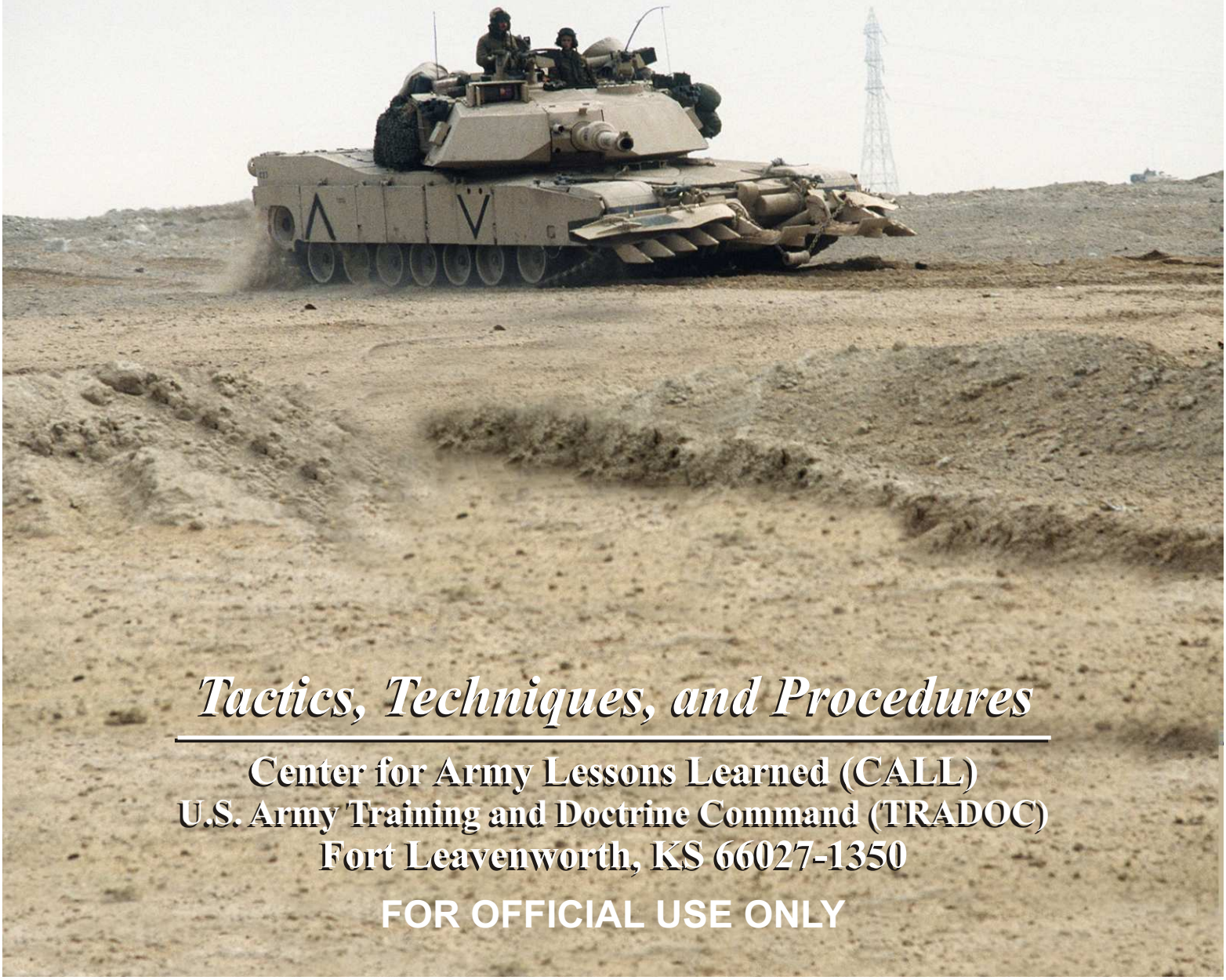
HANDBOOK

No. 03-31 Nov 03

Route Clearance



Tactics, Techniques, and Procedures

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FOREWORD

In the contemporary operating environment soldiers routinely face the threat posed by mines and ambushes along their lines of communication (LOCs). Soldiers have learned, often through trial and error, how to operate in this difficult environment. Maneuver relies on the concept of assured mobility. Commanders can take steps to significantly reduce mine losses. Appropriate tactics, combined with an aggressive training program in route clearance, proves to be an effective means of reducing casualties and equipment losses.

The availability of clear lines of communication during operations is essential to the movement of forces. Operations to clear or secure a route of any length require a huge investment in time, manpower, and resources, especially in restrictive terrain. Military operations in Vietnam and Somalia demonstrated that route clearance must be a combined arms combat effort to ensure success. Route clearance is again proving to be a challenge for U.S. and coalition forces during stability operations and support operations (SOSO) in Iraq and Afghanistan. This handbook provides timely, relevant tactics, techniques, and procedures (TTP) for route clearance.

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Route Clearance Handbook

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CHAPTER 1

ROUTE CLEARANCE: COMMAND AND STAFF CONSIDERATIONS

The ability to move forces and material to any point in an area of operations (AO) is basic to the effective application of combat power and often decides the outcome of combat operations. Maneuver relies on this concept of assured mobility. The availability of clear lines of communication (LOC) during operations is essential to the movement of forces.

In actual combat, route clearance missions often consist of more than just neutralizing mines along pre-existing roads and trails. The enemy, particularly guerillas and other irregular forces, may actively resist such operations and units frequently execute the much more complex task of clearance-in-zone operations to ensure battlefield circulation. Clearance-in-zone eliminates "organized resistance in an assigned zone by destroying, capturing, or forcing the withdrawal of enemy forces that could interfere with the unit's ability to accomplish its mission." In such operations, the unit must plan to destroy the enemy first and clear the road second, with the zone dictated by the route that the commander desires to clear.

This operation typically requires a combined arms team to ensure mission success. In high-tempo, mechanized operations, route clearance may take the form of a maneuver team moving to contact along a route with mine-roller equipped tanks leading the way. After a mine roller detonates a mine (or the team otherwise identifies a minefield across its route), the team executes its standard breaching drill. **FM 3-34.2, *Combined-Arms Breaching Operations*** discusses breaching operations in detail.

Considerations For The Maneuver Commander

The maneuver commanders at brigade and battalion task force (TF) levels must clearly understand the effort required to doctrinally "clear and secure" their routes. Operations to clear or secure a route of any length, especially in restrictive terrain, require a huge investment in time, manpower, and resources, The maneuver commander must determine whether just reducing the obstacles along a specific route will be adequate. Obstacle reduction normally requires smaller forces and less time than securing the route or clearing all obstacles along it. The TF commander must decide the end state he actually needs to achieve the accomplishment of his tactical objectives. He must ensure that he transmits the proper task and criteria for success to his command. In addition, the TF commander must understand how the execution of active route clearance operations within his sector integrates into the brigade plan.

The principles of breaching operations

The principles of breaching operations (Chapter 9, **FM 20-32, *Mine/Countermine Operations***) apply to the development and execution of route clearance missions. The breaching tenets (intelligence, fundamentals, organization, mass, and synchronization) form the basis for effective planning.

Intelligence

When conducting intelligence preparation of the battlefield (IPB) for route clearance operations, the maneuver commander must consider mission, enemy, terrain, troops, time available, and civil considerations (METT-TC). The IPB and the engineer battlefield assessment (EBA) offer an effective method for establishing a useful situation template (SITEMP). After the S2 and the engineer identify the most probable threat sites, the S2 designates them as named areas of interest (NAI). The commander then focuses his

reconnaissance effort on these areas. Engineers work in concert with other reconnaissance assets to confirm the presence or absence of ambushes, unexploded ordnance (UXO) (particularly dud sub munitions), improvised explosive devices (IED) mines, and tactical/protective minefields. The information gathered from the IPB process and the reconnaissance effort determines the method and the type of route clearance necessary and the optimal task organization for route clearance missions including any outside resources (explosive ordnance disposal (EOD), special operations forces (SOF), etc.) that may be needed.

Fundamentals

If the reconnaissance effort locates mines that affect future operations, the maneuver commander ensures that his command is ready to counter them effectively. The TF commander prepares his unit to execute suppress, obscure, secure, reduce, and assault (SOSR-A) as necessary.

Organization

A mix of heavy and light forces are typically best suited for route clearance missions. The TF commander task organizes his forces for route clearance missions in a manner similar to that used for breaching missions. The clearance team is organized into breach, support, and assault forces. The breach force conducts clearing operations, the support force isolates the area being cleared and provides nearside security for the breach force, and the assault force destroys or dislodges the threat on the far side and performs security functions beyond the clearance site. The assault force also assists the breach and support forces in disengagement, as required. Table 1 shows a sample task organization for a route clearance. The organizations are resourced based on reverse planning from the desired end state back to the line of departure.

Table 1. Sample Task Organizations for a Route Clearance			
Team	**Assault Force**	**Support Force**	**Breach Force**
Heavy	**Mechanized infantry platoon with dismount capability** **Armor platoon** **FIST/COLT/Striker** **ADA section**	**Mechanized infantry platoon** **Engineer squad** **Mortar section** **Medical team (two ambulances)** **PSYOP team** **FIST** **MP element**	**Engineer platoon with organic vehicles** **Armor platoon with plows and rollers**
Light/Heavy	**Two infantry platoons (light)** **FO/COLT/Striker** **ADA section**	**Bradley platoon with dismount capability** **Engineer squad** **60-mm mortar section** **Medical team (two ambulances** **PSYOP team** **FIST** **MP element**	**Engineer platoon with organic vehicles** **Armor platoon with plows and rollers**
Light	**Two infantry platoons (light)** **FO/COLT/Striker** **ADA section**	**AT/MP section with M60/MK19 mix** **60 mm mortar section** **Medical team (two ambulances)** **PSYOP team** **FO** **MP element**	**Engineer squad (+)** **Infantry platoon (light)** **AT/MP section with M60/MK19 mix**

Mass

The TF commander ensures the allocation of sufficient maneuver and engineer assets to the clearance team. He considers the anticipated threats and terrain when determining the size and type of units required to perform the tasks of the support force and the assault force. The length and the width of the route and the type of clearance to be conducted determine the size of the breach force. Due to the total lane width to be cleared and the requirement for the rotation of mine-detector operators, clearing a typical main supply route (MSR) with a deliberate clearance technique requires at least two interim vehicle-mounted mine detectors (IVMMDs) or one engineer platoon (see FM 3-34.2, Appendix E and FM 20-32, Chapter 10 for IVMMD employment considerations). Depending on the type of sweep operation selected, the commander will resource a 50 percent redundancy of engineer assets against potential loss or damage.

Synchronization

The maneuver commander ensures the implementation of all aspects of synchronization when preparing for route clearance operations. It is especially important that the clearance team conduct rehearsals at the combined arms level. These rehearsals should include:

- Dismount and remount drills
- Reaction to enemy contact
- Reaction to an ambush
- Breaching an obstacle
- Vehicle recovery
- Communications exercise.
- Fire support (clearance of fires, obscuration smoke, immediate suppression fires, critical friendly zones for counterfire radar, and no-fire area around the clearance site).
- CSS (movement routes, casualty evacuation, resupply of marking materials, and demolitions re-supply)

In situations where there is a significant ongoing threat to a unit's LOC, the maneuver commander must ensure that he maintains adequate control over traffic along his MSRs. This allows the teams conducting route clearance operations to rapidly clear fires without the fear of fratricide. Maneuver commanders should consider establishing a route "czar" for their brigade (BDE)/battalion (BN) sector. This route "czar" controls the opening and closing of routes based on threat levels and the success of combat units in reducing/clearing obstacles. Using positive control measures, he controls movement along all routes in his sector. By establishing a route "czar," the maneuver commander can effectively track the progress of route clearance operations as well as the status of various routes. The brigade commander should consider using either his executive officer (XO) or the forward support battalion (FSB) commander for this task. The route "czar" will have the authority to deploy route clearance teams in the event of enemy activity along the routes or to provide additional security to key assets traveling along a particular route. With centralized control, the brigade can plot the obstacles and enemy contact throughout the brigade sector. The individual designated to track the road-clearance elements must consider the following: How will the route be used? Will it only be used to get attacking forces to an objective or will it serve as a battalion/brigade main supply route (MSR)? Does the route need to support two-way traffic or only one way? What types of vehicles will be using the route?

