Chapter 3

Maintenance Support Operations

This chapter describes maintenance tactics and techniques associated with supporting full spectrum offensive, defensive, stability, and support operations. It also describes maintenance tactics and techniques supporting operations in limited visibility and NBC environments and the reconstitution function and BDAR.

MAINTENANCE FUNDAMENTALS OF FULL SPECTRUM OPERATIONS

3-1. Maintenance is one of the 11 CSS functions that support soldiers and their systems in the field. It sustains materiel in an operational status, restores it to serviceable condition, or upgrades its functional utility through modification or product improvement. The Army Maintenance System designates the scope of tasks performed by maintenance activities. It provides support planning requirements for maintenance of materiel systems when fielded and after fielding. It also establishes requirements for managing activities that physically perform maintenance.

3-2. The dramatic end to the Cold War has caused significant changes in our nation's domestic and foreign policies and priorities. During the Cold War, our military strength was focused on the defense of Europe. Today, instability and uncertainty originate from the spectrum of small and unorganized threats from rogue nations. These threats can have a profound impact on the stability of U.S. national security. To keep pace with the ever-changing threat, the Army has moved from a Forward Deployed Force to a Force Projection strategy. Recent humanitarian assistance operations in Somalia and the Caribbean, and peace operations in Haiti and Bosnia, all point to an ever-increasing number of operations other than war.

3-3. The centerpiece to the operational full spectrum framework is the decisive operations of **Offense, Defense, Stability,** and **Support Operations.** Planning for maintenance operations during these decisive operations requires thorough mission analysis, careful identification of the force supported, and an understanding of the commander's intent. Also, the nature and conduct of maintenance-related sustainment activities will always depend on the operational environment constructs of either contiguous or non-contiguous operations. FM 4-0 provides detail about CSS support of full spectrum operations.

MAINTENANCE OPERATIONS – OFFENSE

3-4. Offensive operations are characterized by fast movement and rapid changes in the situation. Command, control, and communications for the CSS effort are difficult. Maintenance elements normally operate as part of a larger CSS element, which reduces some of this difficulty.

3-5. The DISCOM provides information to the Division HQ on the locations of all support elements operating in the division area. Under conditions of rapid movement and displacement, it is not always possible to provide specific information on the proposed locations of units in sufficient time for inclusion in division orders.

3-6. In a fast-moving situation, the DISCOM might be able to keep the Division Operations Center informed only of its command post (CP) location. This information is contained in administrative orders, on operations overlays, or in fragmentary orders. With this minimal information, units must locate the DISCOM CP to obtain precise locations of subordinate units. The DISCOM continues to provide follow-up reports or situation overlays to support the division's Daily Operations report.

3-7. In extremely fast-moving situations, DISCOM units operating in forward areas may move before advising the DISCOM HQ. These units coordinate their movements and locations with the major subordinate command HQ (normally brigade). Because of distances involved and communications limitations, it may not be possible for these units to effect timely notification to the DISCOM in the DSA. However, since major subordinate HQ report all new locations to the Division Operations Center, the DISCOM HQ will learn of new locations of brigade trains areas from the Division TOC. Each DISCOM unit is responsible for notifying its parent headquarters of the opening and closing of its CP, and for providing advance information of planned moves. Advance information is essential for providing support forward. Table 3-1 lists support procedures units should complete before initiating offensive ground operations.

Table 3-1. Support Procedures

Step	Action
1	Inspect and perform required maintenance on unit equipment.
2	Fill equipment shortages and repair parts stockage to authorized or directed levels, focusing on critical items.
3	Prepare and disseminate operations and administrative orders.
4	Establish support priorities, including priorities for issue of operational readiness operational readiness float stocks and critical repair parts.
5	Establish procedures, priorities, and conditions for resupply.

PLANNING FOR MAINTENANCE OPERATIONS – OFFENSE

3-8. Planners ensure maintenance operations support momentum and massing at critical points. Maintenance personnel maximize momentum by fixing inoperable equipment at the point of malfunction or damage. They enhance momentum by keeping the maximum number of weapon systems operational. Therefore, maintenance and recovery personnel perform their mission as far forward on the battlefield as possible.

3-9. Prior to offensive operations, maintenance planners should consider the following:

- Available support units.
- Stockage levels for repair parts.
- Forward placement of MSTs and the UMCP.
- Channels and procedures for recovery, collection, evacuation, and disposition of captured or abandoned materiel.

3-10. As the tempo of the situation and the distance involved increase, support units may have difficulty keeping pace with requirements. Maintenance support is positioned as far forward as possible, normally placing MSTs with the BMO in the UMCP. In operations where the overall situation requires bypassing pockets of the enemy or guerrilla elements, the effects of bypassing on support units and other logistical activities must be considered. In some situations combat elements may be required to provide security.

3-11. CSS commanders and staff officers must plan for redirection of logistical support to satisfy changing tactical requirements. The following take time and require close coordination and planning:

- Redirection of effort and supplies.
- Redeployment of units.
- Realignment of the support structure.
- Changes in support procedures and emphasis.
- Continuous movement limits the time available to make repairs.

3-12. If the offensive is successful and gains momentum, a culminating point may be reached where logistical support limitations make the entire force vulnerable. Lacking the ability to maneuver and displace as rapidly as combat forces, CSS forces may be outdistanced by combat units. Resupply of repair parts by unit distribution may break down or become ineffective due to lack of transportation, difficulty in locating units, and increased OST.

3-13. The TF commander must be kept informed of the tactical situation's effect on the support structure's capability to provide the support required. Expedient methods for providing maintenance support under these circumstances include:

- Institution of BDAR.
- Authorization of controlled exchange.
- Procedures and controls allowing MSTs to draw items anticipated to be needed from the main warehouse, ASL, or RX high-usage items.
- Increased emphasis on evacuation of unserviceable equipment, with repair operations in forward areas limited to component replacement, adjustment, and servicing.
- Round-the-clock operations by supporting units to the limits of physical endurance.
- Use of air transportation to move maintenance personnel and repair parts.
- Attachment of MSTs to tactical units.

RESOURCING MAINTENANCE OPERATION -- OFFENSE

3-14. Organizational maintenance resources are in increased demand. Unit mechanics accompany or follow the most forward attacking elements. Plans include recovery of weapon systems that mechanics cannot fix within established maintenance repair timelines. Maintainers use BDAR to rapidly return disabled essential equipment to the commander.

3-15. DS maintenance resources are in increased demand. DS maintenance elements in the form of MSTs may also operate with the spearhead of the attack. MSTs and other elements need the following:

- Right people (skills and numbers).
- Equipment (transportation, tools, TMDE, and communications).
- Supplies (components, assemblies, and repair parts).

3-16. Repair parts stockage (in terms of days of supply (DOS)) is kept consistent with mobility requirements. Based on the type of operation, geographical area, and terrain/weather conditions, certain items are increased. For example, extensive operations over rough terrain dictate a buildup in stockage of vehicle springs, shock absorbers, and tires. Forward-deployed MSTs increase stockage of small high-usage RX items such as fire control instruments and automotive subassemblies.

3-17. Maintenance units must maximize repair efforts forward. Unserviceable equipment requiring more than limited component replacement, adjustment, and servicing will be recovered to a centrally located MCP. The centralized MCP maximizes BDAR cannibalization and controlled exchange operations. Unserviceable equipment requiring extended repairs is consolidated and turned over to follow-on maintenance elements. Figure 3-1 shows various maintenance activities and the flow of maintenance elements in the forward area in support of offensive operations.

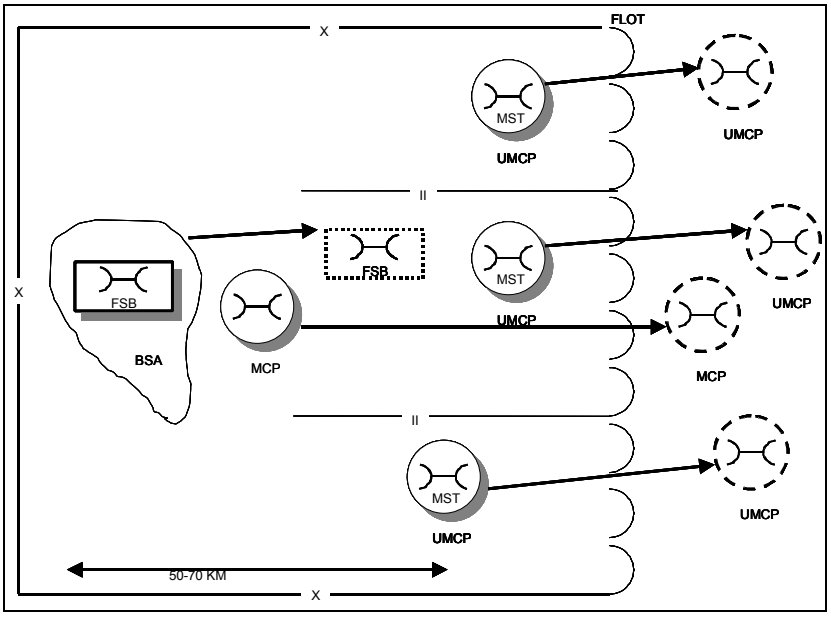

Figure 3-1. Flow of Maintenance Elements, Forward Area, Offensive Operations

CONDUCTING ORGANIZATIONAL MAINTENANCE – OFFENSIVE OPERATIONS

3-18. The four general types of offensive operations are:

- Movement to Contact.
- Attack.
- Exploitation.
- Pursuit.

These operations are roughly sequential and may develop into a more fluid operation or into a defensive operation. This potential for change must be considered in planning maintenance support of offensive operations. Offensive operations are marked by forward movement of combat elements. As the operation moves forward, support elements join in the movement.

Movement to Contact

3-19. During the preparation phase of movement to contact, there is a major effort in logistics. Maintenance personnel place maximum maintenance effort on preparing equipment for combat. The Maintenance Platoon in the combat trains area moves closely behind the TF main body easements during this phase. The platoon's position in the march column is selected to support the combat units while being protected from enemy fire.

Attack

3-20. The attack is quick and violent. The BMO monitors the tactical situation to support the attack. The BMO informs the S3 and S4 of specific UMCP locations. On-site maintenance support and recovery operations are accomplished with high risk.

3-21. During the attack, the majority of the Maintenance Platoon is located in the TF combat trains area. The CMTs are forward with the Maneuver Companies. Maintenance activities during this phase concentrate on recovery and BDAR. After the attack, the BMO coordinates maintenance requirements with the Battalion XO. They discuss the current situation, priority of effort, and plans for the next operation.

Exploitation and Pursuit

3-22. The TF covers a large area during the Exploitation and Pursuit phase. Combat units strike at objectives deep in the enemy rear while keeping pressure on retreating enemy forces. Command, control, and communications are extremely difficult. CMTs perform on-site repair. Equipment that cannot be repaired on-site is recovered to the UMCP or BSA (whichever location can best complete the required maintenance). Maintenance Platoon personnel perform quick repairs in the UMCP. Equipment in the UMCP may be repaired on the spot or evacuated to the field trains or BSA. The UMCP and the field trains move forward to support exploitation and pursuit operations.

CONDUCTING DIRECT SUPPORT LEVEL MAINTENANCE – OFFENSIVE OPERATIONS

3-23. The Maintenance Unit Commander prepares for support of offensive operations in much the same way as the Maneuver Unit Commander. The Maintenance Unit Commander appraises the combat situation, determines the needed support, and then organizes resources to provide the maintenance support. DS maintenance units, as part of the division, must maneuver and deploy to provide maintenance support. Maintenance support operations are influenced by the division's deployment and its organization for combat, the tempo and type of combat operation, and the availability of suitable terrain.

3-24. In some combat situations, maintenance units are deployed well forward; in other situations, they are deployed to the rear. In some cases, maintenance units accompany or closely follow supported units; in others, they remain behind until ordered to move forward. In still other situations, the bulk of the maintenance units may deploy prior to the supported units.

3-25. The type and tempo of combat also affects the nature of the DISCOM maintenance unit's workload. During fast-moving offensive operations, the maintenance shop workload may be light. When the advance slows or the pursuit phase ends, maintenance units must increase their activities. During the offensive phase, priority will be placed on recovery, BDAR, and roadside repair, or on collecting, classifying, and reporting abandoned equipment.

3-26. In extremely fast-moving situations, DISCOM units operating in forward areas may move before advising the DISCOM HQ. These units coordinate their movements and locations with the major subordinate command HQ (normally brigade). Because of distances involved and communications limitations, it may not be possible for these units to effect timely notification to the DISCOM in the DSA. However, since major subordinate HQ report all new locations to the Division Operations Center, the DISCOM HQ will learn of new locations of brigade trains areas from the Division TOC. Each DISCOM unit is responsible for notifying its parent HQ of the opening and closing of its CP and for providing advance information of planned moves. Advance information is essential for providing support forward.

MAINTENANCE OPERATIONS – DEFENSE

MOBILE DEFENSE

3-27. A mobile defense requires maneuver and movement on the part of elements of the defending force. Maintenance units may also expect to move more frequently than during an area defense. In a mobile defense, maintenance requirements are greater than in area defense, particularly for tracked vehicles. This results in increased recovery distance from Forward MSTs to maintenance elements farther to the rear.

AREA DEFENSE

3-28. In an area defense:

- The defending force remains in position for longer periods. Movement and maneuver of the defending force are considerably reduced in comparison to a mobile defense or an offensive operation.
- Support units are not required to move as often as in other types of operations.
- More time is available for maintenance operations.
- Maintenance facilities can operate better since they do not have to react as often to changing situations and requirements.

DELAY AND WITHDRAWAL

3-29. Detailed planning, control, and coordination are required to support delaying or withdrawal operations. Emphasis is given to evacuation of unserviceable equipment that cannot be repaired before opposing forces overtake the position. Displacement of support elements must not conflict with the movement of combat units. When possible, maintenance support units should be displaced at night.

PLANNING FOR MAINTENANCE OPERATIONS – DEFENSE

3-30. The primary thrust of the maintenance effort in the defense is to maximize the number of combat-ready weapon systems. Once the defensive battle begins, the thrust is to fix the maximum number of inoperable systems and return them to the battle. This requires forward support at, or as near as possible to, the intended AO of the systems.

Maintenance Teams locate well forward. Likewise, critical components are placed forward to overcome the effects of combat wear and damage.

3-31. Planners also consider augmenting the maintenance support to covering force elements when they return to the main battle area. Such support may allow them to return more rapidly to fighting condition.

3-32. Maintenance plans must be closely coordinated with the tactical plan to provide maximum support without interfering with combat elements' operations. MSTs will be attached to tactical units to provide a rapid on-site maintenance capability.

RESOURCING MAINTENANCE OPERATIONS -- DEFENSE

3-33. Repair parts stockage is generally focused on supporting critical weapon system components. Care should be exercised in selecting only needed items so as not to impair mobility. Equipment inspections and technical assistance are emphasized to maintain readiness at a high level.

CONDUCTING ORGANIZATIONAL MAINTENANCE – DEFENSIVE OPERATIONS

3-34. Types of defensive operations include area defense and mobile defense. Activities associated with defensive operations include the following:

- Counterattacks.
- Passage of lines.
- Withdrawals.
- Relief to continue the defense.

Large defending formations, such as the division, may have portions of their forces simultaneously conduct any of these operations or activities. Defense may be static or dynamic. It takes a coordinated effort to defeat the attackers and prevent them from achieving their objectives.

MOBILE DEFENSE

3-35. Maintenance support of the mobile defense is marked by reduced available maintenance time. This reduces opportunities for on-site maintenance and CMT support. Equipment that cannot be repaired or recovered must be destroyed to prevent enemy capture.

AREA DEFENSE

3-36. More time is available for maintenance in the area defense when a unit is not actively engaged with the enemy. This provides an opportunity to conduct maintenance to improve materiel readiness.

CONDUCTING DIRECT SUPPORT LEVEL MAINTENANCE – DEFENSIVE OPERATIONS

3-37. DS-level maintenance support for defensive operations must be planned, organized, and executed with the same attention to supported unit requirements as to offensive operations. Supported units in the defense are not as widespread as in the offense. Maintenance support operations can therefore be more centralized. Defensive operations also do not require displacement as often as in the offense, which simplifies

command, control, and communications. The exception is support of retrograde operations such as delay or withdrawal. The need for continued support while engaged in a unit move makes this a difficult operation to support.

3-38. MSTs deployed with maneuver units are task-organized to maximize on-site repair capability. A team may relocate several times a day, keeping pace with supported units. Maneuver organizational maintenance elements must assess unserviceable equipment for on-site maintenance or recovery to the nearest MCP.

3-39. The forward MCP generally contains MST elements not deployed with maneuver units. Initial battle damage assessment (BDA) is determined and a plan is formulated for each unserviceable item. MST elements notify follow-on maintenance elements of maintenance requirements beyond their capacity in order to allow follow-on elements to better allocate their maintenance resources. The Base Company and Forward MCP must leap-frog forward in order to maintain continuous support.

MAINTENANCE STABILITY AND SUPPORT OPERATIONS

OVERVIEW

3-40. Sustainment for stability operations involves supporting U.S. and multi-national forces in a wide range of missions. Stability operations range from sustainment-focused operations in humanitarian and civic assistance missions to major peace enforcement missions. It may involve significant offensive and defensive operations to supporting large-scale Army operations.

3-41. The key to success with support operations is interagency coordination. Only in the most extreme situations will the U.S. military be providing relief directly to those in need. In most support operations, the U.S. military will be assisting non-governmental organizations (NGOs) in providing the required level of support to the affected population. Multi-national support, HNS, and support from NGOs may reduce the demands on transportation, medical, food, water, and housing.

