

CHAPTER 7

Combat Roads and Trails

HISTORICAL PERSPECTIVES

NEED FOR ROADS

The ability to move personnel, equipment, and supplies is essential in defeating enemy forces on land. Even before mechanization, the development and maintenance of road and trail networks was recognized as an essential combat mission. In 1887, a Confederate cavalry officer, John S. Mosby, wrote "... the line that connects an army with its base of supplies is the heel of Achilles—its most vital and vulnerable point. "

In World War II. The need for road and trail

networks increased with the use of mechanized fighting systems. During World War II, armor forces achieved rates of march previously unknown. However, their consumption of ammunition and fuel also increased as did the need for supply routes and lines of communication. Road and trail construction was primitive and usually dependent on conventional engineer equipment.

In Vietnam. In Vietnam, the functional need for combat roads and trails was less

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than that for lines of communications. Because networks were underdeveloped or non-existent, major road projects were undertaken. These generally provided main supply routes within the area of operations and were a general engineering mission. Also, the extensive use of helicopters for forward area maneuver, resupply, and evacuation reduced the need for combat road and trail support.

On the AirLand battlefield. The AirLand battle concept once again places emphasis on combat roads and trails. Unlike in the past, friendly combat forces will be widely dispersed for security and survivability reasons. At critical times and locations, units must be able to converge over multiple routes. The need for surprise and availability of engineers rules out extensive route construction or repair. However, there is a constant need for resupply and dispersion of combat units. Thus, there is also the need for rapidly installed combat roads and trails to maintain freedom of movement.

DEFINITIONS

The reconnaissance of routes to determine availability and trafficability differs only slightly from the means and methods used to detect obstacles. With the understanding of force mobility requirements in the forward area, existing road networks are checked for possible cross-country movement. Shortfalls are identified when the need to move or maneuver cannot be supported by the road or trail network. The reconnaissance effort also takes into consideration combat road or trail construction operations. During winter months in cold environments, this will include the feasibility of snow roads for off-route traffic or ice roads across lakes and streams.

Combat trail construction. Combat trails are built primarily for use by tracked combat vehicles as an expedient supplement to the existing road net. They are designed and built to pass a small volume of traffic over a short design life. This could vary from as long as it takes for passage of a tank platoon

to as long as several days. Requirements for construction will vary, based on local conditions. At one extreme, suitable in-place soil and unrestrictive slopes will already exist. At the other extreme, limiting grades will need to be reduced (by cutting or filling), trees cleared, and expedient improvements made to the trail surface.

Combat road construction. Wheeled traffic will be the primary users of combat roads. These lines of communication are designed and built to support a moderate volume of traffic. Accordingly, the construction effort will be more extensive for combat roads than trails. However, expedient techniques are still applicable. Based on the local conditions, a combat road can be characterized by high grades and numerous curves. Follow-on units and engineers can be expected to maintain or upgrade the combat road.

Combat road and trail maintenance and repair. Maintenance includes all actions to correct poor road or trail conditions which result from normal usage. Repair is the effort needed to restore routes due to conditions other than normal use. This includes heavy usage, accidents, enemy fire, and severe weather conditions.

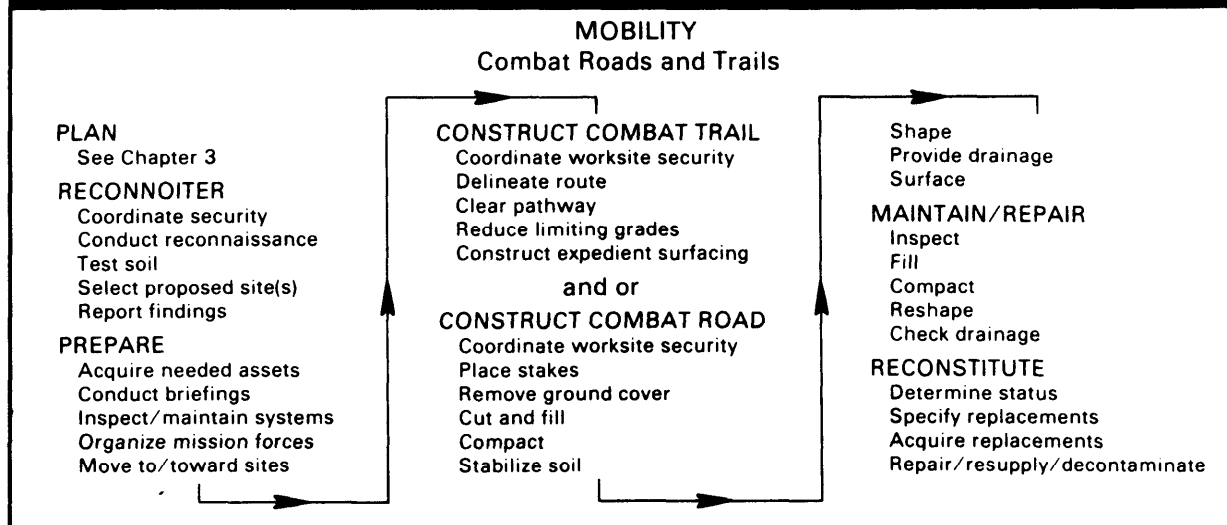
COMBAT ROAD AND TRAIL ACTIVITIES

Combat road and trail activities differ from conventional road construction tasks in several ways. Although the same basic steps are followed, these steps are adjusted for shorter design life and expedient construction. Planning for the use of engineering equipment in the construction of combat roads and trails will be based on the survivability and mobility factors. The combat roads and trails functional area can be divided into seven tasks with each task further divided into several subtasks. Each subtask will vary based on local terrain conditions, tactical situation, and equipment available. Figure 7-1 depicts the relationship of the tasks within the functional area.

Reconnaissance for combat road and trail activities precedes the preparation of forces and equipment. The nature and extent of construction or maintenance is confirmed by

reconnaissance. A decision to construct a new route or trail or to maintain or repair an existing one will depend on the maneuver commander's mission and priorities.

