CHAPTER 3

The Mobility Planning Process

MOBILITY SUPPORT PLANNING

FACTORS

In order to develop and execute a tactical maneuver plan, the force commander must be aware of the factors and requirements regarding the plan to include the degree of risk. This knowledge tells the commander what resources to use to overcome obstacles and improve trafficability. This chapter outlines command and staff procedures for gathering mobility information, preparing estimates, and making decisions required for mobility support. The mobility planning process allows the commander to establish priorities, task organize the forces, and generate plans and orders.

DECISION-MAKING PROCESS

The military decision-making process refers to those steps which a commander and staff take to arrive at decisions. The process provides the commander with enough information to choose the best course of action. The preparation of estimates and plans and/or

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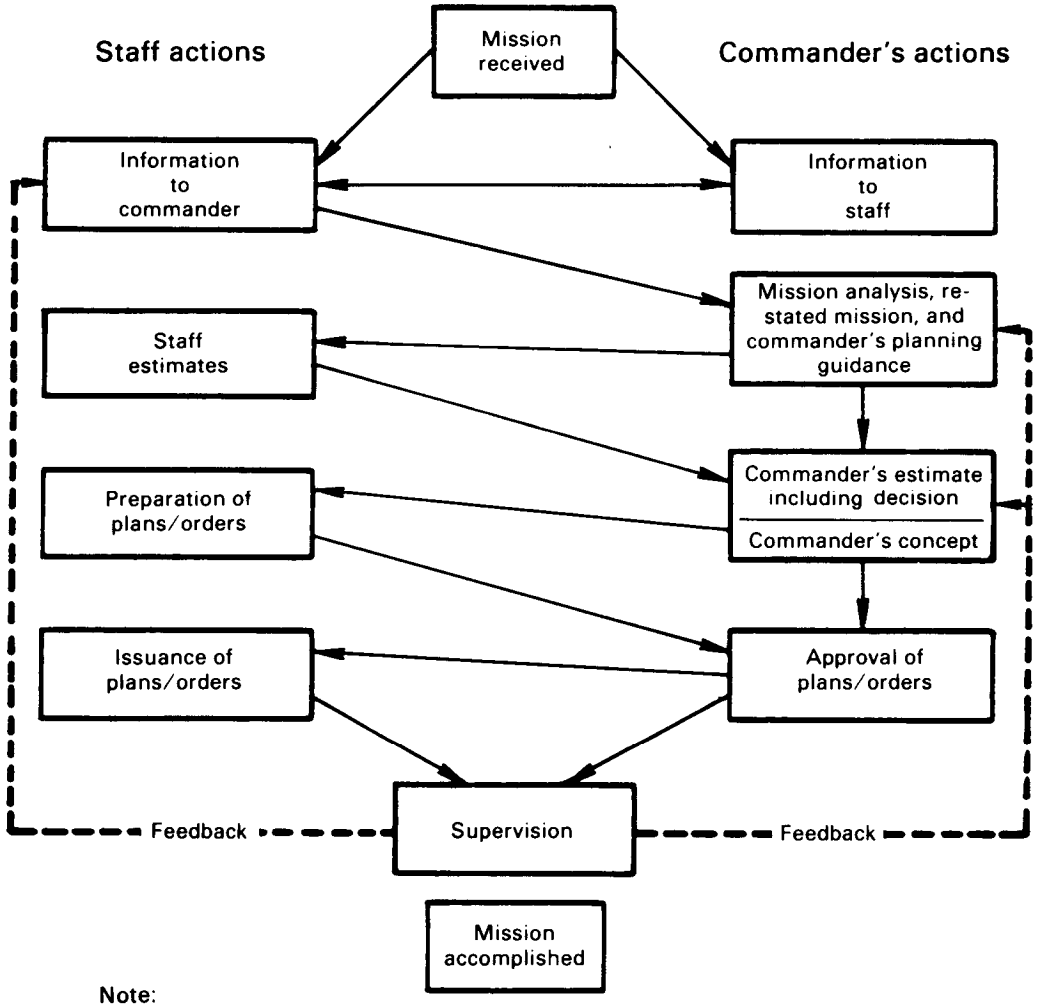
orders is controlled by the chief of staff, executive officer, or operations officer. Possible courses of action are first studied and analyzed by the staff before presenting them to the commander for approval and action. Areas of staff input for this process include—

- Military intelligence (enemy activity, terrain, and weather).
- Intelligence preparation of the battlefield (IPB).
- Operations (tactical maneuver, fire support, and engineer support).
- Administration/logistics (personnel and combat service support activities).
- Civil affairs.

Figure 3-1 shows how the actions of the commander and staff are woven into this process.

FIGURE 3-1. MILITARY DECISION-MAKING PROCESS



Note:

In time-critical situations, the commander may be forced to make a decision and issue oral orders based only on personal knowledge of the situation.

PRIORITIES

Because of increased engineer requirements, commanders must establish clear priorities for mobility, countermobility, survivability and general engineering in support of their operations. For example, a maneuver company team is likely to encounter an obstacle every 3 kilometers. With such a high rate of occurrence, early identification, planning, and organization for mobility tasks are crucial to success.

ENGINEER INPUT

The military decision-making process is used in planning mobility activities within an operation, especially those that involve combat engineer assistance. The engineer prepares or assists in preparation of mobility estimates and plans. In organizations without a staff engineer, the operations officer does the analysis and formulation of mobility plans. In any case, the development of mobility support options and plans follows these steps:

- Receipt of the mission and the commander's guidance.
- Consideration of time available.
- Analysis of Threat situation and Threat countermobility assets.
- Evaluation of friendly situation and mobility support resources (including mobility of equipment).
- Collection of mobility data, including terrain analysis results.
- Development of possible courses of action.
- Preparation of the mobility portion of engineer estimate.
- Constraint of courses of action with actual engineer resources and other requirements.
- Request for additional engineer support, if needed to support plan.
- Preparation of plans, issuing of orders, and conduct of staff supervision.

The engineer contribution to the planning process is completed when the estimates, and then plans, for mobility are combined with those for countermobility, survivability and general engineering. This will provide the commander the basis for deciding task priority and allocation of support. Appendix C, Engineer Mobility Estimate, depicts a typical format of the mobility estimate report outline.