CONDUCTING STABILITY AND SUPPORT MAINTENANCE OPERATIONS

3-42. Maintenance operations during stability and support operations present unique challenges to logisticians. Friendly CSS units are primary targets. Moreover, the constant presence of civilians in these AOs makes identification of threat elements very difficult. Defense against incidents (such as boobytraps, sniping, theft, and partisan activities), quickly reduces personnel and equipment resources. Recognizing operations inside and outside unit perimeters will be hazardous. Logistics planners must prepare for and deliver timely maintenance support (see FM 3-07). These manuals reflect operational doctrine prescribed by FM 3-0. CSS is often the primary focus of support operations as Army forces provide assistance to civil authorities, respond to national and international crises, and provide humanitarian assistance. Army forces have the ability to move large amounts of equipment and supplies under adverse conditions. The can also provide small tailored forces on short notice. This makes Army CSS forces a valuable asset in both domestic support operations and foreign humanitarian assistance missions.

3-43. Divisional or non-divisional units may be deployed to provide maintenance support during peacekeeping, humanitarian, or disaster relief operations. They will probably be at least company size or larger. The type and density of customer equipment will largely determine the modular structure of subordinate Maintenance Companies. A Maintenance Company may be modularized as follows:

- One platoon to perform organizational maintenance for supported customers.
- One platoon to perform DS maintenance.
- Sections and teams as needed to perform specific system support.

PEACEKEEPING

3-44. From a doctrinal standpoint, peace operations do not alter the way in which the Army performs maintenance. However, when planning maintenance support during peace operations, logisticians must consider the following factors:

- Hostile environment.
- Joint or multi-national chain of command.
- Support to multi-national forces.
- Risk assessment.
- Security of maintenance operations.
- Environmental impact.

3-45. Peacekeeping operations will most likely be accomplished as part of a multi-national coalition. This presents new challenges for the Maintenance Commander, who could potentially support HN military and commercial equipment. There may also be a requirement to support coalition force equipment. Beyond some of the special considerations noted here, much of the maintenance support for peacekeeping will not differ substantially from normal maintenance.

NOTE: FM 3-07 covers the full range of peace operations (including peacemaking, peacekeeping, peace enforcement, preventive diplomacy, and peacebuilding).

HOSTILE ENVIRONMENT

3-46. National policy may require the Army, either singularly or as part of a joint or multi-national TF, to conduct peace operations in politically sensitive areas of the world. At such times, regional combatants may disregard the peace initiative and continue a sporadic or repeated armed struggle. Commanders must anticipate this and be prepared to provide logistics support in hostile, potentially life-threatening situations.

LACK OF HOST NATION SUPPORT

3-47. Since friendly forces must operate in hazardous and politically sensitive areas, commanders should never assume availability of dedicated HNS during peace operations. Instead, they must plan for maintenance support using organic resources.

MULTI-NATIONAL OPERATIONS

3-48. Since the Army frequently conducts peace operations with other nations, Logistics Commanders may encounter a multi-national chain of command. In such cases, they must quickly establish communications channels to confirm or clarify mission requirements. Commanders must also determine how and from where they can expect timely resupply to perform their critical maintenance mission. Prompt coordination of mission and support requirements with higher HQ ensures logistics planners deliver timely maintenance support to customer units.

3-49. Logistics Commanders must anticipate support to all friendly forces. To accomplish that task, they must contact higher HQ as well as known customer units to coordinate support requirements. At times, support to multi-national forces may present unique logistical challenges. In such cases, logistics planners must take the initiative to determine customer equipment type and density.

MAINTENANCE OPERATIONS – HUMANITARIAN RELIEF

3-50. As in peace operations, maintenance doctrine does not change during humanitarian operations. However, humanitarian operations do introduce unique challenges to logisticians. Depending on the regional political situation, the Army may conduct humanitarian missions in either friendly or hostile environments.

3-51. Since humanitarian missions are conducted in either friendly or hostile environments, logistics planners must consider the situation and do the following:

- Locate maintenance operations away from dense population centers.
- Identify maintenance sites that units can easily secure and defend.
- Establish and secure LOCs.
- Coordinate with engineer support for earthen barriers if required by the Base Cluster concept.
- Enclose maintenance operations areas with barrier materiel if required by the Base Cluster concept.
- Establish entrance and exit control points and procedures.
- Position crew-served weapons for maximum defensive firepower.
- Maintain responsive 24-hour perimeter security.
- Consider the impact on the environment.

MAINTENANCE OPERATIONS – DISASTER RELIEF

3-52. During the summer of 1992, Hurricane Andrew devastated large areas of Florida. The ensuing calamity and distress placed the Army in a unique and significant support role.

3-53. In disaster relief operations, maintenance and logistics planners perform the following:

- Identify commercial vendors who can quickly supply the technical and repair parts support required.
- Organize assets from other agencies, contractors, and local maintenance resources for economy of effort.

Planners must also consider the impact on the environment and they evaluate and prioritize repair of the following infrastructure equipment:

- Firefighting equipment.
- Medical equipment.
- Construction equipment.
- Generators.
- Organic equipment.
- Equipment belonging to other military elements involved in the operation.

3-54. The type of disaster provides the Maintenance Commander with some insight on whether to plan on availability of fixed facilities or to rely on maintenance under field conditions. The commander also considers how operations and facilities will conform with national, state, local, and HN environmental laws. The type of disaster will dictate Class III and IX supply requirements.

OTHER MAINTENANCE OPERATIONS

Recovery

3-55. Recovery is the process of retrieving or freeing immobile, inoperative, or abandoned materiel from the point where it was disabled or abandoned. The materiel is returned to operation or to a place where it can be repaired, evacuated, or otherwise disposed of. Recovery also consists of the following:

- Returns immobilized equipment to operation.
- Retrieves equipment for repair and return to the user.
- Prevents enemy capture of equipment.
- Uses enemy equipment to support the U.S. and friendly forces intelligence.

Responsibility

3-56. Recovery is a using-unit responsibility. In units below the battalion level where maintenance assets are authorized, the Motor Sergeant, Motor Officer, or another designated individual manages recovery operations. In units where maintenance resources are concentrated at the battalion level, the BMO manages recovery

operations. Recovery operations in CS or CSS units can be either a battalion or individual company responsibility.

3-57. Maintenance units are responsible for recovering their own organic equipment and providing limited backup support with organic wreckers or tracked recovery vehicles when requirements exceed a supported unit's maintenance capability. They may also be tasked to provide recovery support on an area basis to units without a recovery capability.

Management

3-58. The BMO or Unit Motor Officer (depending on the type of unit) coordinates recovery operations with the overall repair effort and the available resources to support the commander's priorities and the tactical situation. The goal is timely return of equipment to operation with the least expenditure of resources. The following general principles apply to the management of recovery operations:

- Centralize management of recovery operations at the battalion level whenever possible. This does not preclude delegation of recovery authority for specific operations to the CMT.
- Coordinate recovery operations with the maintenance effort. Maintenance personnel repair equipment as far forward as possible within the limits of the tactical situation, amount of damage, and available resources. Use maintenance time guidelines established by the commander to make repair-or-recovery decisions. The estimated repair time helps determine to which maintenance activity the item should be recovered.
- Use the right recovery equipment for the recovery mission. Tracked recovery vehicles normally recover tracked equipment while wheeled wreckers normally recover wheeled vehicles. When a unit has only limited assets, it is very critical to select the right recovery vehicle for the mission.
- Do not return recovery vehicles to the rear. Instead, keep them available as far forward as the tactical situation permits. This keeps them available for immediate response as needed. The BMO coordinates recovery and evacuation requirements and may request additional support from the DS Maintenance Company MST or the Support Battalion Support Operations Section.
- Coordinate recovery missions with the Tactical Commander during all combat operations.
- Establish recovery priorities when recovery assets are limited. These depend on the commander's need for an item and the tactical situation. The type of maintenance or repair required will also affect the priority when two or more like items must be recovered. As a general rule, always recover weapons systems before tactical vehicles.

Initiation

3-59. There are four steps in equipment recovery procedures. Table 3-2 outlines the procedural steps for equipment recovery.

Table 3-2. Equipment Recovery Procedures

Step	Action
1	When the equipment operator and crew detect an inoperable condition, they should: • Assess the damage and cause of the inoperable condition. • Initiate action based on their analysis and the tactical situation.
2	Operator/crew/organizational maintenance personnel use organic repair and recovery capability, including: • BDAR techniques. • Self-/like-vehicle recovery. • Assistance from other unit's on-site when unit-level recovery resources are insufficient.
3	Unit requests assistance from the Recovery Support Section located in the UMCP. Requests must provide the following information: • Unit identification. • Equipment identification. • Location (map coordinates, when possible). • Nature of disability. • Evaluation of on-site repair capability. • Repair parts required. • Organic recovery capability. • Tactical situation and security requirements. • Recommended route of approach. Until equipment is recovered, the operator/crew must remain with the equipment and follow unit SOPs.
4	Once the operator and crew initiate SOP/corrective measures, they should: • Take cover. • Provide local security. • Wait for assistance. Assist maintenance/recovery personnel on their arrival with the recovery action.

Repair and Recovery Plan

3-60. The key unit personnel responsible for developing the unit repair and recovery plan are the BMO, Unit Motor Officer, or Motor Sergeant

(depending on the type unit). They develop a plan of action for repair and recovery of the disabled equipment based on the request for assistance.

3-61. **Action Plan.** The BMO, Unit Motor Officer, or Motor Sergeant (depending on the type unit), develops an Action Plan that includes evaluation of the following:

- Extent of damage or system failure at the breakdown site.
- Established priority for support.
- Tactical situation.
- Workload.
- Availability of maintenance and recovery personnel.
- Availability and maintenance status of recovery equipment.

3-62. **Checklist.** The BMO assigns the repair/recovery mission to the CMT. The CMT is provided a Unit Checklist containing the following information:

- Breakdown location and grid coordinates.
- Cause of the breakdown.
- Specific designation of required support:
  - Personnel by rank and MOS.
  - Equipment by line item number (LIN), NSN, and quantity.
- Supply requirements – required classes of supply:
  - Class I (rations and water).
  - Class III.
  - Class V (by type and quantity).
  - Class IX (by part and quantity).
- Tactical situation:
  - Road and movement restrictions.
  - Primary and alternate routes of march.
  - METT-TC and special security or NBC defense requirements.
  - Individual clothing and equipment and NBC defense items.
  - Equipment and supplies to decontaminate the disabled vehicle.
- Communications equipment availability, including applicable call signs, primary and alternate frequencies, and required reports.
- Security and safety requirements.
- Applicable special instructions regarding the disposition of contaminated equipment, Contingency Plans, and any special tactical or security considerations.

Special Considerations

3-63. Recovery personnel requires special training and special consideration of the following when recovering abandoned or unmanned equipment:

- Must be trained to identify contamination and search for booby-traps.
- Must wear MOPP when chemical contamination is suspected.
- Must be trained to clear or disarm the weapons systems of supported equipment to prevent accidental discharge.

3-64. **Abandoned Equipment.** Once the CMT makes the equipment safe, it proceeds with the recovery operation. The equipment is inspected to assess the damage and determine repair or recovery requirements. The CMT reports findings and the situation to the BMO. The BMO may direct repair or recovery of equipment or it may send additional parts or personnel. The CMT proceeds with repair/recovery as directed.

3-65. If the BMO cannot be contacted, the CMT proceeds with the original plan or modifies it based on judgment, the commander's priorities, and the unit SOP. During defensive operations, CMTs recover equipment to the first terrain feature. From there they coordinate its removal to the UMCP. However, this should be done only if the equipment cannot be repaired at the Forward MCP. During offensive operations, MSTs recover to the MSR. From that point, Maintenance Platoon personnel pick up the equipment as they move forward.

3-66. **Recovery Destination.** The following items may influence the CMT's ability to recover equipment to a destination:

- Tactical situation.
- Recovery vehicle requirements.
- Workload.
- Available resources at the unit MCP and the supporting maintenance unit.
- Extent of repairs required.

Logisticians use maintenance time guidelines established by the commanders in conjunction with these factors to decide which maintenance activity can best make the repair. The bottom line is to repair the equipment as far forward as possible using the least amount of maintenance resources.

3-67. **Night and Limited Visibility.** Sometimes the tactical situation prevents access to disabled equipment. When that occurs, the BMO must carefully weigh the potential benefits of recovery against the possible loss of personnel. This is particularly true during night operations when the need for noise and light discipline further complicates the recovery process.

3-68. Recovery operations at night or during limited visibility are generally the same as during daylight. Recovery elements may require night vision devices and additional personnel assistance for ground guides. In some cases, the mission may require the Tactical Commander to approve the compromise of light and noise discipline. When tactical

elements are conducting night or limited-visibility operations, maintenance units must anticipate a potential increase in workload.

3-69. **Foreign Materiel.** Responsibilities for recovery and evacuation of foreign equipment and materiel at various levels are similar to those for U.S. materiel. Capturing units must report the discovery of foreign materiel through intelligence channels. Items for which there are no disposition instructions, should not be evacuated until it is coordinated with technical intelligence elements.

3-70. The capturing unit may be directed to evacuate the item to the C&C Service Company or the supporting technical intelligence unit. The unit may be instructed to guard the item and leave it in place for on-site preliminary examination by technical intelligence personnel. When materiel does not need to remain in place for intelligence evaluation and the discovering unit is incapable of evacuating it, the unit may request recovery and evacuation assistance directly from the support battalion responsible for DS-level maintenance.

3-71. **General Equipment.** Handle the following with a special degree of care and security:

- Electronically-sensitive equipment.
- Items easily damaged by weather.
- Pilferable items.
- High-cost, low-density equipment.

Using units must turn in such items directly to the supporting Maintenance Company. MSTs from the maintenance unit must transport equipment when feasible. The Maintenance Company repairs these items within its capability and evacuates the remainder as directed by the MMC.

3-72. **Explosive Items.** The presence of ammunition and explosives often complicates recovery. Personnel must remain constantly alert and should presume abandoned items are booby-trapped. Exercise caution to prevent explosion, fire, or accidental weapon discharge. When unexploded ammunition (such as bombs, explosive projectiles, or booby-traps) is found or suspected, request assistance from an EOD team.

3-73. If quantities of abandoned ammunition are found during recovery operations, leave the ammunition in place and notify the nearest EOD unit immediately. Do not, **under any circumstances,** attempt to touch or move abandoned ammunition.

COLLECTION AND CLASSIFICATION OPERATIONS

3-74. The UMCP is a geographical area containing maintenance resources that allow maintenance support to adapt to the three-dimensional battlefield. Organizational and DS-level maintenance personnel perform required repairs designed to return maximum numbers of weapon systems to the battlefield. Repairs are designed to keep the force at maximum combat strength for the current battle and the next battle. The UMCP is the integration point of the field maintenance concept. From the UMCP, logisticians coordinate and manage maintenance operations and resources to support the warfighting effort.

Battalion Maintenance Officer

3-75. The BMO has overall responsibility for maintenance operations. Directly responsible to the Battalion Executive Officer, the BMO stays informed of the TF Battle Plan and coordinates maintenance efforts to support those operations. The BMO directs the CMT to place recovery assets forward to support warfighting units. In turn, those assets support the recovery of equipment to the UMCP for repair. The BMO further ensures the following:

- The DS MST coordinates requirements with the MCO.
- The BMT understands the support priority and manages maintenance in the forward area of the battlefield.
- The BMT gives maintenance resource priority to forward fighting elements.
- Soldiers from the Maintenance Service Section (MSS) reinforce the CMT.

Setting Up and Positioning a Unit Maintenance Collection Point

3-76. The UMCP is located on the battlefield in the combat trains area. The BMO must coordinate with the S4 in site selection. Locate the UMCP in an area that facilitates effective radio communication with the CMT. Consider METT-TC in the overall determination and do the following:

- Locate as far to the rear as communications allows during defensive operations.
- Locate as far forward as possible during offensive operations (preferably behind a terrain feature such as a hill mass out of range of enemy mortars).

Direct Support Maintenance Collection

3-77. Maintenance or supply personnel inspect materiel, report its quantity and condition, and perform processing necessary for further repair or evacuation. There will be wide diversity in the types and condition of materiel brought into the collection points. Procedures must be established to control incoming materiel and to direct it to specific locations within the collection point area. This will aid in inspecting, classifying, and processing items for repair or movement to the rear. DS maintenance units will inspect evacuated mechanical and electronic materiel, and dispose of it as follows:

- Report equipment requiring no maintenance or no more than GS maintenance to the MMC. Ship it to the supporting DS/GS maintenance facility or supply activity based on the MMC's disposition instructions.
- Report equipment requiring depot maintenance or considered a candidate for property disposal to the MMC. Ship it to the supporting C&C point based on the MMC's instructions.
- Deliver U.S. medical and cryptographic equipment to the supporting medical or signal activity.

- **DO NOT** send containers of chemical agents, ammunition, explosives, or aircraft to C&C Service Companies. Report them to the MMC for disposition instructions.
- Repair only those items directed by the MMC (friendly forces may not require such equipment even if it can be repaired).

Materiel Classification

3-78. U.S. and foreign materiel returned to a maintenance unit is of no value until it is inspected, classified, and reported. Classifying materiel through close inspection allows the condition code of an item to be established. Classification, which indicates the physical condition of the returned materiel, is necessary to determine the proper disposition of an item. It identifies the extent of repairs required (if repairs can be accomplished) and whether the item is worth repairing. The objective is the efficient, rapid return to use of the greatest amount of materiel.

3-79. At DS-level maintenance, qualified technicians inspect materiel in accordance with instructions and specifications in technical manuals, technical bulletins, and MMC directives. The inspection's results establish the materiel's condition code (classification). The classification complies with instructions in TMs, TBs, and MMC directives. A complete listing of condition codes is provided in AR 725-50.