FIGURE 7-1. SUBTASKS FOR COMBAT ROADS AND TRAILS DEVELOPMENT



PLANNING CONSIDERATIONS

THE MOBILITY SCHEME PLAN

Combat roads and trails, as a function of the mobility scheme, help the combined arms team move fast over difficult terrain. Forces can then concentrate for combat, receive logistical assistance, and disperse. The responsibility for improving, repairing, or abandoning combat roads and trails is transferred to follow-on forces. The requirements for combat roads and trails frequently overlap with those for other functional areas of mobility. The establishment of bypasses for mined areas and other obstacles, for instance, may involve combat route construction or repair. Routes through urban rubble and tree blowdown created by nuclear weapons may require expedient construction methods. Similarly, successful gap crossings depend largely on the trafficability to and from the crossing site. To fulfill the combat roads and trails task, continuous reconnaissance and

inspection of the battlefield is essential. Although engineer reconnaissance teams are specifically trained for this task, maneuver force reconnaissance products provide valuable input. The need for construction, repair, or maintenance of the road and trail network is best identified through combined arms team cooperation and intelligence sharing. Figure 7-2 on page 7-4 shows the reconnaissance and inspection process during a combined arms offensive operation.

ROLE OF PLANNERS

The mobility planner analyzes the avenues of approach during the estimating process. The staff engineer, if available to the maneuver operations officer, examines all information pertaining to the existing road network. The recommendation for engineer effort on combat road and trail activity is based, in large part, on this process. As the plan is

developed and orders issued, the mobility planner continues to update an appraisal of the trafficability condition of the road network. The results of route reconnaissance, engineer reconnaissance, and combined arms situation reports provide this data. Engineer terrain analysis teams can provide information on engineering geology, soils, drainage, slopes, and vegetation to the road and trail builder. Engineer reconnaissance teams provide information on the availability of locally procured class four items. Thus, the monitoring of combat road and trail requirements is a continuous process. The ability of the supporting engineer to assist and support combat construction requirements will vary with two considerations.

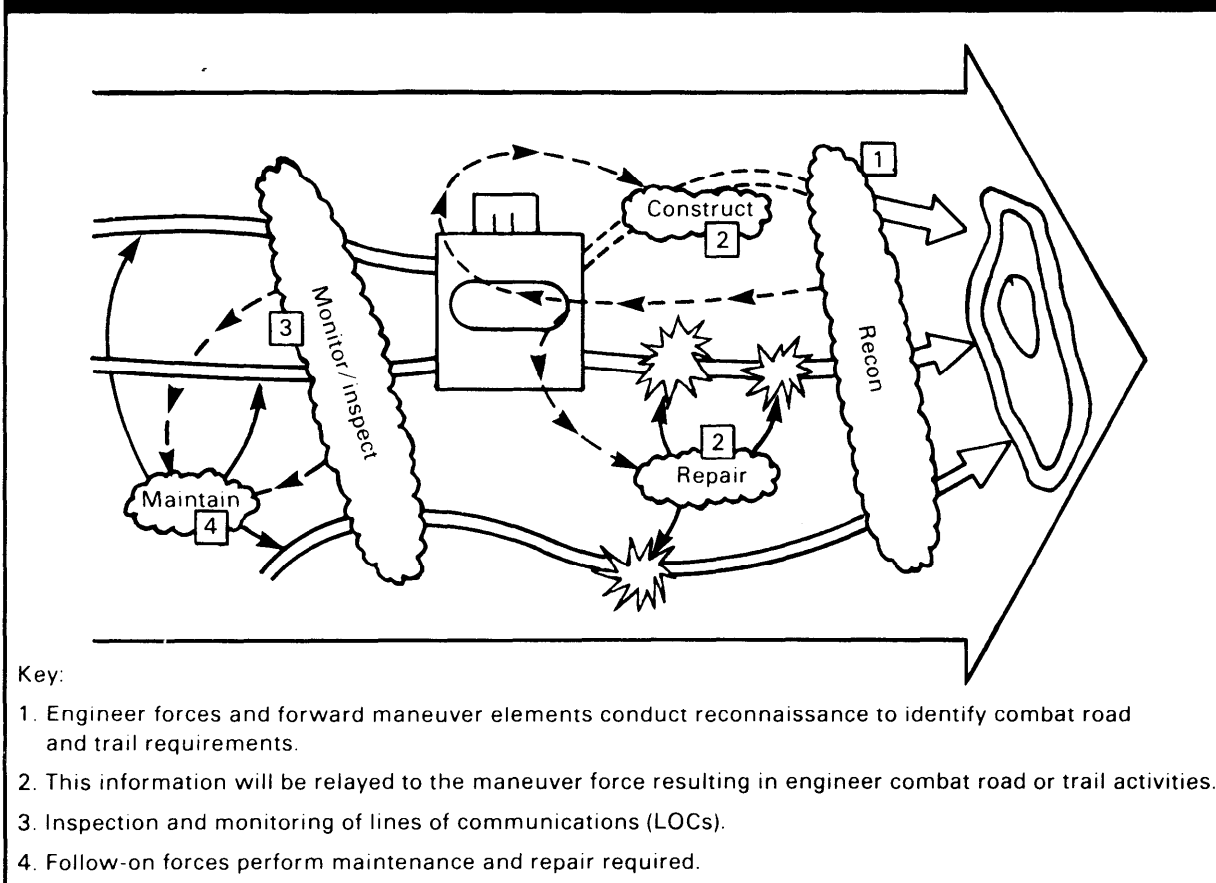
These include—

- The availability of engineer reconnaissance detachments.
- The availability and density of engineer equipment required for combat road and trail activities.

AVAILABLE PERSONNEL AND EQUIPMENT

Within a theater of operations, one divisional and up to four supporting engineer battalions may be required to support each committed maneuver division. The missions of these battalions are coordinated by the division engineer through the G3. Although the construction of combat roads and trails is but one mission in the functional area of mobility, these battalions are equipped with assets to support forward combat construction needs.