Planning Considerations For The Maneuver Unit Staff

Staff tasks to accomplish (according to METT-TC):

- Conduct an air-mission brief

- Develop a fire plan/suppression of enemy air defenses (SEAD)
- Conduct emergency re-supply operations.
- Conduct vehicle recovery and evacuation operations.
- Collect and disseminate intelligence information.
- Provide command and control (C2)
- Conduct liaison with civil authorities
- Respond to press interviews
- Deploy a reserve

BOS planning considerations for route clearance

Like breaching, route-clearance operations require extensive BOS coordination by the brigade and battalion TF staffs.

Intelligence (S2 with the assistance of the staff engineer)

- Along the LOC, identify key terrain, choke points, obstacles (and associated bypasses), bridges, tunnels, critical road junctions, and built-up areas that are likely areas for obstacle emplacement. If the enemy's goal is to disrupt U.S. convoys, routes are typically mined in places that offer him some concealment, such as near curves, reverse slopes, low ground (particularly over metal culverts), forested areas, and built-up areas.
- Maintain a situation map with graphics overlay that reflects the most current intelligence information.
- Maintain an incident map with a graphics overlay to facilitate pattern analysis. Consider recommending incidents of re-mining on previously cleared routes as a CCIR.
- Maintain a threat order-of-battle database, including how the enemy has or may disrupt unit LOC, the type of mines, UXO, IED, and booby-traps that have been encountered (or may be) as well as their employment techniques.
- Together with the task force engineer, identify bridging constraints (width and military load classification (MLC).
- Develop a detailed reconnaissance and surveillance (R&S) plan that incorporates modern battlefield techniques and systems, such as ground-based sensors (ground surveillance radar [GSRs] and remotely monitored battlefield sensor system [REMBASS]), forward-looking airborne radar, signal intelligence (SIGINT), and satellite images, as well as the employment of scout/sniper teams and vigorous mounted or dismounted patrolling.
- At a minimum, consider the following in the context of route clearance operations:

- º Coordinate for unmanned aerial vehicle (UAV) support, if available.
- º Develop friendly infiltration routes to support recon and security of likely enemy ambush sites.
- º Develop an estimate of the impact of civilians on the battlefield (COBs). COBs include local nationals, non-government organizations (NGOs), and private volunteer organizations (PVOs).
- º Develop a plan for refugees and other obstacles to movement.
- º Coordinate periodic flights over the area to provide current intelligence and discourage hostile activities along the route. When available, coordinate Airborne Standoff Minefield Detection System (ASTAMIDS) coverage. Film the route using an AH-64, if possible.
- º Coordinate with the USAF to periodically over fly routes (e.g. using an AC-130 Specter gun ship).

- Establish liaison with the host nation, NGOs, and SOF. Coordinate for additional information/intelligence. Attempt to obtain plans from local highway officials that will assist in classifying the route and bridges.
- Before departure, provide subordinate leaders with intelligence updates on IED hazard areas in the form of a 1:50,000 enemy SITEMP overlay (confirmed and suspected/templated).

Maneuver

- Identify which sections of which routes need to be cleared, including their start/end points.
- Develop and rehearse battle drills.
- Develop adequate control measures (including traffic control posts (TCPs) for movement along routes. Establish appropriate graphic control measures (phase lines, checkpoints, rally points, restrictive fire lines [RFLs], no-fire areas [NFAs], boundaries, and landing zones [LZs] for use by medical evacuation [MEDEVAC]).
- Identify personnel requirements to adequately man the TCPs.
- Close routes to U.S.-controlled traffic during route clearance operations to minimize the target presented to enemy forces.
- Aid in the clearance of direct and indirect fires.
- Coordinate electronic warfare (EW) support if radio-controlled mines are a significant threat. Be aware that jamming radio-controlled mines provides only a temporary countermeasure. Find and neutralize these mines before convoys use the route.
- Coordinate for MPs to support clearance operations and to provide security for convoys during and after clearing operations.

- Consider designating a battalion-level quick reaction force (at least platoon-size) for immediate commitment in support of a route clearance team that becomes heavily engaged. This force should be mechanized or air-assault capable.

- Consider providing operational control (OPCON) of aviation assets to the route clearance commander for clearance support missions.

- Identify security requirements for cleared routes. Coordinate effective transfer of responsibility for route security from the clearance team to its relief. Consider establishing concealed observation post (OP)/listening posts (LPs) or building security points along the cleared route to provide continual surveillance of the entire route and to reduce the probability of reseeding and ambush. Consider the use of GSRs or REMBASS.

Fire support (fire support coordinator)

- Ensure that route clearance teams have a fire support team (FIST) coordinator with them.

- Pre-plan fires (including smoke) for employment against templated enemy locations and activities. Plan suppressive fires on enemy elements capable of placing direct or indirect fires on the breach force.

- Coordinate mortar support to ensure continuous coverage of the entire operation. Consider the need to displace the mortars during the operation or have them move with the assault force.

- Prepare fires within the tactical rules of engagement, pre-clearing as much of the route as possible.

- Designate predetermined obstacle clearance sites as critical friendly zones for counterfire radar and a friendly no-fire area.

- Coordinate adequate Q-36/37 radar coverage for deliberate route clearance operations.

- Recommend best shell/fuze combination, sheath configuration, and type of mission to the S3 and clearance commander. Advise the clearance commander of fire support assets available (including any limitations such as range fans and availability of smoke and illumination rounds).

- Identify dud U.S./allied sub munitions likely to be encountered during a route clearance operation, their location and density.

- Develop clearance of fires procedure and ensure rapid response of fires, especially obscuration fires.

Mobility/survivability (engineer staff officer)

- Provide detailed obstacle intelligence (OBSTINTEL), including:

    - A description of the mines or explosive devices most likely to be encountered.

- º The composition and pattern of anticipated obstacle(s) as well as any unusual or noteworthy enemy mining techniques.

- º Likely enemy actions or techniques associated with obstacles found on routes.

- Provide the TF commander and clearance commander with a realistic estimate of how much time the engineers require to clear a route to a specified level (1 to 4) or by using a specified type of clearance (hasty or deliberate) with the available assets.

- If available, provide bridge and road classification data to the TF S2 and brief the clearance commander on the impact of any operational limitations imposed by the nature of the routes and bridges in question.

- Identify available EOD support; coordinate their inclusion with the clearance team as appropriate. If EOD is available only on an on-call basis, provide contact procedures and estimate response times.

- Coordinate for mine detection dogs (MDD) to assist in clearance.

- Ensure that the marking of minefields remaining near a route meets the standards directed by the supported commander.

- Consider including road repair equipment and material as part of the breach force (for example, two 5-ton dump trucks filled with gravel and an analysis and control element (ACE) to spread the gravel). At a minimum, the engineer unit responsible for providing such support must be identified and available in an "on-call" status. If possible, coordinate for quick-set concrete to cap all road repairs. This denies the enemy a pre-dug hole for any future mine-laying efforts.

- If river mines are a threat, coordinate the construction of mine booms upstream of bridging and fording sites.

- Coordinate the blocking of uncleared roads and trails that branch from the route being cleared to protect units from inadvertently traveling on an uncleared route. As time permits, replace temporary markers (such as barbed wire fences or concertina) with berms or Jersey barriers.

- Debrief the breach force. Determine the location, the composition, and the orientation of all obstacles encountered. Provide a summary of this information to the chain of command and the TF S2 (this information will assist the S2 and engineer in IPB/EBA pattern analysis).

- Update route status with the TF S3, S4, and military police as appropriate. Also, submit updates to the division or corps transportation officer through the S3.

- Assess road surface conditions, particularly hardness and compaction. If the road surface is too hard to probe adequately (certain compacted soil types or frozen ground), then the senior engineer and EOD representatives should consult and consider appropriate courses of action based on mission requirements (mark, bypass, neutralize, move to alternate route if available, etc).

Air defense artillery (ADA) (air defense staff officer or FSCOORD)

- Assist the S2 with the threat-air portion of the IPB.
- Use standard passive air-defense measures:
    - º Eliminate glare by using mud, tape, cardboard, or camouflage nets to cover headlights, mirrors, and portions of windshields.
    - º Reduce dust clouds by reducing speed.
    - º Plan routes that offer natural concealment.
    - º Use air guards; assign them sectors that provide 360-degree coverage.
- Increase the distance between vehicles.
- Incorporate Stinger missile teams into the support force.

Combat service support (CSS)

- Support route clearance operations with a logistical/combat health support (CHS) package from the brigade support area.
- Plan for air and ground evacuation of casualties. The preferred evacuation method is by air; the routine method is by ground.
- Conduct an air-mission brief with personnel from the air ambulance unit, include the location of pickup zones along the route and marking techniques. Rehearse evacuation procedures.
- Ensure that the medical teams consist of one or two ambulances.
- Locate the medical team with the support force.
- Identify the ambulance exchange point along the route to be cleared.
- Identify maintenance and recovery support required (including extracting damaged vehicles).

Task force commander/S-3

- Designate a controlling, coordinating, and supporting HQs for route movement.
- Conduct all necessary rehearsals.
- Assign clearance responsibilities to brigade combat team and battalion TF assets.
- Ensure that the unit has a clear understanding of the mission, the intent, and the end state. For example, the clearance team commander should understand that his unit must clear the road width, including the shoulders, and secure the route. Ensure the command and support relationships for all elements involved in the operation are clearly stated and understood.

- Designate a quick reaction force (at least platoon-size), preferably one that is mechanized or air-assault capable. Deploy this quick reaction force with the clearance team or at an appropriate base on a standby basis, according to the situation.

- Identify communications assets required. Route clearance operations typically require the clearance commander to operate on three separate frequencies—battalion command net, company team command net, and fire-support net. Provide a simple, effective frequency plan. Consider requirements for retrans/relay as needed to maintain continuous communications between the clearance team and the TF HQs.

- Determine the length of route to be cleared, using clearly defined start and end points.

- Control the movement of all personnel and equipment along the route (travel authorization is coordinated through the S4).

- Track the status of routes (red, amber, green) in the TF zone, based on the amount of time since the route was cleared and the intelligence and enemy situations.

- Track the progress of ongoing clearance operations and integrate them into ongoing maneuver and CSS operations.

- Prepare a risk assessment of the mission before issuing the operations order (OPORD). (An example of a mine risk assessment is shown in Appendix F, FM 20-32.)

- Coordinate with adjacent units, host nation representatives, NGOs, PVOs, and SOF.

Special operations

- Ensure that psychological operations (PSYOPs)/civil affairs (CA) support the counterintelligence effort by conducting civilian interviews that include the gathering of information on enemy activities such as the location and timing of ambushes and mine laying.

- Direct civilians along the MSR to the displaced personnel holding areas or to the routes that the unit has indicated for their use.

- Employ PSYOP/CA teams forward to disperse civilians and provide traffic management to isolate the route during clearance operations. If the situation warrants, publicize warnings to civilians to avoid routes being cleared. Coordinate with local officials (including law enforcement) to gain their assistance in route clearing operations.

LOC Overlay

The maneuver brigades HQ will provide subordinate units with a standardized LOC overlay (Figure 1) and track the status of the routes in the brigade area, providing updates to its subordinate units as necessary.