COLLECTING DATA

INFORMATION SEARCH AND ANALYSIS

In the initial stage of planning, an information search and analysis is performed based on the factors of mission, enemy, terrain and weather, troops and resources available, and time and space restrictions (METT-T). The engineer or staff officer conducting the search and analysis applies the factors of METT-T to mobility tasks and requirements.

Mission. The staff mobility planner first considers the mission and guidance given by the commander. The planner examines what mobility missions have been tasked and how these supplement the requirements for countermobility and survivability, The planner deliberately considers both stated and implied mobility requirements.

Enemy. An analysis of the enemy's countermobility capability is a critical step in planning and organizing mobility support assets. The mobility planner must determine the Threat's ability to emplace mines and obstacles, as well as other capabilities. Can the enemy overwatch obstacles by direct or indirect weapons fire? Is the enemy capable of using nuclear munitions or chemical agents in the area of operations?

Terrain and weather. The mobility planner must have complete knowledge of the types and locations of key terrain, soil types, and the probable weather conditions in the area of operations. With this information, the planner can indicate where mobility support is a crucial factor in mission success. Information on terrain adjacent to the tactical boundaries should also be included to isolate routes and terrain that might affect friendly freedom of movement.

Available troops and resources. While planning mobility activities, the staff officer should identify the equipment, personnel, and materiel available for the mission. These resources come from three sources, the maneuver unit troops and mobility support equipment of those organizations, the engineer elements supporting the maneuver force, and indigenous (host nation/local area) support such as engineer equipment, construction materials, or supplies.

Time and space restrictions. Within the framework of an operation, certain limitations are imposed by the commander. These restrictions are the time available to plan and execute the mission and the area on the battlefield in which the force is controlled.

SOURCES OF INFORMATION

Most of the information necessary to analyze an operation in terms of mobility is available through staff coordination. The what, when, and why aspects normally remain constant. The where and how aspects vary, depending on the assessment of friendly forces and the analysis of enemy forces, terrain, and weather. The planner first considers the type, size, and equipment of the force being used in the operation. Specific mobility characteristics of the unit will affect all further analysis.

Role of the intelligence officer. Most Threat intelligence data and terrain information is obtained through the staff intelligence officer. The battalion or brigade intelligence officer (S2) relies on several sources for the collection and update of this information. These sources include reconnaissance, intelligence, and weather experts at and above division level. Staff engineers or mobility planners also use the division intelligence system. This system provides timely information such as Threat order of battle and observed countermobility activities. Also, maneuver units obtain terrain and intelligence data by using their organic reconnaissance elements.

Standard military map. The collection of terrain information begins with the standard military map with a scale of 1:50,000. The commander and staff conduct map studies using the military aspects of terrain as they relate to mobility. The five factors (known as OCOKA) are—

- Observation and fields of fire.
- Concealment and cover.
- Obstacles.
- Key terrain.
- Avenues of approach.

The standard military map, however, will not provide all of the detailed information required for a thorough mobility assessment. For instance, the standard map does not show the following terrain characteristics:

- Tree spacing and diameter that will impede the movement of wheeled and tracked vehicles.
- Canopy closure and density of vegetation that will provide concealment or cover.
- Height of vegetation and built-up areas that will obscure horizontal line of sight.
- Soil characteristics that will limit number of vehicle passes.
- Slope and other surface conditions that make cross-country movement difficult.
- Stream width, depth, and velocity and bank depth for determination of possible crossing points.

- Effects of climatic conditions and seasonal changes as they relate to mobility.

OTHER RESOURCES

In order to supplement the military map analysis, the planner makes use of other resources and documents. These include a current description of the area of operations, intelligence appraisals, results of actual ground reconnaissance, current photographic products, and special terrain analysis studies and special maps such as road and bridge maps and cross-country movement maps. Specifically, terrain analysis products are produced by terrain analysis detachments at division, corps and echelons above corps (EAC). These detachments and teams provide direct support to divisions and corps and general support to a combat theater. Each detachment or team is equipped with a tactical terrain analysis data base. This data base is composed of information on existing terrain of tactical military significance within a given area. The information is placed on transparent overlays provided to appropriate unit commanders and staffs which highlight different terrain mobility factors. The individual factor overlays follow.

Transportation factor overlay. It depicts selected roads, bridges, tunnels, ferries, railroads, and airfields over which troops and supplies can move during a military operation. The data includes route classification, widths, slopes, dimensions, areas under construction, fords, bypasses, and bridge tables.

Obstacles factor overlay. It depicts natural or artificial terrain features which hinder military movement. Obstacles may be escarpments, embankments, hydrologic features, or depressions.

Water resources factor overlay. It is found only in 1:250,000-scale products. It shows the water resources (wells, springs, groundwater) which may be found in the area. This overlay is made only for arid or desert areas of the world.

Surface configuration factor overlay. It depicts categories of slope in combinations from 0-45 percent and open water.

Vegetation factor overlay. It depicts all the information on vegetation of an area. This includes type of vegetation canopy closure (percentage of ground covered by the tree crowns), undergrowth (vegetation between the canopy and above the ground), vegetation height, vegetation roughness factor (an estimate of the degree of degradation of vehicle speed through a type of vegetation on level ground), and stem diameter/tree spacing/vegetation roughness table.

Surface materials factor overlay. Surface materials are limited to those which are significant to military operations. Shown on the overlay are soils (according to the Unified Soils Classification System), depth of surface material, soil moisture, potential landslide areas, and the surface roughness factors (similar to the vegetation roughness factor, but for a vehicle traveling over level ground and influenced by ground conditions).

