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**Maintenance Operations**

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**April 2014**

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**Headquarters, Department of the Army**

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# Maintenance Operations

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## Preface

Army techniques publication (ATP) 4-33, *Maintenance Operations*, describes the operational Army maintenance operations and focuses on how maintenance operations are conducted at the operational and tactical-level. Its primary focus is on maintenance organizations and their missions, but also addresses the roles and functions of strategic level maintenance organizations that provide logistics and individual Soldier support services.

The intended audience for this manual includes the following.

- Commanders at all levels - to give them a better understanding of how maintenance support operations are organized and provided.
- Commanders and Staff of sustainment organizations-to inform them of the integration of transforming maintenance support operations into Army missions.
- Soldiers of all grades - to give them a broad knowledge of the Army's tactical maintenance support operations structure and how it works.

Commanders, staffs, and subordinates ensure that their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure that their Soldiers operate in accordance with the law of war and the rules of engagement. (See field manual [FM] 27-10.)

ATP 4-33 uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. Terms for which ATP 4-33 is the proponent publication (authority) are italicized in the text and are marked with an asterisk (\*) in the glossary. Terms and definitions for which ATP 4-33 is the proponent publication are bold faced in the text. For other definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition.

This manual applies to Active Army, the Army National Guard (ARNG)/Army National Guard of the United States, and the United States Army Reserve (USAR) unless otherwise stated.

The proponent for this manual is the United States Army Sustainment Center of Excellence. The preparing agency is the Combined Arms Support Command, Training Support and Doctrine. Send comments and recommendations on a Department of the Army DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Commander, U.S. Army Combined Arms Support Command, ATTN: ATCL-TS (ATP 4-33), 2221 Adams Ave, Bldg 5020, Fort Lee, VA, 23801-1809; or submit an electronic DA Form 2028 by e-mail to: [usarmy.lee.tradoc.mbx.lee-cascom-doctrine@mail.mil](mailto:usarmy.lee.tradoc.mbx.lee-cascom-doctrine@mail.mil).

# Introduction

The United States Army is organized, trained, and equipped to be the most decisive land force in the world. Army forces are employed within a strategic context and conduct decisive and sustainable land operations through the simultaneous combination of offensive, defensive, and stability operations. Two-level maintenance doctrine was developed to support this type of warfare.

In supporting the Army, the primary goal of two-level maintenance is to generate/regenerate combat power and to preserve the capital investment of weapons systems and equipment to enable mission readiness and accomplishment. The commander that combines skillful use of assigned equipment with effective maintenance management processes has a decided advantage.

The purpose of this ATP is to provide a clear description of the two-level maintenance structure and base operating requirements which enable commanders to provide flexible maintenance support to meet the operational objectives.

Our Soldiers are trained to perform field level maintenance. Leaders have to provide the time on the training schedule for them to build their skills. Training is the cornerstone to a successful unit support mission by ensuring that ready equipment is available for operations.

With all this in mind, leaders must ensure that adequate safety precautions and personal protective equipment are fully utilized in every operation—our Soldiers are our greatest asset.

ATP 4-33 has numerous changes from the previous Army tactics, techniques and procedures ATTP 4-33, the most significant change is the emergence of the Recovery, Battle Damage Assessment and Repair, and Retrograde and Reconstitution Operations in separate sections as part of Maintenance Support Operations, chapter 3.

Additional changes from ATTP 4-33 include the emergence of the Global Combat Support System-Army (GCSS-Army) which replaces a variety of current logistics information systems, and automated capabilities. Appendix B of ATP 4-33 clarifies the relationship between the forward support companies and the maneuver battalions.

**Chapter 1, *Maintenance Fundamentals***, discusses the role of the Army maintenance system as combat multiplier by generate / regenerate combat power, and by preserving the capital investment of weapons systems and equipment to enable mission accomplishment.

**Chapter 2, *Maintenance Organizations***, discusses the different types of maintenance organizations, the makeup, and responsibilities of each organization, it also explains the Army's current forces organizations, and the logistics structure that provides unity of command from the strategic to the tactical level.

**Chapter 3, *Maintenance Support Operations***, discusses the nature and conduct of maintenance-related activities that depend on the operational environment associated with either contiguous or non-contiguous battlefield.

**Chapter 4, *Maintenance Management***, describes the maintenance management process, levels of management, maintenance control and internal management procedures for maintenance operations.

**Chapter 5, *Repair Parts Supply Operations***, discusses the supply support operations and the repair parts supply.

**Chapter 6, *Test, Measurement and Diagnostic Equipment Calibration and Repair Support (TMDE)***, has been completely updated to reflect the current system. This chapter discusses the objectives, structure and employment of calibration and repair of test, measurement and diagnostic equipment.

**Chapter 7, *Other Maintenance Activities***, this chapter discusses the requirements for communication and electronics, missile systems, and Army watercraft and how it tailored to meet the commander's intent.



# Chapter 1

## Maintenance Fundamentals

In a modular Army, maintenance elements are increasingly required to anticipate, analyze, and tailor available resources for effective and timely support of complex weapons systems. Adaptive planning requires maintenance managers to embrace change, innovation, and flexibility. Success will continue to be based on the bottom-line measurement of how quickly equipment can be returned to service when it becomes inoperable (maintainability), how long the user can anticipate failure-free performance (reliability), and ensuring equipment remains operational (availability). This chapter provides an overview of maintenance fundamentals and sets the foundation for the rest of this publication.

### SECTION I – MAINTENANCE SYSTEM OVERVIEW

1-1. The purpose of the Army maintenance system is to generate/regenerate combat power, and to preserve the capital investment of weapons systems and equipment to enable mission accomplishment. Maintenance actions are divided into field and sustainment level tasks. Both of these maintenance levels will be discussed in further detail later in this chapter.

1-2. Maintenance is a combat multiplier central to operational success across unified land operations. The maintenance system is designed to be fast, agile, and responsive to the needs of the Soldier as far forward as possible. Maintenance managers anticipate maintenance requirements by utilizing robust communications networks, tracking and analyzing maintenance reporting, and soon, by being enabled by equipment sensor data to monitor and evaluate equipment performance. The commander that combines skillful use of assigned equipment with effective maintenance management processes has a decided advantage.

### PRINCIPALS OF MAINTENANCE

1-3. Army maintenance is founded on the principle that the useful service life of Army equipment is achieved when the item is operated within its intended purposes, parameters, and maintained in accordance with the appropriate technical manuals and the Army regulations and its designed or engineered specifications. Army maintenance processes and procedures are based on the following principles:

- Commanders are responsible for establishing a command climate that ensures all assigned equipment is maintained in accordance with appropriate technical manuals and AR 750-1.
- Preventive maintenance checks and services are the foundation of materiel readiness.
- Commanders are responsible for providing resources, assigning responsibility, and training their Soldiers to achieve maintenance standards.
- Expeditious return of not-mission capable equipment back to operational status.
- Field level maintenance forward, sustainment level maintenance at echelons above brigade.
- Commanders are responsible for the readiness and safety of equipment.

### MAINTENANCE PROCESSES

1-4. The Army relies on four core maintenance processes to manage equipment during the course of its useful service life to achieve a high state of readiness. They are performance observation, equipment services, fault repair, and single-standard repair. Each of these processes is discussed in greater detail in AR 750-1.

1-5. Performance observation is the foundation of the Army maintenance program and is the basis of the preventive maintenance checks and services that are required by all equipment technical manuals in the before, during and after operation checks.

1-6. Equipment services are specified maintenance actions performed when required, where equipment, components, and systems are routinely checked, adjusted, changed, analyzed, lubricated, and so forth, in accordance with designer and engineer specifications.

1-7. Fault repair is the process used by operators and maintenance personnel to restore equipment to full functionality as originally designed or engineered.

1-8. Single-standard repair is a process that seeks to ensure a single repair standard is applied to all end items, secondary items, and components repaired and returned to the supply system or by exception directly to the using unit. This process assures high quality and establishes a predictable service life using the best technical standard.