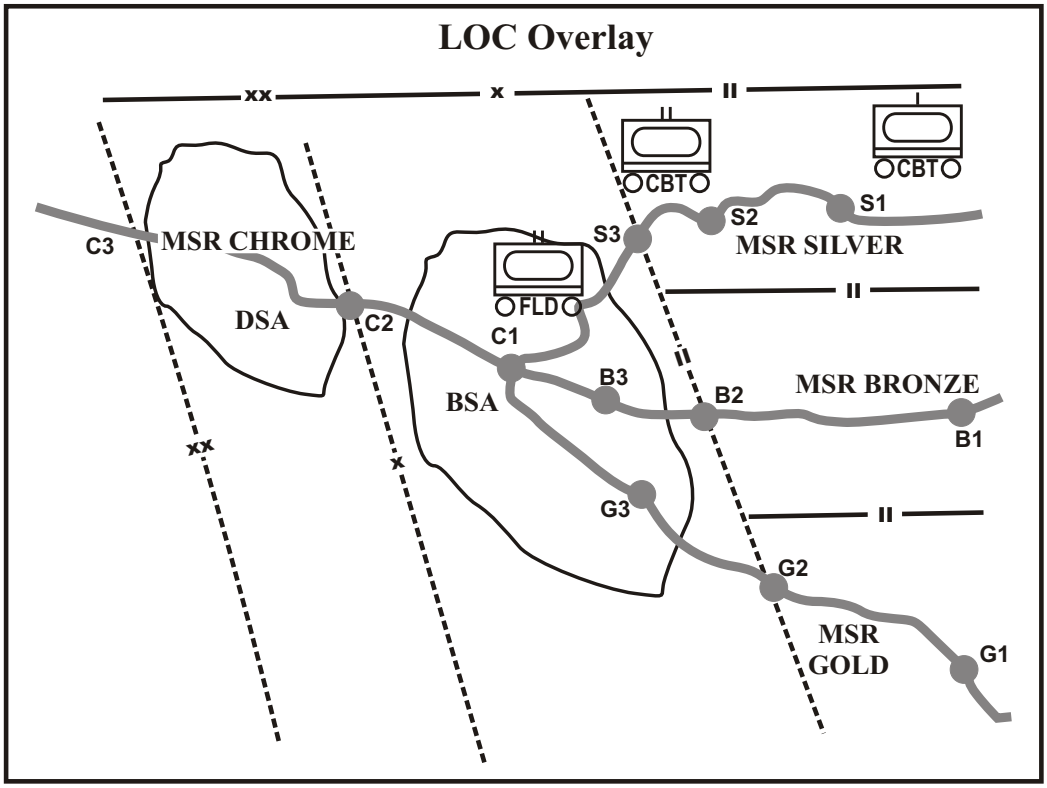

Figure 1. Example of an LOC Overlay

The LOC overlay identifies authorized routes in the brigade area. Each route is subdivided and named. A convoy commander plans his movement along these routes. To check for the route status outside the TF zone, personnel give the route numbers: P1-C2-C3-F1 through the chain of command to the division or corps transportation officer who maintains the most current route status.

The brigade and battalion TOCs will track each subsection's status and report the route's status. For example: "C2 and C3 were clear 15 minutes ago. P1 is unknown. A convoy was fired on while traveling on F1 3 hours ago at grid PV909429. No obstacle was reported." This gives the convoy commander distinct information on which to base his risk assessment.

If a battalion requires a new route that is not on the current overlay, the S3 will request the brigade S-3 to consider a new route. The route's subsections and name will then be sent out in the next intelligence summary (INTSUM) to the brigade's subordinate units. A hard copy will be distributed to the battalions with the next fragmentary order (FRAGO).

Battle tracking

As noted earlier, reporting the status of the routes is critical to maintaining functioning lines of communication. Once the information is compiled at the TOC, the commander must know how to use it. To assist in tracking these route subsections, the staff will use a color-code system to define the status. An example of this system is described in Table 2 below. The LOC color-code system provides a quick method of determining the level of risk on each subsection of a route,

aiding in risk management of the brigade combat team. To track the reports, a LOC status chart would look something like the example in Table 3. The status could be written out as shown, or filled in with the appropriate colored pen for quick reference.

Table 2. Example LOC Color-Code System

Route Condition	Condition Description	Interpretation
Green	**Route with no previous reports of enemy activity; traveled without incident within the last 4 hours. Route with previous report of enemy activity, but has been deliberately cleared, the enemy destroyed, and caches eliminated.**	**Route is considered safe for movement. Force protection is still required**
Amber	**Route either deliberately or hastily cleared, but not traveled within the last 4-8 hours; all previously reported obstacles have been cleared. Caches may or may not have been discovered. Routes only cleared with a hasty sweep cannot be classified higher than amber.**	**Route's status should be relatively safe. However, there is a medium risk of new or reseeded obstacles on the route.**
Red	**Route either deliberately or hastily cleared, but has not been traveled in at least 8 hours**	**This route should be considered medium to high risk. Any movement on this route should be prepared for contact.**
Black	**Route that has either never been cleared or, regardless of previous reported condition, now has known enemy presence that must be neutralized**	**Only combat forces moving to target the obstacle or enemy force should use this route. Route has confirmed enemy presence.**

Table 3. Example Route Status Chart				
Route	**Sec.**	**Status**	**Traveled**	**Remarks as of: 101400 Sep**
A	**1**	**Green**	**101215 Sep**	**Deliberate clearance by A/27 EN BN 101100 Sep**
	2	**Green**	**101215 Sep**	**Deliberate clearance by A/27 EN BN 101100 Sep**
	3	**Amber**	**101200 Sep**	**Hasty clearance by A/27 EN BN 100900 Sep; obstacle neutralized at ET 123233**
B	**1**	**Red**	**NA**	**Hasty Clearance by B/27 EN BN 091400 Sep**
C	**1**	**Green**	**101245 Sep**	**Deliberate clearance by B/27 EN BN 091400 Sep**
	2	**Red**	**091800 Sep**	**Deliberate clearance by B/27 EN BN 091600 Sep**
	3	**Black**	**101145 Sep**	**Obstacle reported at ET 321332 Not Clear**
	4	**Black**	**091800 Sep**	**Obstacle reported at ET 333333 Not Clear**
	5	**Black**	**101250 Sep**	**Mine and ambush reported at ET122323 101250 Sep**
D	**1**	**Red**	**091000 Sep**	**Hasty Clearance by C/27 EN BN 090600 Sep**
E	**1**	**Black**	**100956 Sep**	**Mine and ambush reported at ET332112 100956 Sep**
F	**1**	**Amber**	**100900 Sep**	**Hasty Clearance by C/27 EN BN at 090700 Sep**

Considerations For The Clearance Commander

Route clearance planning checklist:

- Warning order issued, to include routes to be cleared, NAI, and not earlier than (NET) move time.
- Company SITEMP developed with known/suspected obstacles, ambushes, bypasses, danger areas for tanks and light infantry. (An infantry danger area is not the same as a tank danger area.)
- Indirect fires planned using SITEMP to achieve suppression and obscuration.
- Identify existing graphic control measures (phase lines, checkpoints, rally points, restrictive fire lines (RFLs), no-fire areas (NFAs), boundaries, and LZ.
- Rules of engagement (ROE) issued and understood, including its affect on battle drills and standing operating procedures (SOPs)
- Notify adjacent units of operations and start time.
- Identify any additional communication requirements.

- Identify logistics requirements, including the amount of demolitions and marking materials needed. Develop a refueling/rearming plan.
- Identify vehicle recovery requirements.
- Ensure plans are developed for enroute maintenance.
- Train and react to contact battle drills

Organization and subordinate element tasks during route clearance

A brigade combat team or battalion TF normally conducts clearance-in-zone operations. To clear a route, the TF commander normally focuses a company team on the proposed MSR. Table 1 (page 3) shows some sample task organizations for a route clearance.

TF tasks:

- Conduct deliberate sweep operations.
- Detect obstacles.
- Secure the area to be cleared.
- Conduct breaching and clearing operations.
- Conduct route reconnaissance.
- Conduct cordon and search operations.
- Conduct mounted-movement drills.
- Conduct road movement.
- React to enemy contact.
- Conduct a hasty attack (HATK).
- Deploy a reserve.
- Conduct an air-mission brief (AMB).
- Develop a fire plan/suppression of enemy air defenses (SEAD).
- Conduct emergency re-supply operations.
- Conduct casualty-evacuation operations.
- Conduct vehicle recovery and evacuation operations
- Collect and disseminate intelligence information.
- Provide C2.

- React to civilians on the battlefield.
- Conduct liaison with civil authorities.

Subordinate elements tasks:

- Support force is normally comprised of two maneuver platoons and the maneuver company team XO. Normally, the support force must be split into two parts, one for each flank. The support force provides flank security and protection to the breach force, destroying hostile forces before they can effectively engage the clearance team. If snipers, ambushes, command detonated mines, or side attack mines are likely to be encountered, the support force must operate far enough ahead and to the flanks of the breach force to destroy these threats before they can disrupt the route clearance operation. In rugged terrain or highly mined areas, where the employment of a ground-based support force on the flanks would be impractical or too risky, aviation assets may be used to provide flank security while ground forces provide rear security. The support force must also search for off-route mines and the firing wires of command detonated mines, if the presence of such devices is suspected.
- Assault force is normally comprised of a maneuver platoon, an engineer squad, a mortar section, a medical team, a PSYOPS team, an EOD light team (or supported by one that is on call), and a forward observer. The assault force's mission is the same as in a breaching operation (Chapter 9, FM 20-32). The clearance commander normally locates himself well forward in the assault force, with his FIST element close by. As critical sections of a route are completed, the clearance commander should consider leaving a stay-behind force (of squad to platoon size) to secure the site until relieved by follow-on forces (such as MPs, local forces, or a reserve).
- Breach force is normally comprised of a maneuver platoon (for local security) and an engineer platoon. The breach force sweeps the route and reduces explosive threats and mines. The force is further task-organized into sweep teams (as discussed in "Considerations for Engineers" below).

General Pre-Combat Checks Applicable To All Personnel Participating In A Route Clearance Operation

Table 5. Suggested PCI Checklist for Route Clearance Operations			
Check type of ammunition on the tanks (HEAT vs. SABOT	**PMCS of all vehicles and mine detection and demo equipment to include spare parts**	**Tank mounted rollers and plows ready. Additional dog bones, chains, and lifter straps for the rollers and plows on hand**	**Engineers have breaching equipment, mine detectors, marking equipment**
Demolition prepared and cross-leveled	**Grappling hooks for both tanks and infantry**	**Barometric pressure and temperature given to tank crew**	**Weapons cleaned and loaded, pre-fire checks completed**
Register mortars, fire support rehearsals	**Communications exercise with all communication systems to be used during the operation**	**Additional ammo to be carried by the armorer**	**Attach tank field phones if not already done**
Graphics and updates	**Weapons boresighted and zeroed**	**Camouflage of equipment and personnel**	**Soldier's knowledge of the mission**

Considerations for mounted and dismounted operations:

- Plan and conduct unit-developed battle drills appropriate to route clearance operations in accordance with (IAW) FM 3-34.2. At a minimum, the clearance team will rehearse actions on the obstacle, actions on enemy contact, casualty evacuation from a mined area, react to a mine detonation during convoy operations, and the control of COBs.

- After a mine incident, immediately establish all-around security and clear the area of the casualties with a sweep team from the breach force. Do not cluster around casualties. A sweep team will approach the casualties first, followed by an aid and litter team.

- Be wary of establishing a procedure for route clearance and then never deviating from it. Although this practice assures the clearance commander a thorough, well-controlled sweep, it also gives the enemy the advantage of being able to predict friendly movements and actions; consequently, the enemy is then able to employ his mines and ambushes to inflict maximum damage. Consequently, the clearance commander (maneuver team/company commander) will vary his procedures periodically.

- A careless attitude breeds poor security. The enemy may observe this attitude and strike when a unit's guard is down. Physically check likely ambush places. Assume good, dispersed firing positions during halts.

- Designate and include mine indicators (Chapter 10, FM 20-32) as part of clearance team rehearsals for all soldiers (not just engineers). Hostile forces normally place more than one mine in each mined area. Do not focus the detection effort solely on a horizontal mine threat, such as in the ground or in culverts. The mine threat is also vertical, such as in trees or attached to an overpass. Clearance efforts must accommodate the three-dimensional battlefield. Mines and IEDs may be placed in:

- Brush and other traffic obstructions placed on roadways.
- Bridge bypasses and fording sites.
- Road junctions.
- Obvious turnarounds, bypasses, culverts, ditches, and shoulders.
- Key logistic points (water, fuel, food).
- Debris along a route.
- Buildings and walls

Considerations for mounted operations:

- Wear protective vests, helmets, and seat belts.
- The emotional surprise (of the driver) and physical damage (to the vehicle) caused by a mine detonation may cause a vehicular accident.
- Store all loose articles because they may become high-speed projectiles if a mine detonates.
- Leave any unnecessary equipment at the base camp.
- All vehicles will have tow cables, ready for immediate use, in the front and the rear for rapid extraction and recovery purposes.
- Strive for a uniform appearance of all vehicles. Cross load key personnel and equipment.
- Vehicles operating off-route (e.g., with the support force) should follow in the tracks of the vehicle ahead, but avoid old vehicle tracks because they may be mined.
- Maintain a 25-meter interval between proofing vehicles; maintain a 50-meter interval between all other vehicles
- Keep the hatches on armored vehicles open to vent the pressure pulse from a mine detonation.

