

Chapter 1

Maintenance Fundamentals

Global interdependence, reduced time, and fast-changing technology affects every aspect of how the Ordnance Corps must do business today and into the 21st century. In a Force Projection (FP) Army, maintenance elements are increasingly required to anticipate, analyze, and tailor available resources for effective and timely support of complex weapon systems. Today's focus on adaptive planning, to provide increased options for decision makers, is prompting maintenance managers to embrace change, innovation, and flexibility at all levels. Success will continue to be based on the bottom-line measurement of the following:

- How well our customer's equipment remains operational (availability).
- How quickly it can be returned to service when it becomes inoperable (maintainability).
- How long the user can anticipate failure-free performance (reliability).

Sustaining decisive land force dominance through synchronized maintenance operations will challenge commanders at all levels. They must understand customer requirements, the overall support concept, and the Army Maintenance System to have the right capabilities in the right place at the right time.

MAINTENANCE SYSTEM OVERVIEW

1-1. Maintenance is one of the 11 CSS functions that supports 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.

1-2. Maintenance levels form the baseline for determining which specific maintenance tasks are assigned to each level. They are a means to select the scope of maintenance and the skill levels necessary for units and activities at various command levels.

1-3. Maintenance tasks include any action that retains or restores materiel to a fully mission-capable condition. Tasks range from simple preventive maintenance checks and services (PMCS) of equipment to complex depot operations performed in fixed shop facilities. The Maintenance Allocation Chart (MAC) remains the primary tool for assigning tasks.

1-4. Distribution Management. Improvements under the distribution management umbrella must allow the soldier to receive their parts faster, better, and cheaper than the current methods of doing business. A

useful way to improve the logistics processes that affect repair cycle is to apply the distribution management methodology. Distribution management is a management program aimed at improving the Army's Logistics processes. Distribution management is the methodology the Army uses to analyze and improve its logistics performance to improve readiness and reduce cost. This methodology is applicable in garrison and while deployed. The aim of distribution management is to get support to the soldiers as quickly and efficiently as possible without interruption in the logistics cycle. Distribution management seeks to improve the processes within the entire supply chain. The supply chain consists of the following:

- Order and ship time (OST).
- Transportation.
- Inventory planning and warehouse management (also referred to as stock determination (SD)).
- Maintenance (also referred to as repair cycle), to include deployed operations.

It does this by reducing non-value added steps in the Army's logistics processes and thereby reducing unnecessary expenditures of resources (such as manpower and dollars).

1-5. Customer Wait Time (CWT). CWT is an "end to end" metric that measures the actual performance of the Army supply chain. It therefore provides a holistic view of the entire Army supply chain process. CWT shows the performance of the sources of supply, including supply support activities (SSAs), maintenance units, direct vendor delivery, referrals, redistribution, distribution centers and depots. Improvements in the order fulfillment process and in the inventory management process both help to improve the repair process. A major source of delay in repairs is waiting for needed parts to arrive. As more orders are filled from local supply points, and as orders filled at the Wholesale Supply System arrive more quickly, the CWT and time mechanics have to wait for parts delivery decreases. Repair cycle times are reduced and weapons systems are returned more quickly to operational readiness.

1-6. The Single Stock Fund (SSF) is a Headquarters, Department of the Army (HQDA) business process reengineering initiative to improve the logistics and financial process in the Army Working Capital Fund (AWCF), Supply Management Army business area. The national maintenance point (NMP) also requires below-depot sources of repair. The overall quality program consists of compliance with International Organization for Standardization (ISO) 9002 and national stock number (NSN) by NSN technical certification for each item awarded for repair under NMP procedures.

1-7. The SSF is merging wholesale and retail elements of the Army Working Capital Fund-Supply Management Army (AWCF-SMA) below department level into a single, nationally-managed fund. This will streamline current operations that has caused many inefficiencies. These include multiple points of sale and credit, multiple ledgers/billing accounts, and duplicative automated systems managing the same inventory. The SSF is also changing how the Army budgets for base operations, real property management, Army, and other accounts.

1-8. A centrally coordinated and controlled, repair-based logistics system is emerging from changes caused by the Revolution in Military Logistics (RML). This was the direct result of the combination of national efforts to improve equipment readiness support to the Army in the field. Although not the result of new equipment fielding, the requirements for general education and skill training are just as significant.

