CHAPTER 11
MOBILITY, COUNTERMOBILITY, SURVIVABILITY

"A squad of engineers from a platoon of the 1st Engineer Battalion was to accompany each assault company. The squad would be equipped with flame-throwers and dynamite charges for the reduction of pillboxes."

LTC Darrel M. Daniel
Commander, 2nd Bn, 26th Inf Regt
October, 1944, Battle of Aachen

This chapter provides considerations for engineer planners and leaders to employ when battalions and brigades conduct UO. While the considerations in this chapter apply specifically to offensive UO, they can be tailored for defensive, stability, and support operations.

11-1. GENERAL

While the process for planning engineer support for UO follows existing decision-making steps, engineer planners must understand how this diverse terrain impacts engineer operations. Terrain enhances the enemy's countermobility and survivability efforts and increases the friendly force's mobility requirements. Critical points include:

- Structures become key terrain.
- Below ground and multi-layered above-ground dimensions are added.
- Decentralized execution—while staying collectively synchronized—is required.
- Urban specific pre-combat checks (PCCs), precombat inspections (PCIs), and rehearsals must be conducted.

Engineer planners must account for these factors to provide effective engineer support to maneuver forces.

11-2. MISSION ANALYSIS

Mission analysis sets the conditions for planning and ultimate success of UO. All planners must identify specified, implied, and essential tasks as well as constraints and limitations. Well-prepared engineer battlefield assessments (EBA) and terrain analysis products are essential to successful UO planning. Answering the following questions will help engineer planners, in conjunction with the principal battle staff, develop an effective UO mission analysis.

a. **S2, S3, Engineer, FSO.**

(1) ***Where is the key/decisive terrain?*** Identify this terrain for the approach march and for seizing buildings. Conduct a line-of-sight analysis along the route and compare it to the enemy template. Identify the most likely sites for enemy sniper and observer positions. Target these positions for deliberate reconnaissance to confirm or deny enemy presence. Plan obscuration and suppression to facilitate friendly movement.

(2) ***Where are the best obstacle reduction sites and support-by-fire positions for securing a foothold?*** Consider the terrain, the enemy force template, and massing fires. Determine the minimum engineer force required to seize a foothold, seize essential facilities, and provide mobility support to mounted forces, such as sequencing of engineer

tasks and changing the engineer task organization to accomplish essential tasks. Identify the key leaders required to facilitate command and control of critical events and task organization changes. Decide how to best integrate cannon-delivered smoke, hand-emplaced smoke, and smoke generators to conduct breaching operations.

b. **S3, Engineer, S4.** ***How should subordinate units execute in-stride versus deliberate breaching operations based on the enemy template and results of reconnaissance and surveillance (R&S) efforts?*** Decide where to use the mine-clearing line charge (MICLIC), tank-mounted countermine equipment (CME), and manual breach techniques. Balance exposure of the breach force to enemy fires with the probability that a system may be destroyed before it can be employed. Determine acceptable collateral damage when employing the MICLIC. Plan for resupply of Class V (explosives, smoke, machine-gun ammunition) items after the initial foothold is seized.

c. **S3.** Decide how reconnaissance forces link up, guide, or mark obstacles for bypass/breaching operations.

d. **S2, Engineer, FSO.**

(1) ***What are the counterattack routes of the enemy force?*** Consider the terrain and weather. Determine if enemy counterattack routes can be used to move friendly combat service support assets based on the enemy event template and time phasing of the counterattack. Determine what situational obstacles (rapid mining, scatterable mining) the enemy counterattack force has available.

(2) ***What is the safety zone and trigger for using scatterable mines****?* Ensure that this information is disseminated at all rehearsals.

e. **Engineer.** ***What is the composition of the buildings to be attacked?*** Determine the effects weapons will have on these structures (this drives the selection of fuze/shell combinations and aircraft attack munitions).

f. **S2, Engineer.** ***What is the "layout" of the town both above and below ground?*** Determine the protected areas, such as churches, hospitals, and museums. Sources for this information are imagery from the division, gun camera tapes from OH-58/AH-64 helicopters, road maps, and tour books.