FIGURE 7-2. THE COMBAT ROADS OR TRAIL PROCESS



RECONNAISSANCE

TYPES OF RECONNAISSANCE

Reconnaissance may be classified as either area or specific reconnaissance. The first of these refers to a search conducted over a wide area to find a facility site. The second refers to an investigation of a specific site, or a particular undeveloped but potential facility. A facility in this context maybe the possible location for a combat road or trail. Thorough reconnaissance is essential in the selection of roads or trails. It normally starts with a study of available maps and aerial photos. Aerial reconnaissance provides much valuable information. Detailed information, however, is obtained only by ground reconnaissance.

Route reconnaissance. Reconnaissance performed in connection with military lines of communication is referred to as route reconnaissance and is an example of area reconnaissance. It includes information about roads, bridges, tunnels, fords, waterways, and other natural terrain features that may affect the desired traffic flow. Information obtained in a hasty route reconnaissance may be adequately recorded on a simple sketch or overlay. Because of the greater detail obtained in a deliberate route reconnaissance, it may be necessary to support maps and overlays with specifically designed Department of the Army (DA) forms. These formats and their use are fully explained in FM 5-36.

Road reconnaissance. Reconnaissance to check existing roads is called road reconnaissance. An example of a specific reconnaissance, it determines the classification and traffic capabilities of an existing road. It may include enough information for work estimates to bring the road up to certain standards of trafficability. Use DA Form 1248 (Road Reconnaissance Report), depicted in appendix E, to record this information. Maps, overlays, and sketches are used as necessary. Also, the bridge reconnaissance, tunnel reconnaissance, ford reconnaissance, and ferry reconnaissance reports are used when more detailed information is needed.

Their use, along with DA Form 1248, will help to insure a complete, well-organized report.

Location reconnaissance. New road construction is avoided whenever possible to save time and labor. When a new road is necessary, however, the first step is location reconnaissance. This requires an area-type reconnaissance of all possible routes to insure selection of the best. Its main objective is to locate a new road or trail in an area that will hold up under anticipated traffic and meets mission requirements.

Periodic reconnaissance. The conduct of reconnaissance to verify the effects of weather or use is termed periodic reconnaissance. Periodic reconnaissance of military lines of communication is necessary to update the road situation in a specific area. A situation map is prepared showing the current condition of roads, density of traffic, need for maintenance work, and results of various methods of maintenance.

Periodic reconnaissance is especially important during frozen, wet, or unusually dry weather to determine the effects of these conditions. Maintenance requirements based on periodic reconnaissance must be coordinated with the units using the roads. This insures that engineer effort will not be spent on roads that are no longer needed and that engineer crews will not interfere with the movement of critical convoys.

PRINCIPLES OF LOCATION

Maximum use should be made of all existing facilities. In most areas of the world, an extensive road net of varying quality already exists. Where possible, this should be used to the fullest. In most cases, expansion of the roadway and preparation of adequate surfaces are all that is needed. The first step in construction is selection of the best possible location for the facility. A project site that is not well selected may not meet the requirements of the mission with respect to capacity,

usability, or convenience. A poorly-selected site is sure to cause future problems.

Mission. The most important factor in selecting a site is mission fulfillment. Every line of communication must be built to accomplish a specified mission in the most direct and efficient manner possible.

Future expansion. Another important factor in selecting a site is its potential for future expansion. The unpredictability of military operations often requires engineer troops to modify and expand previously completed construction. A road or trail that is adequate today may be inadequate for follow-on operations. Improvement and expansion is a continuing job on all combat roads and trails. The ability to expand an existing route or facility will conserve labor and material and will permit more rapid completion of the project. Specific data and instructions for constructing combat roads and trails can be found in FM 5-34 and TM 5-330.

Soil and rock characteristics. In order to meet the design standards of strength and stability and to minimize the need for removal of undesirable materials, all roads and airfields should be located on terrain with the best possible soil conditions. Obviously, the best soil characteristics will minimize the construction effort and result in a better facility. Before locating any route of communication, consider the general geology of the area. Rock in sizable quantities anywhere along a construction project will present removal problems. Rock outcroppings are more likely to occur in hilly terrain than in flat or rolling country.

Drainage. Unless the soil is free-draining, long stretches of flat ground should be avoided because of drainage problems. The need for drainage structures should be minimized. The bottoms of valleys or other depressed areas should be avoided because they tend to collect water.

Topography. Excessive grades should be

avoided, and steep hills bypassed whenever possible. If very steep hills must be crossed, the route should run along the side of the hill rather than directly over it. This may result in a longer route but will generally be more economical. The amount of earthwork and ground cover to be removed should be minimized. Several factors should be considered.

- **Earthwork.** Earth-moving is the biggest job on any road or trail building project. This can be minimized by following contour lines over hills and valleys. Excessively deep cuts or high fills should be avoided. If possible, all earthwork should be balanced. When both cutting and filling are needed at various points along a project, the material excavated is used to construct the needed embankments.
- **Ground cover.** When crossing wooded areas, trees must be cleared before actual construction can begin. In heavily forested areas, this can be a sizable task. Therefore, all routes should avoid areas where large amounts of clearing are necessary. If this is not possible, the route should be located through areas where the clearing can be classified as light.

Required area. Combat roads or trails constructed over rolling or flat terrain seldom require more area than that necessary for the roadway itself. Road construction requiring deep cuts or fills will require greater areas and effort.

Tactical considerations. Combat routes in the forward area are built according to the tactical situation with little regard for design. In this case, several factors are considered.

- **Defilade.** To avoid enemy observation and direct fire, combat roads and trails are located in a defilade position on the back side of a hill or in a ravine, where possible.
- **Camouflage.** When it is necessary to construct a road or airfield in an exposed location, every effort is made to take

advantage of natural and other camouflage.