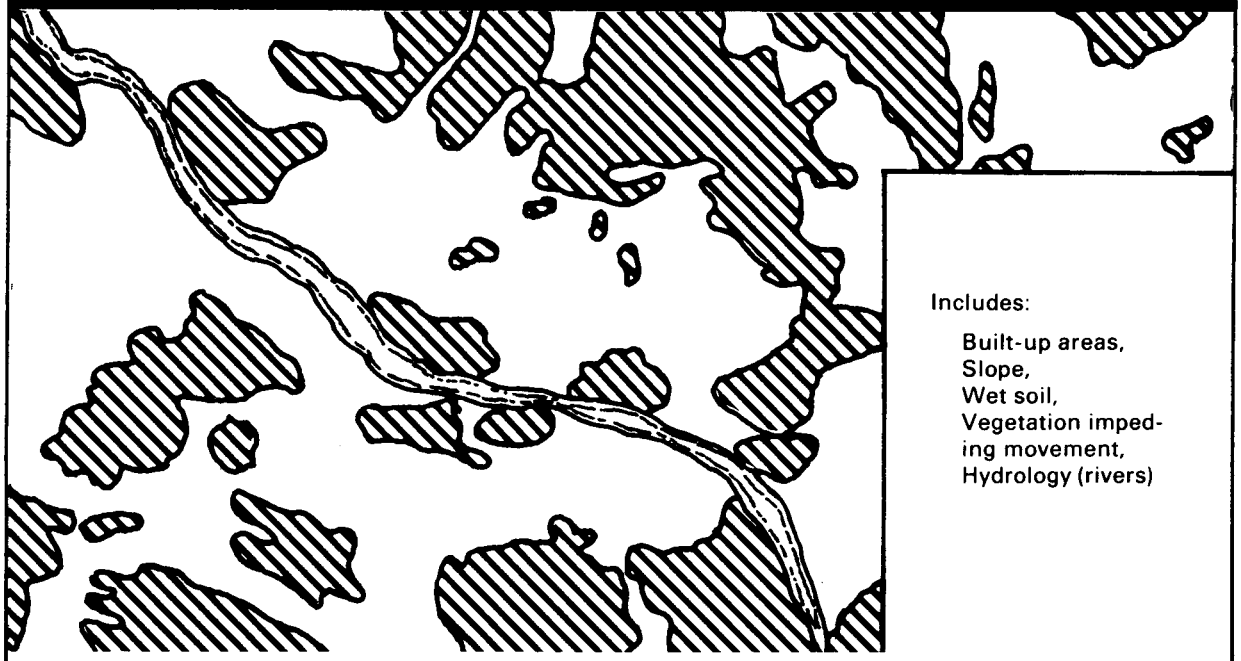
Surface drainage factor overlay. This overlay depicts shorelines, offshore islands, large rivers, and lakes. Information on width, depth, velocity, bank heights and slopes, bottom materials, dams, fords, and locks is given for each feature. An example of a factor overlay is shown in figure 3-2 on page 3-6. Several factor overlays may be combined in one transparent overlay, as shown in figure 3-3 on page 3-6. Vegetation patterns shown in this figure may favor certain tactical movement areas because of natural concealment available.

WEATHER INFORMATION

The impact of seasonal conditions and current weather is a major consideration in the collection of mobility data. The interaction of terrain and weather can affect an operation's outcome. Changes in weather tend to alter the condition of terrain surfaces. This alteration is not always predictable. The same weather condition may produce different effects depending on the type of terrain. For

FIGURE 3-2. INDIVIDUAL FACTOR OVERLAY

FIGURE 3-3. COMBINED OBSTACLES FACTOR OVERLAY



Note: The combined obstacles overlay integrates all obstacles to vehicular movement into one display. Obstacles are crossed-hatched or shaded. Blank areas on the overlay depict where friendly or enemy forces can move unimpeded.

example, rainfall on a clay road makes it less trafficable, while a sandy road may become firmer. Conversely, terrain relief can affect weather conditions such as rainfall, snow depth, wind velocity, and humidity. Moist air moving rapidly up the slopes of a mountain, hill, or ridge may cause fog, mist, or low-lying clouds over elevated terrain, while the adjacent valleys remain clear. Rain at low elevations may be snow at higher elevations.

Trafficability tables. A "hasty" means of evaluating the trafficability of equipment and vehicles has been developed (table 3-1 and table 3-2 on page 3-8). This information is based on comparison of vehicle reactions to specific soil conditions and weather. However, this method only provides data on the vehicles and soil conditions shown. Conditions other than those in the tables must be evaluated using the equipment and techniques in TM 5-330 or TM 5-530. The tables were designed specifically to provide engineers and maneuver units with a rapid means

TABLE 3-1. WHEELED VEHICLE TRAFFICABILITY

Season	Topo Position	Moisture Condition	Soil Group	Vehicles by VCI Category						
					M151 FAV M274 M656 M561 M551 HMMWV	BRDM2 GAZ66 M35 M123	KRAZ 255B URAL 375D ZIL 131 ZIL 132 GAZ 69 ZIL 135 LARC5 M813 M37	M51 LAV	GOER5	MAB
				1	2	3	4	5	6	7
Dry	High	All	All	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
	Low	Low	All	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
		High	A	3(1)	3(0)	2(0)	2(0)	1(0)	0(0)	0(0)
			B	3(3)	3(3)	3(2)	3(1)	3(0)	3(0)	3(0)
			C	3(3)	3(2)	3(0)	3(0)	3(0)	2(0)	2(0)
			D	2(0)	2(0)	1(0)	0(0)	0(0)	0(0)	0(0)
Wet	High	All	A	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
			B	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
			C	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(3)
			D	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(3)
	Low	Low	A	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
			B	3(3)	3(3)	3(3)	3(3)	3(3)	3(3)	3(3)
			C	4(4)	4(4)	4(4)	4(4)	4(3)	4(2)	4(1)
			D	3(3)	3(3)	3(3)	3(2)	3(2)	3(0)	3(0)
		High	A	3(1)	3(0)	2(0)	2(0)	1(0)	0(0)	0(0)
			B	3(3)	3(3)	3(2)	3(1)	3(0)	3(0)	3(0)
			C	3(3)	3(2)	3(0)	3(0)	3(0)	2(0)	2(0)
			D	2(0)	2(0)	1(0)	0(0)	0(0)	0(0)	0(0)

One-pass trafficability (50-pass in parentheses):
0 = NO GO
1 = marginal
2 = OK
3 = good
4 = very good

Soil group:
A = sands and gravels.
B = heavy clays - sticky, moldable, much like modeling clay.
C = clays with sand and/or gravel, and lean clays - difficult to mold.
D = soils with a high percentage of silts and/or very fine sand, also organic soils - musty, offensive odor.

(See TM 5-330 for more detailed definitions.)

of evaluating trafficability in the conditions shown.