EVACUATION OPERATIONS

3-80. The purpose of evacuation is to move damaged equipment from one maintenance unit to another (normally a maintenance unit with a higher-level capability). An important logistics function, evacuation, also moves disabled materiel into the logistics support system. Evacuation also does the following:

- Reduces the maintenance backlog at a location.
- Moves damaged equipment to a maintenance activity where it can be repaired
- Maximizes use of critical supplies and equipment.
- Matches the maintenance workload with maintenance resources.

Principles

3-81. Logisticians manage evacuation to return the maximum number of serviceable items to using units or to the supply system. This requires close coordination of recovery, repair, and transportation activities to include the following:

- Evacuate equipment to the designated maintenance activity immediately after recovery.
- Make maximum use of road and railway networks.
- Evacuate by the fastest means available.
- Prioritize equipment for evacuation (evacuate critical warfighting items first).
- Streamline the evacuation process. Ensure disposition instructions move equipment to the supporting activity best suited to repair it.

- Maximize use of available transportation. Use vehicles to backhaul unserviceable assemblies and end-items on the return trip.
- Prevent further damage to equipment. Protect it from damage in-transit and from the elements with packaging, bracing, and preservation materials.

Responsibility and Control

3-82. Each commander is responsible for evacuating unserviceable materiel as rapidly and efficiently as possible. MACOMs publish evacuation policies through their MMCs. The MCT requests transportation to evacuate unserviceable materiel from one maintenance unit to another.

3-83. The ASCC MMC, in conjunction with subordinate MMCs, controls the flow of unserviceable materiel from the time of recovery until final disposition. ASCC logisticians establish general evacuation policies. In turn, subordinate commanders develop detailed standards and procedures based on ASCC policies. This ensures organizations processing unserviceable materiel have definitive disposition instructions.

3-84. Evacuation success depends largely on instructions supplied to Maintenance Companies by the MMC. These instructions must be complete, timely, and seek to eliminate all unnecessary handling. If higher HQ issues the proper evacuation instructions, the condition and classification of each item will determine its destination. Automatic disposition instructions are used to the maximum extent possible to avoid undue delay.

RETROGRADE OPERATIONS

3-85. Overseas commands return (retrograde) materiel to the CONUS. Retrograde cargo normally consists of unserviceable, economically reparable items and weapon systems destined for depot repair. Reclamation operations involve the removal by collection and classification units of serviceable or economically reparable components, assemblies, and repair parts from end-items or large components classified as uneconomically reparable. Reclamation operations significantly reduce demands on the supply system.

3-86. Units are dispersed during retrograde operations. Command, control, and communications are difficult. A high degree of coordination is required. Movement of combat elements may be performed under enemy pressure.

3-87. Maintenance operations concentrate on quick repairs, BDAR, controlled exchange, and cannibalization. MSTs in the UMCP move to predetermined locations to support combat elements.

Responsibility

3-88. The various areas of responsibility for retrograde operations are listed below:

- The ASCC MMC, in coordination with CONUS Commodity Commands, establishes the type, quantity, and condition of equipment for retrograde.
- The MMC develops and publishes criteria for maintenance units. Materiel managers identify retrograde items as far forward as practical to prevent unnecessary handling and shipment.
- In some cases, the DS-level maintenance unit can make the inspection and decision to retrograde. In other instances, GS-level maintenance units make this determination.
- When required, the MMC publishes updated lists of items to be retrograded with the quantity and destination of each. They also coordinate transportation requirements for retrograde cargo.
- The MMC coordinates and directs all retrograde shipments.

Procedures

3-89. Customer units may requisition Class IX repair parts from their supporting collection and classification unit. Table 3-3 gives an example of how materiel (a tank, combat) is reclaimed, based on the assignment of a serviceable, reparable, or uneconomically reparable condition code by DS-level collection and classification units.

Table 3-3. Materiel Reclamation Procedures

Serviceable Item	Reparable Item	Uneconomically Reparable Item
The serviceable engine of an otherwise destroyed tank is placed back into the supply system.	The unserviceable yet reparable transmission of the destroyed tank is directed to the proper maintenance activity for repair and eventual return to the supply system.	The totally destroyed hull of the tank is directed through the Property Reutilization Office as scrap.

Support Priority

3-90. Maintenance is concentrated on those weapon systems and materials directly required to support the retrograde operation. Priority of support should be given to units that have completed the movement to the next location and are preparing a new position. Emphasis must be placed on items that can be repaired most readily. Other equipment should be evacuated directly to future planned support areas. Extensively damaged and non-reparable equipment should be used for controlled exchange or cannibalization.

Equipment Recovery

3-91. Destroy equipment that cannot be repaired or recovered to prevent enemy capture. Recovery capability is of utmost importance. The first method of choice is self- and like-vehicle recovery. Wheeled and tracked recovery vehicles are used at critical points to keep the route of march open. Recovery Support sections remain close to the combat unit to assist the CMT's recovery assets.

3-92. Recovery equipment is critical to support of retrograde operations. Its use must be rigidly controlled and coordinated. Recovery equipment should be marshaled at critical locations to keep routes open and to recover all materiel possible. Badly damaged equipment should be evacuated or destroyed. Specific instructions must be provided for destruction of supplies and equipment.

Planning

3-93. Continuous maintenance support throughout the retrograde operation is essential to keep the maximum number of weapon systems operational. Maintenance planners should concentrate on providing essential support forward while moving the bulk of the maintenance units to the rear. They organize teams to provide support to essential weapon systems in the forward areas.

3-94. Maintenance efforts should concentrate on “quick fix” items, using assemblies brought forward to facilitate rapid turnaround of weapon systems. BDAR and fixing equipment are top priority. Maintainers should maximize use of controlled exchange and cannibalization.

RECONSTITUTION OPERATIONS

3-95. Reconstitution is an extraordinary action used to restore units to a desired level of combat effectiveness commensurate with mission requirements and available resources. No resources exist solely to perform reconstitution. It is a total process whose major elements are reorganization, assessment, and regeneration. FM 100-9 contains more information on reconstitution.

REORGANIZATION

3-96. Reorganization is a shift of resources within a degraded unit to restore its combat effectiveness. Reorganization can be immediate or deliberate. It includes cross leveling, matching crews to equipment, and forming composite units from two or more attrited elements.

ASSESSMENT AND REGENERATION

3-97. Assessment and regeneration is done as far forward as possible so units may return to combat with minimum delay. It occurs normally in the support area two levels higher than the unit being reconstituted. It measures a unit's capability to perform its mission and evaluates regeneration needs.

3-98. Maintenance support of these operations initially consists of assessing the damage. It then shifts to repairing as many weapon systems as possible to meet the commander's priorities.

BATTLE DAMAGE ASSESSMENT AND REPAIR

3-99. BDAR is rapid damage assessment and repair, bypassing or jury-rigging components, to restore minimum essential capability to support a combat mission or enable self-recovery. Such enabling repairs may be temporary or permanent, depending on the repairs required. In many cases, they may not restore full mission capability. BDA determines damage and reparability, the assets needed to make the repair, and where the repair should take place. Battle damage repair (BDR) includes any expedient action that returns a damaged part or assembly to mission-capable or limited mission-capable condition. The purpose of BDAR is to return disabled combat equipment as quickly as possible to the Tactical Commander.

3-100. BDA is used to appraise major weapon systems status. This effort shows the number of items destroyed or damaged beyond repair in the forward area and the number that can be repaired forward. It also shows the location of forward maintenance and salvage collecting points and the transportation required to support recovery or evacuation. Mechanics concentrate on mission-essential maintenance only and the priorities established by the Senior Commander.

Battle Damage Assessment and Repair Actions

3-101. BDAR actions include the following:

- Using shortcuts to install or remove parts.
- Modifying and installing components designed for other vehicles or equipment.
- Using parts serving a non-critical function on a like vehicle.
- Jury-rigging to bypass non-critical components.
- Cannibalizing critical repair parts.
- Fabricating critical parts.
- Using substitute fuels, fluids, or other POL.

3-102. All repairs are made in accordance with applicable BDAR TMs and available BDAR kits. At the completion of immediate combat operations, mechanics will make repairs that will return the equipment to fully mission-capable status in accordance with appropriate vehicle TM.

3-103. Anyone on the battlefield can perform some BDAR. However, crew, organizational, and DS-level mechanics and technicians must be trained in assessing battle damage in addition to their specialties. The operator/crew performs initial BDA and repairs the damage if possible. The commander decides whether or not to use BDAR instead of normal maintenance procedures. Since it may not be possible to train BDAR techniques in peacetime using actual equipment, the best substitute is to train system-oriented crews and mechanics to understand the theories and principles associated with weapon systems.

Battle Damage Assessment and Repair Training

3-104. All soldiers associated with a piece of equipment, from the operator through the DS-level maintenance mechanic, must be trained and proficient in the conduct of BDAR operations. The operator/crew must be able to perform initial BDA and repair damage if possible. CMT members must also be proficient in BDAR techniques. A good reference is FM 9-43-2, designed for use by operators and by organizational and DS-level maintenance personnel. BDAR TMs:

- Provide a single document for each weapon system that contains proven, effective techniques. They are not meant to be all inclusive and are no substitute for an experienced mechanic who understands how a weapon system moves, shoots, and communicates.
- Are used by operators and by organizational and DS-level maintenance personnel. They have been developed for major weapons systems and are issued with the normal complement of TMs.
- Have been developed for tactical wheeled vehicles, as well as for combat weapon systems.
- Have the same first eight digits as other 9-series TMs followed by the letters “BD” (the BDAR Manual for the M1 Tank is TM 9-2350-200-BD-1).

NIGHT OPERATIONS

3-105. Night operations use the same organization and require the same functions as daylight maintenance support. Commanders continue to effect internal adjustments of their organic maintenance assets to meet unique situations. Additional maintenance assistance is requested from higher echelon resources when needed. Maintenance elements retain responsibility for performing their assigned function. Those that must be deferred until daylight remain the responsibility of the deferring maintenance element.

Training

3-106. The goal of night maintenance operations is to attain the same degree of effectiveness as in daylight operations. Its goal is also to sustain the effort over long periods of time. Intensive night training is a key element in attaining this goal. Such training improves the capabilities of unit personnel performing technical tasks under less than normal light conditions and provides a sound basis for developing a night maintenance SOP.

3-107. Tasks that cannot be performed under subdued visible light or by using night vision goggles are identified. Procedures are developed for deferring them until daylight hours. Procedures are developed for preposition of equipment, tools, and repair parts supplies to allow ready access, identification, and handling at night. Procedures for night movement and relocation stress light discipline and camouflage.

Planning

3-108. Detailed planning for maintenance support of night operations is essential. Maintenance support planners must provide a realistic assessment of the capability to support night operations. The assessment is based on the degree of proficiency attained by the maintenance elements concerned in training and on the SOP for night maintenance operations. Requirements must be identified and coordinated for additional maintenance support from higher echelons to assist in working off the repair of items deferred for daylight maintenance.

3-109. With the present night vision technology, planners must anticipate built-in backlog each morning. They must ensure that the Maintenance Support Plan provides timely support without interfering with or compromising the Tactical Plan.

Procedures

3-110. Using night vision devices, organizational and DS maintenance elements repair and return to service those critical items within their repair capability. Night vision devices are used for tasks that must be accomplished outside. Bulky items or repair parts supply, as well as equipment and tools, are pre-positioned for rapid location, identification, and handling during the night.

3-111. Where enemy observations may be possible, field expedient drape-type shelters are constructed to hide the light source. Lightproof shelters with visible subdued light are used for the repair of small items of equipment (such as radios and small arms). They also provide a place to use required TMs. The Tactical Commander must approve the use of subdued visible light.

3-112. Night recovery is conducted on a case-by-case basis depending on the tactical situation and the need for recovery of the item. Equipment, tools, and repair parts are pre-positioned and marked for easy location, identification, and handling. Elements must also be concerned with aerial observation of heat and light source signatures. Where required, the supported unit provides security for the recovery element. MSTs dispatched from support elements into areas farther forward should have night vision devices.

NUCLEAR, BIOLOGICAL, OR CHEMICAL ENVIRONMENT

3-113. Maintenance personnel must be prepared to provide maintenance support on the integrated battlefield. To do this, individual soldiers must be trained to survive an initial NBC attack and to continue the mission in a toxic environment under great mental and physical stress.

3-114. Leaders must recognize that performance in an NBC environment is greatly degraded, causing a detrimental effect on mission performance. Long-term problems caused by contamination make it doubly important that maintenance units protect themselves. When possible, maintenance activities should occupy protected areas (such as underground garages or concrete buildings) to provide cover from liquid chemical agents and shielding from radioactive contamination.

CONTAMINATED EQUIPMENT

Standing Operating Procedure

3-115. Units should establish SOPs for contaminated vehicle and equipment maintenance procedures for the following:

- Responsibilities for establishing and operating contaminated and uncontaminated MCPs.
- Procedures for operating contaminated and uncontaminated MCPs.
- Procedures for performing unit-level hasty decon or requesting deliberate equipment decontamination from an NBC Defense Company.
- Procedures for contaminated equipment inspection.
- Procedures for repair without electronic test equipment (destroyed by blast or electromagnetic pulse (EMP)).

Hazards

3-116. The following are some special hazards involved in working on contaminated equipment:

- Petroleum products tend to trap chemical contaminants.
- A vehicle that is safe for an operator without MOPP-4 protection may be unsafe for a mechanic to repair.
- Chemical contaminants may collect in bolt threads, hydraulic fluids, and closed assemblies. For example, a mechanic might break open an air filter and be exposed to lethal concentrations of hazardous vapors. Casualties could be high unless all repairs and preventive maintenance on previously contaminated vehicles are performed in MOPP-4.
- Oil, grease, and dirt seriously degrade the protective qualities of a chemical overgarment. Mechanics must keep themselves as clean as possible. Extra overgarments should be on hand to replace dirty ones.
- Wet-weather gear helps keep overgarments clean but increases heat buildup and will eventually be penetrated. The combination of protective gear and wet-weather gear provides good (although hot) protection from a combination of toxic chemicals, grease, and oil contamination. Fuel handlers' aprons and field expedient rubber sleeves provide some added protection with less heat buildup.
- Mission performance is greatly degraded. Repair times are significantly increased with increased MOPP levels. This reduced capability affects the combat readiness of supported units.

Control Principles

3-117. Do not spread contamination or bring contaminated equipment into a clean area. Units may establish separate MCPs or, at a minimum, separate storage areas for contaminated and uncontaminated equipment.

3-118. Mark equipment to protect others. Every effort must be made to repair contaminated equipment in a contaminated area.

3-119. At the MCP BDA/NBC detection point, all personnel and equipment returning from forward areas are properly routed to control the spread of contamination during the repair process. Units will establish an NBC control point for monitoring and decontaminating personnel. Equipment will be decontaminated prior to evacuation to the supporting backup DS-level maintenance facility. All equipment evacuated must be marked with the level of decontamination it has undergone. All equipment evacuated to EAC must be decontaminated and marked using the "x"-system.

Marking Vehicles and Equipment

3-120. Mark vehicles and equipment to protect others. Vehicles and equipment that are contaminated or that have been deconned to low-risk levels for operators and crews could still present a serious hazard to mechanics. They need to know the equipment has been contaminated.

Standard Contamination Signs

3-121. Contaminated vehicles must be identified with standard triangular contamination signs on all four sides and at the operator's controls. The type and date of contamination should be written on the signs. The signs should be easily visible from the outside of the vehicle. Contamination signs on vehicles and equipment contaminated with persistent agents will not be removed even after decontamination. Non-vehicular equipment should be similarly marked in a conspicuous location.

Additional Marking System (x-system)

3-122. An additional marking system may be used to alert personnel of possible hazards, as well as to show the level of decontamination the equipment has undergone. The x-system is the easiest to use. The mark must be made in a contrasting color so that it can be seen from all directions. If a vehicle is marked, the logbook must specify where the contamination was located, as well as the results of each decontamination attempt. See Table 3-4, page 3-28, for a description of the four levels of decontamination.

3-123. No item without at least an XX marking will be taken into MCPs. A detailed decontamination results in an XXX marking. Corps chemical unit decontamination results in an XXXXX marking. Only those marked XXXXX will be evacuated to EAC.

NOTE: A contaminated item is marked initially and then modified as different levels of decontamination are reached.

Table 3-4. X-System

Level	Description
X- One	Item is contaminated; no decontamination was attempted.
XX- Two	Item underwent immediate or operational decontamination: Crew or individual soldier removed gross contamination and prevented its unnecessary spread. Item should still be handled very carefully; only gross surface contamination was removed.
XXX – Three	Item underwent a more detailed decontamination: Detection tests after decontamination attempts show negative results. Disassembly may not have been done; some contamination may be discovered if item is broken down further.
XXXXX – Five	Item was disassembled and completely decontaminated: Completely disassembled and usually exposed to extreme heat for sufficient time to completely destroy all of the agent. If item could not be subjected to heat, other methods ensured absolute decontamination.

Disposition

3-124. Whenever possible, return contaminated repaired equipment with no more than a negligible risk to the owning contaminated unit. Even if equipment has gone through hasty decon, it can still be hazardous to handle. A previously contaminated unit will already be conducting periodic contamination checks and will be able to use the equipment safely because of the precautions being taken.

Evacuation

3-125. Contaminated equipment and tools must be stored at a location downwind of clean areas. Every effort must be made to control the spread of contamination. Contaminated vehicles and equipment should not be sent to the base shop for repairs. NBC considerations may outweigh established maintenance repair timelines. If DS-level maintenance is required, an MST will be sent forward to make repairs in the contaminated MCP. DS maintenance units should treat all customer equipment as contaminated until detection equipment proves otherwise.