1-9. Maintenance management policies and procedures are contained in the 750 series Army Regulations and Department of the Army Pamphlets. Supply policy and procedures are found in the 710 series Army regulations and Department of the Army Pamphlets.

1-10. Maintenance managers at all levels use Sustainment Information System to collect, store, and analyze maintenance information. Sustainment information systems replace the Standard Army Management Information Systems. An example of a sustainment information system is the Global Combat Support System Army.

## SECTION II – TWO-LEVEL MAINTENANCE

1-11. Army units are forces organized, manned, equipped, and trained to be strategically responsive, deployable, agile, versatile, lethal, survivable, and sustainable across unified land operations. The current operating environment is characterized by a non-contiguous operating environment, with long and often unsecured lines of communication. This requires the logistics footprint be minimized as much as possible. In supporting the modular force, the goal of our maintenance system is to reduce repair cycle times by repairing or replacing components, modules, and assemblies as far forward as possible, maximizing reliance on rapid repair parts distribution and visibility. Repair time guidelines are provided in the maintenance allocation charts for both field and sustainment tasks.

1-12. The Army utilizes a tiered maintenance system. Two-level maintenance is a maintenance system comprised of field and sustainment maintenance. Two-level maintenance utilizes equipment design, diagnostic and prognostic equipment and tools, mechanic and technician training, information systems and management aids in component repair or replacement taking full advantage of increased reliability, resulting in increased flexibility and depth of capability. At the core of the maintenance process is performance observation and reporting, equipment services, fault repair, and single-standard repair.

## FIELD MAINTENANCE

1-13. Field maintenance is on-system maintenance, repair and return to the user, including maintenance actions performed by operators. Field maintenance is often performed on or near the unserviceable piece of equipment or weapon system utilizing line replaceable units or modules and component replacement or repair. It is most often performed by the owning or support unit using tools and test equipment found in the unit. Field maintenance is not limited to simply remove and replace actions. Field maintenance allows for repair of components or end items on or near the system if the maintainers possess the requisite skills, proper tools, proper repair parts, references, and adequate time. Field maintenance also includes adjustment, alignment, service, applying approved field level modification work orders, fault/failure diagnoses, battle damage assessment and repair, and recovery. Field maintenance is always repair and return to the user and includes maintenance actions performed by operators.

## **OPERATOR AND CREW MAINTENANCE**

1-14. It is the responsibility of the using organization's operators and crews to perform maintenance on its assigned equipment. These operators/crews receive formal training from their proponent (normally advanced individual training, new equipment training) on a specific system. Tasks normally consist of inspecting, servicing, lubricating, adjusting, replacing minor components/assemblies as authorized by the Maintenance Allocation Chart using basic issue items and onboard spares. The remove and replace authority for this level of maintenance is indicated by the letter "C" in the third position of the source, maintenance, and recoverability code. A "C" appearing in the fourth position of the source, maintenance, and recoverability code, though rare, would indicate complete repair is possible at the crew maintenance level.

1-15. Operator are system specialists in those military occupational specialties (e.g. signal, military intelligence, or a maneuver unit's Master Gunner) that receive formal training from their proponent (normally advanced individual training, specialized functional courses) on diagnosing specific system faults. Their primary focus is on a system's performance and integrity. These personnel troubleshoot the entire system using simplified (or embedded) diagnostic equipment to identify, isolate, and trace problems to a faulty line replaceable unit, line replaceable unit replacement (utilizing on-board spares), and identifying/correcting crew training deficiencies. After operators have exhausted their maintenance capabilities, they rely on Ordnance maintainers in field maintenance organizations or teams to conduct field maintenance on the item of equipment.

## **MAINTAINER MAINTENANCE**

1-16. This is maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, shop replaceable unit within a line replaceable unit or other portion either on the system or after it is removed by a trained maintainer. Depending on system and military occupational specialty involved, the definition of a line replaceable unit or shop replaceable unit is flexible. The characterization of line or shop replaceable units for wheeled and tracked vehicles, radar, or the Warfighter Information Network-Tactical, shifts as the field maintenance troubleshooting increases in complexity. The remove and replace authority for this level of maintenance is indicated by the letter "F" appearing in the third position of the source, maintenance, and recoverability code. An "F" appearing in the fourth position of the source, maintenance, and recoverability code indicates complete repair is possible at the field maintenance level. Items are returned to the user after maintenance is performed at this level.

## **SUSTAINMENT MAINTENANCE**

1-17. Sustainment maintenance is off-system component repair and/or end item repair and return to the supply system or by exception to the owning unit, performed by national level maintenance providers. National level maintenance providers include the Army Materiel Command and installation directorate of logistics maintenance activities. The sustainment maintenance function can be employed at any point in the integrated logistics chain. The intent of this level is to perform commodity-oriented repairs to return items to a national standard, providing a consistent and measureable level of reliability and to execute maintenance actions not able to be performed at the field level of maintenance. Sustainment maintenance supports both operational forces and the Army supply system.

## **BELOW DEPOT SUSTAINMENT MAINTENANCE**

1-18. This level of maintenance is maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion generally after it is removed from the system. The remove and replace authority for this level of maintenance is indicated by the letter "H" appearing in the third position of the source, maintenance, and recoverability code. An "H" appearing in the fourth position of the source, maintenance, and recoverability code indicates complete repair is possible at the below depot sustainment maintenance level. Items are returned to the supply system after maintenance is performed at this level. Below depot sustainment level maintenance can also apply to end item repair and return to the supply system.

## DEPOT SUSTAINMENT MAINTENANCE

1-19. Depot maintenance is maintenance accomplished on end items or on a component, accessory, assembly, subassembly, plug-in unit, either on the system or after it is removed. The remove and replace authority for this level of maintenance is indicated by the letter "D" or "K" appearing in the third position of the source, maintenance, and recoverability code. Depot sustainment maintenance can be performed by either depot personnel or contractor personnel when authorized by the Army Materiel Command. A "D" or "K" appearing in the fourth position of the source, maintenance, and recoverability code indicates complete repair is possible at the depot maintenance level. Items are returned to the supply system or by exception directly to a using unit after maintenance is performed at this level.

1-20. Figure 1-1 illustrates the maintenance process and repair flow chart utilized through the two level maintenance process in both field and sustainment maintenance.