11-3. SUPPORT PRODUCTS

The engineer staff planner uses the following products developed to support the military decision-making process (MDMP). All of these products must be developed in conjunction with the S2. These products are updated based on the results of reconnaissance and surveillance.

a. **Engineer Battlefield Assessment (EBA).** The EBA feeds many of the subsequent products. Clearly articulate the enemy engineer capability based on the most likely and most dangerous courses of action. Consider past experience with this enemy, his current strength, anticipated barrier material basic loads, expected resupply rates, and locally available materials he can use to prepare his defense. This information will support development of the situation template (SITEMP).

(1) Identify friendly engineer capabilities for mobility, countermobility, and survivability operations. Explicitly state the number and types of breaches each engineer unit is capable of executing based on its personnel, equipment, and logistical status. Leader proficiency and audacity impact on this estimate, so plan two levels down based

on the particular unit. Use this information to develop the task organization later in the MDMP.

(2) Estimate the impact of terrain and weather on both friendly and enemy capabilities. Line-of-sight, hydrology, cross-country movement, and line-of-communication overlays are helpful and can be provided by the division terrain detachment or quickly approximated from maps.

b. **Situation Template.** Know the enemy capability based on an estimated unit basic load of Class IV and V materials and anticipated resupply. The time available to prepare the defense is essential. Reconnaissance assets should observe the delivery and emplacement of barrier materials. The S2 and the engineer will template enemy obstacles and counterattack routes based on terrain and weather conditions. Determine what resources are available in the urban area (ammonium nitrate, acetylene, propane, lumber yards, jersey barriers, vehicles, and construction equipment) that can contribute to enemy defensive preparation.

(1) Based on this analysis, the engineer and S2 will jointly template the enemy engineer countermobility/survivability capability on the SITEMP. It should include minefields, tactical and protective wire obstacles, and vehicles and other barriers in roads. This overlay is used to plan the engineer task organization, because this and the friendly scheme of maneuver determine the number of sapper squads needed and where mobility assets are placed in the movement.

(2) Time and materials will impact enemy defensive capability. The force array in the security zone and main defensive belt impacts the amount of defensive preparation. Indirect-fire systems can only service one priority target and must shift to cover other targets, which may help with refining the obstacle template. Locations and movement of mounted weapons may indicate usable lanes for friendly infiltration of vehicles.

c. **Event Template.** Determine what triggers the commitment of enemy counterattack forces. The engineer planner can assist the S2 in determining what situational obstacle capabilities he has, where and for what purpose the capabilities will be committed, and what the triggers are. Determine the structures likely to be set for destruction (such as petroleum and natural gas storage facilities).

d. **Friendly Forces Survivabilitv Time Line.** The engineer and the S4 plan to construct positions to support the forward displacement of combat support and combat service support assets and limited command and control nodes. The survivability effort should be an essential part of the maneuver deception plan.

e. **Breach Execution Matrix.** This matrix helps the task force allocate engineer assets and determine when in-stride and deliberate breach techniques are required. Specify where to use MICLIC, hand-emplaced explosives, armored combat earthmover (ACE), armored vehicle-launched bridge (AVLB), and tank-mounted counter-mine equipment to reduce enemy obstacles. It is important to keep in mind that rubble can be a more significant obstacle than conventional mines and wire obstacles.

f. **Decision Support Template/Decision Support Matrix.** Help the S3 identify and plan viable branches and sequels to the plan. It is essential to know where engineers will culminate and how rapidly engineer platoons/squads can be consolidated, reorganized, and put back into the fight.

g. **Execution Checklist/Operations Schedule.** Develop with the S3 the operations schedule (OPSKED), which is a combination of key events from the synchronization

matrix and associated code words. This product supports the decision support template and helps the battle captain and maneuver commander track the battle and make decisions. Prepare a rough execution checklist after receiving the warning order and continue to refine it during mission analysis. Finalize the checklist during war-gaming and provide advance copies to task force engineers and squad leaders.

h. **Troop-Leading Procedures Timeline.** Ensure that adequate time is available for engineers to both prepare the task force rehearsal site and conduct their own internal rehearsals.