Table 5. Survivability Techniques		
Threat	**Effects**	**Countermeasures**
Boosted mines (stacked with additional mines or explosives beneath them)	**Increase damage to vehicles**	**Lead with vehicle fitted with mine-protection kits**
Antitank (AT) mines laid in the road with anti-personnel (AP) mines laid on the shoulders	**Survivors of a mine-immobilized vehicle dismount into adjacent AP mines**	**If possible, stay on the vehicle. If serious casualties require immediate evacuation, dismount onto the vehicle track on the road. Do not move onto shoulders without first looking for AP mines**
Claymore-type mines placed in trees	**Shoot down into the kill zone through the tops of vehicles**	**Reinforce the top when improvising vehicle protection**

Considerations for dismounted operations

- Maintain proper interval between personnel and equipment.
- Personnel will not run and will move only in previously cleared areas.
- Wear appropriate protective equipment (standard protective vest and helmet). When conducting countermine operations, also wear the body armor set, individual countermine (BASIC). It includes a ballistic face shield and goggles, anti-fragment trousers, and blast over-boots.
- Soldiers should wear ballistic and laser protective spectacles (BLPS). Lightly tinted, protective eye wear may reduce eye fatigue and improve their ability to recognize some mining indicators; however, they may also decrease the ability to spot other mining indicators such as trip wires.

CHAPTER 2

METHODS AND TYPES OF ROUTE CLEARANCE

Using the information gathered by the reconnaissance efforts and developed through the IPB process, the TF commander uses METT-TC to determine the method and the type of route clearance to be conducted.

When conducting stability operations support operations (SOSO), former warring faction (FWF) engineer-equivalent clearance teams should precede U.S. clearance teams within the FWF's area of operations (AO). Do not assume that FWF clearance teams will be thorough in their clearance operation. Treat the route as unsafe until U.S. or coalition clearance teams have proofed the route to confirm that it is cleared.

Methods Of Route Clearance

There are three tactical methods of route clearance—linear, combat, and combined. The method employed depends on the situation and the time and clearance assets available. If the route will regularly be used by U.S./coalition forces, the maneuver force will establish and maintain static security positions at critical locations following the completion of route clearance.

Linear clearance

In linear clearance (Figure 2), the clearance team begins its mission at Point A and completes it at Point B. This method provides the best assurance of complete and consistent route coverage. Although this is an effective method, it is not the most secure method in a high-threat environment. It is also time-intensive and limits the maneuver commander's flexibility.

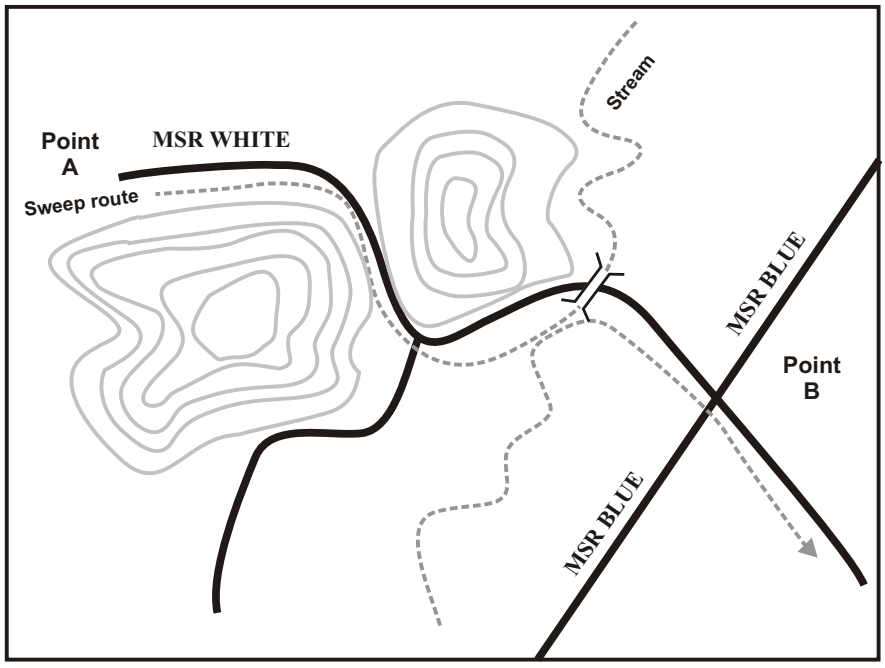

Figure 2. Linear Clearance Method

Combat clearance

Whereas linear clearance focuses on a specific route, combat clearance (Figure 3) focuses on specific points along a route. IPB and EBA can identify areas that are likely to contain mines or ambushes. These areas become NAI or objectives for combat clearance missions. The combat clearance method divides a route into sections according to the number of suspected high-threat areas. Once the clearance teams secure and sweep these areas, the route is considered clear. Combat forces can patrol the route from these objectives to ensure that the route remains secure. Using this method, the commander assumes some risk that his S2 and engineer have identified all high-threat areas and that the route is clear of mines. Combat clearance is ideal for dismounted (light) forces since it provides the maximum use of surprise and concealment.

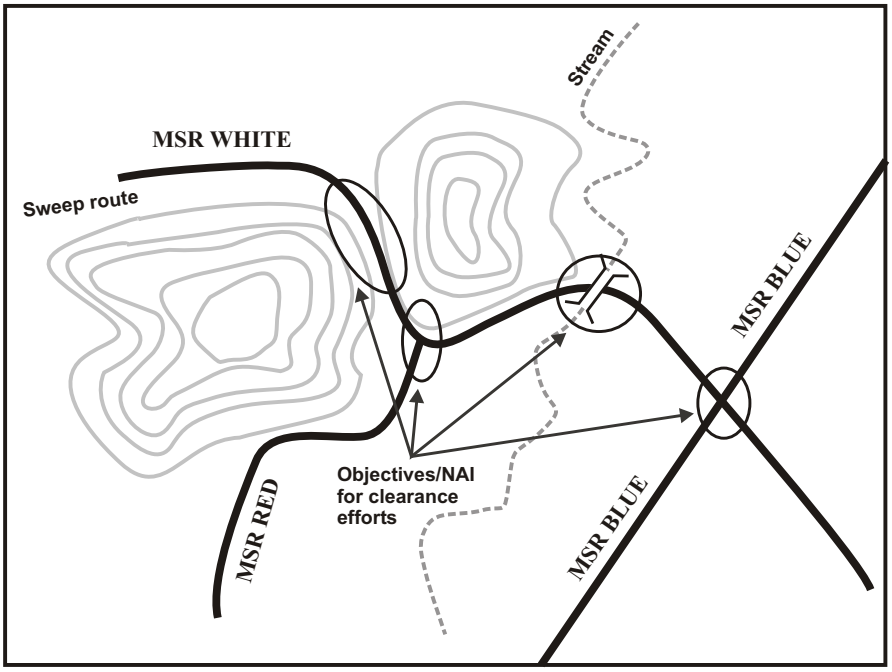

Figure 3. Combat Clearance Method

Combined clearance

This method combines the complete clearance capabilities of the linear clearance method with the security and surprise elements of the combat clearance method. Combined clearance is a two-phase, force-intensive operation and, depending on the length of route to be cleared, may require a battalion-size effort. First, the TF S2 and engineer identify high-threat areas through IPB and EBA and target them as NAI and/or objectives to secure. Then, the support force clears enemy forces ahead of the breach force. The sweep teams of the breach force move down the road and clear all obstacles that impede or endanger movement along the MSR. The main advantage of this method is that it provides the TF commander with a relatively rapid method of securing his MSRs, with a degree of confidence that follow-on forces will be much safer. Subdividing the route and using multiple clearance teams can further reduce the time required to clear a route. In the simplest form, the commander can have a team start at each end of a route and clear toward each other. If there are friendly defensive positions along the route, it may also be possible to have additional teams begin from these points as well.

Types Of Route Clearance

There are two types of route clearance operations, deliberate and hasty. These techniques can be modified to meet the time and equipment limitations of the TF, but the maneuver commander must consider the risks of doing so. Either type of clearance can be used with any of the three methods of clearance (linear, combat, or combined).

Deliberate sweep

A deliberate sweep (Figure 4) is very thorough and includes a complete sweep of the entire road (including shoulders, culverts, ditches, and bridges). It is the most time-consuming sweep operation and relies on electronic (primary), visual (secondary), and mechanical (tertiary) detection systems. If the situation permits, the maneuver commander should task subordinate units with conducting a deliberate sweep when a route is initially opened for traffic, when mining is suspected and, if possible, every morning thereafter. A deliberate sweep has five elements:

- Positioning the troops
- Securing the route
- Clearing the road
- Running the convoy(s)
- Rolling up the forces

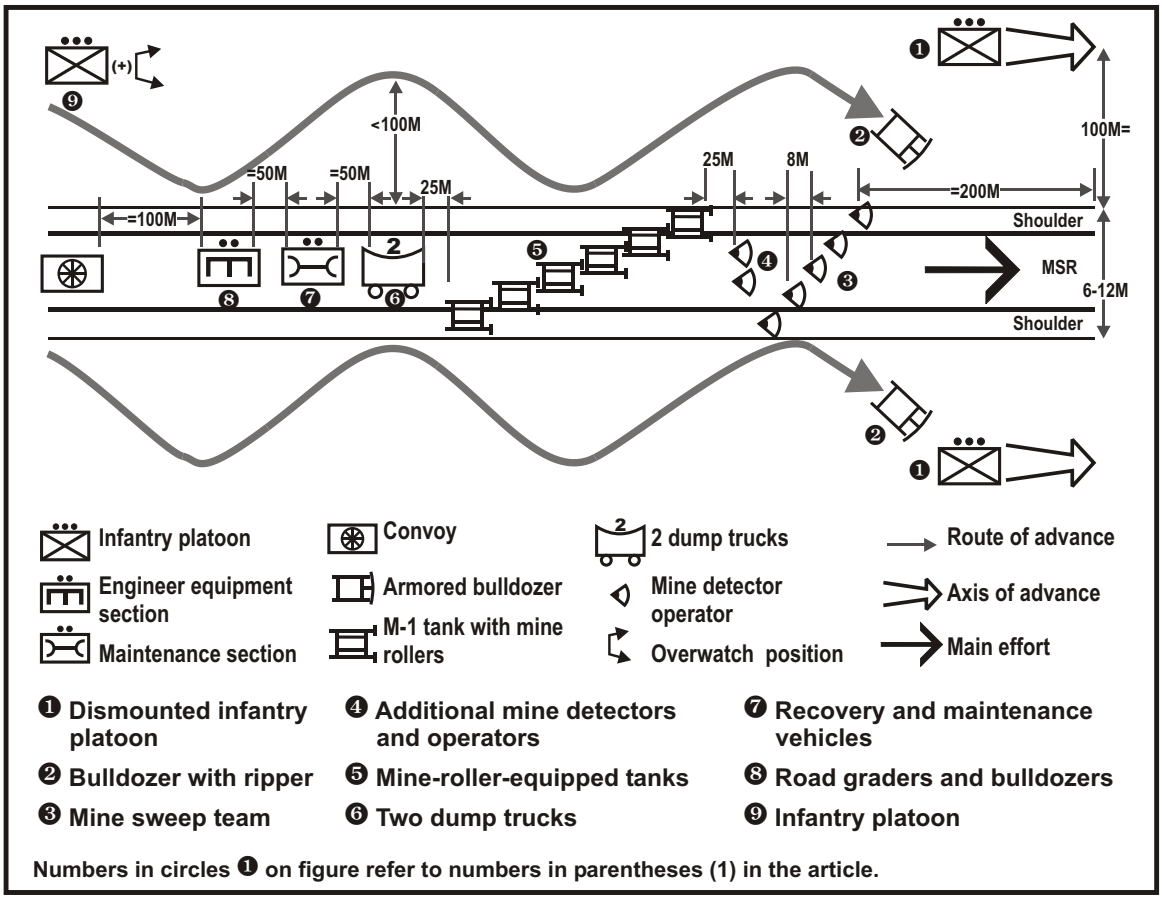

Figure 4. Deliberate Route Clearance

The first element, "positioning the troops" secures key terrain along a route before initiating a route clearance. This may be done by placing defensive positions along the route or by moving troops into position (by helicopter or infiltration) just prior to beginning the clearance. However, the maneuver commander must be cautious of establishing patterns in the employment of airmobile assets. The enemy could use mines or ambushes to exploit an established routine in terms of time of day or terrain occupied.