Tools

3-126. Since it is difficult to decontaminate equipment well enough to eliminate risks to mechanics, it may be impractical to decontaminate tools and equipment used to repair contaminated equipment. Segregate

tools and equipment used to repair contaminated equipment from other tools. Use these contaminated tools and equipment to repair contaminated equipment.

SAFEGUARDS

3-127. Even though decontamination is done, MSTs cannot be sure that toxic vapor trapped by oil or held inside a closed assembly will not appear at some point during the maintenance process. Since decontamination cannot guarantee safety for unprotected mechanics, the Maintenance Officer must decide which MOPP level mechanics should use. This is a tactical decision. Mechanics should use MOPP levels consistent with the threat and the mission.

3-128. Safeguards must be taken to protect people inside and outside contaminated areas. Chemical agent detection equipment should be operated while contaminated equipment is being repaired. The testing must be a continuous process. Vapor hazards may not be present in open terrain. However, as soon as the vehicle is moved into an area where air does not circulate, significant toxic vapors may concentrate.

CONTAMINATED PARTS REMOVAL

3-129. If a vehicle is contaminated and a part removed for use elsewhere (controlled exchange), the part must also reflect the appropriate level of decontamination. This must be done due to the possibility of hidden contamination. A removed item could potentially contain a hidden agent that was never detected. It could pass through all the various levels of maintenance and then be released once it is disassembled. It is worth the few seconds it takes to mark an XXX.

CONTAMINATED ASSEMBLIES

3-130. If contamination is detected after an assembly is opened, the assembly can be deconned quickly by flushing with diesel fuel or motor gasoline. The unserviceable component must then be marked and taken to the contaminated holding area, where it can undergo more thorough decon. For reparable assemblies, personnel should either wait until the assembly no longer gives off vapor or replace it with a new assembly. The fuel used for flushing must also be marked “contaminated” and dumped into the contaminated sumps at the decon site or disposed of per unit SOP.

RADIOLOGICAL CONTAMINATION

3-131. Maintenance personnel repairing equipment with radiological contamination should wear dosimeters and be closely monitored for radiation exposure. They must never exceed exposure levels. When the highest acceptable levels are reached, personnel should be replaced, mission permitting.

3-132. The amount of radiological contamination personnel should be exposed to will vary depending on operational exposure guidance and the tactical situation. The priority for monitoring equipment should go to the Recovery Teams, next to inspection points, and then to the MCP. MSTs should satellite off their supported units for NBC monitoring as much as possible. Figure 3-2, page 3-30, shows how an MCP is set up to

accommodate both contaminated/uncontaminated equipment repair on the integrated battlefield.

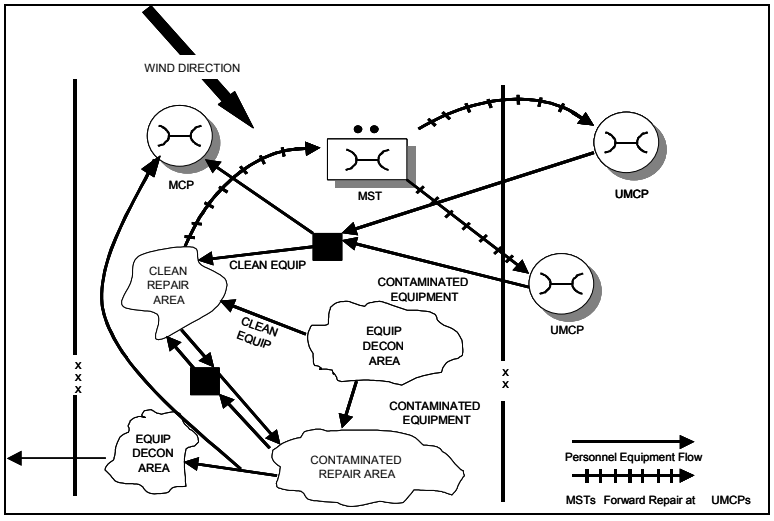

Figure 3-2. MCP for Contaminated/Uncontaminated Equipment Repair

CLEAN AREA SUPPORT STRATEGY

3-133. The strategy for supporting from a clean area is the prevention of contaminated personnel from entering the clean area. Work within a clean area can be done at reduced MOPP and with greater efficiency. When NBC attacks occur within the combat area, the unit must assume all equipment is contaminated and the maintenance unit will set up separate inspection points and MCPs.

3-134. All vehicles, personnel, and supplies must pass through the inspection point before they enter the maintenance area. Here, inspectors in MOPP-4 can use heaters or torches to warm equipment while they check it for contamination. The vapor hazard from liquid contamination may be undetectable at 65° F (18° C) in the open. It becomes lethal at 80° F (26° C) or when brought into a closed area. Some biological contamination, including toxins, may not be detectable. Assume contamination is present if the equipment came from a known contaminated area. Radiac meters can easily detect radiological contamination.

INSPECTION TEAM

3-135. The Inspection Team must segregate the equipment. Uncontaminated equipment can go straight to the clean maintenance area. Contaminated vehicles and equipment must be marked with contamination signs.

3-136. A decision must then be made on the disposition of each item. If equipment is contaminated and repairs can be performed in MOPP-4, the item is sent through decontamination or left to weather. If weathering is the choice, the marked equipment is placed in a holding area where it can decontaminate itself. Waiting for equipment to weather before repair may be a luxury a commander cannot afford. In cool weather, weathering can take weeks. If the choice is to decontaminate, consider the following:

- Before any repairs are made, equipment should go through decontamination to a level deemed necessary by the command.
- Priority equipment must be decontaminated first. Setting priorities is often not easy. For instance, there may be four armored personnel carriers equipped with antitank weapons. If they are lightly contaminated, perhaps all four could be decontaminated and repaired in the time it would take to decontaminate and repair one heavily contaminated tank.
- Decisions require coordination between maintenance units and operational staffs.

Decontamination

3-137. Decontamination should only be done if it is cost-effective. When a persistent agent is involved, every effort should be made to replace a contaminated component with the next higher assembly that can be replaced in MOPP 4. Mark and place contaminated equipment or components in the holding area to await disposition instructions from higher HQ.

On-Site Maintenance

3-138. Uncontaminated teams should not perform on-site maintenance and generally should not attempt recovery of contaminated equipment. Unserviceable, contaminated equipment and vehicles should be recovered to the decontamination site or contaminated MCP by other contaminated vehicles.

SUPPORT TEAMS

3-139. If it is not known whether vehicles and equipment are contaminated, organizational and DS-level maintenance activities will send teams forward to repair or recover vehicles and equipment. Teams must be in MOPP 4 and they must test the equipment for contamination. Testing is a continuous process. Vapor hazards may not be present in open terrain, but significant toxic vapor may concentrate as soon as the vehicle is moved into an area where air does not circulate.

3-140. If contamination exists, the teams must decide whether or not repairs can be made in MOPP 4. If they cannot, the equipment must be deconned. Any surfaces the team will touch to repair or recover the vehicle must be given an operator's hasty decontamination with an on-board decontamination apparatus (such as the M11 or M13). This will not reduce the level of MOPP needed, but it will offer some additional protection and limit the spread of contamination.

3-141. Contaminated equipment maintenance tools may remain contaminated if further maintenance of contaminated equipment is needed. Use rags to wipe off only the gross contamination. Dispose of the rags in a sump or bury them and mark the location. Teams may go through a MOPP gear exchange or detailed troop decontamination, but the team's equipment and tools should be left alone.

3-142. A fresh team can use the contaminated tools on other contaminated equipment. For extended repairs, a rested team relieves a contaminated team, which moves back and undergoes detailed decon. After a rest, the newly deconned team rotates forward and relieves the contaminated team.

TIME AND RESOURCES

3-143. It may be possible to extend the length of time the unit can continue to support from a contaminated location. This can be done by scheduling periodic withdrawal of personnel to a clean area for complete personnel decontamination and a rest period at a reduced MOPP level. However, for continued effectiveness, the unit must leave the area, go through a detailed equipment and decontamination process, and set up shop in a clean area.

3-144. Time may dictate that only the most critical repairs continue while a portion of the unit moves to a clean area. Limited organic transportation may require that some unit and customer equipment be left behind. After reorganization at the clean area, this equipment may be recovered or repaired using the procedures described for support from a clean area.

CONTAMINATION AVOIDANCE

3-145. Avoiding contamination should be the keystone of the support strategy in an NBC environment. Unit NBC defense personnel should monitor the NBC situation by maintaining contact with higher HQ and their counterparts in supported units. Before dispatch of the MSTs, obtain as much information as possible relating to the threat along the route of march and at the support location. The location and availability of complete equipment decontamination stations must be carefully monitored. These facilities are operated under the supervision of elements of the Corps Chemical Company.

CONCEPTS OF SUPPORT FOR MAINTENANCE OPERATIONS

NON-DIVISIONAL MAINTENANCE

3-146. EAD maintenance support is a combination of modularly oriented support groups (Theater ASGs and CSGs). These groups are dependent upon the size and scope of overall TSC CSS operations.

3-147. The TSC provides centralized control and management of maintenance operations through the Support Operations Control Center. TSC maintenance operations provide the following:

- DS maintenance support to units located and or passing through the COMMZ.
- DS maintenance support back up to corps and divisions or other units.
- GS maintenance support to the theater by repairing end items, modules, assemblies, and components evacuated for repair and return to the supply system.

3-148. The Supply and Maintenance Directorate of the TSC Support Operations Control Center plans and manages maintenance support for the TSC. They establish policy, plans, and procedures for all theater maintenance support programs. Maintenance information management at the TSC is accomplished through the retrieval of data from the SAMS-1 and SAMS-2 into the CSSCS system. This provides a theater maintenance database for the commander.

3-149. ASGs are the operational arm for the TSC composed of functional units. ASGs provide DS support to units in its area. The Maintenance Battalion for an ASG usually includes three to five non-divisional DS Maintenance Companies. The Maintenance Battalion may be augmented when required.

3-150. The COSCOM Materiel Management Division of the Support Operations Center provides for overall policy and management for maintenance operations within the corps AOR. The COSCOM Support Operations Center retrieves data from the COSCOM Maintenance Unit SAMS-1 sites and manages the data through the SAMS-2. COSCOM maintenance operations are exercised by maintenance units assigned to the CSG (Rear) and the CSGs (Forward). The CSG (Forward) provides DS to non-divisional troops in its assigned area and GS support to the division. Maintenance support from the multifunctional CSG is provided by a DS Maintenance Company. The COSCOM Rear CSG supports non-divisional units in the corps rear with a Maintenance Company assigned to one of the CSG (Rear) Corps Support Battalions.

MAINTENANCE BATTALION

3-151. The DS Maintenance Battalion normally provides support to all units located in or passing through a designated area. However, it may operate in whole or in part in support of specially designated units.

Location

3-152. The battalion normally operates from multiple locations within its assigned AO. The HHC is located as centrally as possible within the area. Maintenance Companies are located in various parts of the battalion AOR and are oriented on equipment densities. Factors affecting the position of DS units include:

- Tactical situation.
- Road network.
- Availability of suitable terrain for CSS.
- Security requirements.
- Location of other support activities.

3-153. Maintenance Companies may be temporarily attached to another DS Maintenance Battalion when the situation warrants. For example, when one DS Battalion of a support group is not employed to the full extent of its productive capacity, while the other battalion in the group has exceeded its capacity, a temporary attachment of maintenance assets to the overtaxed battalion may be necessary.

Repair Exceeding Capabilities

3-154. Maintenance is performed either in the supported unit with MSTs or in MCPs of DS Maintenance Companies. Equipment exceeding repair capabilities or capacities of the Maintenance Company may be evacuated to another DS Maintenance Company in the TSC ASG or COSCOM. The equipment may also be evacuated to a GS maintenance unit in-theater.

BATTALION HEADQUARTERS

3-155. The battalion is assigned specific AORs by the ASG or CSG based on mission assignments made by the TSC or COSCOM. In the support area assigned to the battalion, the HQ assigns specific areas to attached Unit Commanders and assists in reconnoitering sites for new AOs. Support Group HQ is continually kept apprised.

Mission

3-156. Battalion HQ keeps track of workload, production, and maintenance issues of subordinate units through reports, visits, liaison, and briefings. The Battalion HQ must also stay alert to potential changes in mission and inform subordinate units accordingly. Mission changes might include the following:

- Support of new units.
- Changes in unit end item priority.
- A requirement for repair parts fabrication.

Battalion HQ provides attached units with pertinent instructions governing operations and performs maintenance management and staff supervision to ensure adherence to established policies.

Augmentation

3-157. When the workload exceeds the unit's capability or capacity, the Battalion HQ makes appropriate recommendations to the CSG/ASG and MMC concerning augmentation requirements. Such action is taken only when maintenance management and control within the battalion will not solve the problem. Battalions normally contain at least three Maintenance Companies. When one of them becomes overloaded, Battalion HQ may augment that unit's capacity by temporarily attaching personnel and equipment from another unit.

NON-DIVISIONAL (DS) MAINTENANCE COMPANY

3-158. The company establishes its base of operations in the area with greatest equipment density in its AOR and locates it as centrally as possible within the area. The area selected for operations should be adjacent to a good road network to facilitate easy access to supported units.

Mission

3-159. The company provides DS-level maintenance, repair parts supply support, and technical assistance to units in its AOR. It may be tasked to provide backup or passback support to other Maintenance Companies and recovery/evacuation assistance to supported units. Out-of-sector

support for specific operations may also be a mission of this company. METT-TC will determine the length of time a non-divisional DS Maintenance Company occupies a single field site.

On-site Maintenance

3-160. The company provides on-site maintenance to supported units when practical. This service is provided with the dispatch of properly manned and equipped MSTs to a supported unit UMCP or to the site of equipment failure. All company elements provide personnel for on-site maintenance as directed by the MCS and set forth in the applicable TOE.

3-161. After receiving equipment, the MCS inspects the items that can be inspected and fault-diagnosed without disassembly. It then schedules equipment for shop repair, depending on shop workloads, parts availability, the priority of the requesting unit, and the priority of the specific equipment to support current operations.

Small Items

3-162. Small items and items requiring some disassembly (C-E equipment) or diagnosis using TMDE are normally sent to the appropriate maintenance shop after receipt. In the company, DS-level repairs consist of the following:

- Troubleshooting/replacing defective components and modules.
- Tightening and adjusting components.
- Welding operations.
- Repairing minor components using repair kits.

Records and Reports

3-163. Under a fully automated Maintenance Management System, most maintenance data and reports required by higher HQ are submitted on diskette or transmitted by modem. The company operates the SAMS-1 to manage maintenance and transmit data to the Battalion Support Operations Section. Data submitted by the SAMS-1 pertains to DS Maintenance Company operations. The Battalion Support Operations Section transmits SAMS-2 data to the CSG/ASG, Support Operations Section, or directly to the MMC.

Workload

3-164. Items repaired by the DS Maintenance Company are normally returned to supported units. Items not returned are those repaired for return to RX stocks (starters, generators, fuel pumps, and so on) or to operational readiness float. Items repaired in a backup role are returned to the supported maintenance unit or direct support unit (DSU).

3-165. Workloads exceeding the company's capacity or capability are evacuated according to disposition instructions provided by the MMC. Instructions, which are normally preset, designate shipment to specific units based on type and condition of the item.

3-166. Items reparable at the GS level are evacuated through the Class IX Supply System to a sustainment maintenance base. Certain items with specific condition codes are evacuated to a C&C Company. The Maintenance Company is required to report critical, controlled, or short-supply items to the MMC before evacuation.

Non-tactical Information Systems

3-167. The Defense Information Systems Network (DISN) is a worldwide, non-tactical communications network established by the DoD. The Defense Information Infrastructure (DII) is a worldwide complex of DoD-established information systems networks and control centers organized into a single, seamless, interoperable, long-haul, general-purpose Theater Communications System (TCS). DII facilities may be operated by any of the U.S. Armed Services. In a theater of operations where the Army manages the DII, the responsibility is assigned to the TSC-A.

3-168. The TSC-A Commanding General has the mission to establish, operate, and control the TCS. The commander responds to the operational direction of the ASCC and the Defense Information Systems Agency (DISA) for the DII (Army) under his control. The TSC-A is responsible for expanding and restoring DII web links in-theater and for providing liaison and interface to DII networks managed by the other services. During wartime, the TSC-A provides information systems support to the Wartime Theater Army and its forces in the theater of operations.

3-169. DII and TSC-A fixed information systems facilities use fixed-plant, COTS, and complex systems unique to TCS or DII operations. System complexity, criticality, and equipment configurations mandate that logistical support for non-tactical information systems equipment be provided differently than for ASCC tactical equipment.

Location

3-170. Supported sites may be dispersed over a large geographical area and the equipment maintained may be unique to the theater of operations. A theater may use equipment operating in a frequency range different from another theater's. Equipment may include systems manufactured in the HN.

Support Organization

3-171. The TSC-A Commander is responsible for the operation and maintenance management of facilities and resources that support or relate to the DII. The organization created to provide logistical support to non-tactical information systems in TSC-A is the AMSF. The AMSF may be a TDA organization or an MTOE organization with TDA augmentation. The AMSF provides both maintenance and supply support for TSC-A supported equipment. If specified in the Mission Statement or Statement of Work (SOW), the AMSF may operate as well as maintain telecommunications facilities for the TSC-A. The AMSF provides logistics support to fixed-station, semi-fixed, and special transportable information systems. Maintenance support provided by an AMSF includes DS, GS, and SRA levels.

Functions

3-172. **Maintenance.** Maintenance functions performed at the AMSF include repair of components, assemblies, modules, and PCBs evacuated by supported sites or MSTs. These include COTS equipment and systems. Repairs require specialized skills, special tools, TMDE, and disciplined QC. Repaired items are returned to the sites or RX, or they are restocked in the AMSF. Items beyond the AMSF's repair capability or beyond the scope of the AMSF Contractor SOW are returned to the manufacturer for repair.