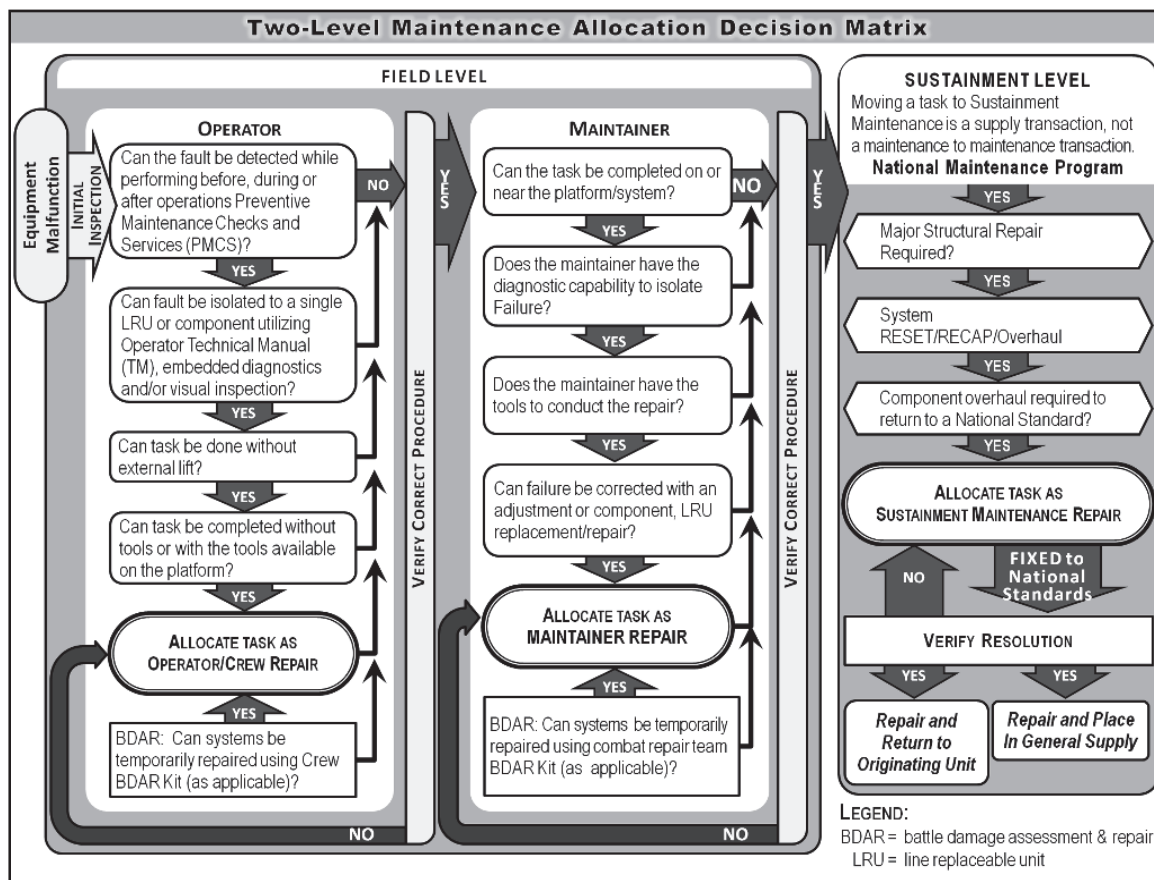


Figure 1-1. Two-level maintenance allocation decision matrix

## SUMMARY

1-21. With the advent of field and sustainment levels of maintenance, maintenance on the battlefield has been streamlined, and redundancy has been eliminated, with no loss to capabilities; in fact, two-level maintenance provides the operating unit with more capabilities forward and able to rapidly respond than ever before. It is an ideal capability for the Army's modular designed formations. Commanders at all levels must understand the Army maintenance system, and the role of operators, crews and maintainers, to have the right capabilities in the right place at the right time.

## Chapter 2

# Maintenance Organizations

The foundation for Army operations is contained in its operational concept unified land operations. Current forces are organized to enable force tailoring and rapid deployment to meet combat commander requirements with properly sized, trained, and organized forces. Logistics structure that provides unity of command from the strategic to the tactical level is the starting point from which the system was built. This chapter discusses the different types of maintenance organizations, the makeup, and responsibilities of each.

### SECTION I – ECHELONS ABOVE BRIGADE

2-1. Within an area of responsibility there are normally three operational headquarters organizations at echelons above brigade; the Army service component command, the corps, and the division. The commander and staff of each of these headquarters organizations have very similar maintenance and repair parts management responsibilities. All are ultimately responsible for ensuring that subordinate organizations have adequate maintenance support and meet equipment readiness standards.

#### THE ARMY SERVICE COMPONENT COMMAND

2-2. The Army service component command is the senior Army command aligned with a geographical combatant command. It has both operational and support responsibilities. Its exact tasks are assigned by the geographical combatant commander; these tasks may be exclusively operational missions, solely logistics tasks, or a combination of both types of responsibility. The Army service component commander is responsible to the unified commander for recommending how assigned Army forces should be allocated and employed. The Army service component commander's support responsibilities include the requirements to organize, equip, train, and maintain Army forces in theater.

#### UNITED STATES ARMY MATERIEL COMMAND

2-3. The United States Army Materiel Command is the Department of Army's sustainment maintenance process owner. The Army Materiel Command equips, resets and sustains the Army by leveraging its capabilities, to include the logistics readiness center on all major Army installations. In addition to Sustainment level maintenance and materiel management, the Army Materiel Command provides logistics technology, acquisition support, and selected other logistics support to Army forces as well as the Army Materiel Command related common support to other Services, multinational and interagency partners. The capabilities of the Army Materiel Command are diverse and are accomplished through national-level maintenance and supply programs managed and executed by its subordinate life cycle management commands, listed in paragraphs 2-5, 2-6 and 2-7 below.

2-4. Other Army Materiel Command major subordinate commands perform specialized functions in support of the operational Army. These major subordinate commands include:

- United States Army Sustainment Command.
- Military Surface Distribution and Deployment Command.
- United States Army Research, Development and Engineering Command.
- United States Army Security Assistance Command.
- United States Army Chemical Materials Agency.
- United States Army Contracting Command.

- Life Cycle Management Commands.

### **THE USAMC LIFE CYCLE MANAGEMENT COMMANDS**

2-5. Together with the assistant secretary of the Army for acquisition, logistics and technology program executive officers and product/project managers ensure support for fielded weapon systems and equipment throughout their entire life cycle. The life cycle management commands support to deploying and deployed forces is coordinated through the Army sustainment command and is executed under the control of the supporting Army field support brigade. The exact organizational make up of each life cycle management command varies.

### **AVIATION AND MISSILE LIFE CYCLE MANAGEMENT COMMAND**

2-6. The Aviation and Missile Life Cycle Management Commands integrates functions across their commodities and sustains aviation, missile and unmanned vehicle systems, ensuring weapon systems readiness with seamless transition to combat operations. It supports materiel developers with the development, acquisition, and fielding of aviation and missile systems and other related equipment. The Aviation and Missile Life Cycle Management Commands performs applied research, integrated logistics support, materiel readiness management, and maintenance support for Army aviation and missile systems, subsystems, and associated equipment.

### **COMMUNICATIONS ELECTRONICS LIFE CYCLE MANAGEMENT COMMAND**

2-7. The Communications Electronics Life Cycle Management Command integrates functions across their commodities and sustains network information systems. It supports materiel developers with the development, acquisition, and fielding of communications-electronics systems (including software/information systems). The Communications Electronics Life Cycle Management Command performs applied research, integrated logistics support, materiel readiness management, maintenance support, and provides technical support capabilities to deploying and deployed Army forces.

### **TANK-AUTOMOTIVE AND ARMAMENTS LIFE CYCLE MANAGEMENT COMMAND**

2-8. The Tank and Automotive Life Cycle Management Command integrates functions across their commodities and sustains Soldier and ground support systems for the operational Army through the integration of effective and timely acquisition, logistics, and technology. It provides acquisition support of tank-automotive, armaments and Soldier end items, repair parts, and supplies for U.S. and multinational weapon systems and overhauls, modernizes, and repairs Tank and Automotive Life Cycle Management Command commodity equipment.

### **JOINT MUNITIONS AND LETHALITY LIFE CYCLE MANAGEMENT COMMAND**

2-9. The Joint Munitions and Lethality Life Cycle Management Command provides the conventional ammunition life-cycle functions of logistics sustainment, readiness and acquisition support for all U.S. military services, other government agencies, and multinational nations as directed. It is the logistics integrator for life-cycle management of ammunition providing a global presence of technical support to frontline units.

### **UNITED STATES ARMY CONTRACTING COMMAND**

2-10. The United States Army Contracting Command works closely with deployed sustainment units to provide contracting support through its Expeditionary Contracting Command.

### **CONTRACT MAINTENANCE SUPPORT**

2-11. Contract maintenance support can come in the form of system support, external support, and theater support contracts. Contract support is used when there is a valid operational need to augment deployed military maintenance support capabilities and to reduce the operational burden on military maintenance

forces. All contract maintenance support requirements and issues should be coordinated with the supporting Army field support brigade or subordinate element.

### **SYSTEM SUPPORT CONTRACT CAPABILITIES**

2-12. System support contracts are pre-arranged by the life cycle management commands and separate Army program management offices. Supported systems include, but are not limited to, newly fielded weapons, mission command, and communication systems. System contractors provide support in garrison and may deploy with the force to both training and contingency operations. System support contract maintenance can include both technical assistance/support via field service representatives as well as complete field and sustainment level support capabilities.