The second element is "securing the route." For example, a company team performing a deliberate sweep advances astride the main supply route (MSR) in an inverted V-formation (Figure 4). A dismounted infantry platoon (#1, Figure 4) with an attached combat engineer team moves along each flank while carefully searching for wires and other signs of command-detonated mines or ambushes. The two infantry platoons will be far enough ahead of the engineers and the tanks of the sweep team to investigate possible sites where the enemy could observe the sweep team and activate a command-detonated mine. If the infantry platoon is near a tree line, a security team should sweep the tree line ahead of it.

Following up each platoon with an M9 armored combat excavator (ACE) or a bulldozer (#2, Figure 4) equipped with a single-tooth ripper and mine-clearing/armor protection (MCAP) kit or improvised armor can significantly increase the effectiveness of this flank security as a countermeasure to command-detonated mines. An M1 tank with a track-width mine plow could also be used. If vehicles fitted with single-tooth rippers are not available, one dismounted soldier with each flank security element can accomplish a similar effect by dragging a pick along the ground; however, this technique will not find deeply buried command firing wires.

The third element is "clearing the road." The mine-sweep teams (#3, Figure 4) move down the road at the point of the inverted V-formation. Allocate one sweep team for every 1.5 meters of width, including road shoulders, on an unpaved road to be cleared. Depending on the width of the route to be swept, ensure that additional mine detectors are provided to the engineer platoon. It may be possible to get these detectors from the engineers' parent or supported maneuver unit.

Since countermine operations are rarely 100 percent effective and mines are occasionally missed, some means of proofing the route is used to confirm the quality of a sweep. Proofing devices such as mine-roller-equipped tanks (#5, Figure 4) should follow the sweep teams. Deploy sufficient proofing devices in echelon to provide complete coverage of the road and the road shoulders.

Three M1 tanks equipped with mine rollers are required to fully proof a road up to 6 meters wide and six M1s are required to proof a road 6 to 12 meters wide. The battalion countermine set issued to M1 tank battalions contains only four sets of rollers and units may need to coordinate for additional assets from another armored battalion or improvise some other means of proofing.

Mine rollers are extremely heavy (11 tons) and may damage unimproved roads. The heavy mine-roller-equipped tank exceeds the capacity of many bridges and may be unable to negotiate some narrow choke points. If roller-equipped tanks are unsuitable or unavailable, improvised, lightweight expendable rollers may be used.

If magnetic-influence fuzed mines are a threat, mount magnetic mine countermeasure systems to the mine roller equipped tank. Such systems include the improved dog-bone assembly or the Field Expedient Coil System. Coalition forces may possess magnetic mine countermeasures systems or they can also be improvised (if standard issue items are not available). Mine rakes or plows are not satisfactory substitutes because they will often destroy the road surface. If rakes or plows are used to clear a route, sufficient engineer assets must be allocated to return the route to a useable condition in a timely fashion.

Tanks (and other armored fighting vehicles) are vulnerable to side attack mines and command-detonated mines. The support force and the sweep teams should always precede the tanks if such mines are expected. To lessen the possibility of casualties if an undetected mine detonates, maintain an interval of 25 meters between proofing vehicles and a 50-meter interval between all dismounted personnel and proofing vehicles.

If the enemy is expected to use roadblocks, support the proofing vehicles by allocating at least two M9 ACEs or armored bulldozers to the breach force. These vehicles can push a roadblock out of the way after the sweep team has thoroughly checked it for mines and booby traps. In Vietnam, the Vietcong often emplaced roadblocks in-depth but only mined or booby-trapped the last few.

The company command post (CP) will accompany the last infantry platoon (#9, Figure 4), which provides overwatching fires to the support and breach forces throughout the operation. If the CP and infantry platoon are mechanized, they remain mounted. The commander carefully synchronizes the movements of this platoon to ensure a continuous overwatch without disrupting

his covering fires and the progress of other subordinate units. One technique is to bound part of the overwatch team from the support force forward while the remainder continues to provide covering fires. The remainder of the platoon bounds forward only after the other overwatch element is ready. If Bradleys or M113s are assigned to the dismounted platoons (providing flank security), they may either follow those platoons to provide close support or position themselves with the overwatching platoon to increase its firepower.

Built-up and other terrain with narrow avenues of approach and restricted fields of fire present a very difficult challenge in route-clearance operations. Units operating in such terrain may need to modify their route-clearing tactics to fit the situation. The key point to countering command detonated mines is to find and neutralize the individual responsible for firing any mines or find and neutralize the firing wires to the mines before the breach force approach the mines. During route clearance missions where intense close combat is likely to occur, the maneuver commander must emphasize survivability and firepower when task organizing units and equipment.

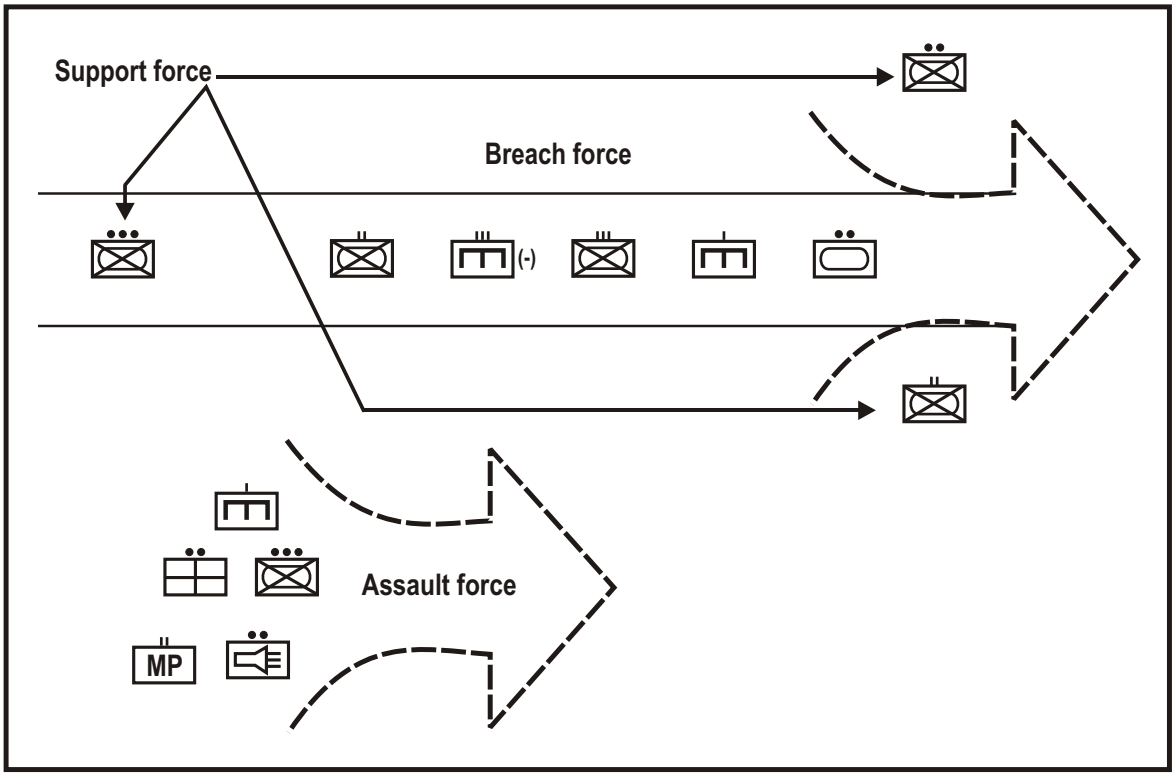

Figure 5. Hasty Route Clearance

When determining how far out and ahead the support force will operate from the breach force, the clearance commander will consider the technical characteristics of the mine threat. For example, most side attack antitank mines have a range of less than 80 meters, however, some of the latest versions of this type have ranges up to 150 meters. Most claymore type mines have a range of 50 meters, although the MON-100 and MON-200 project lethal fragments 100 and 200 meters respectively from their point of detonation.

Additionally, the support force will identify, clear, and secure potential sniper positions, command detonated mine firing points, and the far side of known or suspected obstacle locations

along the route before the breach force begins obstacle reduction or clearance. Terrain permitting, the support force should operate at least 100 meters ahead and to the flanks of the breach force, to clear possible enemy direct-fire systems and any hostile elements that may be overwatching any mines that have been placed in the route. This not only allows the breach force to focus solely on the route but also clears the area of off-route and command-detonated mines. The first time that a deliberate sweep is conducted along a segment of a route, the clearance team should perform a route reconnaissance that looks at all areas of a route, including bypasses and turnarounds. If enemy contact is made, the support force fixes the threat while the assault force reacts. The sweep teams withdraw to a location that provides concealment and/or security.

Since the fourth and fifth elements are relatively routine for all combat units and do not include any unusual countermine requirements, they will not be discussed here. Interested individuals should refer to the applicable manuals.

The deliberate sweep focuses on thoroughness and security rather than speed. This method is very slow and tedious and should only be used when time is not a critical factor. Depending on conditions, a deliberate sweep may advance as slowly as 80 to 100 meters per hour.

Hasty sweep

The mere existence of hasty-sweep procedures is a tacit acknowledgment that the “100 percent solution” is not always feasible and maneuver commanders accept a reasonable amount of risk in these operations. In situations where it is likely the clearance team will encounter ambushes, side attack mines, or command detonated mines, the decision to use hasty sweep procedures is high risk. As always, the maneuver commander must determine the proper balance between risks and requirements. Tactics used for a hasty sweep are based on those for the deliberate sweep but are modified to meet time and resource constraints.

A hasty sweep (Figure 5) consists of visual inspection, physical search or probing, and the use of mine detectors. It is the fastest, most risky method and is suited for an armored or mechanized team. It relies primarily on visual detection of mine indicators through the use of thermal sights or the naked eye. The breach force looks for mines, wire, and other mine indicators. Visual detection is accompanied by a mechanical proofing system. Suspicious areas such as low ground, curves, culverts, and bridges should still be carefully inspected and searched. Sweep teams check all such suspected areas with electronic mine detectors.

The support force includes a maneuver platoon that provides security for the breach force. The assault force includes a maneuver platoon that provides suppressive fire. Actions upon enemy contact are the same as in a deliberate sweep. The breach force focuses on identifying immediate risks to traffic, neutralizing those risks, and continuing on with the mission.

A hasty sweep is used during the combat clearance method to validate the areas that were not deliberately cleared by the sweep teams. It is also used if the METT-TC analysis does not permit a deliberate sweep or if the need for a road to be opened is urgent. A light force may not have access to an M1 tank with a mine clearing roller (MCR) system but can conduct the same sweep method with improvised roller systems or a sandbagged, 5-ton truck moving backwards. Using MCRs or their equivalent to proof the route is absolutely imperative in hasty sweeps due to the risk posed by missed mines.

Hasty sweep levels

The four levels of sweep operations (adapted from FM 3-34.2, Appendix E) provide a maneuver commander with another way to specify the level of effort dedicated to a route clearance. All four levels can be modified to meet the unit's time and equipment limitations. All four sweep levels can be used with any of the three clearance methods (linear, combat, or combined).