1-9. Anticipatory Maintenance. An Army approach to an optimized condition-based maintenance (CBM) strategy is a key function supporting anticipatory logistics. Anticipatory maintenance on the battlefield begins with the information obtained from the embedded diagnostic sensors located on the weapon system. The sensor will feed the maintenance and supply data to the on-board computer. This will be communicated to appropriate supporting activities so the requisite maintenance support will be available when and where required. When the Combat Repair Team (CRT) arrives at the repair site, they will use interactive electronic technical manual (IETM) compact disks, and test, measurement, and diagnostic equipment (TMDE) to confirm the sensor information and ensure there are no additional failures. If the item can be repaired (without the need for evacuation), information from the IETM will be used to request the part(s). The CRT transfers the IETM requisitioning information to the appropriate Standard Army Management Information System (STAMIS) and forwards the supply request via the tactical internet to the servicing supply company SSA for action. Figure 1-1, page 1-4, provides a visual detail of anticipatory maintenance.

1-10. Effective management of the Army Maintenance System depends on a smoothly functioning organization from the national to the unit level. The depot level performs highly complex maintenance operations while units perform simple PMCS operations.

MAINTENANCE LEVELS

1-11. The Army Maintenance System, less aircraft, consists of a flexible, four-level system (see Table 1-1, page 1-5). Each unique level makes a different contribution to the overall system (see Table 1-2, pages 1-5 and 1-6).

LEVELS OF WAR

NOTE: While these are distinct levels, there is flexibility built into the system due to overlapping capabilities. Maintainers do not lock themselves into rigid levels of maintenance. When mission, enemy, troops and support available, terrain and weather, time available, and civil considerations (METT-TC) permit, maintainers at the various levels may also repair selected components to eliminate higher echelon backlogs and maintain technical skills.

1-12. Coordination of maintenance operations occurs at all levels of war. Table 1-3, pages 1-7 through 1-10, describes how the four levels of maintenance overlay the levels of war. The three levels of war are described as follows:

- **Strategic.** Maintenance operations are largely the purview of the depot maintenance level in concert with the continental United States (CONUS)-based industrial and civilian sectors. Maintenance management primarily links the nation's economic base (people, resources, and industry) to its military operations in theaters.
- **Operational.** Maintenance operations link strategic capabilities to tactical requirements. Managers coordinate DS and GS maintenance, specialized/forward repair activities (FRAs), and base logistics operations. At this level, the maintenance system both drives and supports the supply system. DS maintenance works to meet tactical requirements, while GS maintenance provides commodity-oriented repair of components and end items to support the Theater Supply System. The primary focus is to maximize the number of operational combat systems available to support the tactical battle.
- **Tactical.** Maintenance operations consist of activities required to keep weapon systems operational during battle, thereby supporting the tactical commander's scheme of operation. Managers oversee the operator/crew, unit, and DS maintenance operations. The primary focus is on equipment repair or replacement, and return to the user.

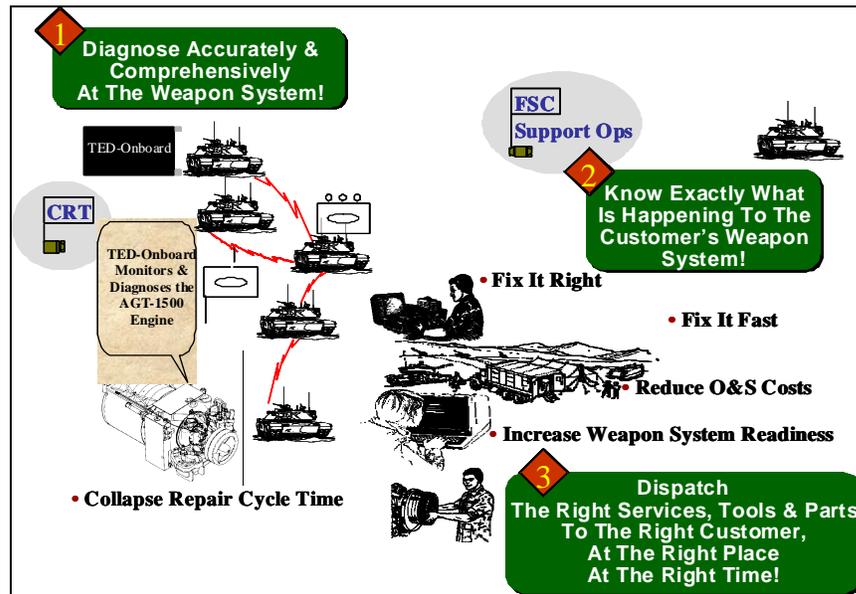


Figure 1-1. Anticipatory Maintenance

Table 1-1. Four Levels of Maintenance

MAINTENANCE LEVEL	CATEGORY
Unit	Operator/Crew Operator/Maintainer Organizational
Direct Support (DS)	Direct Support
General Support (GS)	General Support
Depot	Depot