### **EXTERNAL CONTRACT SUPPORT CAPABILITIES (INCLUDING THE LOGISTICS CIVIL AUGMENTATION PROGRAM)**

2-13. External support contract maintenance is provided via a contract that is issued by contract authorities outside of the operational area. The largest and most commonly used external support contract is the Logistics Augmentation Program. The Logistics Augmentation Program is an Army program executed by U.S. Army Materiel Command that provides the operational commander an alternative source for rapidly filling sustainment and field maintenance shortfalls from commercial sources. The supported Army service component commands, in coordination with the supporting Contracting Support Brigade and Army field support brigades, will utilize Logistics Augmentation Program-related maintenance support when this commercial support augmentation option is determined to be the most effective, expeditious, and cost effective means to augment deployed Army force maintenance capabilities. Other external support and/or theater support maintenance contract support options, other than the Logistics Augmentation Program, should also be considered by the operational commander, especially for long-term, sustained operations and/or for operations with sufficient lead time to plan and coordinate other types of contracted support.

### **THEATER SUPPORT CONTRACT CAPABILITIES**

2-14. Theater support contracts support deployed Army forces under prearranged contracts, or contracts awarded from the mission area, by contracting officers under the mission command and contracting authority of the supporting contracting support brigade or designated Joint Theater Support Contracting Command. Theater support contracts can provide limited maintenance related services based on the regionally available commercial support capabilities. Requiring activities should consult with their supporting Army field support brigade to ensure that other contract venues are not already in place before submitting their maintenance support contract requirement to their supporting contracting support brigade or designated Joint Theater Support Contracting Command.

### **ARMY SUSTAINMENT COMMAND**

2-15. The Army Sustainment Command provides sustainment level logistics (less medical) by synchronizing Acquisition, Logistics and Technology support from the strategic through the operational to the tactical level. It serves as a single face to the field for sustainment maintenance and facilitates reach back across the Army Materiel Command to enhance mission support. The Army Sustainment Command support Army, joint and coalition forces across the unified land of operations, manages Army prepositioned stocks, and provides materiel management capabilities not provided by supporting sustainment brigades. The Army Sustainment Command has Army field support brigades forward deployed at overseas locations regionally aligned to an Army service component command and focused to serve as the bridge between the generating force and the operational force.

2-16. Major Army Sustainment Command responsibilities are:

- **Field Support** – The Army Sustainment Command Field Support network of Army field support brigades, battalions, and teams identify and resolve equipment and maintenance problems, as well as materiel readiness issues for their supported commands.
- **Materiel Management** – The Army Sustainment Command matches materiel to mission and assures logistics readiness in the Army force generation process. This includes issuing,

maintaining and managing theater-provided equipment in combat theaters, storing and maintaining unit maintained equipment, and maintaining and issuing pre-deployment training equipment that can be made available to non-deployed units for training.

- **Army Pre-positioned Stocks** – The Army Sustainment Command maintains, accounts for, and manages combat equipment, supplies, and humanitarian mission stocks at land- and sea-based positions strategically located around the globe.

### **ARMY FIELD SUPPORT BRIGADE**

2-17. The Army field support brigade supports the mission by providing integrated and synchronized acquisition, logistics and technology (less theater support contracting and medical). When deployed, the Army field support brigade is the operational control to the supported theater Army. This operational control relationship is normally delegated to the supporting theater sustainment command and expeditionary sustainment command.

2-18. As it pertains to maintenance activities, the Army field support brigade administers the logistics assistance program to include mission command of their subordinate the Army field support battalions, logistics support elements, and brigade logistics support teams, supporting the tactical commander. The Army field support brigade plans for and provides mission command over Army Materiel Command sustainment maintenance, and synchronizes and coordinates Army acquisition and materiel fielding support. The Army field support brigade also plans for and coordinates special acquisition logistics and technology-related support missions such as Army oil analysis program and ammunition support. The Army field support brigade maintains prepositioned stocks and theater provided equipment packages, property books, and manages Army field support brigade and subordinate command personnel rotation as required, in coordination with the senior headquarters.

### **ARMY FIELD SUPPORT BATTALION**

2-19. Army field support battalions are organizations with tailored capabilities to provide sustainment support to maintain Army operational readiness for all units in an Area of Responsibility. They support active, reserve, and National Guard units through prioritization, integration, and synchronization of the Army's Acquisition logistics and technology capabilities in support of the Army modular force.

2-20. Army field support battalions are modular teams of Army Sustainment Command personnel with technical support from various life-cycle management commands. Army field support battalions provide area support that is tailored to their assigned missions, mission command. Subordinate commanders might also serve as the senior Army Materiel Command logistics support advisor to a Division or Corps commander. Army field support battalion commanders are multi-tasked as deployable commanders and are also responsible for home station field and sustainment maintenance support to include, reset management. Army field support battalions can provide integrated support by reaching back to the Army field support brigade and/or national sustainment base when required. Additionally, Army field support battalions can provide additional maintenance support to deployed units by performing modification work orders on selected items of equipment and assisting with in theater reset, and left behind equipment sustainment. Distribution management teams may be utilized by Army field support battalions to perform materiel management functions as required.

2-21. When the Army field support battalion is ordered to forward deploy, a portion of the battalion remains at home station to handle Army force generation-related functions, such as below depot sustainment level maintenance management and accountability of unit maintained equipment. This ensures continuous and uninterrupted support. When deployed forward in support of Army contingency missions, Army field support battalions are attached to the Army field support brigade upon arrival at the port of debarkation and might be further attached or placed under tactical control to a designated unit for logistics support and incorporation into the local security plan.

2-22. The Army field support battalion mission areas and capabilities in garrison include re-equipping redeployed units (reset) management, unit maintained equipment management and accountability, authorized stockage list management, supply and ammunition activities, representing Army Materiel



Command as logistics advisors to division and/or corps commanders and their staffs, and providing logistics assistance representative support to active, USAR and ARNG units within an assigned area.

## **BRIGADE LOGISTICS SUPPORT TEAM**

2-23. The brigade logistics support teams are organized under a specific table of distribution and allowances based on the type of unit they support. The brigade logistics support teams normally have a major or senior warrant officer, senior logistics assistance representative as the logistics area coordinator, and logistics assistance representatives that coordinate for deployable support on brigade level issues. The brigade logistics support teams chief has direct interface with the brigade support battalion support operations office, and is responsible for the brigade logistics support team operations and personnel. There are two types of brigade logistics support teams:

- **Brigade logistics support teams for brigade combat teams and combat aviation brigades** - They are aligned with each of the active component brigade combat teams and combat aviation brigades. They are comprised of 8-11 logistics assistance representatives from the Army Sustainment Command and various life cycle management commands. The team provides support to the brigades and limited area support to other units in their geographical area.
- **Brigade logistics support teams for echelons above brigade** - A small modular team headed by the brigade logistics support team chief, aligned with the maneuver enhancement, air defense artillery, signal, theater aviation brigades and special operations force units, comprised of 8-11 logistics assistance representatives from various life cycle management commands. They provide support to these units and limited area support to other units in their geographic area.

2-24. The skill sets that make up the brigade logistics support team depend on equipment and technology densities being supported. When deployed, brigade logistics support teams are normally attached to an Army field support brigade in accordance with METT-TC. Brigade logistics support teams, with augmentation, can perform limited and short-term split-based operations. The brigade logistics support team mission areas and capabilities include but are not limited to:

- Providing logistics assistance representatives technical expertise from the appropriate Army Materiel Command organization.
- Assisting in coordinating acquisition logistics and technology assistance called forward to support their supported unit.
- Providing technical support and reach capability from their supported unit to the appropriate Army Materiel Command organization.
- Assisting the Army support brigade reception, staging, onward movement and integration cell, and supervising the accounting of and deployment assistance of personnel.