11-4. ENGINEER STAFF PLANNING CHECKLIST (BRIGADE AND BELOW)

a. **General.**

- Identify and resource all mobility/survivability essential tasks.
- Address all the breach tenets during planning and rehearsals.
- Request terrain products, urban layout diagrams, and data on building composition from higher headquarters.
- Study available terrain products to determine which sub-surface routes to use and how to defend against enemy use of these systems.
- Study available maps and photos to determine the best routes to use when approaching the city and within the city, as well as identifying tentative locations for casualty collection points, aid stations, and ammunition and water resupply points.
- Use scatterable mines to support engagement areas that block mounted counterattack routes. Disseminate this plan to critical maneuver and combat service support leaders.
- Establish essential engineer friendly forces' information requirements and no-later than (NLT) report times.
- Nominate engineer-specific PIR and associated named areas of interest (NAIs) to support the reconnaissance plan. Ensure that the latest time information is of value (LTIOV) is clearly understood. Decide what actions to take if the PIR are not answered before LTIOV.
- Disseminate the enemy obstacle template to all engineer leaders.
- Task-organize engineers to support essential mobility/survivability reconnaissance missions.
- Determine how much and what types of obscuration smoke are available. Determine the wind direction and speed, which will impact the effects of smoke. Coordinate with the fire support officer for recommended uses of white phosphorus (both mortar and artillery delivered) and handheld smoke. Coordinate with the smoke platoon leader for duration of smoke and level of obscuration.
- Designate and clear routes for mounted forces and reserve forces.
- Identify the *conditions* and a decision point for initiating deliberate breaching operations during each critical event of the operation.

b. **Approach March.**

- Designate routes for ground convoys and allocate engineers to clear them.
- Determine the clearance method and acceptable risk.

- Ensure that all vehicles have lane and by-pass marking materials on board.
- Designate ground evacuation routes.
- Determine the decision point for using alternate routes.
- Determine when to establish TCPs/guides at critical obstacles on the route.
- Establish NAIs along the ground route to confirm or deny the enemy obstacle template.

c. **Secure a Foothold.**
- Designate the best reduction site and technique based on enemy force array, terrain, and trafficability.
- Nominate NAIs for breaching operations.
- Designate one lane for each simultaneously assaulting platoon and the engineers needed to reduce it.
- Explain the lane-marking system.
- Establish a traffic-control plan for dismounted and mounted traffic.
- Establish a vehicle route and a dismounted route of evacuation from the foothold to the helicopter landing zone.
- Designate locations for blocking positions to keep counterattacks from interfering with breaching operations.
- Resource blocking positions with MOPMS, conventional mines, and expedient barrier capability (such as abatis). Depict the planned locations of scatterable mines (include the safety zone) on maneuver and combat service support graphics to reduce fratricide.

d. **Seize Objective.**
- Designate buildings to enter and a reduction site that will support maneuver to the point of penetration.
- Designate where the support force will enter buildings.
- Resource battalions and their engineers with sufficient explosives and hand-emplaced and artillery smoke.
- Explain the cleared-building and cleared-lane marking systems.

e. **Prepare/Execute.**
- Construct appropriate rehearsal sites to support maneuver and CSS operations.
- Provide enough detail in the troop-leading procedure timeline to encourage both engineer and combined arms rehearsals.
- Issue sketch maps and terrain products to engineers.
- Construct a lane marking system and by-pass marking system that all vehicle drivers must go through en route to the objective area.
- Provide enough detail in the maneuver and engineer execution checklists to effectively use the Decision Support Matrix.
- Specify times for engineer-specific pre-combat inspections conducted by platoon leaders, company commanders, and first sergeants.