Sources of data. Since weather will affect the mobility aspects of each course of action, the planner collects weather data from traditional weather products and weather overlays. Both types of weather products are available through the staff intelligence officer. Traditional weather products include light data charts, 12-, 24-, 36-, and 72-hour forecasts, long-range forecasts, and climatological studies. Intelligence weather overlays include those showing ground fog, cloud coverage, rain (and storm) effects, wind direction, ice thickness, and snow depth. The unpredictability of weather conditions must be considered when collecting weather data. This is particularly true when the operation is planned in advance. Updated weather reports should be regularly requested and mobility planning revised as a result.

TABLE 3-2. TRACKED VEHICLE TRAFFICABILITY

Season	Topo Position	Moisture Condition	Soil Group	Vehicles by VCI Category						
				M116 M571 M729	M88 M3 M2 M551 D7 ACE M113 M578 M60 ZSU23-6 PT76	AVLB M48 M1 MTU20 BMP T62 T72	CEV			
				1	2	3	4	5	6	7
Dry	High	All	All	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
	Low	Low	All	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
		High	A	3(2)	3(0)	3(0)	2(0)	1(0)	0(0)	0(0)
			B	3(3)	3(3)	3(3)	3(2)	3(0)	3(0)	3(0)
			C	3(3)	3(2)	3(0)	3(0)	3(0)	2(0)	2(0)
			D	2(0)	2(0)	1(0)	0(0)	0(0)	0(0)	0(0)
Wet	High	All	A	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
			B	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
			C	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(3)
			D	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(3)
	Low	Low	A	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)	4(4)
			B	4(4)	4(4)	4(4)	4(4)	4(3)	4(3)	4(3)
			C	4(4)	4(4)	4(4)	4(3)	4(3)	4(3)	4(2)
			D	4(3)	4(3)	3(3)	3(3)	3(2)	3(0)	3(0)
		High	A	3(2)	3(0)	3(0)	2(0)	1(0)	0(0)	0(0)
			B	3(3)	3(3)	3(3)	3(2)	3(0)	3(0)	3(0)
			C	3(3)	3(2)	3(0)	3(0)	3(0)	2(0)	2(0)
			D	2(0)	2(0)	1(0)	0(0)	0(0)	0(0)	0(0)

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(See TM 5-330 for more detailed definitions.)

EVALUATION AND ESTIMATES

COMPARISON OF OPTIONS

Once the collection of mobility information is complete, the planner begins to develop courses of action. The planner applies analysis of the data to specific mobility considerations. The planner must confirm where the forces are going (by identifying the objectives), where they cannot move (by identifying hindering terrain), and where they can move (by confirming the avenues of approach). The next step is to outline the effects and potential effects of the terrain and weather (by analyzing each avenue of approach). The planner then compares and analyzes all possible courses of action. The last step is to develop task organizations and mobility work priorities for each course of action. The planner then recommends a mobility option to the maneuver commander based on thorough analysis and military judgment, and on the commander's guidance.

OBJECTIVES

The objectives for an operation are usually provided in the commander's restated mission and planning guidance (figure 3-1 on page 3-2). Defensive and retrograde operations may include terrain which must be retained as the operational objective. The mobility planner studies the mission, essential tasks, and terrain to grasp the intent of the commander and confirm the objective, Objectives determine where the force must move and designate the location of key terrain. The planner must always keep in mind the purpose behind the objectives.

HINDERING TERRAIN

The most useful products for the identification of hindering terrain are the cross-country movement (CCM) maps (overlays) or the combined obstacles overlay made by terrain teams or detachments. These maps or overlays graphically separate terrain into different degrees of cross-country movement (CCM) for armored or mechanized forces. CCM predictions are tailored to friendly or Threat vehicles. An example of mobility categories for planning requirements is shown in table 3-3. The planner may use these categories depending on the detail required. As a minimum, the locations of GO/NO GO terrain are considered.

TABLE 3-3. MOBILITY CATEGORIES

Category	Estimated Maximum Speed	Maneuverability
1	40 km/hr	GO
2	32 to 40 km/hr	GO
3	16 to 32 km/hr	SLOW GO
4	8 to 16 km/hr	SLOW GO
5	Less than 8 km/hr	NO GO
6	Passage blocked	NO GO
7	Built-up area	NO GO

Shading in difficult terrain. Where time is limited or factual terrain data is unavailable, the planner may conduct an analysis by shading in hindering terrain on the military map. This is done to identify terrain that is impassable or will severely slow down cross-country movement. The planner would shade in such features as steep slopes, heavily wooded areas, swampy or unstable soils, river/stream confluences, other water obstacles, and built-up areas. This technique is shown in figure 3-4 on page 3-10.

Modifying terrain data. Terrain data should be modified by the planner using tactical judgment. Combined obstacle products and the shading technique tend to overlook the road and trail network. If a hindering area has two or more trafficable routes per grid square for vehicle movement, the area should not be considered hindering. Engineer terrain studies do not count urban areas of less than 0.25 square kilometers. Urban areas must be analyzed in relation to obstacles and other hindering terrain. Small towns of less than about 1 square kilometer may not be considered hindering if they can be easily

bypassed or they do not reinforce other hindering terrain.