## **THEATER SUSTAINMENT COMMAND (TSC) AND EXPEDITIONARY SUSTAINMENT COMMAND (ESC)**

2-25. Unified land operations are conducted in a complex, interconnected, and increasingly global environment encompassing air, land, maritime, and space domains and the information environment. It is within this setting that the TSC commands and controls Army operational- level logistics (less medical) in support of a joint or multinational force; providing centralized mission command and decentralized execution of logistics operations throughout the theater. The TSC and its subordinate units are assigned to an Army service component command.

2-26. The mission of the TSC is to plan, prepare, rapidly deploy (as necessary), and execute operational-level sustainment (less medical) within an assigned theater. The TSC is capable of planning, controlling, and synchronizing all operational-level sustainment operations for the Army service component command or Joint Force Commander. It provides centralized logistics mission command in theater; simultaneously supporting deployment, movement, sustainment, redeployment, reconstitution.

2-27. The role of the ESC is to provide forward-based mission command of TSC logistic forces. The ESC does not represent another echelon of command but rather an extension of the TSC mission command capabilities, such as an operational command post does for the Army headquarters. It normally deploys to

the area of operations or joint operations area and provides mission command when multiple sustainment brigades are employed or when the TSC determines that a forward command presence is required. This capability provides the TSC commander with the regional focus necessary to provide effective operational-level support to Army or joint task force missions. The TSC may employ multiple ESCs within the theater.

2-28. The TSC distribution management center receives requisitions from across the theater through the Corps/Theater automated data processing support center. It determines if the requested item is available from within the theater and directs a materiel release order to the sustainment brigade capable of satisfying the requirement. If the item is not available, the distribution management center passes the requisition to the appropriate national inventory control point for fill. This application of centralized control and decentralized execution enables responsive and agile support throughout the theater, effectively minimizing customer wait time.

## **SUSTAINMENT BRIGADE**

2-29. The sustainment brigade is attached to a TSC or an ESC, if employed, and provides maintenance and class IX management and support to Army forces on an area basis. The sustainment brigade coordination requirements differ from the ESC and TSC. The sustainment brigade is the link from echelons above brigade sustainment to the brigade. Therefore the sustainment brigade must continually coordinate with the supported operational headquarters, normally division headquarters, and the supported brigades. This coordination is necessary to ensure the sustainment brigade commander and staff understand maintenance support priorities, maintenance requirements, and allocates maintenance assets properly. The sustainment brigade executes maintenance support through combat sustainment support battalions. The sustainment brigade SPO office coordinates maintenance management and support within the supported area. The SPO advises the commander on balancing maintenance support requirements with maintenance capabilities. The SPO section contains a maintenance branch that manages electronic, armament, mechanical, special purpose, and engineer equipment maintenance.

2-30. The sustainment brigade maintenance section has assigned field maintenance capability that supports headquarters equipment. For more information refer to ATP 4-93, *Sustainment Brigade*, 9 August 2013.

## **COMBAT SUSTAINMENT SUPPORT BATTALION**

2-31. The division and corps aligned combat sustainment support battalion is a modular organization that consists of a headquarters company, a multi-capable supply company, a composite truck company, and a SMC capable of providing flexible and responsive sustainment throughout the corps or division area.

2-32. The combat sustainment support battalion is the headquarters organization to which SMCs are normally attached, mission dependent. The combat sustainment support battalion oversees the SMC and directs their maintenance support efforts. The combat sustainment support battalion ensures that the SMC are properly allocated based upon supported unit density and is capable of commanding up to seven companies. The combat sustainment support battalion does not manage maintenance support to BCT but does manage supply distribution to the BSBs within the BCT.

2-33. The combat sustainment support battalion SPO office conducts maintenance and class IX management and support within its supported area. The SPO office has a maintenance manager and a maintenance control sergeant to oversee maintenance workload, requirements, and to identify systemic maintenance problems. These personnel manage electronic, armament, mechanical, special purpose, and engineer equipment maintenance.

2-34. The combat sustainment support battalion headquarters company has assigned field maintenance capability that supports combat sustainment support battalion headquarters equipment.

## **SUPPORT MAINTENANCE COMPANY (SMC)**

2-35. The SMC is a modular maintenance company that provides field maintenance support on an area basis to units at echelons above brigade. The SMC is normally attached to a combat sustainment support battalion but may be attached directly to a sustainment brigade headquarters or other headquarters element

if dictated by the situation. The SMC is structured to provide maintenance support to a wide variety of organizations and for most types of equipment. The SMC provides allied trades support; wheeled vehicle recovery; armament; wheeled vehicle; communications; electronics; special electronic devices; ground support equipment; power generation equipment; utility equipment; and test, measurement, and diagnostic equipment maintenance and quality control.

2-36. The SMC has maintenance teams that can be tasked to provide support in multiple locations. It is designed to augment the field maintenance capability of modular units operating above the brigade echelon. The SMC is not intended or designed as a source of back up maintenance support for the brigade support battalion. The SMC does not have M1 or M2/M3 system maintenance capability. The SMC receives maintenance support priorities from the combat sustainment support battalion.

## **SECTION II – BRIGADE AND BELOW MAINTENANCE ORGANIZATIONS**

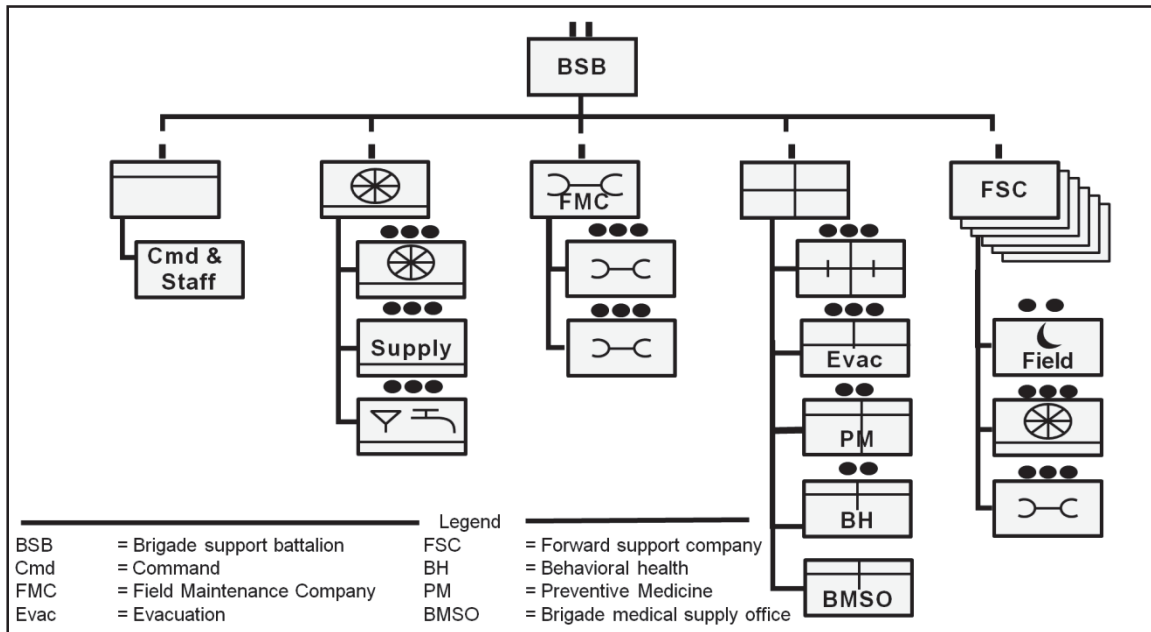
2-37. Army maintenance organizations are structured to provide a wide range of maintenance management and logistics support in order to meet operational requirements of the brigade to which they are assigned, and within the limits of their capability, to elements transiting the BSB assigned area of support that are without assigned or organic support capability.

### **BRIGADE SUPPORT BATTALION (BSB)**

2-38. Brigade support battalion (BSB) is an organic unit of the brigade combat teams (BCT) and support brigades. The BSB plans, coordinates, synchronizes, and executes logistics operations in support of brigade operations.