Level one: This is the fastest, riskiest type of route clearance. It is best suited for use by an armored/mechanized team. The breach force is a squad-size or larger element that is task-organized with mine detectors, demolitions, and possibly an IVMMD. The breach force looks for mines along the road width of a route. This sweep relies primarily on visual detection, using thermal or infrared sights or the naked eye for mine identification. It is followed immediately by a secondary, mechanical detection system such as MCRs. The primary objective of a level one sweep is speed, with the breach force moving at 5 to 8 miles per hour. The breach force identifies immediate risks to traffic, neutralizes them, and continues on with the mission

Level two: A level two sweep uses electronic measures (primarily mine detectors) as the primary detection method in high-threat areas. These areas include intersections, choke points, and areas within 10 meters of wood lines. A level two sweep employs more caution and forces the unit to update the IPB before beginning the mission. This level of operation employs a company team for security and command and control (C2). Dismounted forces clear and secure the flanks and the far side of a mined area, while an engineer squad clears a section of the road.

Level three: A level three sweep is more in-depth and more time-consuming. The sweep team must examine the route's entire width, including the shoulders and drainage ditches. This technique ensures that follow-on forces are protected if they are forced to the side of the road. The security and support element also moves, mounted or dismounted, to provide rapid response and security. The breach force provides a route recon report that updates current maps and further identifies high-threat areas.

Level four: A level four sweep is very time-consuming. It relies on visual and electronic means for clearance. A platoon-size breach force is dismounted to focus attention on the route's entire length. A company-size support force clears and secures the flanks and front of the breach force (at least 100 meters in each direction in forested areas). This clears the area of snipers and ambushes as well as off-route and command-detonated mines, thus allowing the sweep teams to focus solely on the route. MCRs are used to proof the route after the sweep team passes through an area. Level four sweeps include route and area recons, and they are used when thoroughness and security, not speed, are critical to the mission.

Considerations For Engineers

A sweep team of the breach force is trained on detection and searches for mines and explosive devices. The organization of the sweep team depends on the type of sweep mission and the length, the width, and the surface composition (pavement, gravel, dirt) of the road to be swept. A platoon-size element can normally clear a 6-meter-wide path and a squad-size element can normally clear a 1.5-meter-wide path. If the route is wider or time does not permit multiple passes of the route, additional engineer assets are required. Table 7 outlines personnel and equipment requirements for a sweep team.

Organization of breach forces sweep teams:

Table 7. Personnel and Equipment Requirements for a Sweep Team		
Personnel	**Support Personnel**	**Equipment**
NCOIC **Mine-detector operators**	**Medics** **Vehicle operator**	**One VS-17 marker** **Operational map with required maneuver graphics** **Four smoke grenades (minimum)**
Probers/markers **Radio operator** **Demolition teams**		**Six mine detectors (includes three backups from another unit) and extra batteries** **Two grappling hooks with 60 meters of rope each** **One demolition kit or bag for each demolition man** **Six probes** **Mine marking material**

Squad-size sweep team

The normal configuration for a squad-size sweep team is seven soldiers in a modified column (Figure 6). The squad leader supervises the entire sweep operation. This configuration is designed for sweeping routes in friendly territory that are not under constant surveillance.

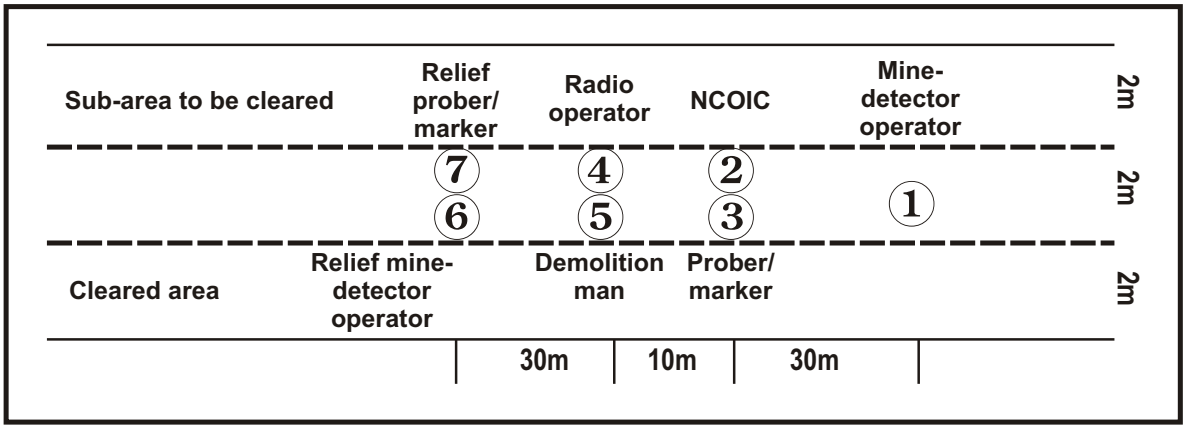

Figure 6. Squad-Size Sweep Team

- Soldier 1 (mine-detector operator) leads the sweep team and covers a 1.5-meter-wide path.
- Soldiers 2 (NCOIC) and 3 (prober/marker) follow 30 meters behind Soldier 1 and are centered in the cleared lane. The prober/marker is responsible for marking the cleared lane on both sides.

- Soldiers 4 (radio operator) and 5 (demolition man) follow 10 meters behind Soldiers 2 and 3 and are centered in the cleared lane.
- Soldiers 6 (relief mine-detector operator) and 7 (relief prober/marker) follow 30 meters behind Soldiers 4 and 5.
- If the squad does not have seven members, the relief prober/marker position can be eliminated from the formation.

Platoon-size sweep team

The engineer platoon leader can configure the platoon into squad-size sweep teams and place them in echelon (Figure 7).

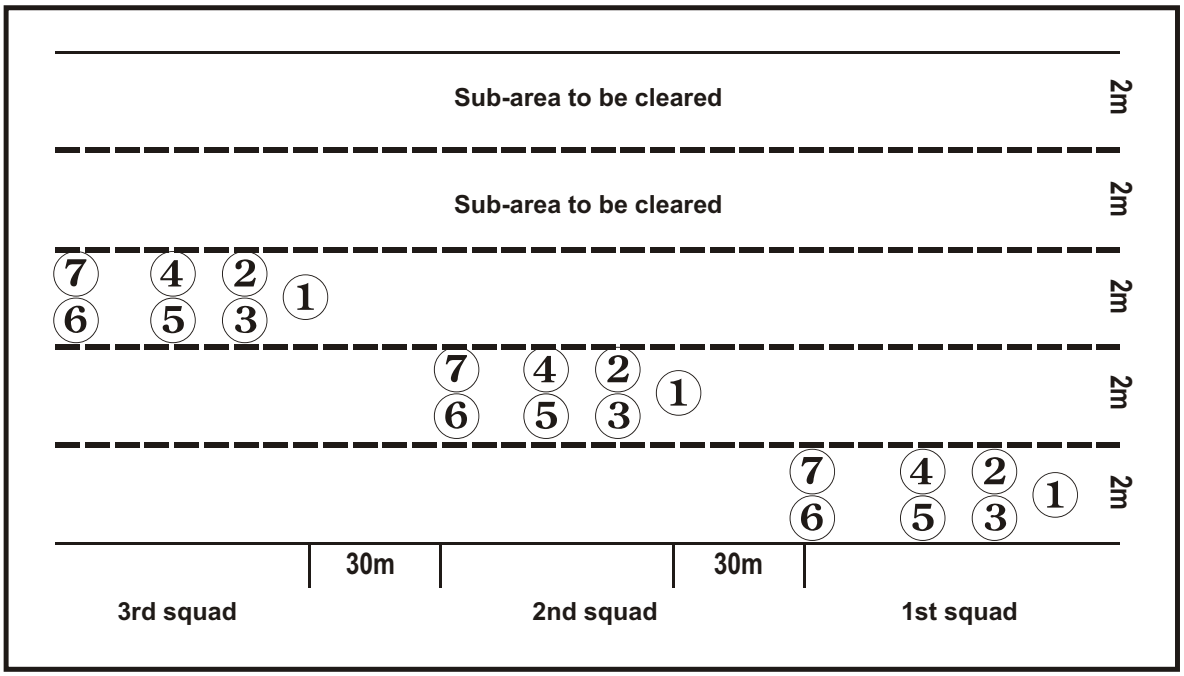

Figure 7. Sweep Teams in Echelon

However, the normal configuration for a platoon-size sweep team is twelve soldiers in a modified column (Figure 8). The platoon leader supervises the entire operation. This configuration is best suited for sweeping routes in friendly territory that are not under constant U.S./coalition surveillance.

- Soldiers 1, 2, and 3 (mine-detector operators) lead the sweep team in echelon. Each sweep team covers 1.5 meters of front, with detector operators spaced 30 meters apart to prevent fatalities from accidental detonation by other operators. If required, a fourth mine-detector operator can be added to the detection column.

- Soldiers 4 (NCOIC) and 5 (prober/marker) follow 30 meters behind the last mine-detector operator (Soldier 3) and are centered in the cleared lane. The prober/marker is responsible for ensuring that the detector operators overlap their sweeps and for marking the cleared lane on both sides.
- Soldiers 6 (radio operator) and 7 (demolition man) follow 10 meters behind Soldiers 4 and 5 and are centered in the cleared lane.
- Soldiers 8, 9, 10 (relief mine-detector operators), 11 (relief prober/marker), and 12 (reserve demolition man) follow 30 meters behind Soldiers 6 and 7, providing local security. If a fourth mine-detector operator is added to the column, an additional relief mine-detector operator must also be added.
- The remaining platoon members move with and assist the support force or act as a reserve force, as required.

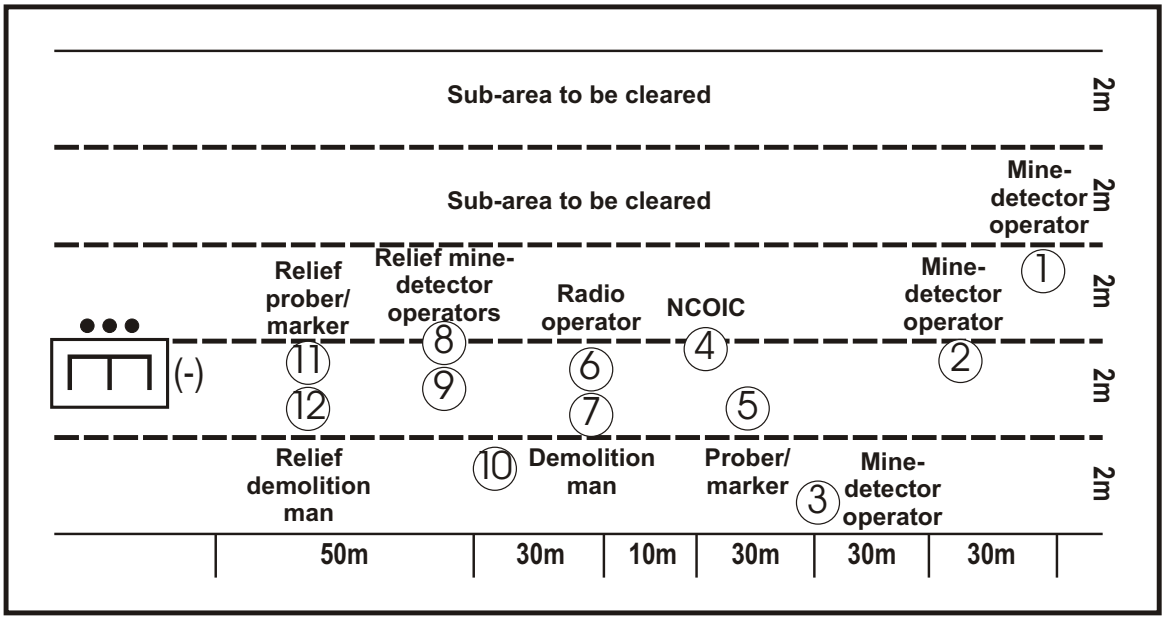

Figure 8. Platoon-Size Sweep Team

CHAPTER 3

TECHNIQUES AND PROCEDURES FOR ROUTE CLEARANCE

The engineer platoon leader and his NCOs will consider the following points and enforce them as appropriate.