3-173. **Supply.** The AMSF provides C-E repair parts for information systems operated at supported sites. It maintains a stockage of repair parts, circuit components, modules, subassemblies, special design tools, and test equipment for its own operation, as well as for supported site requirements. The AMSF provides complete support for all peculiar repair parts requests and organizational PLL. Repair parts support to customer units does not include repair parts for other items of organizational equipment, such as automotive, arms, and NBC equipment. The DS maintenance unit of the theater CSS organization charged with the normal DS support mission provides non-C-E parts support.

3-174. AMSFs requisition C-E repair parts and supplies directly from the appropriate CONUS NICP and other wholesale sources as prescribed by Integrated Logistics Support (ILS) Plans and Wholesale Interservice Supply Support agreements. They also receive, store, maintain account for, and issue non-force organic information systems project materiel and equipment (formerly referred to as Class IV project materiel) in support of the DII (Army).

3-175. **Operational.** If specified in the Mission Statement or SOW, the AMSF may also operate, as well as maintain, selected DII telecommunications facilities, AUTODIN, the Standard Theater Army Command and Control System (STACCS), Defense Red Switch Network (DRSN), and government-owned, contractor-operated (GOCO) facilities in the theater for the TSC-A.

NOTE: Chapter 2 of this manual provides additional information about the various non-divisional maintenance support organizations that may be required to provide maintenance support, based on the theater overall concept of support.

Liaison, On-site, and Emergency Service

3-176. Maintenance units must be mission-oriented and proactive in providing as much assistance to customer units as possible. Customer-oriented support is the overriding principle all DS maintenance operations are based on. Maintenance units will provide on-site maintenance to supported units whenever practical. On-site support keeps the maximum amount of serviceable equipment in the hands of supported units, reduces operational downtime for certain types of equipment, and provides supported units with on-the-spot instruction and advice to improve their operations. It also reduces the maintenance unit's workload, as well as handling and transportation requirements

needed if all unserviceable equipment were work-ordered to the maintenance unit for repair.

Liaison Visits

3-177. To provide adequate, effective support, the location of the supported unit, its equipment status, repair parts supply status, equipment density, and repair requirements must be determined. Upon being assigned a support mission and arriving in their operating area, DS maintenance units perform liaison visits to make initial contact with supported units.

3-178. The SPO, accompanied by one or more key personnel, makes initial contact. Supported units are informed of the supporting unit's location, services to be provided, and procedures for obtaining these services. Maintenance and repair parts issues and requirements are discussed. After initial contact, liaison is maintained on a frequent basis. The DS Unit Commander makes additional visits to supported units to maintain good working relationships.

Technical Assistance

3-179. Technical assistance is providing instruction and technical guidance to supported units to enable them to perform their mission more efficiently. It can increase the quality of maintenance at the unit level, thereby reducing the workload at the DS level. Technical assistance may be provided formally by the AMC Logistic Assistance Program or MACOM-level Maintenance Assistance and Instruction Teams (MAITs). The DS Maintenance Unit Commander may also provide assistance informally. Technical assistance includes visits by Technical Assistance Teams made up of competent experienced soldiers from the DS unit. The team's functions include, but are not limited to the following:

- Advising the supported Unit Commander on the responsibilities for unit-level maintenance and repair parts supply.
- Determining the nature and scope of maintenance support required so that a properly manned and equipped MST can be sent to provide on-site maintenance.
- Assisting the supported unit in the operation of maintenance management automation (ULLS-G).
- Discussing and resolving mutual maintenance support issues regarding personnel, equipment, or operational procedures and policies.
- Assisting the Unit Commander with the evaluation of equipment condition and the effectiveness of the maintenance program, and formulating required remedial action.

On-Site Maintenance

3-180. On-site maintenance support includes the following:

- Performing maintenance at the location of equipment failure or at the supported unit's MCP.
- Delivering repair parts directly to supported units.
- Providing technical assistance.

It also includes liaison visits to identify issues and requirements of supported units and to inform them of the support available and the procedures required to obtain it. Liaison Teams and MSTs provide on-site maintenance support.

MAINTENANCE SUPPORT TEAMS

3-181. MSTs perform on-site maintenance. They may also be used to help supported units determine the condition of supported equipment and to provide advice and assistance for correcting equipment failures noted in inspections. The MST organization varies according to the mission.

Employment

3-182. Employment of MSTs depends on maintenance support requirements. Some teams are dispatched in response to a specific requirement in a specific area. They return to the DS unit after completing their mission. Other teams may operate away from the DS unit in a UMCP for extended periods. The MCO determines how the MST operates. It depends on the mission of the team concerned and known requirements for on-site maintenance support. MSTs not only are dispatched as a result of requests from supported units, but also to satisfy planned operations (such as responses to anticipated requirements).

Equipment

3-183. MSTs will be equipped with the tools, equipment, and repair parts needed to do a specific job. When requesting on-site maintenance, supported units report the type of malfunction and any known parts requirements. MSTs must also know the supported unit's equipment density and any special support requirements (for example, welding). This helps determine the proper composition of personnel, equipment, and repair parts for the MST organization.

Personnel Assignment

3-184. When possible, personnel and supervisors are assigned to an MST permanently. This simplifies management, facilitates cooperation, and promotes better understanding of the job by team personnel.

ENVIRONMENTAL/TACTICAL SITUATIONS

3-185. The environmental or tactical situation and reports from supported units often permit an accurate forecast of on-site maintenance requirements. Caution and good judgment must be used. In a situation where supported units operate from remote locations, it may be necessary to attach a DS MST temporarily to the supported unit.

3-186. The relative merits of transporting personnel and equipment to repair items, as opposed to receiving items at the company base, must be weighed before a decision is determined. This is especially true in situations where air transport is the only means of personal contact. In these situations, great reliance must be placed on providing DS-level maintenance at the supported unit's location (especially for maintenance of heavier and bulkier items), which are difficult to transport, by air.

EMERGENCY MAINTENANCE SERVICE

3-187. Besides providing DS-level maintenance to specific units in a specific geographic area when requested, each DS maintenance unit provides emergency maintenance support. This service may be provided at the roadside, in the DS shop, or on-site.

ROADSIDE SERVICE

3-188. Roadside service may consist of the repair of disabled equipment, BDAR actions, or recovery of disabled vehicles. Normal BDAR repair involves a minimum of parts, tools, and time. Fuel system failures, overheated engines, and electrical failures are the usual malfunctions. The form and scope of emergency roadside service are governed by need, the weather, the tactical situation, and traffic. Road patrols, recovery service, or maintenance elements at refuel points provide this type of service.

Road Patrols

3-189. Road patrols consist of two or more automotive mechanics in a light vehicle carrying a small stock of repair parts, repair kits, and tools. Patrols are dispatched and routed so they will pass any given point on a main supply route (MSR) at least every two hours. However, road patrols reduce the unit base shop maintenance capability. Emergency service is rendered on the spot to any disabled vehicle found along the route. When necessary, a recovery vehicle is called by the patrol to recover the disabled equipment to an MCP, evacuation point, or the DS maintenance shop.

Recovery Vehicle

3-190. A recovery vehicle may be stationed at a convenient intersection along the route or may remain on call in the DS maintenance unit. Recovery vehicles are the primary source of heavy-lift capability for removal and replacement of automotive power train assemblies in the field. Therefore, they should not accompany a road patrol unless the requirement for their services is known beforehand.

Refuel Points

3-191. DS-level maintenance support can be set up at refuel points along heavily traveled routes. This is a practical method of providing efficient, economical roadside maintenance service. Petroleum platoons can provide assets along roads for convoy refueling. These services can be extended to provide fuel to all vehicles using the route. A small maintenance element can also be located here. This element may consist of four to six automotive mechanics equipped with a vehicle and cargo trailer carrying small, easily replaceable repair parts and RX items.

3-192. While vehicles are being refueled, the maintenance element can assist the operator/crew in performing spot checks of the vehicle. Minor deficiencies can be corrected on the spot with available tools, repair parts, and BDAR techniques. Deficiencies that do not deadline the vehicle will be annotated on DA Form 5988-E. This form is given to the vehicle driver for action on return to the unit.

DIVISIONAL MAINTENANCE CONCEPTS OF SUPPORT

ARMY OF EXCELLENCE CONCEPT OF MAINTENANCE SUPPORT

3-193. AOE maintenance uses the "four-level fix forward" philosophy. The mission support requires that sliced support elements must be task-organized (not modular). Only selected component repair is conducted in the CZ. EAD assets provide support to Corps units in the Division CZ and backup DS support to DISCOM Maintenance Companies. AOE maintenance units have very limited on-board prognostics and diagnostics.

3-194. The primary STAMIS' that provide supply support, maintenance management, and materiel readiness data are the ULLS-G, the SAMS-1, the SAMS-2, and the SARSS. ULLS-G systems are located in every organizational maintenance element. SAMS-1 systems provide maintenance support to all DS maintenance activities. SAMS-2 systems provide maintenance management support at the Maintenance Battalion and MMC levels.

3-195. AOE DISCOM maintenance elements operate throughout the division area. They typically perform their functions on-site, at MCPs, and company base shops. The DMC provides maintenance management for the ASB as it does for the MSB and FSBs.

3-196. The Materiel Section of the DMC manages repair parts supply and maintenance. It designs and manages the division Class IX inventory and directs the Class IX issue.

3-197. Logistics Support Activity (LOGSA) provides the Maintenance Master Data File (MMDF) to the SAMS-2 MMC. The MMDF is subsequently forwarded to the SAMS-1 and ULLS-G. The MMDF provides reportable systems and subsystems materiel readiness reporting guidelines. The Materiel Section manages maintenance for all items of materiel and oversees the document control and edit functions. This section supervises its branches in providing integrated maintenance management using SAMS-2 materiel management processes and materiel readiness procedures.

3-198. DMC management is limited to the maintenance functions that are generally external to the MSB, FSBs, and AMCO. These include the monitoring of unit maintenance throughout the division. The section also collects, analyzes, and reports maintenance statistics and maintains records on the status of MWOs. The Materiel Readiness Section also processes the materiel readiness data for all reportable systems that is forwarded to LOGSA. It compiles reports on the operational status of division equipment and provides disposition instructions on unserviceable materiel.

3-199. The DMC Materiel Section uses the SAMS-2 MMC as a tool for developing data and reports for maintenance management. The SAMS includes a maintenance control system and MWO accounting procedures. Data to support the SAMS is provided from using organizations and maintenance units using the SAMS-1. The data is summarized and prepared in the form of reports that are used by SAMS-1 and SAMS-2 Maintenance Managers and Commanders. These reports are used for management purposes by supported units, Maintenance Unit Commanders, the DMC, and the DISCOM Commander and staffs.

3-200. The Light/Electronic Maintenance Companies of the MSB operate the Main Division MCP at the base shop in the DSA. The MCP receives unserviceable equipment from supported units. The Electronic Maintenance Company also establishes a base shop in the DSA. When required, these companies send MSTs out in the division rear to make repairs as close to the site of equipment failure as possible. Teams may also be sent to augment the FSB's maintenance capability. At the MCP, maintenance personnel, assigned by the MCO, perform large-scale BDA. They may use controlled exchange and cannibalization to maximize operational systems. All supported units are responsible for recovery of equipment. Units bring recovered materiel to the nearest collecting point. When units cannot recover equipment to an MCP, they should recover items as close as possible to an MSR to await maintenance support. The unit must provide or arrange for security. It must also provide accurate location information to the MCS.

3-201. The Electronic Maintenance Company operates from the DSA. It normally collocates with the main Maintenance Company. It has a base shop capability to repair equipment for which it is responsible. The objective of the company is to return to operation the maximum amount of light equipment in the least time.

3-202. The MSB Support Operations Section coordinates with the DISCOM Support Operations branch to arrange all reinforcing support for the MSB. This includes evacuation of materiel, emergency needs, and technical help. The Support Operations Section monitors the ASL and PLL levels. It ensures the company maintains proper operating levels. The Support Operations Section also coordinates MST operations with Maintenance Companies and supported units. The Maintenance Support Platoon of the MSB combined with the C-E Support Platoon set up and operate the base of operations. When required, the company sends MSTs into the division rear or forward to the FSB to provide support consistent with tactical limitations and support capabilities.

3-203. The Electronic Maintenance Company is organized and equipped to provide forward support maintenance. It also operates a base shop in the DSA. MSTs of the Electronic Maintenance Company provide limited on-site DS maintenance of malfunctioning equipment, to include repair by RX of selected components. Malfunctioning components are returned to the Electronic Maintenance Company base shop by MSTs for repair. MSTs provide support for land combat missile systems, multiple launch rocket systems, and air defense artillery systems. The Electronic Maintenance Company has an additional mission of fielding BDA Teams. This function will normally be accomplished by the MSTs as they perform their mission.

3-204. The maintenance relationship between the MSB and the ASB is established by the DISCOM Commander. Command priorities and the ASB's capabilities to accomplish specific missions determine the amount of support. The MSB provides timely, tailored reinforcing support for DS maintenance. The ASB Support Operations Section coordinates with the DISCOM S3 when the GMC needs reinforcing support. The MSB Electronic Maintenance Companies maintain technical heavy maintenance relationships with the GMC.

3-205. The ASB GMC is a critical engineer, utility, power generation, C-E equipment, component in fixing the force. The Cavalry System Support Team (CSST) is structured for ASB non-air items and DS maintenance to support the Aviation Brigade (AB) Cavalry Squadron. This team for AB/ASB non-air items, including automotive, normally works in a maneuver BSA.

3-206. DS units and the DMC share the job of Class IX Supply in the division. The DS units receive, store, issue, and turn in the parts. Supply personnel in the Materiel Section of the DMC manage and account for the Class IX inventory. They use demand history and command-directed actions to help them.

3-207. To prevent overstockage in the FSB Maintenance Companies, forward stockage of Class IX is restricted. Selection of this forward stockage is made in coordination with the MSB and FSB SPOs and the FSB Maintenance Company Commander. Determinations are based on the PLLs of the units to be supported and on the immediate mobility needs of the forward support maintenance units. The remaining stocks of the division Class IX ASL are maintained by the proper maintenance operating units. Examples of these operating units would be Conventional and Electronic Maintenance Companies usually located in the DSA.

3-208. Customers in the DSA submit their requests directly to their supporting DS Supply Support Activity SARRS-1 via the ULLS-G. The MSB Maintenance Company also passes requests directly to the SARRS-1 via the SAMS-1.

3-209. Class IX items arriving in the division are received by the Electronic Maintenance Company of the MSB. This company reports receipt of the item to the DMC and updates the SARRS-2 management files. Non-stocked items are forwarded directly to the user in the DSA. Items are forwarded to the FSB Maintenance Company for issue to the user located in the brigade area. All issues are reported to the DMC for updating SARRS records. Turn-ins are handled in the same manner as receipts and are also reported to the DMC. Missile Class IX items are managed through the MSB Electronic Maintenance Company in the same manner.

3-210. On the basis of METT-TC considerations, the FSB Maintenance Company Commander, MCO, and the FSB Support Operations Section form MSTs to operate at battalion unit MCPs. The core of the MSTs are the SSTs for infantry artillery and tank systems. Typically the FSB Commander has the assets of two Tank SSTs and one Mechanized Infantry SST. Operating out of the battalion TF UMCP, SSTs provide on-site repair for heavy maneuver systems. The SAMS-1 is the FSB's

primary automated maintenance management tool for work load management and shop operations. Though the Maintenance Company Commander retains command and control of these teams, the Maneuver Battalion Maintenance Officers set the priorities for equipment repair. The Maintenance Company provides DS maintenance and common repair parts service to supported units in the brigade area. The FSB Maintenance Company includes a variable number of SSTs. Each team is designed to support a Tank or Mechanized Infantry Battalion. The company receives one team for each Maneuver Battalion assigned to the brigade.

3-211. Other FSB maintenance assets are positioned at MCPs or the base shop. When unit maintenance resources cannot handle the workload, MSTs or other teams of Maintenance Company assets may be dispatched to perform on-site repairs. On the basis of maintenance timelines and the tactical situation, the Team Chief will determine whether to perform on-site repairs or to recover the equipment to a MCP.

3-212. The FSB can operate up to two MCPs to receive unserviceable equipment from supported units. MCP personnel perform large-scale battle damage assessment and may use controlled exchange and cannibalization to maximize operational systems.

3-213. All other FSB maintenance elements are located at the base shop. The base shop is responsible for receipt, inspection, control, repair, and coordination of evacuation of equipment. Elements of MSB Maintenance Companies may be used to augment the FSB's maintenance capability when the workload across the division and the division's mission dictate. Figure 3-3 provides a visual representation of AOE maintenance operations. Chapter 2 of this manual provides more detail about each AOE maintenance organization.

FORCE XXI CONCEPT OF MAINTENANCE SUPPORT

3-214. The overarching principle of FXXI maintenance is to replace forward and repair rear. This philosophy of maintenance allows the FSCs to maintain pace with their supported units. In the redesigned division, some maintenance procedures and doctrinal methods are changed to gain greater effectiveness and efficiencies. Increasing emphasis is placed on prognostics and diagnostics. FXXI maintenance has limited component repair conducted in the CZ. The majority of repairs are passed back to EAD elements. The FXXI primary maintenance STAMIS' remain. The ULLS-G, SAMS-1, SAMS-2, and SARSS-1 provide the automated maintenance management and supply support to the FXXI force structure similar to the AOE.