Table 1-2. Maintenance Level Descriptions

LEVEL OF MAINTENANCE	DESCRIPTION
Unit	<p>Foundation of the maintenance system. Requires continuous emphasis by the commanders.</p> <p>Repairs are made by the operator/crew, as well as the mechanics assigned to the organization.</p> <p>The operator/crew is the cornerstone. They perform PMCS in accordance with the applicable Operator's series (-10 level) technical manual (TM).</p> <p>TM 20-series PMCS tables are used to perform scheduled PMCS services to sustain and extend the combat-capable life of the equipment.</p> <p>Repairs on certain equipment are completed by the operator/maintainer. The operator performs checks, services, and maintenance prescribed in both -10 and -20 level TMs.</p>
DS	<p>Repair and return to user.</p> <p>One-stop service to supported customers.</p> <p>Highly mobile, weapon-system-oriented maintenance.</p> <p>Backup support to unit-level maintenance.</p> <p>Support provided to dedicated customers or on an area basis.</p>

Table 1-2. Maintenance Level Descriptions (continued)

LEVEL OF MAINTENANCE	DESCRIPTION
GS	<p>Commodity-oriented repair of components and end items in support of the Theater Supply System.</p> <p>Backup maintenance support to DS units.</p> <p>Job shop/bay or production line operations with the capability to task/organize to meet special mission requirements.</p> <p>Located at Echelons Above Corps (EAC).</p> <p>NOTE: Based on the METT-TC, platoon/team-sized elements can be found as far forward as required to support the tactical situation.</p>
Depot	<p>Provides combat-ready materiel to the Army Supply System.</p> <p>Maintenance performed by Tables of Distribution and Allowances (TDA) industrial-type activities operated by the Army.</p> <p>Repairs and returns to the Wholesale Supply System at the national level, or, by exception, to the Theater of Operations.</p> <p>Provides technical support and backup to DS and GS maintenance units.</p> <p>In wartime, the "warfighter" combatant commander assumes control of depot-level maintenance operations in the Theater of Operations.</p>

Table 1-3. Maintenance Level Information

LEVEL	UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT
WHO	Operator Crew Unit Maintenance Personnel Operator/Maintainer	DS Maintenance Units Installation Support Maintenance Shops Host Nation Support (HNS)	GS Maintenance Units Specialized Repair Activities (SRAs) Installation Support Maintenance Shops HNS	Predominately Army Materiel Command (AMC) Commercial Contractors HNS
WHERE	Breakdown Site Equipment Location Unit Maintenance Areas Unit Maintenance Collection Point (UMCP)	Mobile Maintenance Shops Fixed Shops in Installations/Units Equipment Location/ Breakdown Site/ UMCP Division, Corps, and EAC Maintenance Collection Points (MCPs)	Fixed/Semi-fixed Maintenance Facilities Installation Maintenance Shops Equipment Location EAC	Fixed Plant-type Facilities On-site, on exception CONUS and Selected Theaters

Table 1-3. Maintenance Level Information (continued)

LEVEL	UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT
	<p>PMCS</p> <p>Inspections by sight and touch</p> <p>Lubricating, preserving, cleaning, replacement, and minor adjustments authorized by the MAC</p> <p>Diagnosis and Fault Isolation per MAC</p> <p>Manufacture of parts not otherwise available</p> <p>Replacement of unserviceable Parts, Modules, and Assemblies per MAC</p>	<p>Diagnose and isolate Components and Assembly malfunctions</p> <p>Adjust, calibrate, and align Components and Assemblies</p> <p>Replace Components, Modules, Assemblies, and Piece Parts</p> <p>Repair defective End Items and Components</p> <p>Operate Repair Parts Supply Reparable Exchange Activity (RXA)</p> <p>Recovery</p>	<p>Diagnose and isolate Equipment Components and Assembly malfunctions to the Internal Piece level</p> <p>Adjust, calibrate, align, and repair Components and Assemblies</p> <p>Repair/modification of End Items/ Components and Assemblies to the Internal Piece Part level (overhaul)</p> <p>Heavy Body, Hull, Turret, Frame repair</p> <p>Collection and classification of unserviceable Class VII</p>	<p>Overhaul of Components and End Items</p> <p>Repair End Items, Components, Assemblies, and Modules to the original manufactured tolerances/ specifications (rebuild)</p> <p>Repair requiring special environmental facilities</p> <p>Non-destructive testing</p> <p>Cyclic overhaul and special Maintenance Programs</p>

Table 1-3. Maintenance Level Information (continued)