- Sunny slopes. If tactical concealment is not a consideration (with the exception of snow, ice, or frozen soil roads), roads are located on the sunny and exposed sides of valleys or hills, particularly in wet or cold areas. Road surface and subgrade will dry faster this way and minimize the possibility of freezing. Also, maintenance is generally easier.

EXPEDIENT SOILS TESTING

Simple soil tests can be made during the location reconnaissance to determine the soil characteristics. Expedient testing techniques suitable for the combat roads and trail reconnaissance can be found in TM 5-530 and TM 5-545. They also contain technical information on soils and are valuable references in the solution of soil problems encountered

in the design and construction of conventional military roads.

RECONNAISSANCE REPORTING

To swiftly report the results of combat road and trail location reconnaissance, units of all arms and services use a simple and concise format. The combat route site report (figure 7-3) is designed primarily for radio transmission. It can, however, be used for written reports and supplemented by drawings, maps, tracings, or overlays. Much of the detail required can only be provided by qualified engineer personnel. Nonspecialist personnel of other arms include only the detail they are qualified to collect and report. This report is sent through operational channels and monitored by the staff intelligence section and staff engineer, if available. At division level, terrain analysis detachments are also provided the information in order to update their data base.

FIGURE 7-3. SAMPLE COMBAT ROUTE SITE REPORT

ALFA	Map sheet.	
BRAVO	Grid reference of site and date-time group of reconnaissance.	
CHARLIE	Type of combat route required (TRAIL or ROAD).	
DELTA	Type of vehicles considered (wheeled or tracked) and anticipated traffic (light, moderate, heavy), for example, WHEELED-MODERATE.	● Gray. A site where a concentrated engineer construction effort is required to produce the required trafficway. Heavy clearing, soil stabilization, and the provision of drainage structures are examples of work required. Vehicles may still require assistance to negotiate steep grades.
ECHO	Classification and length (in meters) of complete site, for example, GRAY-200 meters.	● Black. An impractical combat route site owing to the excessive amount of assistance required.
	● White. A site where a minimum of engineer effort is required due to suitable soils, existing grades, and sparse vegetation clearing requirements.	
	FOXTROT	General information to include other limitations, for example, mines, enemy observation, enemy fire, existing or reinforcing nonmine obstacles.

CONSTRUCTION PROCEDURES

DESIGN FACTORS

The selection and design of combat roads and trails depend on several factors. These include the nature of subgrade, traffic and drainage conditions, construction times, the supply of local and imported materials, and the engineer equipment and personnel available. Road design must be practicable and adequate and based on sound principles. In a forward combat zone, military urgency almost always dictates rough, hasty work, designed primarily to meet pressing needs. Combat routes are designed for progressive improvements at different stages. In this way, follow-on forces can develop roads and trails to satisfy increased traffic demands. For road construction methods, see TM 5-330 and TM 5-337.

METHODS OF CLEARING

Land clearing consists of clearing a designated area of all trees, brush, other vegetation, and rubbish. It includes removing surface boulders and other material embedded in the ground. Grubbing consists of uprooting and removing roots and stumps. Stripping involves removing and disposing of objectionable topsoil and sod. These three operations are done primarily with heavy engineer equipment. Hand or power tools, explosives, and fire are used where applicable. The methods to be used depend on the path to be cleared, the type and density of vegetation, the terrain as it affects the operation of equipment, the availability of equipment and personnel, and the time available for completion. For best results, a combination of methods is used in a sequence most suitable and effective to the operation. In forward combat areas, clearing also includes countermine, counterobstacle, and gap-crossing tasks.

Clearing and grubbing. In most cases, engineer equipment is the fastest and most efficient means of clearing and grubbing. The use of such equipment is limited only by unusually large trees and stumps, by terrain which affects its maneuverability, and by

maintenance requirements. This equipment includes bulldozers, M9 ACE, CEV, tractor-mounted clearing units, winches, power saws, and so forth. Pioneer tools are also used in certain types of clearing operations. The selection of equipment usually is limited to that which is available on the job.

Stripping. Stripping consists of removing and disposing of the topsoil and sod which would be objectionable as a subgrade, as a foundation under a fill, or as borrow material. Examples include organic soils, humus, peat, and muck. In shallow fill sections of 2 feet or less, the unsuitable material must be removed to a depth great enough to place at least 3 feet of suitable subgrade material in the fill. Stripping is done concurrently with clearing and grubbing by using bulldozers, graders, scrapers, front end loaders, and sometimes shovels. It is often helpful to stockpile good topsoil and sod for later use on bare areas for dust or erosion control or for camouflage.

USE OF EXPLOSIVES

Explosives may be used to fell standing trees, to uproot entire trees and stumps, and to remove and dispose of large boulders. Explosives have several disadvantages. They cannot be used where loud noises violate security. In loose soil, the initial charge maybe entirely expended in compacting the soil under a tree or stump, and a second charge may be required to remove it. Deep taproots are often only broken by explosives and have to be removed mechanically or by hand. Explosives generally take time to place and they create large craters which require borrow excavation and compaction to backfill. In spite of these disadvantages, however, it is still necessary to use explosives to clear an area. This necessity applies especially where the terrain impedes the operation of heavy equipment.

CAMOUFLAGE OF WORK SITE

To aid in camouflaging the construction site, standing trees and brush outside the designated cleared areas are not to be removed or

touched unless necessary. For this reason, care is taken when uprooting trees. Timber for logs, piles, and lumber is trimmed and stockpiled for future use in bridge, culvert, and other types of construction. This type of timber is placed in a salvage area.