2-39. The BSB typically plans and executes replenishment operations in support of maneuver forces. It distributes supply classes I, II, III, IV, V, VII, VIII, and IX; provides food service and Army health system support, as well as field maintenance and recovery. It relies on the theater distribution system to synchronize the flow of throughput into the brigade's operational area. These deliberate, time-sensitive operations are conducted to replenish the forward support companies (FSC), also organic to the brigade.

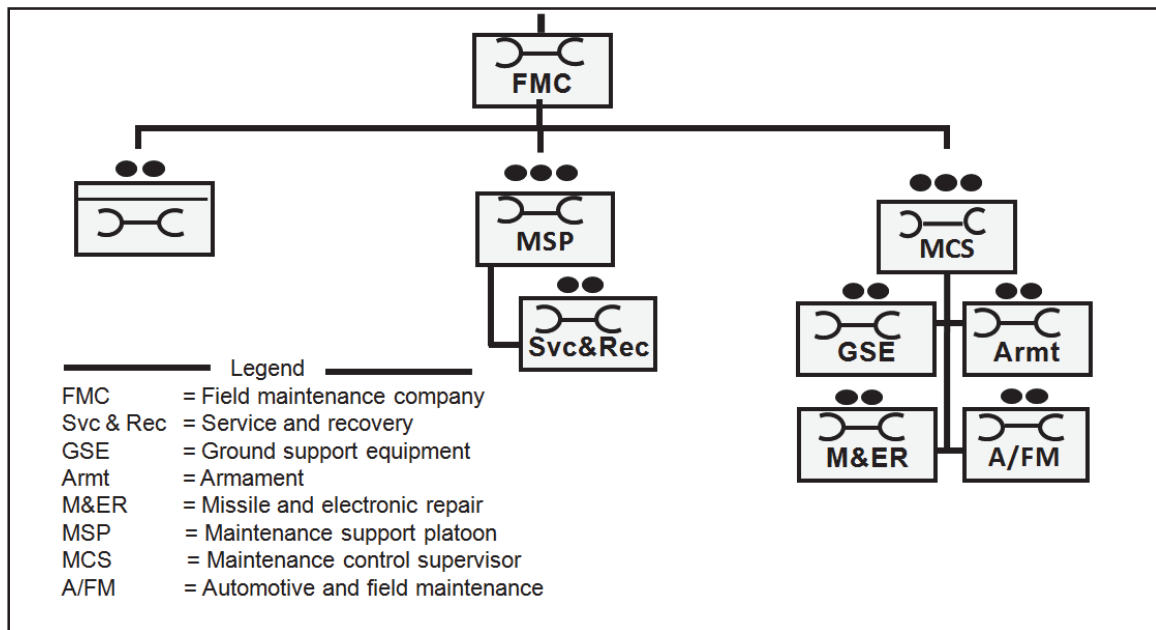
2-40. Although capabilities differ somewhat depending upon the type of brigade (e.g. Armor, Infantry, Stryker) the core capabilities include maintenance, medical, supply, and distribution. In most instances, support brigades such as the Fires brigade, battlefield surveillance brigade, maneuver enhancement brigade, combat aviation brigade, are supported by maintenance capabilities similar to those found in the BCTs, with support tailored to the appropriate brigade structure. Figure 2-1 on page 2-8 shows units typically assigned to a BSB.



**Figure 2-1. Brigade support battalion within a BCT**

## FIELD MAINTENANCE COMPANY (FMC)

2-41. The mission of the field maintenance company (FMC) is to provide field level maintenance support for units in the brigade not supported by a forward support company (FSC) and specialized low density field maintenance support to the entire brigade. The structure of the field maintenance company (FMC) is tailored to the brigade's mission. It provides automotive, armament, ground support equipment, communications and electronics maintenance support including signal assemblages, electronic missile systems repair, radar repair, allied trades support, recovery support, and maintenance management support to the BSB and provides back-up support in all areas to FSCs. It also provides support to the brigade and serves as the central entry and exit point for all equipment requiring evacuation for repair and return. It possesses limited backup capabilities in the area of automotive maintenance and recovery support, but has expanded capability in armament, electronics, allied trades, and ground support equipment section. During peacetime, the FSC field maintenance team (FMT) low density MOSs should be consolidated in the field maintenance company for efficiency, ease of training, and mentoring by the senior NCOs and warrant officers. Figure 2-2 shows units normally assigned to an FMC.



**Figure 2-2. Field maintenance company**

## FORWARD SUPPORT COMPANY (FSC)

2-42. Forward support companies (FSCs) are organic to the BSBs in brigade combat teams (BCT). The role of the FSC is to provide direct logistics support to the supported battalion. The FSCs are the link from the BSB to the supported battalions and they are the organizations that provide the brigade, battalion, and BSB commanders the greatest flexibility for providing logistics support across the brigade.

2-43. Each FSC is organized to support a specific type of maneuver battalion or squadron. FSCs provide field feeding, fuel, ammunition, field maintenance, and distribution support to a battalion. The forward support companies are structured similarly with the most significant differences in the maintenance capabilities. Figure 2-3 shows units normally assigned to a FSC.

2-44. The FSC commander is the senior logistician for the maneuver battalion. The FSC commander assists the battalion S-4 with the battalion logistics planning and is responsible for executing the logistics plan in accordance with the BSB and supported battalion commander's guidance.

2-45. The FSCs are assigned to the BSB and normally receive mission command from the BSB commander. This allows the BSB commander and the BSB support operations office to task organize the FSCs and cross-level assets amongst the FSCs when it is necessary to weight the logistics support to the brigade. The task organization of the FSCs is a collaborative, coordinated effort that involves analysis by the staffs and consensus amongst all commanders within the brigade. Since the FSCs are assigned to the BSB they depend on the BSB for administrative support, some logistic support, and technical oversight.

2-46. Depending on the current operation and situation an FSC may be attached to or placed under operational control to one of its supported battalion. The decision to establish these types of command relationships is made by the brigade commander upon the advice of the BSB commander after careful and thorough mission analysis. All commanders must understand that these types of command relationships limit the BSB commander's, and ultimately the brigade commander's, flexibility to support the brigade. FSC attachment or operational control to its supported battalion is generally limited in duration and may be for a specific mission or phase of an operation.

2-47. The FSCs normally operate in close proximity to its supported battalion. The location of the FSC is determined by the supported battalion. The distance separating the FSC and the battalion is METT-TC dependent and will vary based upon the mission, situation, and environment.

2-48. The FSC may be divided with some elements co-located with the supported battalion and some elements located in the brigade support area. For example, it may be desirable to locate the FSC field maintenance teams with the supported battalion and the remainder of the FSC in the brigade support area. This type of task organization must be determined by the FSC commander in collaboration with the BSB and maneuver battalion commanders. Figure 2-3 shows the typical structure of the forward support company.