LEVEL	UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT
WHAT	<p>Fault verification and level of repair</p> <p>Requisition, receipt, storage, and issue of Repair Parts Prescribed Load List (PLL)</p> <p>Recovery and transport operations</p> <p>Battle Damage Assessment and Repair (BDAR)</p> <p>Army Oil Analysis Program (AOAP)</p> <p>Reporting Materiel Readiness per Army Regulation (AR) 700-138</p>	<p>Light Body repairs</p> <p>Technical Assistance</p> <p>BDAR</p> <p>Apply DS-level Modification Work Orders (MWOs)</p> <p>DS-level Repair/Issue Operational Readiness Float (ORF)</p> <p>Reinforce support to Unit-level Maintenance</p> <p>Provide Maintenance Support Teams (MSTs)</p> <p>Estimated Cost of Damages (ECOD) Support</p> <p>Repair Parts Supply (Shop Stock)</p>	<p>Evacuate Disposable Materiel</p> <p>Technical Assistance</p> <p>Backup support to DS units</p> <p>Operation of Cannibalization Point</p> <p>Mobile Maintenance Teams (MMTs)</p> <p>GS-level repair of ORF</p> <p>Limited recovery</p>	<p>Manufacture of parts not otherwise available</p> <p>Technical Assistance</p> <p>Reinforcing support to DS and GS units</p> <p>Wholesale-level Repairable Exchange</p> <p>Restoration</p> <p>Conversion</p> <p>Renovation</p> <p>Parts fabrication</p> <p>Modification of serviceable assets</p> <p>Restoration of unserviceables to prescribed levels of serviceability</p> <p>Inspections/modifications requiring extensive disassembly or elaborate Test Equipment</p>

Table 1-3. Maintenance Level Information (continued)

LEVEL	UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT
	Support user unit's Materiel Readiness	Support using unit Materiel Readiness	Support the Theater Supply System by repair and return to supply stocks Support of local supply stocks, ORF stocks of DS units, and repair and return to user programs	Support of Army/Theater supply inventory by repair and return to supply stocks Support of user unit's materiel readiness with repair cycle float

SUSTAINMENT MAINTENANCE SUPPORT

NOTE: Elements from GS- and depot-level activities can be found as far forward as required to support the tactical situation.

1-13. Sustainment maintenance is generally performed above the DS level. It consists of active and reserve GS maintenance units, directors of logistics (DOLs), depots, SRAs, FRAs, and contractors, which can be tailored to meet sustainment maintenance demands anywhere in the world. It is integrated management that focuses on centralized management with decentralized execution of maintenance programs at local, regional, and national levels. It maximizes repair capability while providing high levels of weapon system availability at the least cost.

1-14. Centers of Excellence (COEs) are established for sustainment activities to determine how maintenance units can best support the Theater Operations Plan. COEs support the Theater Supply System through Tables of Organization and Equipment (TOE) or TDA units, HNS, and contract personnel.

Local Sustainment Maintenance Manager

1-15. The Local Sustainment Maintenance Manager (LSMM) manages the workloading responsibility for all Army sustainment maintenance units and activities in a designated geographical area that could be at multiple maintenance centers. There may be situations where an LSMM operation is established in an overseas theater of operations as part of the logistics support element (LSE).

Regional Sustainment Maintenance Manager

1-16. The Regional Sustainment Maintenance Manager (RSMM) at a designated geographical area has the authority to prioritize or redirect workload among the LSMMs. Depending on the extent of support required, an RSMM operation may be established in an overseas theater of operations as part of the LSE.

National Sustainment Maintenance Manager

1-17. The National Sustainment Maintenance Manager (NSMM) integrates sustainment maintenance for the total Army. The NSMM develops and implements policies and procedures to provide optimal sustainment maintenance support to the full spectrum of total Army missions. The NSMM also participates in developing and integrating the LSE. Support is provided in a seamless process transparent to the user.

Logistics Support Elements

1-18. Logistics support elements:

- Generally move into fixed or semi-fixed facilities in the theater, where they remain for the duration of operations.
- Can displace forward, but through a very time-consuming, labor- and equipment-intensive process. However, they can deploy platoons, sections, or teams as far forward as required to support the tactical situation.
- Are attached, when deployed forward, to the nearest maintenance company; all requirements pass through that headquarters (HQ).

MAINTENANCE ALLOCATION CHART

1-19. The MAC designates overall authority and responsibility for the performance of maintenance functions on an item of equipment. Figure 1-2, page 1-12, displays a MAC. Table 1-4, page 1-12, describes the MAC's six columns.

LOCATION

1-20. The MAC is found in equipment TMs that contain unit-level (-12, -13, -14, -20, -23, and -24) maintenance procedures. Some recently fielded, highly complex weapon systems have separate manuals for the MAC. In those instances, the TM has the same first eight digits as other series TMs, followed by "MAC."

OBJECTIVES

1-21. The Army Maintenance System is organized to service and repair equipment throughout its in-service life. Organizations are tailored to provide the required equipment maintenance capability at appropriate levels throughout the maintenance system.