EARTHWORK

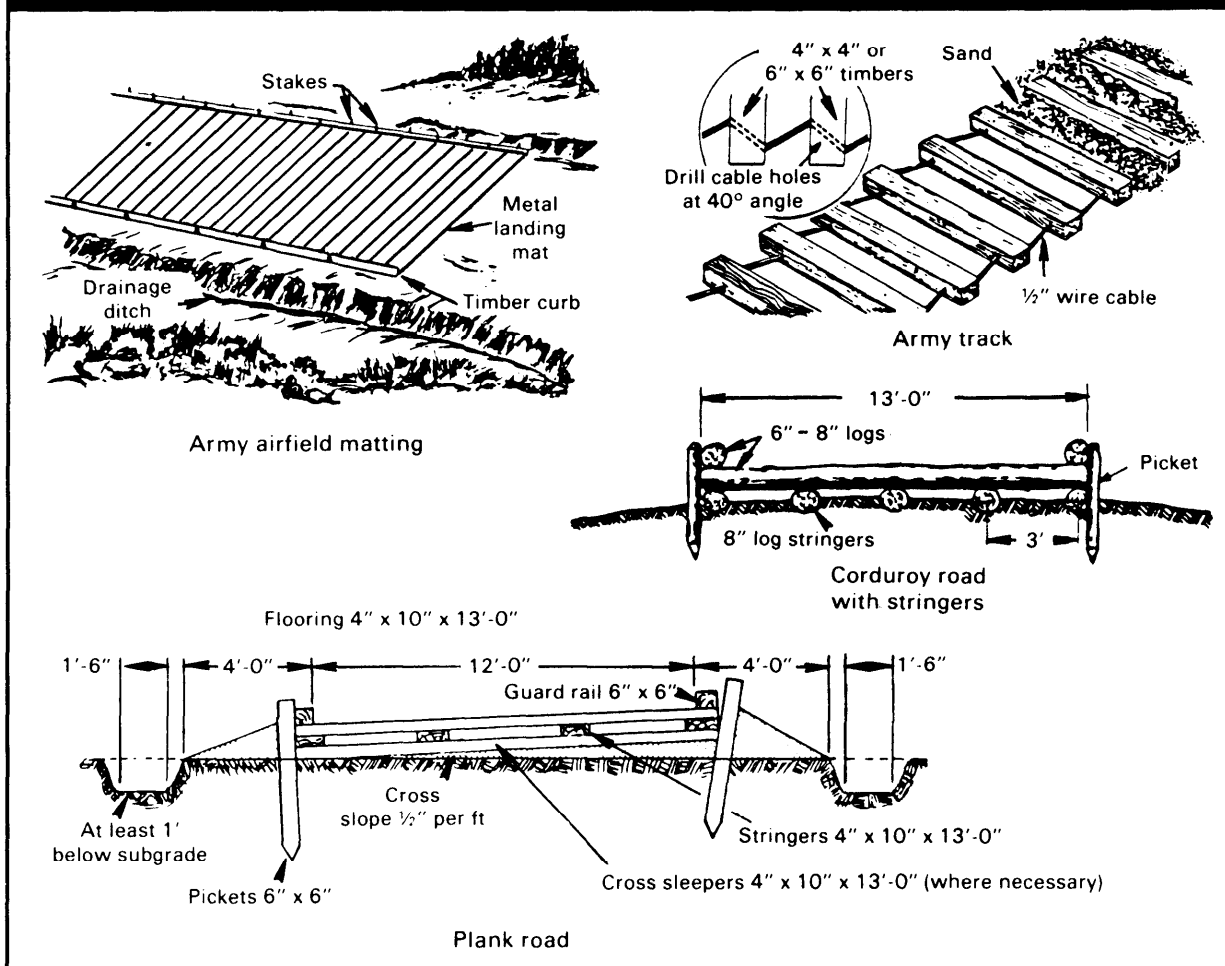
Earthwork is one of the most time-consuming construction operations. It should therefore be avoided or minimized whenever possible. The combat road or trail will be aligned along the topography in order to avoid cut and fill operations. Cut and fill operations should be undertaken only in areas where the slopes of

existing terrain surpass the recommended slope for vehicles using the road/trail.

SURFACING

In the construction of combat roads and trails, expedient surfacing methods (figure 7-4) will be used to get the traffic through. Such routes will usually have earth surfaces consisting of native fine-grained soils graded and drained. These roads are designed to satisfy immediate traffic needs and to provide a subgrade for higher-type surfaces. Although unsurfaced roads may be adequate for the anticipated traffic load, terrain and weather conditions may dictate the use of expedient

FIGURE 7-4. EXPEDIENT SURFACING OF COMBAT ROADS, TRAILS



surfacing techniques. Expedient surfaces should be covered with a layer of fill material, when possible, to minimize wear from heavy armored vehicles. Specifications for use of these surfacing techniques are given in TM 5-337. In many cases, an adequate wearing surface can be obtained using soil stabilization techniques. These techniques are explained in TM 5-330.