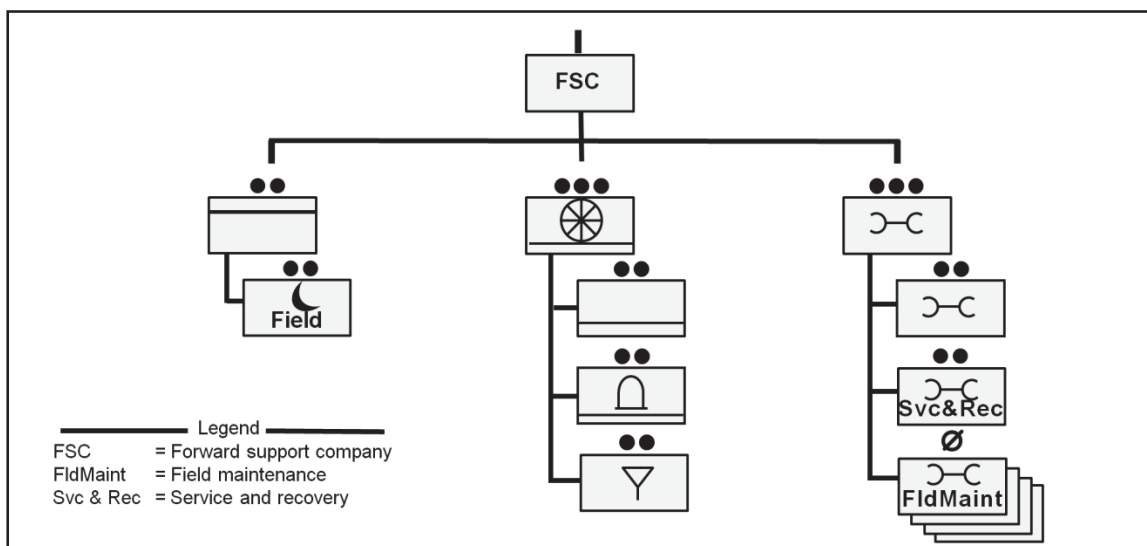


Figure 2-3. Forward support company supporting combined arms battalion

## BRIGADE SUPPORT BATTALION MEDICAL COMPANY

2-49. The brigade support medical company provides Role 1, unit level medical care, and Role 2, basic primary care, Army health system support to all BCT units operating within the brigade area of operations. The brigade support medical company's brigade medical supply office provides primary field level medical equipment maintenance for the company and may provide emergency medical equipment maintenance for the medical platoons in the BCT. Brigade medical supply office provides medical equipment reporting and oversight for all medical equipment within the brigade. Units within the BCT that do not have organic medical equipment repair capabilities will coordinate with the brigade medical supply office for field and sustainment maintenance from the medical logistics company FMTs. Field and very limited sustainment medical equipment maintenance support, including class VIII repair parts, is provided by the medical logistics company under the mission command of the medical battalion (multifunctional) external to the BCT. The brigade medical supply office will carry minimal Class VIII repair parts in support of the brigade. Class VIII repair parts will be requested from the supporting medical logistics company. All medical equipment within the brigade shall be reported to the supporting medical logistics company. The brigade medical supply office is responsible for ensuring that an accurate density list of all medical equipment in the BCT is developed, accounted for, and forwarded to the medical logistics company daily. See FM 4-02.1, *Army Medical Logistics*, for additional information on medical equipment maintenance support. (See figure 2-4 and figure 2-5)

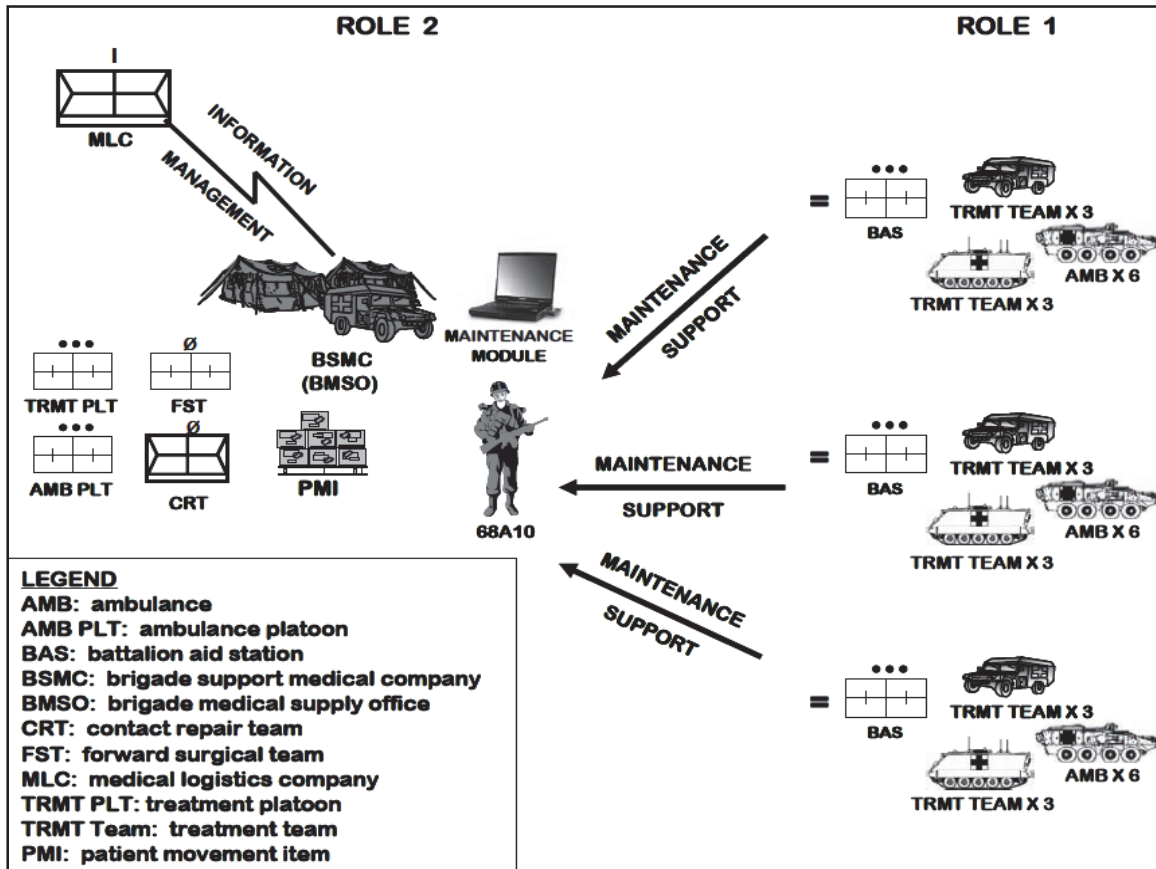


Figure 2-4. Roles 1 and 2 medical maintenance support

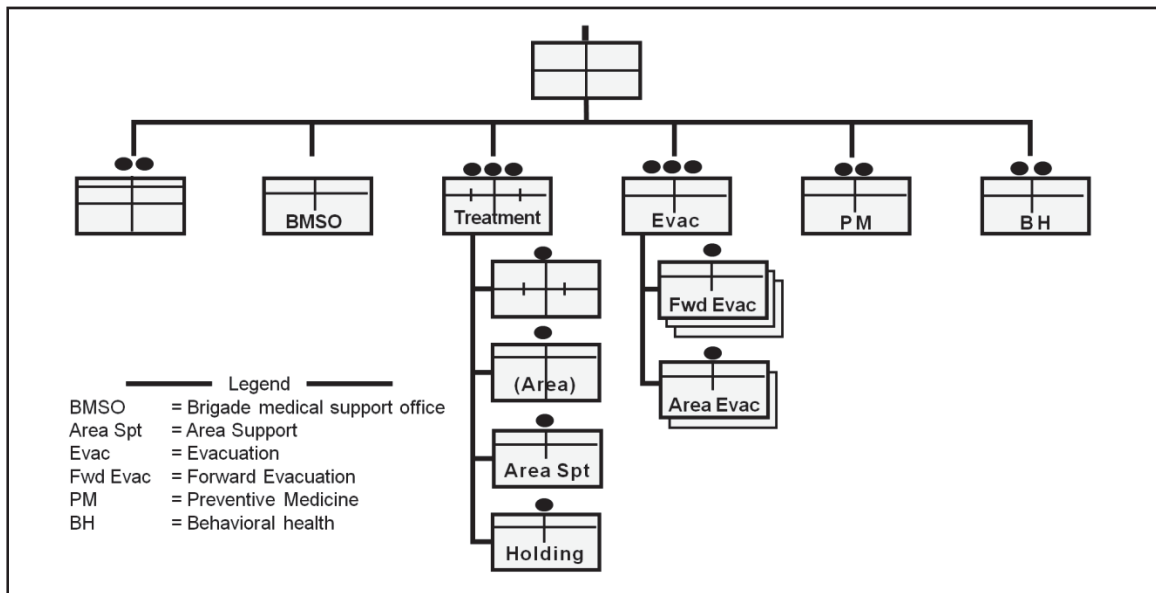
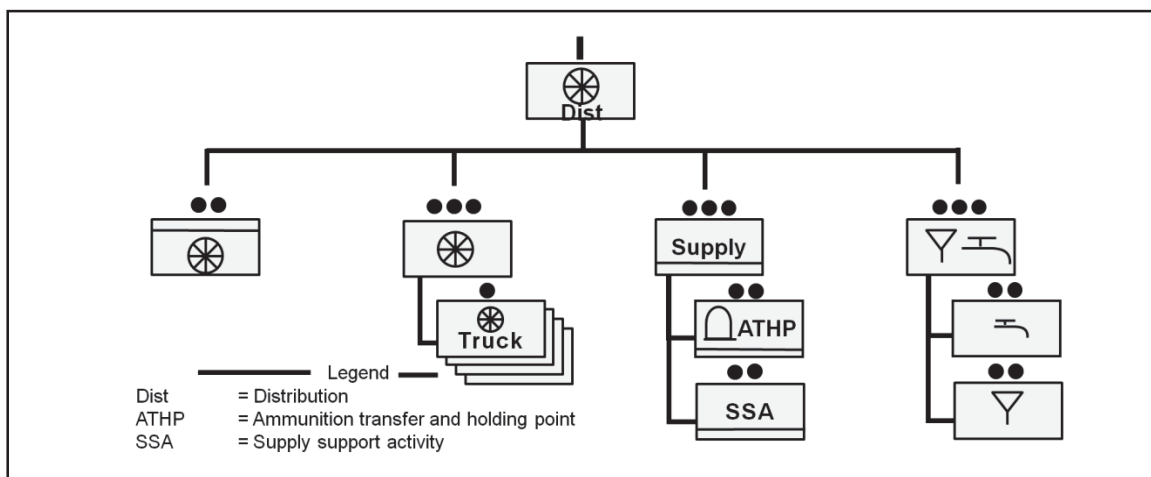