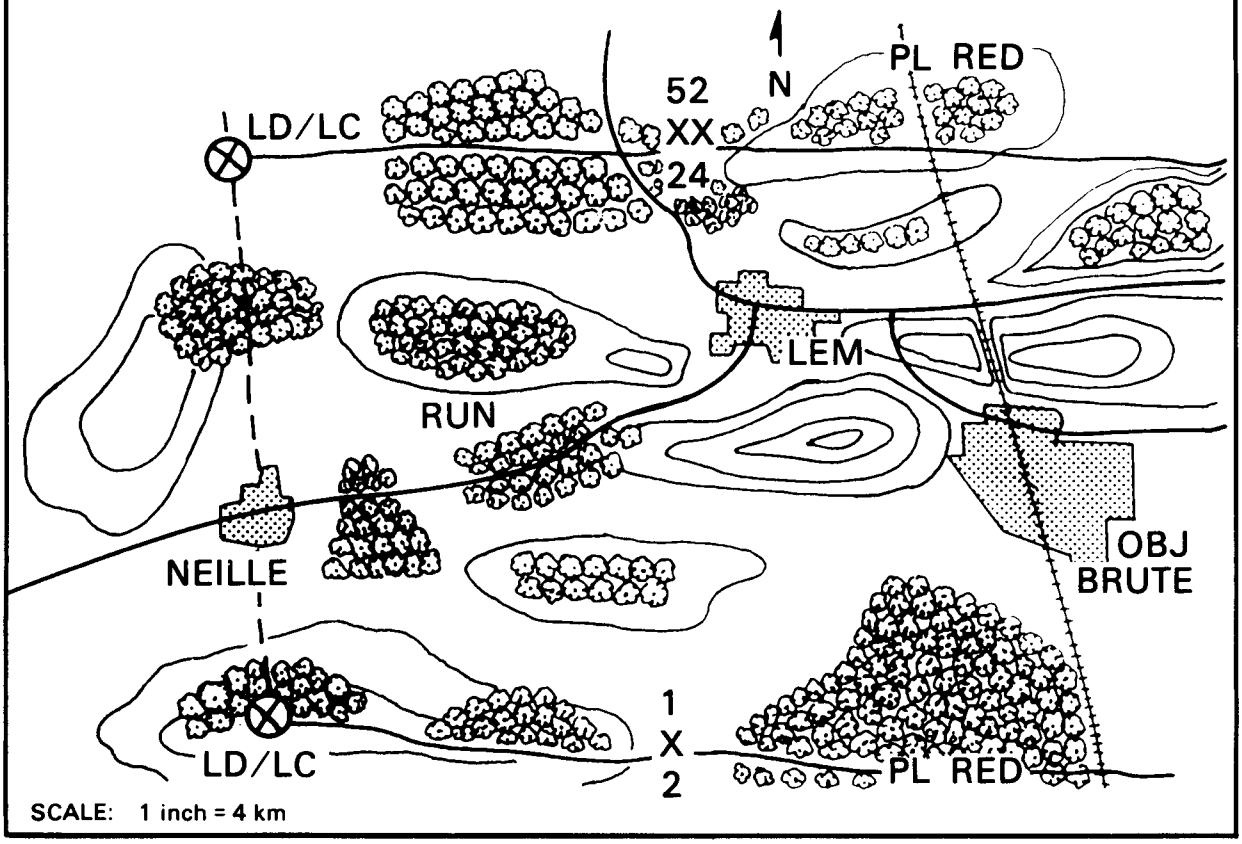
FRIENDLY AVENUES OF APPROACH AND ROUTES FOR MOVEMENT

The identification of hindering terrain will isolate routes where forces can move and maneuver. These areas are the mobility corridors. The planner also identifies crossover corridors for lateral movement. Compared with the commander's guidance, the planner confirms the avenues of approach, if stipulated, in the courses of action. The planner selects avenues of approach based on the number of mobility corridors and the likely composition and possible formation of the maneuver force. The recommended frontages for an avenue of approach at each echelon of maneuver unit are shown in table 3-4. The mobility planner takes into account the road and trail network that would be used for combat support elements and the movement of follow-on maneuver forces. Avenues of approach include such existing transportation networks. Figure 3-5 shows how two

TABLE 3-4. WIDTHS FOR AVENUES OF APPROACH

UNIT	WIDTH (for penetration)
Division	6 to 10 kilometers
Brigade	3 to 6 kilometers
Battalion	1 kilometer
Company	500 meters

FIGURE 3-4. HINDERING TERRAIN



avenues have been identified on the situational map used in figure 3-4.