3-215. Generally speaking, all DS and unit maintenance functions are consolidated in the FSB and are now called "field maintenance." This applies to the Mechanized and Armor Maneuver Battalions, Engineer Battalions, Brigade HQ, Division HQ, and Brigade Reconnaissance Troops. The division troops and field artillery retain their unit maintenance sections. Division troops are provided DS maintenance from either the base shop of the Area Maintenance Company of the DSB or MSTs organic to the DSB. The only exception is the Artillery Battalion supporting a Maneuver Brigade. The BSC of the FSB provides a DS MST to support the Artillery Battalion in that scenario. Mechanics accomplish

their mission by using advanced diagnostics and prognostics to diagnose to the major component fault, at which point, the component is replaced under the “replace forward” concept. “Replace forward” focuses on “on-system” maintenance tasks or those tasks that can be performed at the breakdown site, if possible, or UMCP.

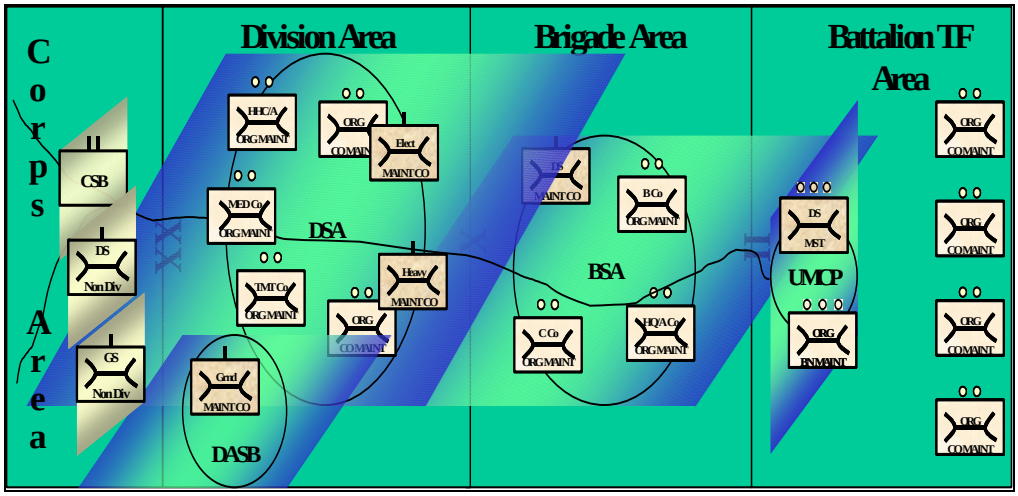

Figure 3-3. AOE Maintenance Concept

3-216. The Maintenance Section of the division support operations manages maintenance workload and priority of effort. It manages the maintenance functions that are generally external to the DSB, DASB, and FSBs. The section monitors unit maintenance throughout the division. It collects, analyzes, and reports maintenance statistics. It maintains status on the materiel readiness of the reportable systems and subsystems. This section also provides disposition instructions for the evacuation of all unserviceable materiel.

3-217. The DSB Area Maintenance Company provides DS maintenance to division troop units not supported by the Brigade Support Company or Forward Support Company of the FSB. The DASB provides maintenance support to the Aviation Brigade and Division Cavalry Squadron.

3-218. The ASMC establishes base shop operations in the DSA. As directed, MSTs from the Area Maintenance Company provide on-site maintenance support to elements of the ADA, Signal, and MI Battalions, as well as the Division's MLRS Battery. The company is focused on returning as many systems to the battle as quickly as possible. The Area Maintenance Company is oriented toward equipment through the replacement of major components and LRUs. The Area Maintenance Company typically collocates near the Quartermaster Company to facilitate the flow of Class IX parts to and from the company.

3-219. All requests for Area Maintenance Company maintenance support are directed through the DSB Support Operations Section. The DSB Support Operations Section receives the maintenance calls for support (CFS) and forwards the task orders (TOs) to the Area Maintenance Company MCS. The MCS forwards the TO to the applicable section or team that will perform the mission.

3-220. The Area Maintenance Company Maintenance Control Section provides command, control, and communications for the DS maintenance mission. This section coordinates maintenance priorities with the Company Commander and DSB SPO. The MCO task organizes the DS maintenance assets to execute the established maintenance priorities. Maintenance assets provide maintenance support from either the base shop located in the DSA, from predetermined MCPs, or from on-site based on the METT-TC. As the division task organizes to conduct combat operations, ASMC maintenance assets are tailored to support the changing missions.

3-221. The Area Maintenance Company manages organizational maintenance using the ULLS-G. When unit level parts are required, the ASMC checks its PLL. If not available, the ULLS-G forwards the request to the SARSS-1 site in the DSB Quartermaster (QM) Company where the request is either filled out or passed to the SARSS-2A site at the DISCOM Support Operations Section. The SARSS-2A site checks divisional SSAs and either issues the part or forwards the request to the Corps MMC.

3-222. When DS level maintenance support is required, the supported unit sends a call for support to the DSB Support Operations Section via the FBCB2 or SINCGARS radio. The DSB Support Operations Section sends a TO to the Area Maintenance Company Maintenance Control Section. The MCS dispatches appropriate maintenance personnel and equipment to link up with the supported unit at the predetermined place and time to diagnose/troubleshoot and repair the piece of equipment. If repairs cannot be made on-site, the inoperable piece of equipment is recovered to the Area Maintenance Company MCP or other designated location.

3-223. The MST and Base Shop Platoon order all required DS level repair parts on a DA Form 2407 (Maintenance Request), which is then inputted into the SAMS-1. The MCS issues the available shop stock items and orders the remaining parts through the SARSS-1 site in the DSB QM Company. The MCS monitors inoperable equipment using its SAMS-1 computer system. The DSB Support Operations Section and the Maintenance Section of the Division Support Operations Section also use the SAMS-2 to assist in inoperative equipment repair, maintenance workload, and materiel readiness management.

3-224. The Ground Maintenance Company of the DASB provides unit maintenance for all DASB non-air items. They also provide DS support maintenance for Aviation Brigade/Division Cavalry Squadron non-air items, including automotive, engineer, utility, power generation, C-E equipment, and small arms. Its mission is to provide support as far forward as possible to return, as rapidly as possible, ground combat systems to the battle. Repairing equipment forward saves transportation assets and time. Whenever practical, equipment repair should be done on-site. The tactical situation, extent of damage, and availability of resources may require recovery and evacuation. The ULLS-G provides automated maintenance management in support of the organizational maintenance mission.

3-225. The CSST is structured to support the Division Cavalry Squadron. This team normally operates out of the Cavalry Squadron trains area. It is reinforced with other DISCOM elements as required. The team's repair capabilities include the following:

- Automotive/tracked vehicles.
- Armament/fire control systems.
- Ground support equipment.
- C-E.

3-226. The digitized division depends on a significant number of automated systems to accomplish its missions in peacetime and wartime operations. Automation is a critical component of gaining information dominance, shaping the CZ, conducting decisive combat, and protecting the force. A major part of the success in leveraging all this automation involves the development of an integrated Maintenance Plan for keeping all the associated hardware and software operational and functioning. The ULLS-G, SAMS 1, SAMS-2, and SARSS-1 are the backbone of the FXXI integrated automated and SSAs. The Maintenance Plan must be integrated to maximize operator level, organizational, and DS maintenance capabilities within the division and the reinforcing DS and contractor maintenance capabilities at EAD.

3-227. The maintenance mission of the BSC is to provide field maintenance not only to itself but also to the following:

- Brigade HHC.
- Brigade Reconnaissance Troop.
- FSB FSMC.
- HDC.

It also provides limited backup maintenance to the FSCs and divisional units in the brigade area. The BSC also provides DS maintenance to FA units that are part of the brigade.

3-228. The BSC Base Maintenance Platoon provides field maintenance (organizational and DS) to the HDC FSB, BSC, FSMC, HHC Brigade, and Brigade Reconnaissance Troop. It also provides DS maintenance support to other units operating in the BSA. The platoon performs and coordinates backup and reinforcing support to the FSC Maintenance Platoons and the engineer support element (ESE) Forward Engineer Repair Teams. The goal of the "replace forward" concept is to repair systems forward on the battlefield, returning combat systems to battle as rapidly as possible.

3-229. The FSC Commander is the single CSS operator at the maneuver BN/TF level. The FSC provides field maintenance and all classes of supply, minus medical, to its supported battalion/task force (BN/TF). The FSCs accomplish their core functions through centralization of support and new technologies. Centralized support allows the FSB Commander to cross-level between FSCs and weigh the battle logistically, or surge as required. Centralization of support is enhanced through employment of maturing technology available to the Division Logistician. The FBCB2 and its capability to provide near real-time SU to all on the battlefield greatly assist in the support effort. CRTs from the FSCs are placed

forward with each Maneuver Company under the operational control of the Maneuver 1SG. The FSC CRTs are the Maneuver Battalion's first level of support. These modular, task-organized teams provide tactical field maintenance for all organic Maneuver Company systems.

3-230. A FBCB2 call for support message is the preferred method to initiate recovery operations. This will enable recovery vehicles to identify the inoperable piece of equipment's exact location. Figure 3-4 provides an overview of FXXI maintenance operations. Chapter 2 provides more detail about FXXI maintenance organizations.

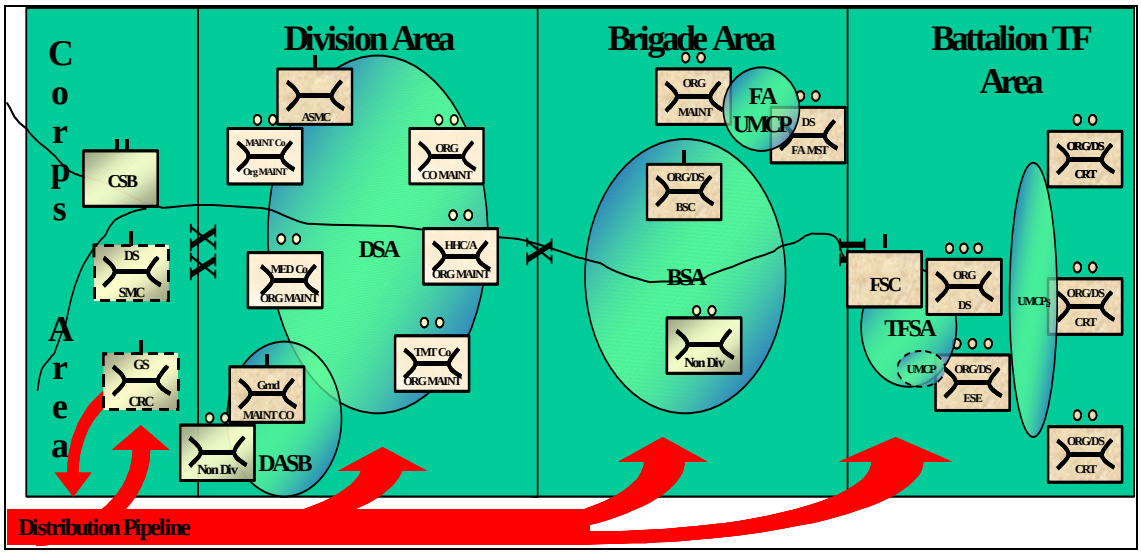

Figure 3-4. Force XXI Maintenance Concept

STRYKER BRIGADE COMBAT TEAM CONCEPT OF MAINTENANCE SUPPORT

3-231. The SBCT Maintenance concept is related to the emerging FXXI doctrine using a two-tiered maintenance system and centralized management. These tiers are field and sustainment maintenance. Field maintenance tasks are those that directly return the system to an operational status. Sustainment tasks are those that support the supply system. Field maintenance tasks are the responsibility of the operators and tactical maintenance units performed in the CZ. The primary methods of returning systems to a mission-capable status are through the use of Class IX repair parts, BDAR, controlled substitution, cannibalization, and Class VII replacement. The essential maintenance tasks for this organization are LRU, component, and major assembly replacement in the CZ.

3-232. The FMC of the BSB, combined with the essential equipment supported contractors, provide all maintenance support for the SBCT, (less medical) and the limited automation capability, which is integrated into the Brigade's S6 Section and the Signal Company. The FMC has the maintenance capability to perform automotive, armament, missile, communications, special devices, and ground support equipment repair. However, its depth is very shallow.

3-233. The combination of organizational/DS maintenance (field maintenance) unifies organizational and DS level maintenance responsibilities and capabilities into one organization. The FMC Maintenance Control Section will be able to focus maintenance leadership, management, technical expertise, and assets under a single CSS operator. This will ensure that maintenance can be planned, allocated, and swiftly executed when and where needed to satisfy the commander's requirements.

3-234. The interim SBCT Maintenance concept, pools maintenance assets under a single CSS operator (for example, the MCO). It also brings together maintenance leadership and management ensuring that maintenance support is planned, resourced, and executed when and where needed, with a unified focus, in support of a common mission and objective. Enablers (such as the FRS and emerging diagnostics and prognostics) will enhance the forward deployed CRTs' ability to execute this concept. The CRTs are tailored with the right people with the right tools and test equipment to provide automotive field maintenance forward on the battlefield and rapidly return combat systems to the fight. The FMC does not provide full manpower requirement code (MARC) support to the SBCT.

3-235. The MCS is the nerve center for maintenance operations within the SBCT. It operates the SAMS-1 and provides maintenance management and materiel readiness data to the commanders and materiel readiness managers. The section consists of the MCO, Maintenance Control Sergeant, and the Equipment Records/Parts Specialists. The Equipment Records/Parts Specialists have oversight responsibility for all TAMMS operations in the brigade and manage the DS shop stocks. CRTs are equipped with a remotely operated ULLS-G (legacy STAMIS) and a minimal number of operators. The remotely operated ULLS-G provides near real-time inoperative equipment data for reportable systems and subsystems. It also identifies repair parts requirements for inoperable equipment that the CRT was not able to repair on-site. When forward, CRTs may take STAMIS equipment with them and may use any available means (such as at the Battalion S4 or Battalion Aid Station) to establish connectivity to pass maintenance data back to the FMC. Using available systems, the CRTs perform as much of the repair operations as far forward as possible. The FMC will require augmentation in both garrison and deployed environments to perform all TAMMS management functions, dispatching operations, and coordination for all maintenance and recovery support to units within the brigade. While deployed, TAMMS management is extremely limited until additional maintenance management personnel arrive. This may be in the form of either civilian or military augmentation. The MCS also dispatches Contact Maintenance Teams and MSTs to provide forward support. MSTs, such as the Missile Repair Teams, are teams operating from the BSA that are designed to move forward to provide support. Contact Maintenance Teams are task organized as the situation warrants and are not formally organized.

3-236. CRTs are based at the BSA. They move forward to conduct maintenance operations and then return to the BSA for further tasking to support the next maneuver element requiring maintenance. CRTs may

take a remotely operated automated maintenance system (ULLS-G) forward with them and establish near real-time reporting connectivity via the Battalion S4 or Battalion Aid Station. If connectivity can be established, this should increase the speed of the Class IX requisition system and thereby reduce repair cycle time. However, the CRT's primary focus is combat replacement/repair. CRTs will often require daily Class IX resupply in order to maintain sufficient readiness levels. Supported by IETMs and the FRS, the teams perform the following:

- Identify faults.
- Monitor embedded prognostics.
- Advise Unit S4s regarding forward maintenance management.
- Conduct component and major assembly replacement for supported equipment.

3-237. The FMC retains maintenance capability in the BSA due to limited resources and mobility of certain pieces of test equipment. The Base Maintenance sections provide dedicated field maintenance on an area basis to brigade troops, as well as backup support to the CRTs and Maneuver Battalions. The MCS maintains automated maintenance systems (legacy STAMIS or when developed, GCSS-Army) to support the SBCT separate companies and the BSB. It also serves as the MCP for all maintenance records prior to being sent to the support operations staff. Base Repair sections can perform contact maintenance missions as required depending on the criticality of the NMC system and METT-TC. The MCS assesses all vehicles requiring evacuation to determine if they can be returned to a mission-capable status. Vehicles that cannot be returned to a mission-capable status in the AO are evacuated through the HDC to a sustainment maintenance facility as time permits. Maneuver units will employ like-vehicle recovery to the greatest extent possible. When this is not a reasonable alternative, the inoperable vehicle may be recovered to the CRT or evacuated to the BSA location either by the CRT or the FMC Recovery Section.

3-238. Class IX repair parts will be carried in many locations throughout the SBCT AO to perform field maintenance. The HDC will maintain the ASL of Class IX repair parts in its Supply Support Platoon. Requests for Class IX resupply will be near real-time and originate at a maintenance node (CRT or base shop) and travel through maintenance STAMIS' to the supporting Class IX activity. Requests may also be sent via the FBCB2 or voice communication as an alternative. This alternative requires additional time and effort to input the necessary fields in the system so that a part can be ordered. Objectively, mechanics will be connected via IETMs that have embedded prognostics and diagnostics. The mechanic will determine the fault and input it into the IETM that will then order the necessary part(s) through the STAMIS. Many Class IX LRUs normally repaired by FSBs and MSBs in the AOE CZ will not be repaired in the SBCT CZ due to the mobility and OPTEMPO demands noted above. Instead, they will be evacuated to a Sustainment Maintenance Center for return to the supply system. In these cases, an LRU is turned into the SSA and subsequently retrograded via normal resupply operations by EAB. Replacement LRUs, repaired at sustainment

maintenance facilities, will be returned via the same channels to the SBCT/BSB.

3-239. Maintenance management in the SBCT will require close coordination and collaboration between the Battalion/Brigade S4s, the support operations staff, CRTs, and the MCO. The SPO performs the following:

- Tracks maintenance/supply data and trends.
- Provides guidance to the MCO on priorities as they are passed down from the Brigade Commander.
- Develops current and future support plans.
- Acts as the central logistics integrator for the SBCT and BSB Commanders.