DRAINAGE FACILITIES

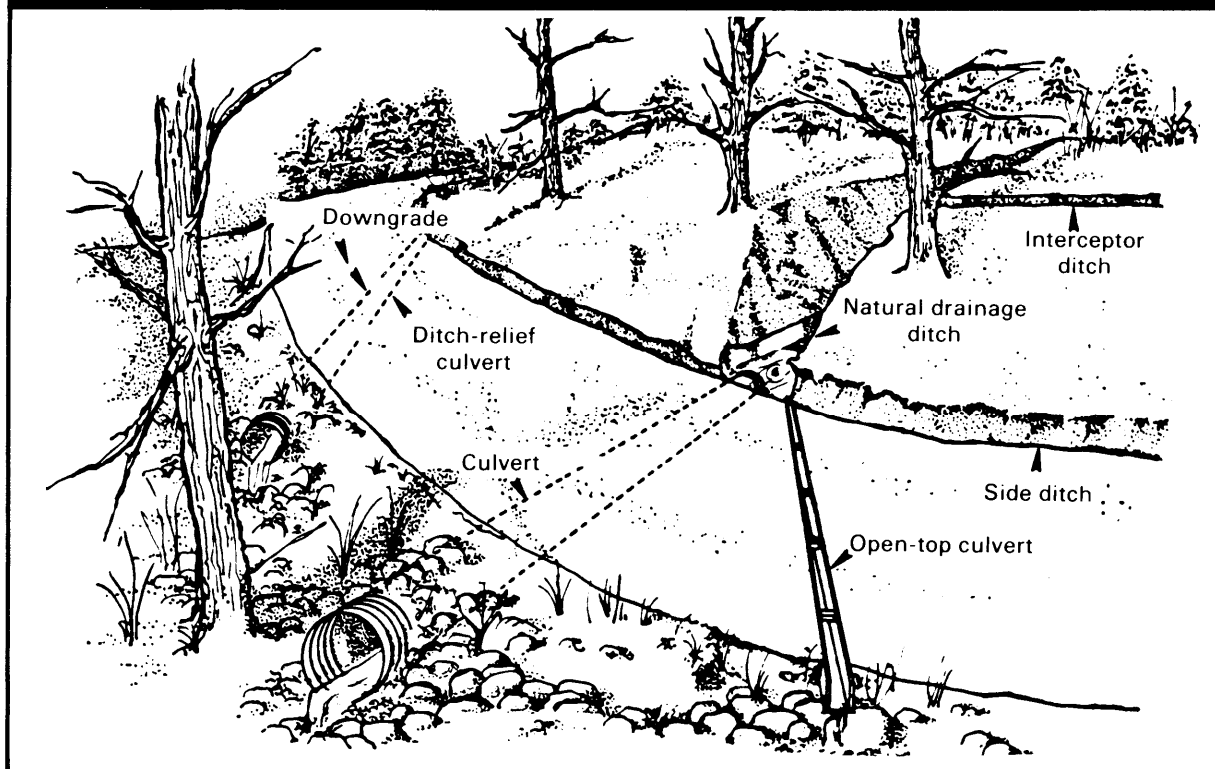
Properly planned, designed, constructed; and maintained drainage facilities are essential to continuous serviceability of combat roads and trails. The washout or blockage of a single culvert may close the route to traffic at a vital time. Drainage facilities should be developed in stages at the beginning of clearing, grubbing, and stripping operations to insure uninterrupted construction. Delays caused by flooding, subgrade failure, and

mud can be avoided by careful development of the drainage system. Natural drainage features are used as much as possible to insure minimum disturbance of natural grades.

During clearing and grubbing operations, existing or natural watercourses must be kept cleared and holes and depressions filled. Adequate drainage for the site must be provided to insure that no water interferes with construction operations. Construction drainage measures include use of the following.

- Diversion ditches. Diversion ditches re-route surface water heading toward the project site, sending it in a controlled manner to a more desirable location.
- Existing ditches and drainage features. Maximum use should be made of existing ditches and drainage features. Where

FIGURE 7-5. SURFACE DRAINAGE OF A ROUTE



possible, grading operations should run downhill, both for economy of effort and to utilize natural drainage. Figure 7-5 shows the drainage features associated with a combat road.

- **Culverts.** Whenever the natural flow of surface water or flow due to existing ditches crosses a combat road or trail, an expedient culvert should be built to maintain trafficability.

DRAINAGE CHARACTERISTICS OF SOILS

Different types of soils vary in their ability to help or hinder drainage of the terrain. Soils are divided into three general groups on the basis of drainage characteristics.

Well-draining or free-draining soils.

Soils that may be drained by gravity systems, such as clean sands and gravels, fall into this category. In road and trail construction, for example, open ditches sometimes may be used in these soils to intercept and carry away surface water which comes in from surrounding areas. Such ditches dug to a proper depth may also be effective in draining the base of the subgrade of groundwater.

Poorly-draining soils. Included in this group are inorganic and organic fine sands and silts, organic clays of low compressibility, and coarse-grained soils which contain an excess of nonplastic fines. Surface water control of these soils is no different from control of well-drained soils. However, subsurface drainage may be difficult due to the relative impermeability of the soils.

Impervious soils. Fine-grained, homogeneous, plastic soils and coarse-grained soils which contain plastic fines belong in this category. Subsurface drainage is so slow in these soils that it is of little value in providing subsurface drainage. However, surface drainage is the same as with other soils.

MAINTENANCE AND REPAIR

Maintenance is the routine prevention and

correction of normal damage deterioration from use and the elements as necessary to keep roads in usable condition. Repair is that work necessary, other than maintenance, to maintain surfaces and facilities in usable condition. It is the repair of damage caused by abnormal use, accidents, hostile forces, and severe weather. Repair includes the resurfacing of a road when maintenance is no longer sufficient.

PREVENTIVE MAINTENANCE

The purpose of all maintenance and repair is to keep road surfaces in as usable and safe a condition as possible. Prompt and adequate maintenance is of paramount importance. Once deterioration or destruction of the surface has started, it can proceed very rapidly. A minor maintenance job postponed can thus develop into a major repair job. Principles of good maintenance are—

- **Minimum interference with traffic.** Maintenance and repair activities should interfere as little as possible with the normal flow of traffic permitting at least partial use of the route. Scheduled maintenance should be done at night or during periods of reduced visibility, when possible. Otherwise, it should be done when the traffic flow best permits. Emergency repairs will be handled immediately.
- **Correcting the basic cause of a surface failure.** Surface repairs made on a defective subgrade are wasted. The cause of damage should be investigated and corrected before the repair is made. If not, the damage is likely to reappear.
- **Priority.** Priority in making repairs depends on the tactical requirements, the traffic volume, and the hazards which would result from complete failure of the facility.

DRAINAGE MAINTENANCE

Defective or inadequate drainage can cause many surface failures and deterioration.

**Surfaces must be inspected
after rainfall and areas
marked for pending.**

Ponding or delayed runoff of surface water allows seepage unless the surface is tightly sealed. Surfaces must be inspected after rainfall and areas marked for ponding. Correction is made by filling or raising local depressions and by providing additional diversion ditches or culverts, where needed.