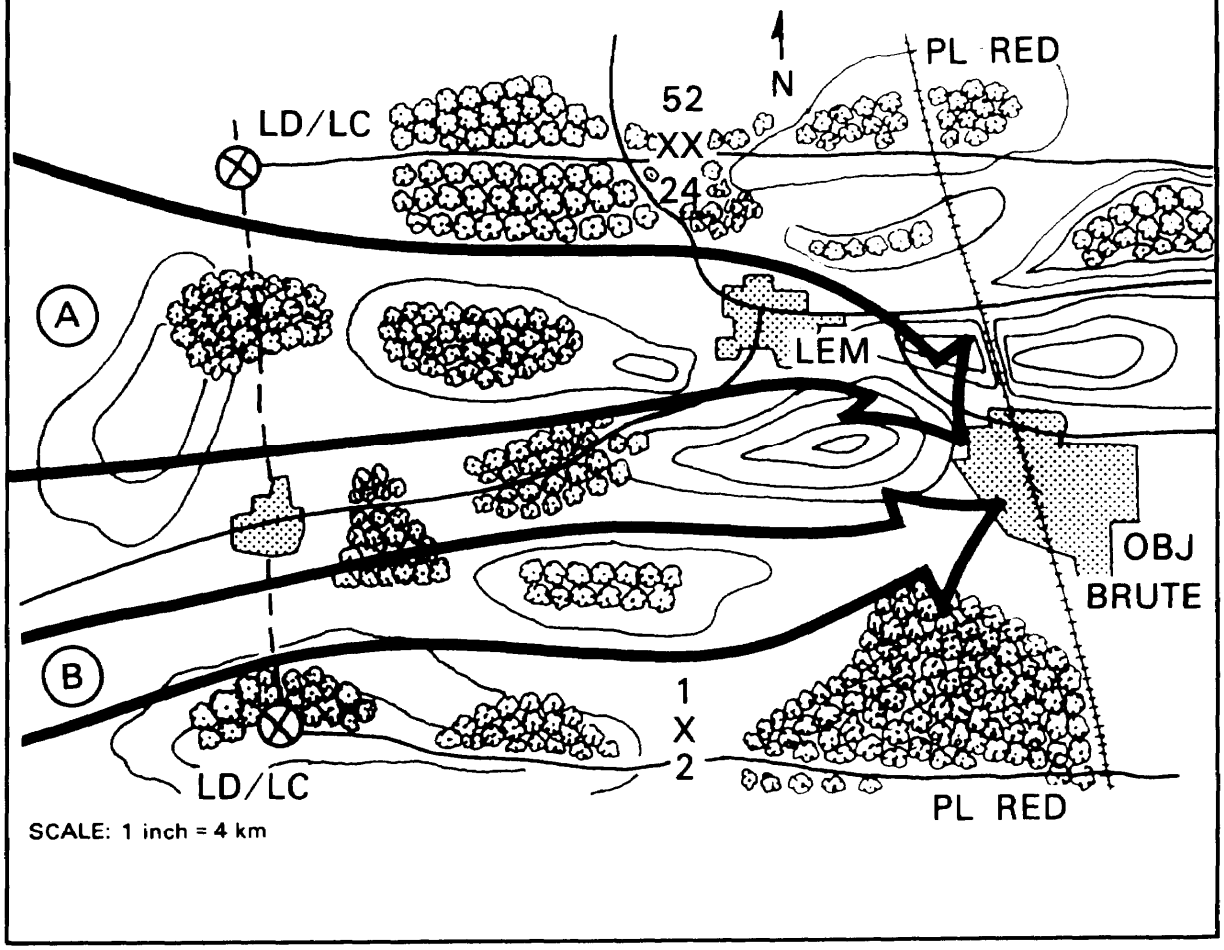
ANALYSIS

Each avenue of approach confirmed by the mobility planner should be analyzed in detail to determine the tactical merits and potential problems of each avenue. All the collected terrain and weather information should be used for this analysis and should follow OCOKA sequence. The analysis should include the following considerations, from both the friendly and enemy points of view.

Observation and fields of fire. The ability of friendly forces to overwatch and fire along the avenue is determined, Also, the enemy's ability to observe and fire on the avenue from various positions is considered. The friendly capability to overwatch the avenue with direct fire weapons from certain positions can be defined by drawing fans of weapons coverage for the different weapons systems.

Cover and concealment. Concealment is protection from observation while cover provides protection from weapons' effects. Having considered those areas over which the enemy has observation and fire, the planner studies those areas where friendly

FIGURE 3-5. LOCATION OF AVENUES OF APPROACH



forces can maneuver or move with concealment. Such areas include woods and low ground. Areas that provide concealment and cover for the enemy are considered, particularly those providing concealed counterattack routes. Often, the planner will consider concealment and cover in conjunction with observation and fire.

Areas providing concealed counterattack routes are especially considered.

Obstacles. The planner considers both existing and reinforcing obstacles. Areas where existing obstacles can be easily reinforced are noted. The mobility corridors coming into the avenue from the flanks could be used by the enemy for the counterattack. They are therefore good locations for obstacles to protect friendly forces. These corridors can be covered with fires, smoke, obstacles (planned or emplaced), forces in blocking positions, or a combination of these measures. An example is shown in figure 3-6.

Key terrain. Key terrain is an area offering a considerable advantage to either side occupying it. The mobility planner considers key terrain in view of the objectives and avenues of approach determined earlier. The planner is looking for terrain features that, if occupied by the enemy, would dominate the avenues of approach, intermediate objectives, or final objectives. An example is shown in figure 3-7.

Adequacy of maneuver space. The planner has already identified mobility corridors and from these decided on the avenues of approach. The planner knows where forces can move down the avenues and must consider how to overcome potential enemy observation and fire from key terrain. This analysis includes how to use, bypass, or capture key terrain, and how much free maneuver is available on the avenue. This will determine how restrictive the avenue is and where chokepoints are located.

Ease of movement. This factor is primarily one of time and space. The planner considers the overall trafficability of the avenue, its length compared to other avenues, and the directness of the approach as a means of

FIGURE 3-6. ENEMY FLANK AVENUES

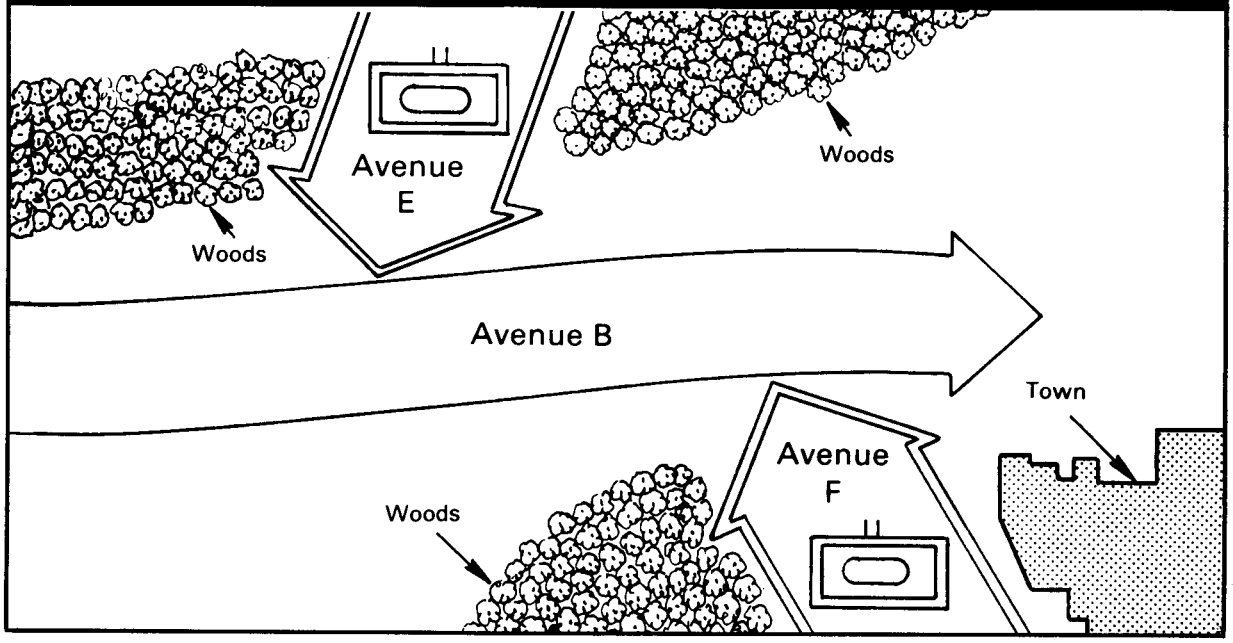
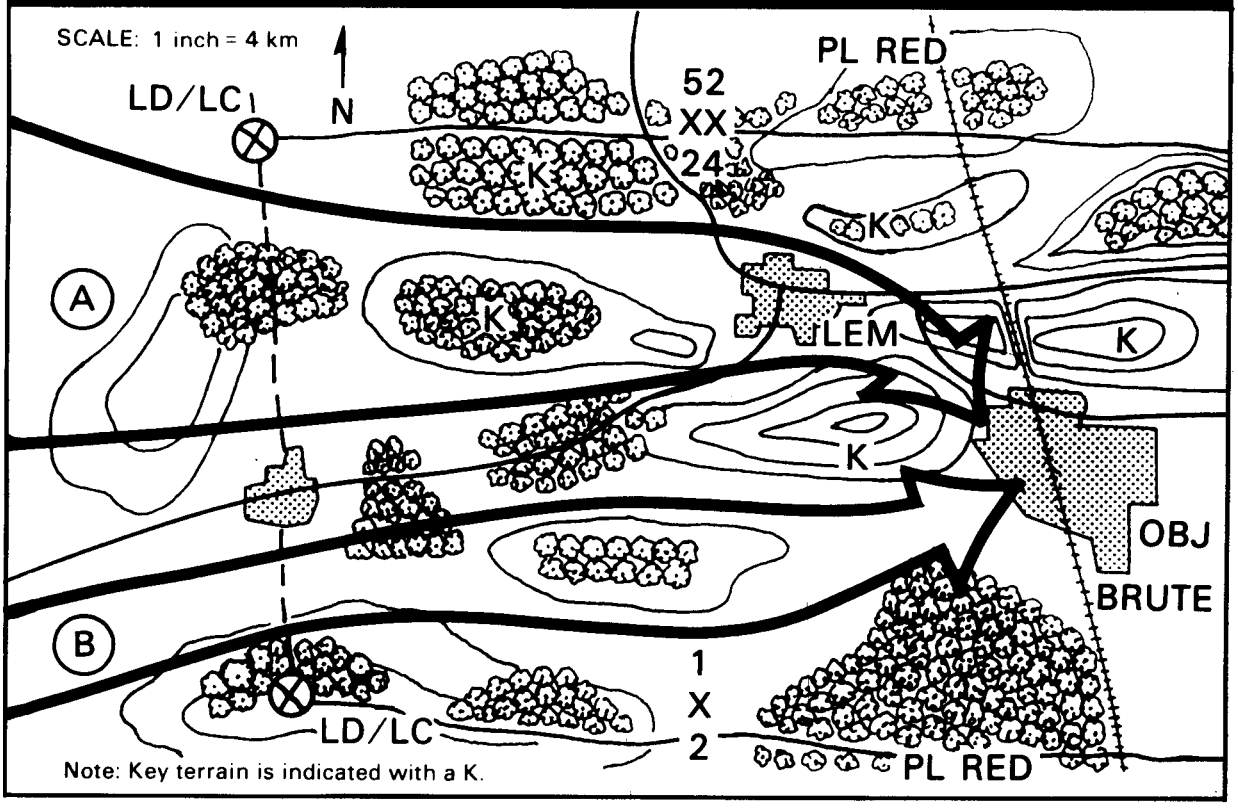