1-22. To ensure balance in the maintenance system, it is important the responsibilities of each maintenance level be kept in perspective. It is a tactical necessity for user units to perform preventive maintenance. However, users are not expected to perform support or depot maintenance.

MAINTENANCE ALLOCATION CHART								
1	2	3	4			5	6	
Group Number	Component Assembly	Maintenance Function	*Maintenance Level			Tools and Equipment	Remarks	
			C	O	F	H	D	
05	COOLING SYSTEM CONT							
0505	Fan Tower Assembly	Inspect		0.2				
		Test		0.2				
		Replace			0.3			
		Repair		4.5				A
		Overhaul					35	
						**	37	
06	ELECTRICAL							
0601	Alternator	Inspect		0.2				
		Test		0.2				
		Replace		2.0				B
		Repair			8.0			
		Overhaul					**	
0602	Voltage Regulation	Inspect		0.2				
		Test		0.2	0.2			
		Replace		2.0				
		Repair			1.0			
		Overhaul						
0603	Motor Starting	Inspect		0.2				
		Test		0.2				
		Replace		2.0				
		Repair			2.4			48
		Overhaul					**	

****Worktimes are included in DMWR**

*C Operator or crew
 O Organizational
 F Direct support maintenance
 H General support maintenance
 D Depot maintenance

Figure 1-2. Maintenance Allocation Chart

Table 1-4. MAC Columns

Column 1 – Group Number	Lists group numbers, which identify components, assemblies, subassemblies, and modules with the next higher assembly.
Column 2 – Component/Assembly	Contains noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.
Column 3 – Maintenance Function	Lists functions to be performed on items in Column 2. Maintenance functions are limited to, and defined as, those listed in Table 1-5.
Column 4 – Maintenance Level (Four levels of maintenance with specific tasks divided into five maintenance categories)	Specifies the lowest level of maintenance authorized to perform the function listed in Column 3. Listing a work-time figure in the proper subcolumn does this. The work-time figure represents the man-hours required to perform the function. The number of man-hours specified is the average time required to restore an item to use under field operating conditions. This includes preparation, troubleshooting, and technical inspection/quality control time, in addition to the time required to perform the specific task.
Column 5 – Tools and Equipment	Names, by code, the common tool sets, special tools, and test/support equipment required to perform the designated function.
Column 6 – Remarks	Lists references to the page at the end of the MAC.

FUNCTIONS

1-23. There are many functions that are essential to ensure that equipment sustains its service life. Maintenance functions are defined in Table 1-5.

Table 1-5. Maintenance Functions

Title	Description
Inspect	To determine the serviceability of an item by comparing its physical, mechanical, or electrical characteristics with established standards through examination.
Test	To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing with prescribed standards.
Service	To periodically perform required maintenance that keeps an item in operating condition.
Adjust/Align	To maintain or regulate an item, within prescribed limits, by bringing it into proper or exact position or by setting the operating characteristics to specified parameters.
Calibrate	To determine corrections and cause them to be made or to make adjustments on instruments or TMDE used in precision measurement.
Remove/Install	To remove and install the same type of item. Could also occur separately (for example, MWO, installation kit, but nothing removed).
Replace	To remove an unserviceable item and install a serviceable counterpart in its place. This could refer to fluids, such as oil.
Repair	To perform maintenance required to correct material damage and to restore an item to serviceability standards.
Overhaul	To restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications.
Rebuild	To restore unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment.

MAINTENANCE SUPPORT

1-24. Maintenance support is a flexible, decentralized operation (maintenance execution) capable of keeping up with shifts in operational tempo (OPTEMPO). Centralized control (maintenance management) provides maximum resources used to accomplish the mission. The maintenance support concept focuses on sustaining operations by maximizing equipment availability to the FP Army. It strives to create a seamless system operating across strategic, operational, and tactical levels, interweaving and mutually supporting all levels of maintenance for maximum effectiveness. Maintenance support requires continuous coordination with customer units to tie the soldier in the field to the national level. The emerging operational concept for maintenance embraces requirements and capabilities in an interlocking scheme of maintenance support from the breakdown site to the CONUS base.

TWO-LEVEL MAINTENANCE

1-25. It is the Army's intent to transition to a two-level maintenance system beginning in fiscal year (FY) 06. Under a two-level maintenance system the unit and DS levels of maintenance will be combined (and called "field level") and the GS and depot levels will be combined (and be called "sustainment maintenance"). Field maintenance would be characterized by "on-system" maintenance. Field maintenance would be repair and return to user; sustainment maintenance would be repair and return to supply.