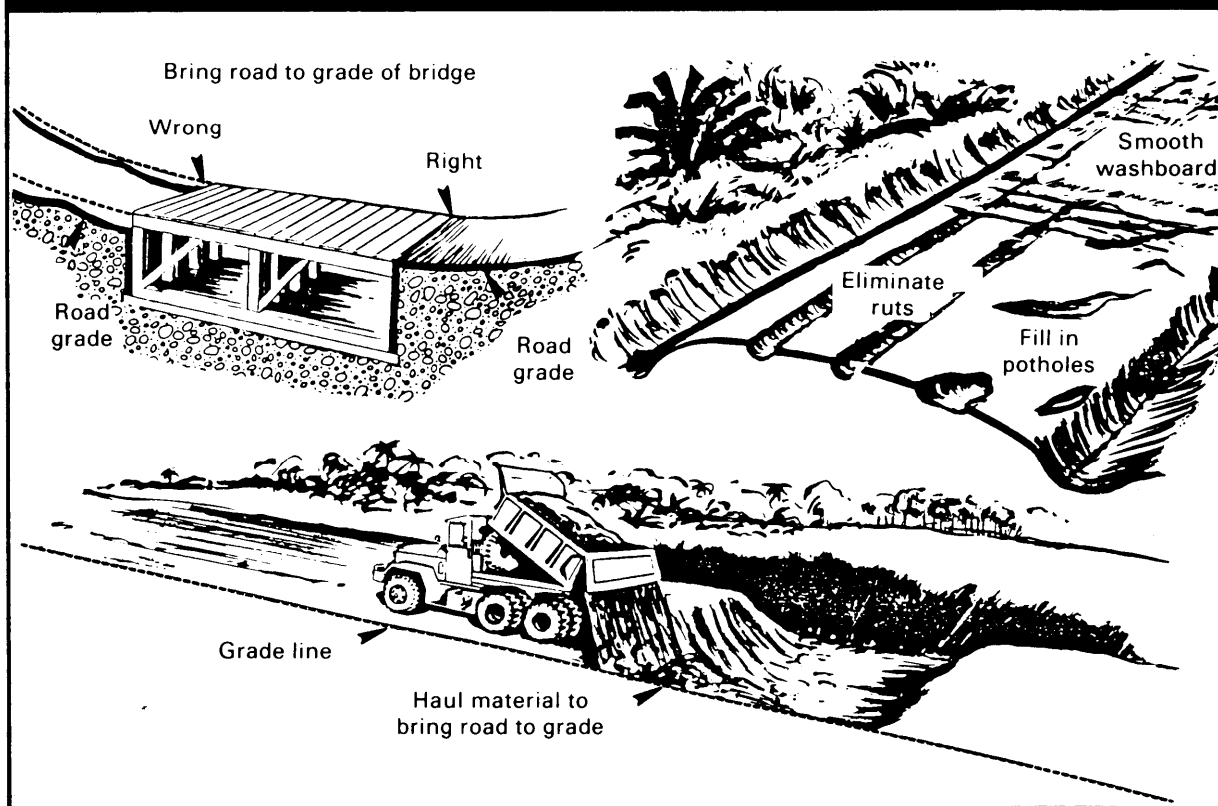
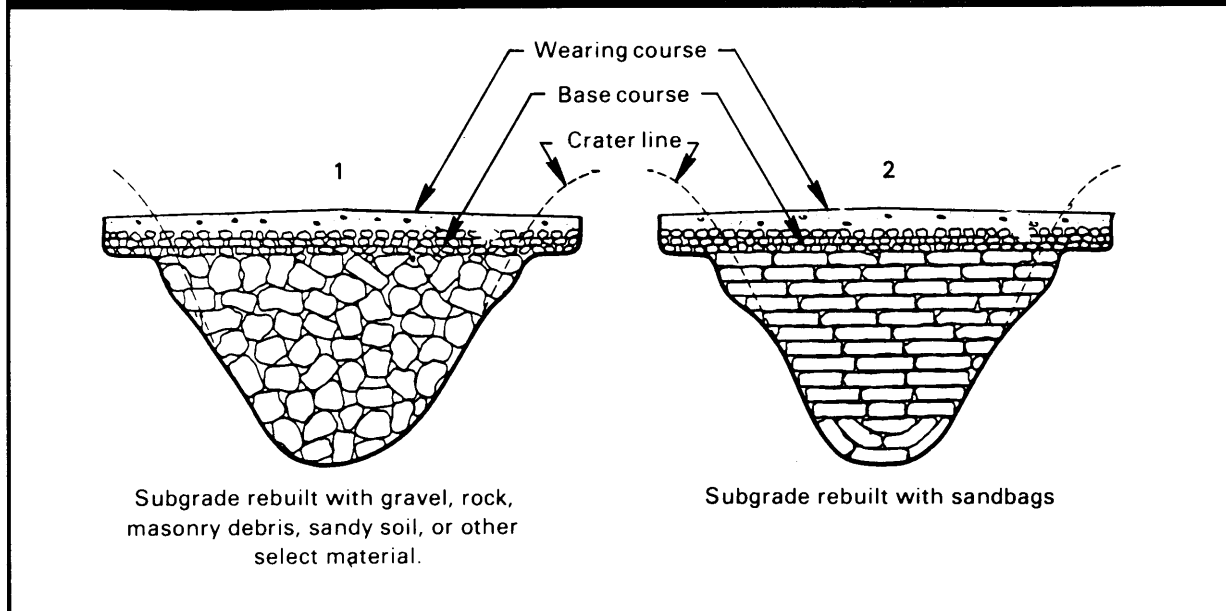
EARTH SURFACE MAINTENANCE

Basic maintenance requirements for natural earth surfaces include shaping to maintain adequate drainage and to keep a compact, reasonably smooth surface. Traffic areas and shoulders are kept free of potholes, ruts, and similar irregularities. Light blading is done to prevent corrugation or "washboarding." Examples of earth surface road repairs are shown in figure 7-6. When possible, attention will be given to dust abatement.

