rear if it is attacked.

Train order operation, started after dependable communications are established and sidings are usable, is more efficient and flexible than fleet or manual block. Trains are operated under orders from the train dispatcher to block station agents. The agent writes the order and repeats it back for accuracy. One copy is given to the train conductor and one to the engineman. Train movements are expedited because meeting and passing of trains can be arranged or changed, and train rights conferred or reversed. Timetable operation, used after rail traffic has been stabilized, is the most efficient method. The timetable gives a train the right to occupy a stretch of track at a specified time; it tells which train has right over another train and which one must take the siding and where. In a theater, timetable operation is normally used with train order and manual block operation to provide more flexibility.



Appendix I

REFERENCES

Army Regulations

AR 310-25	Dictionary of United States Army Terms
AR 310-50	Authorized Abbreviations and Brevity Codes

Field Manuals

FM 54-7	The Theater Army Support Command
FM 55-1	Army Transportation Services in a Theater of Operations
FM 55-20	Army Rail Transport Operations

Technical Manuals

TM 55-200	Railway Operating Rules
TM 55-206	Railway Train Operations



Appendix II

GLOSSARY

Ballast--selected material placed on roadbed to hold track in line and surface; preferably consists of hard particles, easily handled in tamping, which distribute the load, drain well, and resist plant growth.

Combat service support--assistance provided operating forces, primarily in the fields of administrative services, chaplain service, civil affairs, finance, legal service, maintenance, medical service, military police, replacement, supply, and transportation.

Combat zone--that part of the theater of operations in which combat troops actively engage the enemy.

Communications zone (COMMZ)--rear part of theater of operations behind and adjacent to the combat zone that contains the lines of communication, establishments for supply and evacuation, and other agencies for the immediate support and maintenance of the field forces.

Dispatcher--individual who has complete charge of train movements over main tracks.

Division--that portion of a railroad, 145 to 241 kilometers long, assigned to the supervision of a railway battalion commander.

Double-track main line--main line having two tracks, one for movement in one direction and the other in the opposing direction.

Engineer command (ENCOM)--mission command of TASCOM that provides general construction support to Army, Air Force, and other services operating in the COMMZ, and general topographic support to the field armies, TASCOM, and other services in the theater of operations.

Extra train--train not authorized by a timetable schedule.

Fleet operation--method of train operation in which loaded trains move to forward areas for a specified period and then empty trains are moved to the rear for a similar period.

Guerrilla warfare--combat activities carried out by irregular, predominantly indigenous forces, frequently in small groups, in enemy territory.

Interzonal service--highly centralized activities crossing sectional boundaries to provide a common-user service.

Line of communications--land, water, or air route that connects an operating military force with a base of operations and along which supplies and reinforcements move.

Manual block operation--method of train operation in which trains operate from one station to the next (a block) where they are either cleared to proceed to the next or held until the track to the next station is clear. Such operation may be permissive or positive. See Permissive block operation, Positive block operation.

Materiel command (MATCOM)--mission command of TASCOM that provides general support supply and maintenance services to U.S. forces and any other element in the theater as directed.

Medical command (MEDCOM)--mission command of TASCOM that provides COMMZ-level medical support within a theater of operations and includes all medical units in the COMMZ.

Meet--procedure whereby two opposing trains meet at a designated location.

Mission command--organization established to perform a specific task, function, or requirement.

Outsize equipment--any equipment exceeding, in height or width or both, the restrictive clearances of tunnels and other track structures.

Permissive block operation--method of manual block operation of trains in which more than one train may occupy a block of rail at one time. See Positive block operation.

Personnel command (PERSCOM)--mission command of TASCOM that directs, coordinates, and provides general support personnel, administrative, fiscal, accounting, morale, internment, custodial, crime laboratory, and graves registration services to the theater.

Phase I operation--initial operation of railways by the military upon successfully establishing a lodgment in a theater of operations and in all areas of the theater subject to enemy action.

Phase II operation--joint civilian-military railway operation, with military in control, in a theater of operations after combat forces move forward and COMMZ is fairly stable and secure. That railway operation in a theater initiated after phase I operations cease.

Phase III operation--railway operation carried out by civilians, under military supervision, usually in the rear area of a theater of operations. That railway operation in a theater initiated after phase II operations cease.

Positive block operation--method of manual block operation of trains in which only one train is allowed in a rail block at any one time. See Permissive block operation.

Rear area protection (RAP)--actions taken to prevent and neutralize local damage or enemy threats to units, activities, and installations in the rear area and those actions taken before, during, and after attacks to avoid or minimize the effects of enemy actions, major accidents, or natural disasters.

Roadbed--finished surface of roadway upon which track and ballast rest.

Roundhouse--engine stalls placed in a circular position, usually forming 50 to 80 percent of a circle, in which engines are inspected, serviced, and repaired.

Siding--track auxiliary to main track for meeting or passing trains.

Spur--short track with a dead end.

Theater army area command (TAACOM)--operating command of TASCOM that provides direct support, except medical and ammunition, to TASCOM, to units passing through or located in the

COMMZ, and to other forces as directed by the TASCOM commander; also responsible for rear area protection within the COMMZ.

Theater army support command (TASCOM)--major subordinate command of theater army that provides combat service support to U.S. Army forces as directed. Six commands carry out TASCOM's mission: personnel, medical, engineer, transportation, materiel, and area support.

Theater of operations--that portion of a theater of war necessary for military operations, either offensive or defensive, pursued according to an assigned mission and for the administration incident to such military operations.

Timetable operation--method of train operation, used in a stabilized theater of operations, in which trains operate according to a printed schedule of regular train movements and special instructions for that railway.

Train order--written order from a dispatcher to a train crew giving instructions and authority to proceed over specific sections of a railroad.

Train order operation--method of train operation in which trains move on orders from the train dispatcher to the station agents at rail stations.

Transportation command (TRANSCOM)--major transportation headquarters in a theater.

Transportation railway service (TRS)--the command, supervisory, operating, maintenance, and service units needed to operate railway trains, maintain railway lines of communications, and perform organizational and direct support maintenance of locomotives and rolling stock in a theater of operations.

United States army strategic communications command (theater) (USASTRATCOM) (theater)--agency that provides army signal communications within the COMMZ.

Wye track--section of track laid out in the form of a Y to be used for turning locomotives and equipment.

Yard--system of tracks within defined limits, providing for making up trains, storing cars, etc.

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