FIELD MAINTENANCE

1-26. Field maintenance actions typically involve replacement of Class IX components, on-system, for repair and return to echelon, and in deployable TOE units. These repairs will generally be performed by uniformed maintenance personnel at least through corps/joint task force (JTF) level. Some examples of field maintenance include the following:

- Replacement of a starter on an engine assembly.
- Timing of a fuel injection pump.
- Replacement of a temperature sensor.
- Replacement of a head gasket.
- Replacement of an external maintenance wiring harness.

Determination of exactly which maintenance actions are field maintenance actions will be done during the normal maintenance analysis performed between the materiel developer and the combat developer.

SUSTAINMENT MAINTENANCE

1-27. Sustainment maintenance actions typically involve repair of reparable Class IX components, off-system, for return to the supply system. Sustainment maintenance will be performed at echelons above brigade (EAB), and perhaps eventually at echelons above division (EAD). Sustainment maintenance can be performed by uniformed maintenance personnel, Department of the Army (DA) civilians, or contractors. The decision as to whether or not to have sustainment maintenance includes

detailed off-system inside-the-box repair of line replaceable units (LRUs) thru shop replacement unit (SRU) repair/replacement, and rebuild of engines, transmissions, and the like.

1-28. Operations in peacetime and in combat place heavy demands on equipment. Weapon systems and other equipment are subject to severe use. A tank that will not move is a definite liability to the tactical commander. A radio that does not work can cause a breakdown of communications that could result in the loss of lives. The link between the using organization and maintenance support is a trained operator/crew who can properly use and maintain the equipment. Though time is limited, the continued availability of equipment demands that the operator/crew perform PMCS.

1-29. The cornerstones of maintenance support are the tenets, “fix forward” and “anticipate support.” Repairing equipment far forward enhances the ability to quickly return the maximum number of combat systems, at the earliest opportunity, as close to the using unit as possible. However, as maintenance operations transform with FXXI and beyond, maintenance concepts are evolving in replacing modular components forward and “fixing” in the rear.

1-30. Replace Forward and Repair Rear is the replacing of LRUs or modules instead of attempting to repair them. It is also the leveraging of advanced prognostics and diagnostics tools, support equipment, and training. The LRUs or modules are then retrograded to higher levels of maintenance for repair and returned to the distribution system. FXXI field maintenance operations are characterized by lean, modular, and enabled maintenance units focused on maximizing combat power. At the velocity in which future field maintenance operations must be performed, the workload will consist of FXXI distributed operations and capabilities of battlefield distribution. This would increase expected gains in diagnostics and prognostics, facilitating our ability to fix equipment forward through replacement of LRUs or component assemblies.

Replace Forward

1-31. Replace Forward means a soldier performs “on-system” maintenance. “On-system” refers to replacing components or subcomponents at the point of repair, the breakdown site, or the UMCP. Maintainers normally diagnose down to the major component failure. They then replace that component and return the system to operational condition. Based on the METT-TC, the soldier may diagnose and replace subcomponent items depending on the availability of tools, parts, and time. An example of a replace function is the replacement of a full-up power pack (FUPP). If a serviceable FUPP is available, the maintainer replaces the major assembly. If the FUPP is not available, the maintainer might swap out a serviceable engine from an unserviceable FUPP with a bad transmission.

Repair Rear

1-32. Repair Rear means that soldiers perform “off-system” maintenance. “Off-system” refers to those actions taken to return components and subcomponents of weapon systems to serviceable condition. These repair actions take place at designated places throughout the battlefield. Corps maintenance units may have the

capability to repair certain LRUs or assemblies for major weapons systems they support. Corps component repair companies or special repair activities in the corps or theater area repair other components and assemblies as determined by sustainment maintenance managers (SMMs). An example of a repair function at the corps or theater level is the rebuild of a tank engine or other major assembly.

1-33. Anticipating future requirements allows prepositioning of maintenance support capabilities. Anticipation rests on the ability to foresee future operations and to identify, accumulate, and maintain the assets, capabilities, and information required to support them.

1-34. Leaders must tailor and position maintenance support to provide quick, mobile responses to changes in units and weapon systems. Maintenance managers must coordinate the best use of available resources to repair and return the maximum number of critical items. They must maintain close, consistent interaction between maintenance organizations and their SSAs to ensure quick access to repair parts. Support elements must perform maintenance work as far forward as practical within the limitations of the METT-TC and the commander's priorities.

METHODS

1-35. There are four methods of support used by maintenance organizations. Table 1-6 gives a brief description of each method. The four methods are:

- Forward support.
- Area support.
- Backup/Reinforcing support.
- Passback support.

MANAGING BATTLEFIELD MAINTENANCE

1-36. When requirements have been identified, the maintenance manager must identify the resources on-hand and those already committed. Available resources are then managed within the established support framework to return the maximum number of items to fully mission-capable status.