Contracted maintenance personnel may perform much of the maintenance management and TAMMS functions within the brigade to include ULLS-G and SAMS-1/2 (to be replaced by GCSS-Army modules) operations while in garrison.

3-240. As the OPTEMPO of the brigade intensifies or the duration of a deployment increases, the FMC will require additional capabilities. In both garrison and deployed environments, the SBCT will require external support to perform scheduled and unscheduled maintenance, as well as TAMMS functions to maintain readiness. When deployed, the SBCT may receive additional support by increasing the existing capabilities of the force with people and equipment (scaling) or adding capabilities that are presently non-existent in the deployed force (augmentation). One source of augmentation will be the CSSC.

3-241. The need to augment the BSB, in order to sustain the force after the initial stages of employment in extended operations, has been a key tenet of the concept of support. Even if a CSSC is available to support an SBCT in garrison, it does not have all the resources to maintain SBCT readiness on a sustained basis. The CSSC is an austere solution to fill only the most critical requirements of the SBCT that the BSB cannot provide. Even with a CSSC, the SBCT will require additional support in such areas as personnel transportation, servicing, and maintenance. The CSSC is intended to deploy after the initial stages of employment in order to sustain an SBCT in extended operations.

3-242. The CSSC provides the FMC with a Maintenance Platoon that increases the capabilities of each section in the FMC. Technical expertise, TAMMS functions, and increased repair capability are provided to the CRTs in terms of Warrant Officers, Equipment/Repair Part Specialists, and Mechanics. The CSSC Maintenance Platoon also provides increased repair capability to the base shops of the FMC. The addition of the CSSC Maintenance Platoon enables the FMC to move from remedial maintenance (move, shoot, and communicate repairs) towards 10/20 level maintenance. This scaling also decreases the FMC's heavy reliance on Class VII exchange. The FMC will still require further scaling beyond the CSSC to perform scheduled services on equipment. Figure 3-5, page 3-52, provides an overview of SBCT maintenance operations. Chapter 2 provides more information about SBCT maintenance organizations.

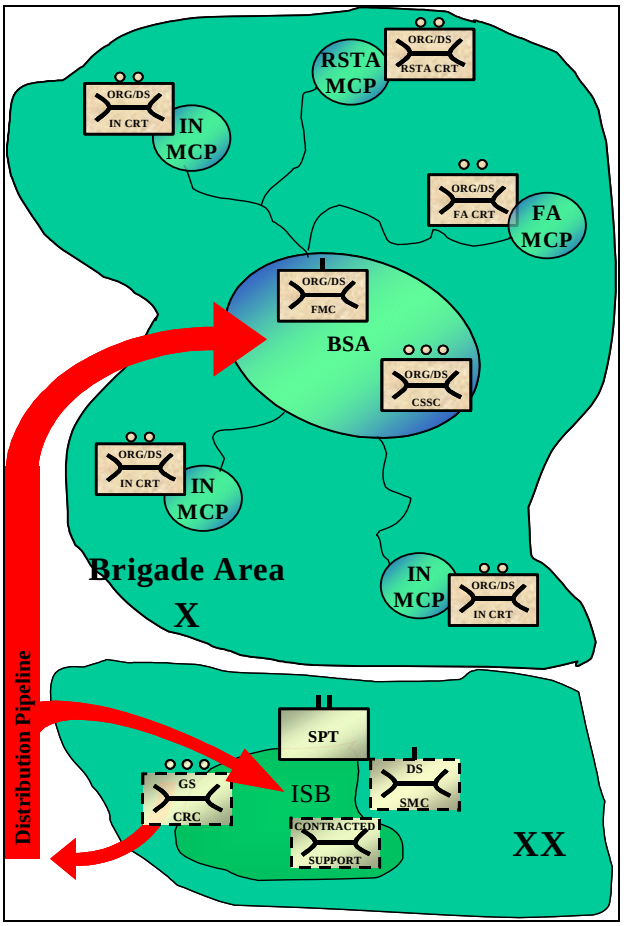

Figure 3-5. SBCT Maintenance Concept

ADVERSE ENVIRONMENTS

3-243. The first step in preparing for maintenance support operations is an analysis of the mission. Time, tools, skills, and repair parts (Class IX) are important to maintenance operations. A detailed analysis of the AO to identify LOCs will play a major part in determining how maintenance support operations will be conducted.

3-244. It is probable that LOCs will be limited in hostile environments. Airfields, good roads, and railroads will be the exception rather than the rule. Airdrop of supplies and equipment is an effective alternative to air landing. Airdrop is a rapid means of delivery that makes deliveries to isolated units possible without further transshipping. Armor-Infantry-Mechanized (AIM) Divisions have no organic airdrop support. They rely on corps units for airdrop support. Maintenance Unit Commanders must keep themselves informed at all times of user requirements and their own maintenance capabilities.

DESERT OPERATIONS

3-245. Maintenance support for desert operations requires an understanding of the environment. Temperatures vary according to latitude and season (from over 136^0 F to the bitter cold of winter). In some deserts, day to night temperature fluctuation can exceed 70^0 F. Some species of animal and plant life have adapted successfully to desert conditions where annual rainfall may vary from zero to ten inches. Desert terrain also varies from place to place; the common denominator is lack of water and little, if any, vegetation. This environment can profoundly affect military operations.

Location

3-246. Desert locations are seldom close to normal LOCs. The effects of the environment on equipment are severe, requiring increased levels of support to maintain a standard level of efficiency. Distances between units and LOCs are long. Due to their importance, maintenance units are primary targets.

Security

3-247. Enemy ambushes on MSRs are a threat in desert operations. Enemy patrols may lay nuisance mines on routes, especially at critical points. The following are some actions that can reduce the threat to supply routes:

- Patrol routes before immediate use and at irregular intervals when not in use. If the route is patrolled by surface vehicles, they must have maximum protection against mine blasts. MP patrols also provide a resource for continuous monitoring of supply routes.
- Locate observation posts so their surveillance equipment interlocks in poor visibility conditions. Observation posts can maintain a constant presence along the route but are relatively expensive in manpower.
- Schedule convoys at irregular intervals. Convoys may require armed escorts, as determined by the commander on the basis of the METT-TC.

Operations in a Nuclear, Biological, and Chemical Environment

3-248. NBC contamination of personnel and equipment make maintenance operations more difficult and time-intensive. Automatic chemical alarms on vehicles do not react fast enough to prevent passengers from receiving incapacitating doses of a chemical agent. Therefore, vehicle movement in a potential NBC environment normally occurs in full MOPP.

3-249. Although training extends a soldiers ability to operate effectively in MOPP, they eventually reach a physical and psychological limit. Since continuous wearing of full MOPP may hinder the recovery mission, a uniform modification may become necessary. Commanders make decisions based on the following variables:

- Chemical threat to the unit's mission.
- Unit vulnerability to future chemical attacks.
- Reaction time of unit personnel.
- Time required donning protective clothing.
- Types of potential threat agents.
- Weather conditions.
- Work rate.

3-250. Water, solvents, and petroleum products degrade the protective quality of MOPP garments. When the mission permits, individuals should replace protective clothing. Units operating in an uncontaminated area must establish NBC inspection points to monitor recovered equipment entering the area. Process contaminated vehicles through a decontamination station or leave them downwind in a holding area away from the unit for weathering and decontamination. Label all chemically contaminated equipment and repair parts.

3-251. **Contaminated Equipment.** If practical, decontaminate and recover equipment previously contaminated by NBC agents. Both using units and supporting maintenance units have chemical agent detection kits and radiometers to detect chemical and nuclear contamination. If the item cannot be decontaminated and the contamination is severe enough to prevent recovery and evacuation, carefully note the location of the item. Coordinate through the Battalion HQ for decontamination or disposal instructions. Ensure maintenance unit SOPs include instructions on recovering and evacuating contaminated materiel.

3-252. **Hazards.** There are certain actions and precautions to take for hazard recovery. Table 3-5 lists these recovery hazards.

Class IX Supply Support

3-253. Demand for Class IX supplies will increase due to environmental effects on equipment and the extra maintenance effort required. Small items with high-usage rates should be held as far forward as practical. Typical high-consumption items include:

- Filter elements.
- Tires.
- Water pumps, gaskets, fan belts, water hoses, and clamps.
- All parts for ignition systems.
- Wheel and sprocket nuts and wedge bolts.
- Spare caps for all liquid containers.
- Speedometers and cables (due to dead reckoning navigation, these are critical).
- Cleaning fluids for electronic equipment and windshields.

3-254. A unit's PLL depends on its equipment, but parts should be limited to only those items preventing equipment from performing if the items failed. Larger, heavier items are carried by MSTs from the DS Maintenance Company. As demand varies from day to day, arrangements must be made for unexpected requirements to be moved to repair sites.

Table 3-5. Recovery Hazards

Hazard	Action
Wire Rope and Cables	Personnel handling wire rope and cables must exercise caution. Frayed cable can cause serious injury, whether static or moving. Wear heavy leather-palmed gloves and handle cables carefully.
Rigging	Inspect equipment before the recovery operation begins. Shut off engines and apply brakes to prevent movement. Ensure rigging lines do not cross or rub against each other. Cross cables only when towing a disabled vehicle.
Disabled Vehicles	Before hooking up or unhooking a tow bar, or disconnecting any drive parts, chock the disabled vehicle with blocks so that it cannot move during the hooking and unhooking procedure. Failure to block disabled vehicles can result in serious damage or injuries. See FM 9-43-2 for proper procedures.
Backlash	During winching operations all personnel must stand clear of the wire rope a distance of the cable length plus two feet. Snapped wire cables can cause serious injury. Operators and other personnel assisting in the recovery effort should keep their hatches closed and use periscopes to view hand signals directed to them by ground guides. To eliminate confusion, use only one ground guide.
Gun Tubes	Position the main gun tube in a manner that avoids damage to personnel and equipment. If the gun tube of a disabled tank collides with the recovery vehicle, have it examined by DS-level maintenance personnel before firing.
Armed Weapon Systems	Recovery crews should know how to make Weapon systems safe in an emergency. Get immediate help from the supporting EOD unit.

Effects of Desert Environment on Equipment

3-255. **Terrain.** Terrain varies from nearly flat with high traffic areas to lava beds and salt marshes with little or no traffic areas. Drivers must be trained to judge terrain in order to select the best method for conditions. Tracked vehicles are best suited for desert operations. Wheeled vehicles will go many places that tracked vehicles can go. However, their lower average speed on poor terrain may be unacceptable during certain operations.

3-256. Vehicles should be equipped with the following:

- Spare fan belts.
- Tires.
- Tow cables or chains (if not equipped with a winch).
- Extra water cans.
- Fuel cans.
- MREs.
- Desert camouflage nets.
- Other items likely to malfunction.

Air recognition panels, signal mirrors, and a tarpaulin (to provide shade for the crew) are also very useful to have on hand. Wheeled vehicles should also carry spurs, mats, or channels as appropriate to aid mobility.

3-257. The harsh environment requires a high standard of maintenance. This maintenance may have to be performed well away from specialized support personnel. Operators must be fully trained to operate and maintain their equipment. Some types of terrain can have a severe effect on suspension and transmission systems, especially those of wheeled vehicles. Items affected by mileage (such as wheels, steering assemblies, track wedge bolts and sprocket nuts, and transmission shafts) must be checked for undue wear when completing before-, during-, and after-operation maintenance checks.

3-258. **Heat.** Vehicle cooling and lubrication systems are interdependent. A malfunction by one rapidly places the other under severe strain. All types of engines may overheat to some degree, leading to excessive wear and, ultimately, to leaking oil seals in the power packs.

3-259. Commanders should be aware of which vehicle types are prone to overheating and ensure extra maintenance is given to them. Check oil levels frequently (a too high level may be as bad as a too low level) and check seals for leaking**.** Keep radiators and airflow areas around engines clean and free of debris and other obstructions. Water-cooled engines should be fitted with condensers to avoid waste of steam through the overflow pipe. Cooling hoses must be kept tight (one drip per second amounts to seven gallons in 24 hours). Operators should not remove hood side panels from engine compartments while the engine is running. This causes turbulence, leading to ineffective cooling.

3-260. Batteries do not hold their charge efficiently in intense heat. Battery-specific gravity must be changed to adjust to this environment. The unit can either adjust the electrolyte to 1.200 or 1.225 specific gravity or obtain sulfuric acid with a specific gravity of 1.2085 to 1.2185. Air vents must be kept clean or vapors may build up pressure and cause the battery to explode. Voltage regulators should be set as low as practical. Stocks of dry batteries must be increased to offset the high attrition rates caused by heat exposure.

3-261. Severe heat increases pressure in closed, pressurized systems and increases the volume of liquids. Care must be exercised to ensure working pressure of all equipment is within safety limits. Caution must be exercised when removing items such as filler caps. Some items of equipment are fitted with thermal cutouts that open circuit breakers when equipment begins to overheat. Overheating can be partly avoided by keeping the item in the shade and wrapping it in a wet cloth to maintain a lower temperature by evaporation. Wood shrinks in a high-temperature, low-humidity environment. Equipment, such as axes carried on tracked vehicles, can become safety hazards as heads are likely to fly off as handles shrink.

3-262. Keep ammunition away from direct heat and sunlight. If it can be held by bare hands, it is safe to fire. White phosphorous ammunition filler tends to liquefy at temperatures over 111^0 F, which will cause unstable flight unless projectiles are stored in an upright position.

3-263. **Radiant Light.** Radiant light or its heat effect may be detrimental to plastics, lubricants, pressurized gases, some chemicals, and Infrared Tracking and Guidance systems. Items like CO^2 fire extinguishers, M13 decontamination and reimpregnating kits, and Stinger missiles must be kept out of constant direct sunlight. Since optics may discolor in direct sunlight, limit their exposure to the sun's rays.

3-264. **Dust and Sand.** Dust and sand are probably the greatest dangers to efficient functioning of equipment in the desert. Lubrication must be the correct viscosity for the temperature. The temperature must be kept to the absolute minimum in the case of exposed or semiexposed moving parts. Sand mixed with oil forms an abrasive paste. Lube fittings, which are critical items, should be checked frequently. Teflon bearings require constant inspection to ensure that the coating is not being removed. Engine maintenance is critical due to the strong possibility of sand or dust entering cylinders or moving parts when the equipment is stripped. Screens against flying sand are essential. They also provide shade for mechanics.

3-265. Examine and clean air cleaners on all equipment at frequent intervals. The exact interval depends on operating conditions but should be at least daily. Use filters when refueling all vehicles. Keep the gap between the nozzle and the fuel tank filler covered. Fuel filters require frequent cleaning and oil filters require replacement more often. Engine oils require changing more often than in temperate climates. Over time, windblown sand and grit will damage electrical wire insulation. All cables likely to be damaged should be protected with tape before insulation becomes worn.

3-266. Sand will also find its way into parts of items like spaghetti cord plugs. This can prevent electrical contact or make it impossible to join the plugs together. A brush (for example, an old toothbrush) should be carried and used to brush out such items before they are joined.

3-267. Dust affects communication equipment such as amplitude-modulated (AM) radio frequency (RF) amplifiers and radio-teletypewriter sets. The latter is especially prone to damage due to their oil lubrication, so use dust whenever possible. Some receiver-transmitters have ventilating parts and channels that can get clogged with dust. Check them regularly and keep them clean to prevent overheating.

3-268. Weapons may become clogged or missiles jammed on launching rails due to sand and dust accumulation. Sand- or dust-clogged barrels can lead to in-bore detonation. Keep muzzles covered by a thin cover so an explosive projectile can be fired through the cover without risk of explosion.

3-269. Missiles on launchers must also be covered until used. Working parts of weapons must have minimum lubrication. It may even be preferable for them to be totally dry, as any damage caused during firing will be less than that produced by the sand-oil abrasive paste.

3-270. All optics are affected by blowing sand. Their performance gradually degrades due to small pitting and scratches. It is necessary to guard against buildup of dust on optics that may not be apparent until low-light optical performance has severely deteriorated. It may be advisable to keep optics covered with some form of cling film until operations begin, especially if the unit is near a sandstorm. Store optics in a dehydrated condition using hydroscopic material. Those in use should be kept where free air can circulate around them and they should be purged in frequent intervals.

3-271. Sand and dirt can accumulate in hull bottoms of armored vehicles and, when combined with condensation or oil, can cause jamming of control linkages. Sand accumulation in the air bleeder valve can inhibit heat from escaping the transmission and result in damage.

3-272. **Temperature Variations.** In deserts with relatively high dew levels and high humidity, overnight condensation can occur wherever surfaces are cooler than the air temperature (such as metal exposed to air). This condensation can affect optics, fuel lines, and air tanks. Fuel lines should be drained at night and in the morning. Optics must also be cleaned frequently. Weapons, even if not lubricated, will accumulate sand and dirt due to condensation; another reason for daily cleaning.

3-273. Air and fluids expand and contract according to temperature. Tires inflated to the correct pressure during the night may burst during the day. Fuel tanks filled to the brim at night will overflow as temperatures rise. Check the air pressure when equipment is operating at an efficient working temperature and fill fuel tanks to their correct capacity as defined in the appropriate TM.

3-274. **Static Electricity.** Static electricity is common in the desert, caused by atmospheric conditions coupled with an inability to ground out due to dry terrain. It is particularly likely with aircraft or vehicles having no conductor contact with the soil. The difference in electrical potential

between separate materials may cause a spark on contact. If present, flammable gases may explode or cause a fire. A grounding circuit must be established between fuel tankers and vehicles being refueled. It must be maintained before and during refueling and both tankers and vehicles must be grounded.

3-275. **Winds.** The velocity of desert winds can be destructive to large, relatively light material (such as aircraft, tentage, and antenna systems). To reduce wind damage, materiel should be given terrain protection and firmly picketed to the ground.