11-5. RECONNAISSANCE AND SURVEILLANCE PLANNING CONSIDERATIONS

Consider the following during reconnaissance and surveillance planning:

a. **Integrate Engineer Reconnaissance Teams.** Consider the integration of engineer reconnaissance teams into the brigade R&S plan. Focus these teams on engineer targets such as landing zone denial, obstacles in the reduction area, enemy survivability on the objective, and obstacles on approach routes. The NAI assigned to engineers should have priority intelligence requirements (PIR) that determine the best reduction sites in the urban area and confirm or deny enemy fortification of key sites.

b. **Precombat Inspections.** After conducting precombat checks (PCCs), inspect materials used to mark obstacle by-pass lanes. Conduct FM radio communications exercises using the OPSKED and reports specific to the current operation. Inspect all maps for operations security considerations. Sterile maps are not required, but information provided on overlays should not compromise the attack plan. Overlays should portray only NAIs. Targets, pickup and landing zones, and link-up locations should not be on overlays taken into the objective area. All soldiers must clearly understand the NAI priority and associated PIR, casualty evacuation (CASEVAC) plan, abort criteria, compromise plan, exfiltration and linkup plan, and communications windows.

11-6. MOBILITY PLANNING CONSIDERATIONS

Providing mobility support to a maneuver force during UO normally will require engineers to support multiple combined arms breaching operations. The reverse planning process (discussed in FM 90-13-1) applies to all terrain situations. The considerations discussed in this paragraph complement this process.

a. **Conduct the Approach March.** The S3 and the battle staff plan a primary route and an alternate route to support the movement of each maneuver battalion's combat forces. The engineer makes recommendations based on trafficability of the terrain and the ability to clear these routes using standard tactics, techniques, and procedures (TTP). Control of movement routes is critical, particularly when ground evacuation is the primary method of removing casualties. The S4, S3, and XO coordinate one-way, two-way, and alternating-direction traffic on task force routes and identify decision criteria for switching to alternate routes. Maximize aerial reconnaissance of routes to identify possible obstacles, combat outposts, and ambushes. The engineer planner ensures that the task force has enough engineer assets dedicated to accomplish the implied tasks and ensures that enough Class IV and V are available to support the movement.

(1) ***Precombat Inspections.*** The engineer ensures that subordinate engineer squads conduct standard route-clearance PCCs and PCIs, which should be listed in the unit SOP. As a minimum, the task force engineer should check initiation systems, demolition charges, reduction equipment, marking materials, and mine detectors, and have a basic understanding of the concept of engineer operations.

(2) ***Rehearsals.*** The engineer, with the S3, ensures that all of the breach tenets and control measures are understood by key leaders at the task force rehearsal.

b. **Secure a Foothold.** Create lanes through obstacles using one sapper squad per lane, with a minimum of one lane per simultaneously assaulting platoon. (This does not necessarily mean nine lanes per Infantry battalion; this requirement should be carefully

analyzed.) Use adequate marking materials, guides for assault and follow-on forces, and lane hand-over procedures. It takes at least 30 minutes to *cycle* this engineer squad back into the fight. A squad cannot support breaching operations continuously. A decision point or trigger must support any changes in task organization and missions for engineers. Establish decision points for changing approach routes, reduction sites, and initiation of SOSRA (suppress, obscure, secure, reduce, assault).

(1) ***Precombat Inspections.*** Equip the unit with bolt cutters (two per engineer squad), grappling hooks (three per engineer squad), a lane-marking kit, hand-emplaced explosives (10 per squad, per lane), mine detectors, and probes. Ensure that handheld smoke is available for each Infantry soldier and that vehicles or utility helicopters carry smoke pots. Mass this smoke with the breach force at the breach point. Ballast load marking system upgrade materials on gun trucks. Use expedient reduction tools, such as SKEDCO litters, for wire reduction.

(2) ***Rehearsals.*** No matter what rehearsal type or technique is used, perform basic rehearsals IAW SOSR factors.

(a) *Suppress.* Ensure that all personnel understand the location of support-by-fire positions and the pyrotechnic and radio signals to initiate obstacle reduction and indicate when the lanes are open (proofed and marked). The rehearsal site should have a full-scale lane-marking system visible to every soldier. All key leaders should understand the commitment criteria for the breach force.

(b) *Obscure.* Rehearse triggers for artillery-delivered, hand-emplaced, and vehicle-generated smoke. Consider the position of the moon relative to the support-by-fire position, the percent of illumination, and the night-vision goggle window.