CRATER REPAIR

Bombs, shells, land mines, and cratering charges produce extensive craters in traffic areas. Surface damage creates no unusual repair problem, but the explosion may displace or destabilize large areas of the subgrade. Drainage may also be disrupted so that water penetrating the broken surface accumulates and further softens the subgrade. Subgrade stability must be restored to support traffic and prevent undue settling of the surface. Gravel, rock, masonry debris, sandy soil, or other suitable stable materials can be used in filling craters (1, figure 7-7). Material blown from the crater can be used for much of this fill. In an emergency, material from the shoulders of the roads or trails may be borrowed and replaced later.

When the situation permits and where enemy action may be anticipated, stockpiles or material pits should be prepared at convenient sites. Alternate layers of filled sandbags and tamped earth furnish good subgrade compaction where other suitable material or equipment is not available (2, figure 7-7).

FIGURE 7-6. COMBAT ROAD AND TRAIL SURFACE REPAIR**FIGURE 7-7. CRATER REPAIR METHODS**

COMMAND AND CONTROL

RESPONSIBILITIES

Combat maneuver units and combat engineers are responsible for combat road and trail construction that corresponds to their equipment capabilities. Combat units are capable of creating combat trails and helicopter landing zones. Equipment such as dozer tanks and recovery vehicles provide this basic capability. Engineer units will assist combat units in combat road and trail development, as required. Extensive combat construction efforts will be accomplished by engineers. In the forward areas, priority of engineer route development and maintenance goes to preserving the mobility of the maneuver elements. Both division and corps engineers share in this task under the mobility systems concept. Division engineers concentrate on removing obstructions that hamper the freedom of movement and maneuver for combat units and their supply vehicles. The division engineer coordinates other engineer units, when available, to accomplish combat road and trail tasks which exceed the battalion's capability. Corps engineer units, in support of the division, may be employed within the forward area on an area or task basis. Combat roads and trail tasks for these engineer units generally involve maintenance of lines of communications.

MANAGEMENT CONSIDERATIONS

There are several command and staff considerations unique to combat road and trail constructions within the division areas. The management of trafficable road and trail networks involves the following individuals and activities.

- The divisional engineer battalion commander coordinates engineer assets throughout the division sector with the exception of those precluded by command/support relationships. This commander advises the division commander on mobility efforts, specifically the status of trafficable networks and engineer effort required to maintain them.

- The assistant division engineer (ADE) provides staff engineer coordination at the division level. The ADE coordinates with division engineer, brigade engineers, and assistant corps engineer to insure integration of assets and efforts for building and maintaining combat roads and trails.
- The G3/S3 formulates mobility plans and determines main supply route locations. The G3/S3 is also responsible for integrating road and trail location reconnaissance and construction efforts into the operations plan.
- The G4/S4 determines logistics road and trail network requirements. This estimate is integrated with the G3/S3 mobility operations scheme. The G4/S4 determines the general usages of combat construction materiel sites such as landfill areas and lumberyards.
- The terrain analysis team, provides the commander, staff, and engineers with terrain and soil trafficability data.

PROJECT REPORTING

In order to effectively command, coordinate, and update engineer work priorities, the commander and staff must be constantly informed of the changes to the road network capability. This is done through the use of simple reporting formats. Units of all arms and services use these reports to forward information concerning road status and the location of road-making equipment on the battlefield. The road closed, road open, and road-making equipment reports are forwarded through operational channels and monitored by the staff intelligence, logistics, and engineer sections (if provided). Also, at division level, the reports are provided to the terrain analysis detachments in order to update their data base. The combat road and trail report formats are designed primarily for radio transmission. They can, however, be used for written reports and supplemented

by drawings, maps, tracings, or overlays. If not transmitted by radio, the fastest possible means of relaying this information is used. The originator completes only those parts of the format which apply to the road, trail, or road-making equipment reported. Figure 7-8 is an example of a road(s) closed report.

These reports can be written and supplemented with drawings and maps.

FIGURE 7-8. SAMPLE ROAD(S) CLOSED REPORT

ALFA	Map sheet(s).
BRAVO	Date and time of collection of information.
CHARLIE	From grid reference _____ or show on trace.
DELTA	To grid reference _____ or overlay.
ECHO	Reason for closing of road.
FOXTROT	Estimated duration.
GOLF	Detour from _____ to _____ including, if possible, class of road, or at least the following information: width of road, smooth or rough surface, gradual or sharp curves, gentle or steep grades.
HOTEL	Cross-country bypass permitted to _____ (wheeled or tracked vehicles and class).
INDIA	Any other information.

Note: Paragraphs CHARLIE and DELTA apply only to major axial or lateral routes. Classification of roads is to be given according to the weakest part of section of road under report, that is, the class of the route may be restricted by a bridge with a low military load class. The reason for closing of road should be the nature of the obstacle, that is, bridge blown at grid reference or road unusable through heavy traffic.

Figure 7-9 is an example of a road-making equipment report, and figure 7-10 is an example of a road(s) opened report.

FIGURE 7-9. ROAD-MAKING EQUIPMENT REPORT

(To cover static and mobile mechanical equipment)

ALFA	Map sheet(s).
BRAVO	Data and time of collection of information.
CHARLIE	Location (grid reference or trace).
DELTA	Type.
ECHO	Number.
FOXTROT	Condition.
GOLF	Any other information which could be given.
DELTA	Type equipment.
ECHO	Number on hand.
FOXTROT	Condition of equipment.
GOLF	Any other information which could be given.

FIGURE 7-10. SAMPLE ROAD(S) OPENED REPORT

1. First road in report.

ALFA	Map sheet(s).
BRAVO	Date and time the road is opened.
CHARLIE	From grid reference _____ or show on trace.
DELTA	To grid reference _____ or overlay.
ECHO	Class of road and characteristics of the road to include information on shoulders.
FOXTROT	Minimum widths.

2. Second road in report (include information as above).

Note: Paragraphs CHARLIE and DELTA apply only to major axial or lateral routes. Classification of roads is to be given according to the weakest part of section of road under report, that is, the class of the route may be restricted by low class of bridge.