1-37. When a shift or change in priorities could provide a greater overall return, the maintenance manager takes appropriate action or makes recommendations through the chain of command. Although a maintenance planner may not formally lay out a management matrix as such, a mental estimate of these factors is necessary. Figure 1-3 shows the basic concept for managing maintenance support on the battlefield.

Table 1-6. Description of Support Methods

<p>Forward Support</p>	<p>Maintenance-oriented toward quick turnaround to the user in order to maximize operational time by minimizing repair and evacuation downtime.</p> <p>End item repair thrust as <i>far forward</i> as possible within tactical time criteria, or recovered and evacuated to the point where repairs can be made. "Fix Forward" remains the preferred maintenance concept.</p>
<p>Area Support</p>	<p>Maintenance resources concentrated in a <i>defined geographic area</i> based on the type and quantity of equipment supported.</p> <p>Focus is placed on the supporting units operating in or moving through defined geographic boundaries.</p>
<p>Backup/Reinforcing Support</p>	<p>Customer <i>backup support</i> is provided to the supported unit for excessive maintenance requirements that cannot be performed due to time or resource limitations.</p> <p><i>Backup support</i> is provided to like-maintenance units for temporary excessive requirements that must be performed to meet operational readiness needs.</p>
<p>Passback Support</p>	<p><i>Passback support</i> is provided by one maintenance unit to another supported maintenance unit. This requirement is a predictable and permanent maintenance workload that is allocated by force structure.</p>

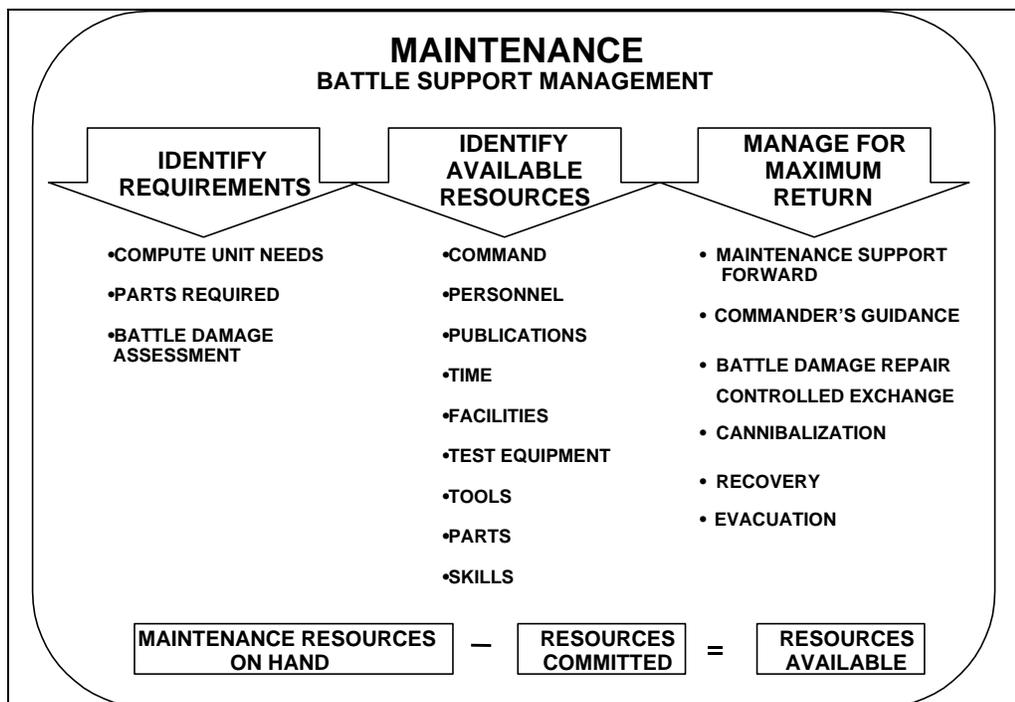


Figure 1-3. Managing Battlefield Maintenance Support

Battle Damage Assessment and Repair

1-38. Use BDAR to inspect damaged equipment to determine the extent of damage, to classify the equipment according to the type of repairs required, and to develop a plan of action for each item. Priorities for repair of battle-damaged systems are as follows:

- Most essential for completion of the immediate mission.
- Can be repaired in the least amount of time.
- Repairable but not in time to continue the immediate mission.

1-39. BDAR uses emergency expedient repairs, as outlined in the BDAR TMs, to return the system to fully or partially mission-capable status. Under combat conditions, BDAR may be performed on fueled or armed systems. The commander may also waive other precautions. All operations must be conducted as safely as possible. More details about BDAR procedures can be found in field manual (FM) 9-43-2.