(c) *Secure.* Hold a combined arms rehearsal of the breach force using the full-dress rehearsal technique. This rehearsal includes engineers and attached maneuver elements dedicated to suppressing direct fires and destroying local counterattacks.

(d) *Reduce.* The combined arms rehearsal should include handing over lanes from engineers to maneuver soldiers. The rehearsal should occur at the "NCO to NCO" level and discuss details of linkup and handover. Consider the need to back-haul casualties when planning the number of lanes.

c. **Seize Key Facilities.** Plan procedures for dynamic entries into buildings and vertical envelopment, which require prepared special demolition charges (see Chapter 8) and expedient assault ladders. Rehearse the TTP for getting into windows on second and third floors. Have cutting tools available to prepare climbing poles at the breach point. Plan for sub-surface entry, if necessary. Consider the use of reducing wire in stairwells and hallways.

(1) ***Precombat Inspections.*** Inspect special breaching charges (see Chapter 8.). Ensure that charges are properly constructed and that they will "stick" when placed on walls and doors. Use double-sided foam tape when placing vertical breaching charges during warm, dry conditions. Use spikes, braces, or Ramset-type power-actuated fasteners during rain or when temperatures are below freezing. Ensure that sufficient handheld and hand-emplaced smoke is available. Assaulting soldiers can carry smoke pots and additional explosives. Where METT-TC factors permit, consider using mechanical breaching tools to enter doors. Conserve explosives by bringing one or two 24-inch crowbars to lift manhole covers and pry open entryways in buildings and sewers. Provide night-vision goggles to soldiers who reduce obstacles, because Infantry leaders

use infrared "tactical pointers" extensively, and reduction element soldiers must be able to see these signals. Use all available infrared lights. Mount and zero all AN/PAQ-4s and AN/PVS-4s during the preparation phase of the mission. Engineers must bring handheld infrared and visible light sources to help move and reduce obstacles inside buildings and sub-surface structures. (See Appendix B.) Ambient light inside hallways and underground is virtually zero, so plan for additional light sources. Mark cleared buildings so the marking is visible from rotary-wing aircraft, armored vehicles, and by dismounted soldiers (Appendix I).

(2) ***Rehearsals.*** Focus on the location and control of support forces and signals for committing the breach force. Ensure that soldiers understand the minimum safe distance and the best reduction site based on the building structure. Clearly identify routes between buildings and the marking method for "safe routes." Deconflict building clearance markings from collection points for casualties, displaced civilians, and enemy prisoners of war. Rehearse precision clearing techniques with the Infantry for interior building clearing. Basic SOSR rehearsals from "secure the foothold" apply to dynamic entry into buildings, but these rehearsals usually focus on the Infantry platoon and an engineer squad.

NOTE: The company, battalion, and brigade engineers must be knowledgeable of demolitions effects and recommend minimum safe distances based on the amount of and type of explosives which will be used and the construction of buildings to be breached.

(3) ***Noncombatants and Enemy Prisoners of War.*** Establish "protected areas" for noncombatants, and clearly mark routes for displaced civilians. Consider an expedient countermobility effort to restrict access to noncombatants and enemy prisoners of war (EPWs). Liaison officers from psychological operations, civil affairs, and the military police should address this topic in the brigade maneuver rehearsal. Although there are no specific engineer requirements, engineers should be prepared to provide technical assistance during planning and execution phases.

(4) ***Subsurface Considerations.*** Important points are:

- Entering the tunnel or sewer complex using hand tools or explosives
- Identifying and neutralizing mines and booby traps.
- Marking cleared areas.