Detection

- Detection is the most important fundamental of assured mobility during route clearance. However, effective mine detection takes time. Do not sacrifice engineers because of impatience! Do not take any more risks than the situation requires. Non-engineers (outside the chain of command) may become impatient at the delay caused by a route clearance operation. The senior engineer will advise them of the situation and let them determine whether or not to bypass the sweep team.

- The support force bulldozers will be equipped with single-tooth rippers that can cut a narrow, 24-inch-deep trench and cut or uncover the firing wires to command-detonated mines. An M1 tank with a track-width mine plow or an M9 ACE fitted with an improvised single-tooth ripper is also well suited to this task. Terrain permitting, these vehicles may be employed as far as 100 meters off the road and will zigzag their routes to locate firing wires laid parallel with the road. Roller-equipped tanks will precede the bulldozer or ACE when antitank mines are expected off-road.

- Demolition and local security teams may support more than one sweep team, reducing the number of engineers by as much as 25 percent.

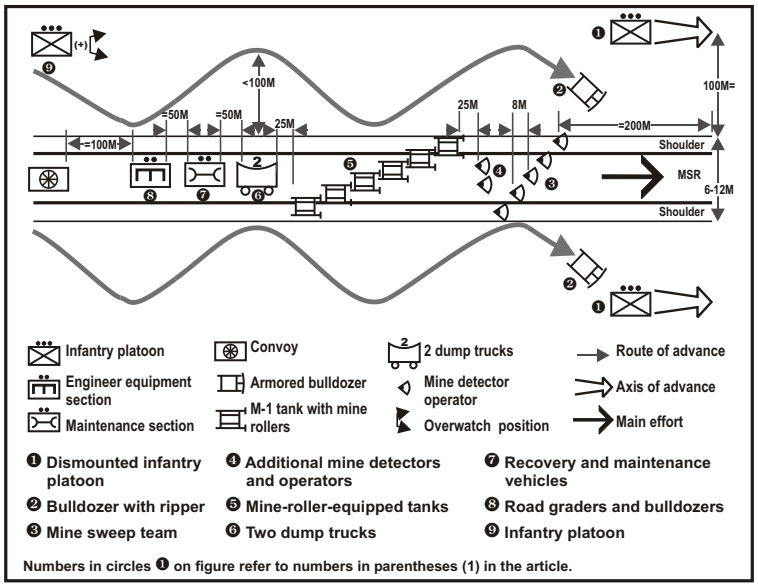

Figure 4 (previously printed on page 22)

- Two additional mine detectors and operators (#4, Figure 4) will follow the sweep teams. The additional assets provide a reserve that allows the recommended rotation of operators approximately (every 20 minutes) and may reduce the time needed to sweep difficult areas such as culverts and bridges. These teams will be augmented with EOD personnel and mine dog teams if they are available.

- Loaded 5-ton dump trucks driven in reverse (to reduce the possibility of driver injury in a mine detonation) or some type of improvised, easily repaired mine roller may be fabricated and used as an expedient. A wrecker and a truck carrying repair parts and maintenance personnel will follow the roller. When improvising a roller, design it for a 5-ton truck or larger. To avoid driving over unproofed ground during turns, consider the vehicle's turning footprint in the design process. A sheepsfoot roller is also effective against pressure-fuzed mines.

- Two dump trucks (#6, Figure 4) loaded with gravel to fill craters and chuckholes follow the proofing vehicles. Areas over culverts and road repairs should be capped with asphalt or quick-setting concrete to make enemy mining more difficult to perform and easier to detect. Recovery and maintenance vehicles (#7, Figure 4) follow next and, if necessary, graders and bulldozers (#8, Figure 4) follow them to improve the road surface and drainage.

- After the sweep is completed, engineer road repair teams will be on call to repair any subsequent road damage.

- Thoroughly check all suspicious areas, including road craters, bypasses, potholes, culverts, fords, intersections, turn-around areas, abandoned roadblocks, and choke points.

- Hostile forces often place more than one mine in a mined area. Do not focus the detection effort solely on a horizontal mine threat, such as on the ground or in culverts. The mine threat is also vertical, such as in trees, within walls, under the eaves of buildings, or attached to an overpass. Clearance efforts must accommodate the three-dimensional battlefield.

- Observe people along the route. Increase alertness when a normally crowded area is abandoned. If questioned, local civilians may provide critical information about mined areas. All such information, however, will be carefully verified.

- Use binoculars to scan the route ahead to identify hazardous areas where increased alertness is warranted.

- Practice locating mines visually. In Vietnam, 50 percent of the mines were detected visually and 33 percent were detected with metallic mine detectors (most of these had significant amounts of metal). Watch for mine packing materials such as wood boxes, metal cans, and cardboard tubes along the side of a route that may indicate mine laying activities.

- Ensure mine-detector operators and probers are highly trained and experienced. Rotate them every 20-30 minutes. The average soldier can effectively operate a detector for one turn every 4 hours.

- Without disturbing the object, probers will uncover just enough to confirm that it is a mine. Assume that all mines and explosive devices are equipped with anti-handling devices (AHDs), until proven otherwise. Once the prober confirms the presence of a

mine, he withdraws and notifies the senior engineer (who determines how the mine will be neutralized).

- Sweep the entire road, including shoulders, out to a minimum of 5 meters from the edge of the road. This width allows most vehicles to do a U-turn or to pull off to the side to allow another unit to pass. Watch for trip wires along the shoulders. Dirt and gravel shoulders are normally the easiest areas of a road to mine.

- The senior engineer will ensure that the sweep teams responsible for checking the shoulders of the road look for any signs that the enemy has dug underneath the road to emplace a command detonated mine.

- Consider supplementing the route-sweeping teams with mine detection dogs. Dogs can work 3 to 4 hours in moderate climatic conditions, and this period may be extended if the dogs take a 15-minute break every hour. Multiple dog teams are needed to conduct sustained operations. Always consult with the dog handlers for additional employment recommendations. The use of dog teams in any operation requires additional support that will not come with the dog team. This includes, but is not limited to mine clearance after marking, EOD support, kennel and training area needs, and special veterinary support.

- Do not assume that a road is cleared of mines where it passes through a friendly village or outpost or if it has not been under continuous friendly observation since it was last swept.

- In some instances, the ground or road surface may be too hard to probe adequately (certain compacted soil types or frozen ground). If these conditions are present, the senior engineer and EOD representatives should consult and consider appropriate courses of action based on mission requirements (mark, bypass, neutralize, or move to alternate route if available).

- In the initial phases of a sweep operation, removing all items on the road that cause a positive reading on a metallic mine detector will save time on subsequent sweeps by significantly decreasing the number of false positive readings on the mine detectors.

- Increase the size of the basic sweep team to allow one metallic mine detector for every 1.5 meters of road width (including the shoulders), plus two in reserve. If a positive reading is obtained, mark the location. Check for command firing wires. If none are found, have probers search the area with assistance from the two reserve detectors, while the other detector operators continue their sweep. This technique allows the primary detector operators to remain together and ensures complete and continuous coverage of the road.

- When IEDs are a threat, look for possible trigger reference points (such as sign posts or lone trees) along the route and remove them if possible.

- When IEDs are a threat, task organize some engineers with the support force to carefully search for wires and other signs of command-detonated mines or ambushes, as well as disturbed earth or foliage used to cover firing wires. In Vietnam, engineers located these wires by having a soldier with each flank element drag a pick or bush hook along the ground while he moved in a zigzag pattern between the flank element and the road.

- If possible, have the road paved with asphalt to discourage mine laying. Failing that, coordinate for a distributor to place lines of asphalt or oil along the surface of the route at the end of each day. Any attempts to dig a hole in the road for a mine will be obvious.

- Keep all radios, electronic equipment, and aviation assets at a safe distance (as specified in **FM 5-34, *Engineer Field Data*** in Table 9-2 "Minimum Safe Distance From Transmitter Antennas") from the sweep teams during reduction operations.

- In hasty sweep operations, use deliberate sweep techniques at least 200 meters before and past an obstacle or suspected threat.

Additional threat mine-laying techniques and detection considerations are shown in Table 8.

Table 8. Mine-Detection Techniques

Threat	Effects	Countermeasures
Low-metal mines	**Very difficult to detect using the AN/PSS-12 metal mine detector**	**1) Drastically reduce the sweep rate** **2) Lead with probers or mine-roller equipped tanks and follow with AN/PSS-12 detectors** **3) Look for visual indicators** **4) Supplement sweep teams with infrared (IR) sensors**
Antitank (AT) mines stacked with dirt between them	**Conceal presence of mines**	**Resweep hole after lifting or neutralizing a mine**
Stacked low-metal AT mines with only the bottom one fuzed	**The only metal in some mines is in the fuze. The depth of the buried fuze makes detection impossible**	**1) Look for visual indicators** **2) Supplement sweep teams with IR sensors**
Metal debris (such as machine-gun links) scattered across road surface (especially on dirt or gravel roads)	**Slows the sweep rate and makes operators complacent**	**Ensure operators are highly trained. experienced, and can differentiate metallic debris from a mine**
Metal AT mine (either surface laid or buried) surrounded with a buried low-metal AP mine cluster or buried low-metal AT mines	**The metallic mine masks the presence of low-metal mines close to it.**	**1) Probe the area around the mine before kneeling down to investigate a possible detection** **2) Proof the entire width of a route as a routine part of minesweeping**
Low-metal AT mine placed over a metal culvert	**The culvert masks the presence of low-metal mines**	**1) Look for visual indicators** **2) Supplement sweep teams with IR sensors**

AT mines placed at ford sites adjacent to destroyed bridges	**Thoroughness of the sweep decreases due to the discomfort of sweeping a cold, wet ford site**	**1) Maintain a disciplined sweep technique in the cold water** **2) Use divers if available and appropriate**
Minefields emplaced with a mix of inert mines	**Sweepers become complacent after locating several inert mines**	**Treat each mine as live; the one treated as inert may be a live one with an anti-handling device (AHD)**
Roadblocks consisting of a series of earth berms with AT mines placed only in the last one	**Sweepers become complacent after clearing several berms and finding no mines**	**Maintain a disciplined sweep technique.**

Reporting

Timely, accurate reporting is critical to saving lives. Accurate reporting allows the clearance commander and his higher headquarters battle staff to analyze and distribute information on the overall mine situation as well as develop appropriate countermeasures. Mine-contact reports (Figures 9 and 10) are sent through maneuver command channels with a priority of "flash" or "immediate." Consider the following guides:

- Provide a situation report at designated checkpoints and after completing a route clearance.
- Send a spot report in a size, activity, location, unit, time, and enemy (SALUTE) format to the clearance commander immediately after a mine is discovered or detonates. The SALUTE report must contain an accurate location (coordinates) of the incident. Forward a written report containing all facts and the commander’s comments within 24 hours of the incident. If possible, include sketches of the site showing where the mine was, road shoulders, center of road, crater dimensions, etc. Send recovered information and materials to the S2 within 24 hours.
- Provide progress reports. The clearing unit submits progress and completion reports until the clearance operation is complete. Progress reports must be timely and accurate. Report format and frequency are established in the OPORD before the clearance mission is executed.
- The clearance unit provides mine incident reports, as needed. A mine incident report includes any unplanned activity involving a mine, UXO, or booby trap. It also includes near misses that could have resulted in damage or injury. The mine incident report (Figure 10) is a technical report that follows a serious incident report (SIR), and it should be submitted as soon as possible (local SOP will indicate time requirements).