NOTE: Equipment that is damaged beyond repair becomes a candidate for cannibalization.

Organizational Flexibility

1-40. Maintenance managers must be aware of changing support requirements. Maintenance resources must also be tailored to ensure support is provided as required. This tailoring encompasses adding or removing resources, such as personnel and equipment, to meet mission requirements and to best support the tactical commander's intent. Restructuring Company Maintenance Teams (CMTs) or requesting MST assistance from supporting maintenance units should be done as required.

Repairs and Recovery

1-41. To maximize unit combat readiness, equipment must be repaired and returned to the user as quickly as possible. Repairs should be made as far forward as possible. As equipment in the corps and communications zone (COMMZ) is not always "forward," forward also means on-site or at the supported unit's UMCP.

1-42. Recovery of equipment to maintenance collection points removes equipment from using units and increases the time it is not available. Repairing equipment as far forward as possible reduces transportation requirements and non-mission-capable time and increases equipment availability.

1-43. Commanders must ensure the degree of maintenance performed is consistent with technical and tactical requirements. During combat, only maintenance needed to return equipment to mission-capable status is performed. This concentrates the maintenance effort on those areas that affect the outcome of the battle.

1-44. Non-mission-essential maintenance is deferred until after the battle. Sometimes a weapon or support system may contain redundant systems that enable it to operate even when one or more of them are damaged. Commanders may decide to keep a weapon/support system in the battle at reduced capability rather than lose it entirely while the inoperable system is repaired.

CENTRALIZED MANAGEMENT OF DECENTRALIZED OPERATIONS

1-45. Maintenance managers at all levels must maintain control over their respective maintenance operations even though the support is decentralized. This provides support as far forward as possible and focuses available maintenance resources on the work to be done.

Manager Responsibilities

1-46. Managers must be aware of the maintenance workload and available resources in order to make necessary maintenance support decisions. Since the situation may change rapidly, information must be as near real-time as possible. Managers must direct the use of maintenance resources or shift the workload to the maintenance elements best suited to make the repair. They should avoid having damaged equipment awaiting repairs in one area of the battlefield while maintenance personnel are idle in another. Managers must create a flexible maintenance environment so that resources and workloads can cross various command boundaries.

Reporting Systems

1-47. Accurate reporting is the link between decentralized operations and centralized management. The measure of success of a maintenance manager is based on the ability to manage maintenance operations to maintain desired operational readiness standards. The Unit Level Logistics System-Ground (ULLS-G) performs The Army Maintenance Management System (TAMMS) functions at the unit maintenance level. The Standard Army Maintenance System (SAMS) provides maintenance managers with an automated management information system that can assist them in managing DS maintenance operations. For additional guidance, maintenance managers should refer to Training Circular (TC) 43-4.

1-48. The Army is currently developing a seamless, interoperable system that consolidates the current stovepipe management information systems. The Global Command Support System-Army (GCSS-A) integrates and standardizes the format for data entry used by current Army systems. The GCSS-A also standardizes communication protocols. The GCSS-A consists of multiple modules that interface with each other. The modules and their relationship with ordnance maintenance operations are as follows:

- **Maintenance Module (MNTM).** The GCSS-A combines the functions of the current ULLS-G, Unit Level Logistics System-Aviation (ULLS-A), and Standard Army Maintenance System-Level 1 (SAMS-1) into a single maintenance module. This module manages workload and coordinates repair services, provides applicable financial information, reports maintenance status, and performs

TAMMS records management. The module will also leverage emerging technologies to support split-based operations and increased mission support requirements. This module has the capability to process Class IX supply requisitions.

- **Management Module (MGTM).** The GCSS-A will integrate the capabilities currently found in the Standard Army Retail Supply System-Objective (SARSS-O) Integrated Logistics Analysis Program (ILAP), the maintenance management reporting performed by the Standard Army Maintenance System-Level 2 (Management Level-MMC/Battalion) (SAMS-2), and the planning and management functions developed for the Unit Level Logistics System, S-4 Module (ULLS-S4) (logistics estimates, CSS planning and management-type functions, and unit status reporting). This module will allow users the ability to access required CSS data from a single database and make decisions using that data.
- **Integrated Management Module (IMM).** The GCSS-A integrates the functionality of the Standard Army Ammunition System-Modified (SAAS-MOD), Standard Property Book System-Redesign (SPBS-R), Standard Army Retail Supply System-Level 2A (Division) (SARSS-2A), Standard Army Retail Supply System-Level 2AC (SARSS-2AC), SARSS-Gateway, and SAMS-2. This integration produces a package of functions for use by sections within materiel management centers (MMCs) at all levels.