FIGURE 3-7. ANALYSIS OF KEY TERRAIN



gaining the objective. This should lead to an estimate of travel time along the avenue. An estimate of the fighting time will depend on the degree of enemy resistance, the possible firepower superiority of the attacker, and the type of battlefield terrain.

COMPARISON

In order to rate the merits of each course of action, the planner orders the avenues based solely on terrain considerations. To do this, a matrix is often used. By assigning a relative value to each factor, the mobility planner attempts to identify the best avenue of approach. An example of a matrix is shown in table 3-5. The desirability of using each avenue is now reevaluated in light of likely weather conditions. If a change in weather is expected, the planner tries to predict its impact on each avenue of approach. Major river valleys are high-speed approaches most likely to be affected by weather conditions. Rain and boggy conditions can severely limit mobility along these low-lying routes. Also,

TABLE 3-5. MOBILITY ANALYSIS MATRIX (TERRAIN)

CONSIDERATION	AVENUE OF APPROACH A	AVENUE OF APPROACH B	REMARKS
As support objective	3	5	"B" supports current disposition and be prepared order.
Observation and fire	2	4	
Cover and concealment	4	4	"B" and "A" masked from objective and key observation points.
Obstacles	2	4	"A" has two chokepoints; "B" has one.
Uses key terrain	1	2	Flanking terrain "A" has 5; "B" has 4.
Adequate maneuver space	2	4	"B" is less restrictive: battalion plus space for maneuver.
Ease of movement	3	5	"B" has 2 LOCs and 3 natural LZ/DZs.
Total—	17	28	Avenue "B" has most merits-weather not considered.

Key:

Provides major advantage	= 5	Equal advantage to both forces	= 3
Provides slight advantage	= 4	Provides enemy slight advantage	= 2
		Provides enemy major advantage	= 1

fog in low-lying areas or low clouds can conceal movement and limit visibility, thereby limiting close air support, attack helicopter, airmobile, and other air operations of both friendly and enemy aircraft. A weather analysis matrix, as shown in table 3-6, can graphically portray the effects of inclement weather.

TASK ORGANIZATION

The engineer or mobility planner must organize mobility assets to support the maneuver commander's plan. Command or support relationships between engineers and maneuver units must be such that they insure supporting engineers enhance mobility mission accomplishment. Table 3-7 on page 3-16 lists these relationships and how they affect the engineer planner and leader.

PRIORITY OF WORK

As mentioned earlier, priorities for engineer support are established between mobility, countermobility, and survivability efforts.

TABLE 3-6. MOBILITY ANALYSIS MATRIX (WEATHER)

CONSIDERATION	AVENUE OF APPROACH A	AVENUE OF APPROACH B	REMARKS
Temperature			Impacts on ground moisture content and trafficability.
Humidity			Density/altitude affect aircraft performance.
Wind			Affects aviation, smoke, and NBC operations.
Visibility			Impacts on concealment, observation, fire, and aviation restrictions.
Light data (day/night visibility)			Impacts on terrain and maneuver and aviation restrictions.
Rain			Affects soil trafficability and drainage features along avenues and is an aviation restriction.
Snow/ice cover			Affects trafficability, observation, concealment, and effectiveness of obstacles.

Note: Weather forecast for operation is applied to each avenue of approach in the matrix.