ENEMY OBSTACLE REPORT

As of_____

Obstacle No.	Obstacle Location	Reporting Unit	Info DTG	Obstacle Description (Type of Mine/Wire)	Depth	DTG Marked	DTG Reduced	DTG Cleared	Lane/ Bypass Grids	Remarks

Figure 9: Sample Obstacle Report

Mine Incident Report		
DATE: **FROM** **THRU:** **TO:** **REFERENCE SIR#**		
A. Incident DTG	**A1. dd/time/zone/mm/yy**	
B. Incident location	**B1. Map sheet/UTM/grid reference (8 digit)**	**Include a site sketch as an attachment**
	B2. Location (road, field, building)	
	B3. Emplacement (buried, surface-laid, off-route	
C. Effects (to complement information already in SIR)	**C1. Casualties (rank, name, date of awareness training, time in the mission area, protection equipment used)**	
	C2. Vehicle damage (number, type, extent of damage)	**Include a photo, if possible**
	C3. Collateral damage	
D. Device suspected	**D1. Type of mine (AT, AP, make, model)**	
	D2. Type of booby trap (pull, release, pressure)	
	D3. Type of UXO (dropped, thrown, projected)	
	D4. Unknown (detail, color, shape, size)	
E. Circumstances	**E1. Activity at the time of the incident**	
	E2. Degree of previous use of the route, area, location	
	E3. Date of previous clearance and proofing by engineers	
	E4. Where the route, area, or location is monitored	
F. Reconnaissance	**F1. Recommendations to prevent reoccurrence**	
G. Miscellaneous	**G. Any other pertinent information**	

Figure 10: Sample Mine Incident Report

Neutralization

While many potential mine-neutralization hazards are obvious, some are not. Neutralization teams must proceed with caution and patience. The following techniques may be employed:

- Only one member of the sweep team will neutralize mines. All others will move a safe distance away (300 meters in the open, 100 meters in a missile proof shelter), in case of stacked or boosted mines.

- The common practice is to blow in place any enemy mine detected with a one-pound block of explosive placed next to the mine. This action often creates a large crater in the road that must be backfilled and capped. For example, craters made by TMA-3 mines are usually 12-18 inches deep and 30-36 inches across. Since some cratering is inevitable, road repair equipment and fill material should accompany the breach team.

- Once the prober confirms the presence of a mine, he withdraws and notifies the senior engineer. The senior engineer must decide whether to avoid and bypass the mine, destroy it in place, remove it with a grapnel, or notify EOD for hand neutralization. However, mines on or near routes will only be bypassed if they are part of a larger minefield, the clearance of which is beyond the scope of the mission assigned to the clearance team. In this case, the edge of the minefield should be marked and reported to the battalion TF HQs. If the object uncovered turns out to be debris, the prober will move to a protected position and carefully remove the debris with a grapnel hook. Be alert for booby traps or AHDs wired to the debris.

- In many situations, it may be preferable to extract mines located on a LOC. Removing mines allows the road to be reopened immediately, eliminates the need to repair large craters, and denies the enemy an excellent location for laying their next mine (in a road crater filled with loose gravel). Additionally, mines removed using this technique pose little danger to personnel. To extract a mine, first check for stacked mines, anti-handling devices (AHD), and booby traps by thoroughly searching the mine by hand. Next, uncover only enough of the mine to expose a handle or a projection. Then extract the mine using about 60 meters of parachute cord (or wire, rope, etc.), an A-frame or tripod, and a grapnel. If there is no projection, engage a grapnel on the bottom side of the mine, opposite the direction of pull.

DANGER

Do not move the mine while uncovering it or attaching the rope because movement may detonate an AHD

- Ensure that the covered area is not mined. Take cover and lie in a prone position at least 50 meters from the mine. Pull the rope to remove the mine from the hole. Pull the mine at least 1.5 meters from the hole and wait at least 30 seconds before leaving cover and approaching the mine if the mine type is unknown. Dispose of the mine according to the unit directive or SOP.

- If multiple mines are extracted from an area, pick up the pressure-fuzed AT mines by hand and move them to a single point for demolition to save both time and explosives. *Remember that these mines are still fuzed.* This technique is not normally recommended for use against AP mines (which might be found along the shoulders of the route) or AT mines with full-width attack fuzes (tilt rods or electronic influence fuzes), because of their sensitive fuzing. However, if necessary, rig the pull line so that

the mine can be dragged out of the way and into a suitable area before destroying it with explosives. Check the hole with a mine detector and probe for more mines and then fill and cap it. Do not attempt to use this technique to lift tilt-rod or magnetic-fuzed mines.

- When the situation permits, save time by having the sweep team or breach force mark the mines and bypass them, leaving demolition to follow-on elements. If multiple mines are to be blown in place, use a ring main or line main to reduce the demolition time.

- Check both ends of all trip wires (both slack and taut) for "breakwire"-type fuzes before cutting them. Breakwire-fuzed mines should only be blown in place or neutralized with a grapnel. If breakwire-fuzed (as well as tilt-rod or influence-fuzed) mines must be removed from a sensitive location without detonation, EOD technical support should be requested.

- After neutralizing a mine (by blowing it in place or lifting it), check the hole again with a metallic mine detector and a probe in case the enemy stacked more mines or explosives in the same hole to enhance the effect of the mine.

- When firing wires or mines are detected, one soldier will immediately search for lead wires because all ordnance, including pressure-fuzed AT mines, can be rigged for command detonation. Lead wires should be traced to source. If positive firing train can be determined, then wires should be cut and shunted. If complete firing train cannot be determined, the wires should be cut remotely. Remember, AP mines may be placed along the firing wire to protect the firing wire.

- When a new unidentified explosive device is discovered, the clearance commander (after consulting with his senior engineer or EOD support) must decide if a recovery attempt is warranted. This decision must be based on the essential elements of information specified in the operations order and guidance from higher headquarters. If possible, photograph the device before taking any actions. If the decision is to recover an unidentified explosive device, only one soldier (preferably an EOD technician) attempts the recovery. He digs carefully around the explosive device until a grappling hook or wire can be passed through or under it. Then he attempts to pull it with a line and a small A-frame. If the recovery attempt becomes too dangerous in the opinion of the senior EOD technician or engineer, he blows the device in place. Under no circumstances should anyone attempt to disarm an explosive device if the NCO in charge does not consider it safe. Do not take unnecessary risks.

- Foreign mines and booby traps should only be hand-neutralized by EOD personnel. Normally during route clearance operations, mines are only neutralized by hand if:

    - The mine is located on a bridge, building, or other facility required for use by friendly forces

    - The mine type is unknown and recovery must be attempted for intelligence purposes (as discussed above)

    - Chemical mines are located in areas where contamination would restrict the use of the area by friendly troops.

- Hand-neutralization is only undertaken:

- º When neutralization by other means is not possible
- º The mine can be positively neutralized by hand and is required for reuse
- º When units are conducting a covert breach.

(Procedures for the hand neutralization of U.S. mines are provided in Appendix A, **FM 20-32, *Mine/Countermine Operations***.)

- Mark the boundaries of any uncleared minefields that border the assigned MSR in accordance with the standards outlined in Chapter 10, FM 20-32, OPORD, and unit SOP.
- Additional neutralization techniques described in Table 9:

Table 9. Mine-Neutralization Techniques

Threat	Effects	Countermeasures
Coupled mines (such as the Romanian MC-71 or improvised mines) where the fuze is separated from the mine body	**May be used to destroy mine roller equipped tanks**	**Have dismounted mine sweepers precede mounted elements of a sweep force**
Side-attack mines	**May be used to destroy mine roller-equipped tanks**	**1) Support force covers flanks and should precede mounted elements to detect and neutralize this threat.** **2) Neutralize visually detected side-attack mines using disruption by gunfire.** **3) Check carefully for AP mines if it is necessary to approach this type of mine.**
AT mines fitted with AHD	**Discourages manual lift techniques**	**1) Blow in place or use an A-frame or tripod to lift mines from a remote location** **2) Precede mounted elements with dismounted sweepers** **3) A strong signal on the AN/PSS-12 from a normally low-metal mine may indicate the presence of an AHD**
Breakwire-fuzed fragmenting AP mines	**Cutting what appears to be a slack trip wire activates the mine**	**Check both ends of all trip wires (both slack and taut) for unusual fuzing before cutting them**

Low-metal AP mines laid along trip wires	**Personnel tracing trip wires become casualties**	**1) From a covered position a safe distance away (remember that the lethal range of some directional mines is 200 meters), pull the trip wire using a grapnel . Then carefully sweep/probe the area that was under the trip wire.** **2) Probe along trip wires; do not become overly focused on the wire**
Multi-impulse AT mine is improvised by placing a simple pressure-fuzed AT mine upside down in a conical hole	**Mine detonates after repeated vehicle contacts force it to the bottom of the hole. Mine rollers do not reliably clear this arrangement.**	**1) Employ good detection techniques.** **2) A circular depression is a visual indicator that this technique was employed**
Surface-laid AT mines fitted with AHDs appear to be hastily laid	**Soldiers grab the mines to throw them off the road**	**1) Assume all mines are fitted with AHDs.** **2) Use A-frame or grapnel to move mines.**
Surface-laid AT mines surrounded by trip-wire fuzed Bouncing Betty	**Soldiers activate the trip wires when they walk up to grab the AT mines and throw them off the road**	**Maintain sweep discipline when approaching surface-laid mines.**

Improvised Explosive Device Threat

Military forces organic to the host nation or its enemies do not always employ mines conventionally. In many cases, terrorists operating along LOC against coalition forces or the host-nation populace also employ them. The threat increases because of the improvised methods in which the mines are frequently emplaced. In conventional emplacement of mines, a pattern emerges from the emplacing force's doctrine, and using this knowledge can easily reduce the threat. There is less pattern in the case of improvised mining methods, consequently, a highly organized and disciplined approach to detection and removal is required.

Improvised mining has many different employment techniques. In most of the techniques shown below, a UXO can easily be employed in place of a mine.

Coupling mines

Coupling is normally done by linking one fused mine to another unfuzed one, usually with detonating cord. When the initial mine is detonated, it detonates the linked mine. Coupling defeats countermine equipment. A related technique is daisy-chained mines. Command-detonated AP mines are commonly used in daisy chaining. Hostile forces link the mines with trip wires or detonating cord. When the initial mine is detonated, the other mines will detonate.

Boosting mines

Buried mines are stacked atop one another and the farthest mine from the surface is fused. This reduces the probability of detection and increases the force of the blast.

Sensitizing AT mines

On some nonmetallic AT mines, the pressure plate can be cracked and the spring removed or the mine's explosive can be cut into smaller blocks and employed as powerful AP mines. The pressure plate can be removed from metallic AT mines and employed in the same manner. Alternatively, a pressure-fused AP mine can be placed on the top of an AT mine.

Mixing training mines with live mines

Hostile forces can employ training mines at the start of a minefield and emplace live mines toward the end. The sweep element falsely believes that the minefield is phony and becomes complacent in its reduction activities. When this technique is used, live mines are painted to resemble training mines.

References

The following three references contain current route clearance operations information: **FM 5-7-30,** ***Brigade Engineer and Engineer Company Combat Operations (Airborne, Air Assault, Light***). This is the only manual that clearly outlines planning considerations for route-clearance operations at the task-force level. The manual lists facts and assumptions for planning, tasks to be accomplished by the task force, and recommended task organizations. It also gives some planning guidance for employment of the Battlefield Operating Systems (BOSs).

CALL CTC Bulletin 1QFY96 No. 96-1, Jan 96, "Route-Clearance Operations," by Captain John Leighow.

CALL Video Tape No. 14, "Combined Arms Route Clearance," produced at the Joint Readiness Training Center.

See also:

FM 3-34.2, ***Combined-Arms Breaching Operations,*** 31 August 2000.

FM 5-114, E*ngineer Operations Short of War*, 13 July 1992.

FM 19-1, ***Military Police Support for AirLand Battle*,** 23 May 1988.

FM 19-4, ***Military Police Battlefield Circulation Control, Area Security, and Enemy Prisoner of War Operations*,** 7 May 1993.

FM 20-32, ***Mine/Countermine Operations*,** (with Change 2), 22 August 2001.

FM 21-16, ***Unexploded Ordnance (UXO) Procedures*,** 30 August 1994.

FM 33-1, ***Psychological Operations Techniques and Procedures*,** 18 February 1993.

FM 34-130, ***Intelligence Preparation of the Battlefield*,** 23 May 1989.

FM 41-10, ***Civil Affairs Operations*,** 11 January 1993**.**

FM 63-6, ***Combat Service Support in Low-Intensity Conflict*,** 21 January 1993**.**

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