Subterranean navigation inside sewers and radio communications from underground to soldiers above ground are challenging. There is no ambient light inside tunnels, so plan and rehearse using infrared and visible light signals. (See Appendix D.)

d. **Movement Within the Urban Area.** Plan one vehicle lane per mounted platoon entering each section of the urban area. The lane through tactical and perimeter protective obstacles will become an axis of advance within the urban area. These lanes initially will support one-way traffic. Plan and rehearse traffic control when lanes become alternating traffic lanes to allow for MEDEVAC/CASEVAC. Improve at least one lane to two-way traffic and designate this as the primary MEDEVAC/CASEVAC route. Designate, clear, and mark a route from the casualty collection point to the MEDEVAC/CASEVAC primary and alternate helicopter landing zones. Use combat route-clearance techniques to clear the ground MEDEVAC/CASEVAC route. Reduce or bypass obstacles created by

disabled vehicles, rubble, and so forth. If by-passing is part of the plan, make it a branch to the plan and include decision points and conditions.

(1) ***Precombat Inspections***. Inspect mine clearing line charge (MICLIC) and tank-mounted CME. Ensure that designated dismounted sappers have at least 20 blocks of TNT or C4 and 500 feet of detonating cord to reduce a 100-meter deep "lane" for vehicles. Inspect mine detectors carried by engineers designated to execute this mission. Sandbag one vehicle to use for proofing vehicle lanes, and dismount all passengers when proofing the lane. Ballast load additional lane marking material on vehicles. To assist the maneuver force in locating the correct lane to support their tactical plan, ensure that markings for multiple lanes are easily distinguished by day and at night. MEDEVAC/CASEVAC lanes must have a dedicated traffic control post (TCP). Integrate a tank-mounted plow or properly prepared heavy vehicle (dozer, loader, or 5-ton truck with winch) into the plan to reduce rubble or obstacles caused by disabled vehicles.

(2) ***Rehearsals.*** A combined arms breaching rehearsal is required (according to FM 90-13-1). This rehearsal will serve as the final check for mission-essential equipment and final adjustments to the plan based on PCIs. Synchronize the establishment of support-by-fire positions to isolate reduction sites and trigger conditions for initiating reduction operations (the conditions and who makes the decision). Determine who shifts obscuration and suppressive fires and when they are shifted. Leaders must rehearse handing over lanes to follow-on forces. Rehearse time-phasing the ground MEDEVAC/CASEVAC route clearance to helicopter landing zones and ambulance exchange points. Construct the unit's standard lane-marking system and route signs at the rehearsal site.

11-7. COUNTERMOBMITY PLANNING CONSIDERATIONS

These issues should be addressed in brigade, battalion, and company-level rehearsals. Plan to issue a scatterable mine warning (SCATMINWARN) to prevent fratricide.

a. **Tactical Employment of Scatterable Mines.** The S3, engineer, and FSO should plan, in detail, the employment of artillery-delivered antipersonnel mines/remote antiarmor mines (ADAM/RAAM) and multiple-delivery mine systems (VOLCANO). Specify the target to be attacked, a tentative location, its effect (disrupt, turn, fix, or block), the delivery system, the observer, and the trigger. To reduce the risk of fratricide, the scatterable mine execution plan must be clearly understood by leaders of mounted elements.

b. **Protective Employment of Scatterable Mines.** Ballast load the modular pack mine system (MOPMS) on vehicles moving into objective area blocking positions. Consider sling loading the MOPMS, conventional mines, and limited barrier materials to support transitioning to the defense and blocking enemy counterattacks.

c. **Engagement Area Development.** The S3 should specify the engagement area to interdict the enemy counterattack force. Ensure that battalion and brigade reserve forces have specified routes to move to the engagement area. The engineer must ensure that these movement routes are obstacle restricted zones. Engineers may not be available to emplace obstacles, so specify the engagement area development tasks, including obstacle emplacement and fire integration, to maneuver units.

11-8. SURVIVABILITY PLANNING CONSIDERATIONS

Perform this work concurrently with initial reconnaissance and the effort to shape the area of operations (setting conditions) by the brigade, to support the brigade and division deception plans. Specific considerations include:

- **Field Artillery.** Determine positioning areas and plan counterfire radars and ammunition.
- **Forward Area Refuel Point.** Establish locations for stocking fuel and ammunition. Plan for multiple refueling sites to support the attack and lift aviation simultaneously.
- **Battalion Aid Station.** Locate forward treatment facilities and ingress/egress routes. The implied task is to establish helicopter landing zones for these sites.