Key:
- Provides major advantage = 5
- Provides slight advantage = 4
- Equal advantage to both forces = 3
- Provides enemy slight advantage = 2
- Provides enemy major advantage = 1

TABLE 3-7. COMMAND AND SUPPORT RELATIONSHIPS

ELEMENT	SUPPORT RELATIONSHIPS		COMMAND RELATIONSHIPS	
An engineer element with a relationship of—	Direct support (DS)	General support (GS)	OPCON	Attached/ assigned
Is commanded by—	Parent unit [1]	Parent unit [1]	Supported unit	Supported unit commander
Maintains liaison and communication with—	Supported and parent units	Supported and parent units	Supported and parent units	Supported unit
May be task organized by—	Parent unit	Parent unit	Supported unit	Supported unit commander
Can be— [2]	Dedicated support to a particular unit. May be given task/ area assignment.	Used only to support the parent force as a whole. May be given an area/ task assignment.	Placed OPCON to other engr/ maneuver units, or made DS to bdes or task forces.	Further attached, OPCON, or DS to bdes or task forces, or retained GS.
Responds to support request from—	Supported unit	Parent unit	Supported unit	Supported unit
Work priority established by—	Supported unit	Supported unit	Supported unit	Supported unit
Spare work effort available to—	Parent unit	Parent unit	Supported unit	Supported unit
Request for additional support forwarded through—	Parent unit	Parent unit	Supported unit	Supported unit
Receives logistical support from— [3]	Parent unit	Parent unit	Parent unit	Supported unit

Notes:
1. It is possible that units will receive additional support without a command relationship, the support relationship of DS to the division.
2. Regardless of type of relationship, activities of engineer units working in an area are under the staff supervision of the engineer.
3. The supported unit, regardless of command/support relationship, is to furnish engineer materials to support engineer operations.

The amount of effort and resources applied to each function are constantly changing with the tactical situation. For example, the mobility requirements within an offensive operation might receive the commander's first priority for engineer work. However, these tasks may only require using 30 percent of the resources while countermobility tasks (flank protection or mining of enemy counterattack routes) demand 60 percent and survivability 10 percent of available engineer assets. The establishment of engineer work priorities is the maneuver commander's decision. This decision includes establishing priority for tasks within the three functions. Using the analysis of each avenue of approach, the intelligence assessment of enemy countermobility activities, and the knowledge of obstacles emplaced by friendly forces, the commander can set individual priorities for mobility work. Generally, these priorities of work are recommended by the mobility planner or staff engineer.

ENGINEER STAFF ESTIMATE

The means through which collected data and recommendations are presented by the engineer to the commander or supported unit is the engineer staff estimate. It enables the engineer to quickly, thoroughly, and logically present an analysis. The engineer estimate should include a recommendation for task organization and priorities of efforts between mobility, countermobility, survivability, and general engineering tasks. It should state the recommendations for mobility support based on an analysis of existing and reinforcing obstacles to be overcome and the amount of movement support (roads, trails, and forward aviation/combat engineering) required. The engineer compares this data and recommends the most favorable course of action. The following is the format used for the engineer staff estimate:

- Mission.
- Situation and courses of action.

  METT-T analysis.

  Tactical courses of action given by commander.
- Analysis of opposing courses of action.

  Enemy Threat to each course of action.

  Estimation of outcome of all courses of action.
- Determination of successful course of action.
- Recommendation of course of action.

  Task organization.

  Command or support relationships.

  Priority of effort.

EXECUTION

ORDERS

Operations orders are issued by a commander or leader following the estimating and planning process. Written orders should follow the standard five-paragraph operations order format. Mobility tasks may be assigned subsections for specific units in the operations order for all units, including both engineers and nonengineers. The order will describe the command or support relationship for engineers that the mission requires and any special operations or areas of responsibility. Priorities will be specifically defined in the coordination portion of the operations order.

RESPONSIBILITIES

The responsibility of leaders in the planning and conduct of mobility tasks is divided three ways, the maneuver commander's responsibilities, the staff engineer's responsibilities, and the engineer commander's responsibilities.

Maneuver commander. The maneuver

commander is in charge of organization, planning, coordination, and effective use of engineer resources in performing the mobility function. The maneuver commander relies on the unit engineer or engineer staff officer for analyses and recommendations for use of mobility assets. Also, the maneuver commander implements decisions through the unit engineer by providing guidance, priorities, and tactical constraints, such as time and space restrictions.

Staff engineer. The staff engineer, in addition to fulfilling advisory responsibilities to the maneuver commander, has the following specific responsibilities:

- Develops mobility plans as part of the operations plan.
- Monitors execution of mobility tasks by engineer units.
- Coordinates execution of mobility tasks with operational maneuver and movement.
- Insures timely reports concerning mobility tasks are forwarded to the G3/S3.

Engineer commander. Using a knowledge of mobility support capabilities, the engineer commander advises the maneuver commander throughout an operation. The engineer commander insures that the plans and tasks developed for an operation are executed.

STAFF COORDINATION

As a special member of the commander's staff, the engineer interacts with other staff personnel. The object of staff coordination is to provide the commander, and the forces under the commander's control, with up-to-date plans and orders. This is done by integrating mobility considerations with plans and actions of the other staff members. Staff responsibilities concerning mobility plans and execution are as follows:

The staff engineer works closely with the G3/S3 to develop the staff estimate of the situation.

The G2/S2 uses all available intelligence sources to detect, locate, or isolate likely areas of emplaced obstacles, and receives minefield/obstacle reports and records from the G3/S3, disseminates the information, and forwards records to the senior theater Army engineer. The G2/S2 is also responsible for preparing and disseminating the intelligence preparation of the battlefield (IPB).

The logistics/supply officer (G4/S4) works closely with the staff engineer and the division ammunition officer (DAO) to insure that breaching munitions are available in the types and quantities needed. These staff agencies, the G4/S4, engineer, and DAO, gather data for the required supply rate (RSR) and assist in establishing the controlled supply rate (CSR), The G4/S4 is responsible for coordinating transportation and equipment which provides engineer supplies and materiel in accordance with the commander's priorities for engineer support.

The civil affairs officer (G5/S5) is responsible for the coordination necessary to repair damaged lines of communication or utilities and return them to use.

MOBILITY DRILLS

A unit's immediate response to an obstacle or mined area may mean the difference between quick passage and a critical loss of time, equipment, and personnel. Tactical proficiency is built upon training by the combined arms team. This training should focus on the specific tasks needed when encountering an obstacle. Units able to quickly implement well-rehearsed battle drills have the best chance to bypass, breach, or cross an obstacle in stride. Both commanders and staffs have the responsibility to see that mobility drills are incorporated in their organizational training.