Maintenance Support

3-276. The following are general guidelines for desert repair of equipment:

- Repair only what is necessary to make the equipment combat-ready.
- Recover the equipment to the nearest reasonably secure site, followed by on-site repair.

Establish a recovery and maintenance SOP before or immediately after arrival in-theater. The SOP should include the following:

- Crew-level recovery and expedient repair.
- Unit-level maintenance recovery.
- DS-level maintenance recovery.
- Recovery priorities by vehicle types.
- Limitations of field expedient recovery techniques (for example, the distance/time that one tank is allowed to tow another considering the heat buildup in transmissions in this environment).
- Security and guides for Recovery Teams.

3-277. The Recovery Plan should include locations of maintenance collection points for equipment that cannot be repaired forward. These points must be located where they can be reached by heavy equipment transporters (HETs), which may require the recovery vehicle to perform a longer than normal tow.

3-278. The MCP should cover a large area to allow for dispersion of the supporting unit's equipment and inoperable weapon systems. An MST from the forward maintenance unit will normally be located at the MCP to determine the disposition of inoperable equipment. Equipment authorized for disposal may be used for controlled exchange to support the repair of like vehicles. When considering recovery in the desert, pay special attention to ground-anchoring equipment since natural anchoring material is scarce.

COLD WEATHER OPERATIONS

3-279. One of the major problems for units operating in cold weather conditions is the lack of personnel with adequate training in cold weather operations and maintenance support. If troops stationed in warm climates must move to cold climates to perform their mission, cold weather training is of utmost importance. Much time and energy in cold

weather areas are expended in self-preservation. This reduces personnel efficiency in operating and maintaining materiel. Maintenance personnel must learn how to live and work in cold regions.

Locations

3-280. Operation of materiel in temperatures down to -10^0 F present a few problems. Conditions are similar to those in the northern portions of the CONUS during the winter. From -10^0 F to -40^0 F, operations become difficult.

3-281. Proper training will prevent failures of materiel and injuries to operating personnel. When the temperature is below -40^0 F, operations become increasingly difficult. At temperatures near -65^0 F, the maximum efforts of well-trained personnel are required to perform even a simple task with completely winterized materiel. Figure 3-6 displays the levels of increasing difficulty as temperatures drop.

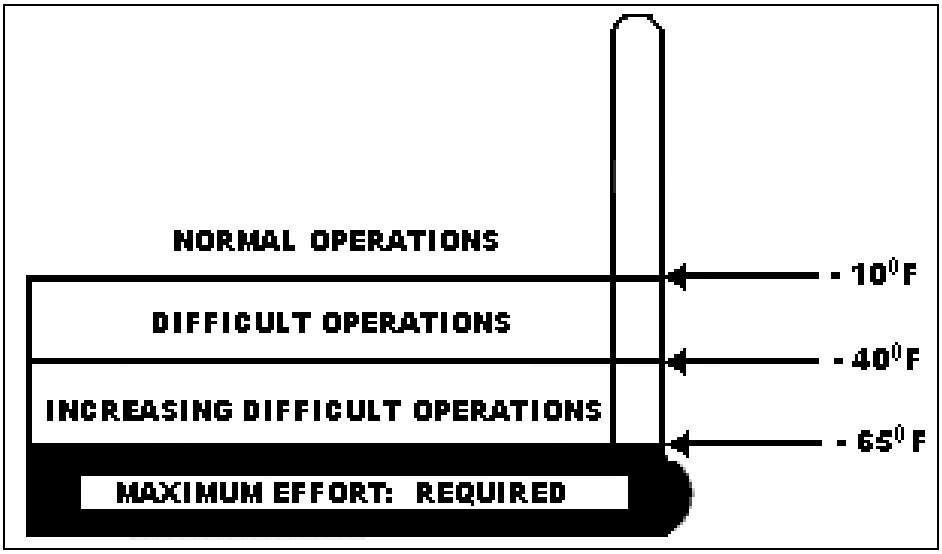

Figure 3-6. Cold Weather Operations – Levels of Difficulty

Security

3-282. Enemy ambushes are always a threat in snow-covered terrain. Since units must furnish their own security, reconnaissance, and surveillance, camouflage is a basic tool used to defeat detection by the enemy. In the absence of issued camouflage uniforms, soldiers can improvise camouflage suits, adapting color and pattern to the terrain background.

3-283. A white garment designed to blend with a white or mottled white and black background is used in snow-covered terrain. This snowsuit does not conceal small patches of shadow that surround a human figure, but this is not necessary since snow country usually contains many dark spots and shadows. If certain snow areas are all white with absolutely no shadows, make use of defiles and natural folds in the ground.

Class IX Supply Support

3-284. The effect of cold weather on Class IX supply support makes handling and storage of materials of prime importance. Supplies are delivered as far forward as weather, terrain, and the tactical situation permit. However, the following supply handling requirements will vary significantly from those encountered in temperate climates:

- Metals become brittle at extremely low temperatures. Parts cannot withstand the shock loads that they sustain at higher temperatures.
- Extreme care is required when handling rubber-covered cables at low temperatures. If rubber jackets become hard, cables must be protected from shock loads and bending to prevent short circuits caused by breaks in the covering. Neoprene jackets on cables become very brittle and break readily at low temperatures.
- Tires become rigid when cold, causing flat spots on portions that come into contact with the ground during shutdown periods. At extreme low temperatures, sidewalls become brittle and crack.
- Plastics expand and contract much more than metal or glass. Any parts or materials made of plastic must be handled carefully.
- Glass, porcelain, and other ceramics should perform normally at low temperatures if handled carefully. Cracking may result if heat is applied directly to cold windshields or vehicle glass.
- Fabrics retain their flexibility even at extremely low temperatures provided they are kept dry.

Maintenance

3-285. Personnel must be aware of the importance of maintenance, especially PMCS. Maintenance of mechanical equipment is exceptionally difficult during cold weather. Automotive and other mechanical maintenance cannot be completed with normal speed because equipment must be allowed to warm up before maintenance personnel can make repairs. Routine tasks require additional time. The time lag, which cannot be overemphasized, must be included in all planning. Personnel efficiency is reduced by bulky clothing, which must be worn at all times.

3-286. The resulting loss of the sense of touch further reduces efficiency. Even the most routine operations, such as handling latches or opening engine enclosures, become frustrating and time-consuming with gloves. At temperatures below -20^0 F, maintenance requires up to five times the normal time. Complete winterization, diligent maintenance, and well-trained crews are the keys to efficient cold weather operations.

3-287. The following requirements, affecting maintenance planning and preparation, should be complied with before beginning a cold weather operation:

- Shelter for materiel requiring maintenance.
- Proper clothing and tools for maintenance personnel.
- Ground cover (plywood or canvas) for personnel to lie on under vehicles.
- Adequate portable heaters.
- Suitable methods to store and issue antifreeze materials, fuels, hydraulic fluids, and lubricants.
- Sufficient lighting equipment.
- Supply of repair parts for equipment.
- Sufficient equipment for removal of snow and ice.

Building And Shelters

3-288. Heated buildings or shelters are needed for cold weather maintenance operations. Maintenance of many components requires careful, precise servicing. Without heaters, the increase in maintenance manhours will be from 25 to 500 percent above normal requirements. When buildings are not available, maintenance tents are used as a temporary expedient. When possible, wooden flooring should be laid inside all tents. Heat tents by portable duct heaters or tent stoves.

3-289. In the absence of buildings or maintenance tents, tarpaulins may be used as a field expedient to create overhead shelter and wind breaks. The tarpaulin can be supported on a framework of poles erected around the vehicle. Parachutes can also serve as temporary shelters. The parachute should be deployed over the vehicle, securely staked down at the bottom, and then inflated with air from a portable duct heater. If parachute shelters are used, extreme care should be taken to avoid carbon monoxide poisoning.

WARNING

Provide proper ventilation to avoid the danger of carbon monoxide poisoning caused by operation of engines or from contaminated hot air from defective heaters.

Do not use heaters that produce contaminated hot air in buildings or maintenance tents where personnel are present.

Fill fuel tanks/containers of vehicles, generators, and POL containers brought into warm storage from the cold no more than three-quarters full. Failure to follow this procedure results in expansion of the cold POL products in the fuel containers, which could cause spillage and a serious fire hazard.

Be constantly on the alert to detect vehicle deficiencies that expose personnel to carbon monoxide poisoning. Inspect and test passenger and crew compartments of wheeled and tracked carriers at regular intervals to detect any signs of air contamination from exhaust gases due to leaking gaskets, improper exhaust installation, cracked exhaust pipes, defective personnel heaters, or auxiliary generators.

Lighting Equipment

3-290. Sufficient equipment must be available to furnish lights during maintenance operations. Lights with ample cable extensions, attachment plugs, connectors, and spare bulbs are essential.

Maintenance Personnel, Tools, and Equipment

3-291. An increase in the number of mechanics will be required to maintain equipment in cold weather operations. As a minimum, a highly organized, more intensive effort is required of personnel on-hand. Remember that the amount of work performed under cold conditions is considerably less than work accomplished in moderate temperatures.

3-292. An additional supply of battery chargers must be available to meet the heavy requirements for battery maintenance in subzero temperatures. Hydrometers and testers must be on-hand to check the state of charge of batteries. Tools provided in the various tool kits are adequate for maintenance at subzero temperatures.

3-293. Gloves worn while performing maintenance on fuel systems and lubrication of cooling systems may become saturated with fluids. This reduces the insulating value of the gloves and may result in cold injury to personnel. Maintenance personnel should carry extra gloves.

3-294. Personnel should avoid leaning on cold, soaked equipment or kneeling or lying on the ground. Rapid body cooling caused by heat transfer to the equipment or ground may result in cold injury. Some sort of insulation (such as fiber packing material, corrugated cardboard, rags, or tarpaulins) should be placed between the mechanic/repairer and the equipment.

3-295. When performing maintenance under arctic winter conditions, a box or a pan should be used to hold small parts. A tarpaulin should be placed under the vehicle to catch parts that may be dropped to prevent them from being lost in the snow. See FM 9-207 for more information.

JUNGLE OPERATIONS

3-296. Maintenance units in a jungle environment retain the same basic mission and capabilities as in other environments. However, they must make adjustments due to terrain, weather, and vegetation.

Location

3-297. Jungle operations subject personnel and equipment to effects not found in other environments. Traffic areas and security problems often affect maintenance units as much as maneuver forces. The lack of an extensive all-weather transportation network in many jungle areas makes the mission of support units more difficult. Transportation difficulties may dictate that maneuver units be resupplied by air, pack animals, or human portage.

Security

3-298. Ambushes and infiltration characterize jungle combat operations. The security threat caused by infiltrators requires that LOCs be patrolled frequently and that convoys be escorted. Therefore, maintenance support must be performed as far forward as the tactical situation permits. This

improves response time, reduces road movement, and allows maintenance units to take advantage of the security offered by combat units.

Class IX Supply Support

3-299. Repair parts that deteriorate or wear out faster in the jungle environment must be identified. The PLL must reflect the increased turnover of these parts.

Maintenance

3-300. Maintenance units in the jungle function essentially the same as in other operations. High humidity and temperatures in jungle areas increase maintenance requirements. PMCS on any items affected by moisture and heat is extremely important. Emphasis must be directed toward on-site maintenance and the use of aircraft to transport MSTs and repair parts to the supported unit. The need for responsive maintenance support means the number of repair parts for immediate use must be increased.

Transportation

3-301. Maintenance units should consider the employment of all types of transportation. Surface transportation facilities are poor in most jungle areas. They especially cannot handle heavy military traffic without extensive improvements. An ALOC can eliminate many of the problems associated with surface movement. Human portage is a basic means of moving supplies and equipment in jungle operations. However, this method, at best; is slow, laborious, and inefficient.

3-302. Wheeled vehicles are normally restricted to roads and wider trails. However, sometimes even these may prove impassable during heavy rains. Sometimes repair parts must be transported by transloading from wheeled to tracked vehicles. For example, large wheeled vehicles move supplies as far forward as possible, where they are transloaded to tracked vehicles. The tracked vehicles move the supplies cross-country. In rugged terrain, supplies may require further transloading to pack animals or native supply bearers.

3-303. Fixed-wing transport aircraft can usually operate at greater distances without refueling than cargo helicopters. However, use of fixed-wing aircraft to land supplies requires more landing strips than may be available. Construction and maintenance of airfields in jungles are difficult engineering tasks, but a savanna may be large and firm enough to use as an airstrip.

3-304. Airdrop of supplies is an alternative to air landing. Airdrop makes deliveries to isolated units possible without further transloading. Disadvantages include the dispersion of supplies and the possibility of lost cargo under the jungle canopy, vulnerability to local enemy air defense, and requirements for, at least, local friendly air superiority.

MOUNTAIN OPERATIONS

3-305. Historically, the focal point of mountain operations has been the battle to control the heights. Changes in weaponry and equipment have not altered this fact. In all but the most extreme terrain and weather, infantry, with its light equipment and mobility, remains the basic

maneuver force in the mountains. With proper equipment and training, the infantry is ideally suited for fighting the close-in battle commonly associated with mountain warfare. Mechanized infantry can also enter the mountain battle, but it must be prepared to dismount and conduct operations on foot. Because of the severity of the environment, maintenance support in mountainous areas can be somewhat difficult.

Location

3-306. Due to terrain constraints, it may be necessary to disperse support units over a wide area. Dispersion reduces the vulnerability of maintenance units. However, it may cause problems with command, control, and local security. Since maintenance units will be high-priority targets, they must have adequate protection against ground and air attack to ensure continuous operations. In all cases, maintenance units must locate as far forward as possible.

Security

3-307. Mountains provide excellent opportunities for ambush and attacks on vehicle traffic on MSRs. Enemy units can be airdropped or air landed on key terrain that dominates supply routes. Maintenance units must be alert for enemy infiltration detachments that may seize important road junctions to isolate combat units from maintenance support. Route patrols and observation posts are required to secure MSRs.

Class IX Supply Support

3-308. In mountain operations, rugged terrain and climatic extremes cause repair parts consumption to increase. Movement of repair parts should be expedited into and within the combat area. Parts with high usage rates should be stocked on the ASL at both the MSB and FSB. Typical high-consumption repair parts include the following:

- Tires.
- Tie rods.
- Transmissions.
- Brake shoes.
- Tracks and pads.
- Final drives.
- Winch parts.

Isolated operations require an increased repair parts stockage in each category. However, ASLs should contain only those repair parts that are combat-essential and demand-supported for a particular piece of equipment.

Maintenance

3-309. Fixing equipment as far forward as possible is extremely important in mountain operations. Vehicle crews and maintenance personnel must be trained to accurately evaluate damage to their equipment. Maintenance Teams from the organizational maintenance element of the supported unit or by MSTs from the DS Maintenance Company should make the repairs. Recovery of equipment will be very

difficult. When recovery is required, equipment should be moved only as far rearward as the point where repairs can be made, frequently the combat trains area.

Transportation

3-310. Although vehicles are used to move a large share of repair parts forward, they are not always able to reach deployed units. Locally obtained animals or individual soldiers must often move repair parts from roads to unit positions. Whenever possible, use vehicles to move heavy, bulky items or repair parts.

3-311. When weather permits, use helicopters to move repair parts from the SSA directly to forward units. Helicopters speed resupply operations and reduce multiple handling. Helicopters are good for emergency resupply and movement of high-priority supplies. Use helicopters whenever possible. Resupply by U.S. Air Force aircraft is another option.

URBAN TERRAIN

3-312. The urban battlefield does not cause significant changes in maintenance doctrine or organizations. However, it does impact how maintenance is provided. Urban regions normally contain a well-developed distribution system, major portions of which are highways, rail lines, airfields, manufacturing plants, and storage areas.

3-313. Built-up areas frequently provide suitable locations for deployment of maintenance units. Such areas offer excellent cover and concealment. They may also contain easily adaptable maintenance and storage facilities. At the same time, rubble or damaged built-up areas may present obstacles along LOCs, which are vital to the effective functioning of maintenance units.

Location

3-314. Because of the tactical situation, maintenance units may support from a built-up area. When using built-up areas, protection and physical security become important considerations. Supplies and equipment must be protected from both enemy attack and theft. Refugees may seriously impede or block movement over routes required by MSTs or movement of equipment to MCPs. Maintenance units may take advantage of hard stands, overhead lift, installed communication systems, and maintenance facilities existing in their areas of responsibility.

Security

3-315. Buildings provide excellent locations for snipers and thieves to use to attack maintenance units. Maintenance units must be alert for enemy infiltration detachments that may move among the civilian population. Maintenance shop areas should be blocked off, as required to secure the area, with patrols and observation posts.

Class IX Supply Support

3-316. In urban terrain operations, the use of vehicle repair parts may decrease as units dismount. Consumption of repair parts for small arms and engineer equipment may subsequently rise. Concentrated operations allow centralized control of repair parts in urban operations. MSTs may operate on-site with the supported unit or from the base company location.

Maintenance

3-317. Fixing equipment on-site is extremely important in urban operations. Organizational maintenance personnel must be trained to evaluate damage to their equipment accurately. Recovery of equipment will prove very difficult. When recovery is required, equipment should be moved only as far rearward as the point where repairs can be made. Consider the following when selecting the maintenance site:

- Security.
- A sufficient area around equipment for lift or recovery vehicles to operate in.
- Use of a nearby maintenance facility or garage.

Transportation

3-318. Although wheeled vehicles are used to move many repair parts forward, they are not always able to reach the unserviceable equipment due to rubble and blocked roads. Tracked vehicles can often move repair parts forward over the obstruction. Individuals and soldiers must often move repair parts from clear areas to equipment locations.