Figure 2-5. Brigade support battalion medical company

## BRIGADE SUPPORT BATTALION DISTRIBUTION COMPANY

2-50. The brigade support battalion distribution company is the primary supply and transportation hub of the BCT. The mission of the distribution company is to provide transportation, supply, Class III, and water support to the BCT. This unit is employed in the brigade support area and operates as part of the BSB with subordinate elements that operate throughout the BCT area. This unit provides the planning, direction, and supervision of supply distribution and transportation support to the BCT, daily receipt, temporary storage, and issue of Supply Classes I, II, III, IV, V and IX to the BCT. This unit also provides for the transportation of cargo for the brigade. Distribution companies are also a vital link in the retrograde of materiel. Retrograde of materiel is the return of new, reparable or salvageable materiel from the owning/using unit back through the distribution system to the source of supply, directed ship-to location and/or point of disposal. Retrograde of materiel is as important as the forward distribution of materiel. Retrograde functions include turn-in/classification, preparation, packing, transporting and shipping. To ensure these functions are properly executed, commanders enforce supply accountability and discipline, and maintain proper packing materials. (See Figure 2-6)



**Figure 2-6. Brigade support battalion distribution company**

## SUMMARY

2-51. Maintenance operations are vital to unified land operations at every echelon and in support of every operation that generates combat power. Maintenance is a key logistic function that sustains the Army's equipment. There are maintenance operations performed by Soldiers, civilians and contractors, occurring in every organization at every echelon in the Army. Maintenance operations support the Army's unified land operations through an integrated and synchronized multi-level sustainment structure.



## Chapter 3

# Maintenance Support Operations

Unified land operations require continuous, simultaneous combinations of offense, defense, and stability or defense support of civil authorities (DSCA) tasks. Planning for maintenance support during these operations require thorough mission analysis, careful identification of the force supported, and an understanding of the commander's intent. This chapter discusses the nature and conduct of maintenance-related activities that depend on the operational environment associated with either contiguous or non-contiguous battlefield.

### SECTION I – SUPPORT CONSIDERATIONS

3-1. Maintenance is one of the logistics 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.

#### OFFENSE

3-2. The maneuver brigade conducts, or participates in, movements to contact, attacks, exploitations, and pursuits. If offensive momentum is not maintained, the enemy may recover from the shock of the first assault, gain the initiative, and mount a successful counterattack. The change from one type of operation to another, such as from a hasty attack to a pursuit, does not require a major shift in logistics plans and procedures. However, the priorities and requirements for support may change.

3-3. The maneuver brigade provides information to the sustainment brigade on the locations of all maintenance elements operating in their operating environment. The brigade S-4 along with the BSB commander provides the link between the sustainment brigade and the supported brigade. It is crucial to know what, when, and where supplies are needed. Because of the fast pace of offensive operations and communications limitations it requires extended effort to make it work effectively.

#### PLANNING FOR MAINTENANCE OPERATIONS-OFFENSE

3-4. Planners ensure maintenance operations support momentum and massing at critical points. Operators, crews and 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 as possible.

3-5. Planning considerations for maintenance support in offensive operations include rapid repair and return of not-mission capable equipment to support the operation and establishment of command maintenance priorities. Other planning tasks include:

- Identify maintenance collection points.
- Establish criteria for requesting additional recovery assets.
- Consider the feasibility of splitting recovery assets to provide broader coverage for attacking companies.
- Identify critical combat spares and have them ready to move forward on short notice.

- Ensure rapid repair and return of not-mission capable equipment to support the operation.

### **Anticipate Requirements**

3-6. Anticipate increased consumption of class III (B) and class IX due to substantial maneuver. Offensive operations place a heavy requirement on BCT transportation assets. Offensive operations also increase equipment maintenance requirements and impact sustainment information system connectivity.

### **Class IX And Maintenance Support**

3-7. The commander establishes his maintenance priorities based on what systems and units are critical to the success of the operation. The FSC or FMC sends maintenance teams forward to support combat units as close to the battle as possible. The maintenance teams must have the necessary transportation, communications assets, tools, and repair parts to ensure rapid return of not-mission capable equipment to support the operation. When necessary and feasible, use air transportation to bring critical repair parts forward. Reliable sustainment information system connectivity must be maintained in order to rapidly replenish supplies and share maintenance information. When standard maintenance repairs are not practical, based on urgent situations, approved battle damage repairs may be applied following the battle damage assessment and repair process.

### **Anticipate Requirements**

3-8. The support operations officer along with the brigade S-4 are responsible for integrating resupply operations, locations, and routes into the scheme of maneuver to ensure proper timing to avoid interfering with likely or planned maneuver actions.

### **MOVEMENT TO CONTACT**

3-9. During the preparation phase of movement to contact, there is a major logistics effort. Maintenance personnel place maximum effort on preparing equipment for combat. The maintenance assets move closely behind the combat unit's main body to insure rapid recovery, repair, and return of damaged and/or disabled equipment. The maintenance assets position in the march column is selected to support the combat units while being protected from enemy fire.

### **ATTACK**

3-10. The attack is quick and violent. The FSC commander monitors the tactical situation to support the attack. The FSC commander informs the S-3 and S-4 of specific field maintenance point locations.

3-11. During the attack, the maintenance teams are forward with the maneuver companies. On-site maintenance support and recovery operations are accomplished with high risk due to the rapid advances of the combat forces. Maintenance activities during this phase concentrate on recovery and BDAR. After the attack, the FSC commander coordinates maintenance requirements with the Battalion XO and S-4. They discuss the current situation, priority of effort, and plans for the next operation.

### **EXPLOITATION AND PURSUIT**

3-12. The maneuver brigade covers a large area during the exploitation and pursuit phase. Combat units strike at objectives deep in the enemy's noncontiguous operating environment (rear) while keeping pressure on retreating enemy forces. Mission command and communications are extremely difficult. Maintenance teams will perform on-site repairs. Equipment that cannot be repaired on-site is recovered to the combat trains or to the brigade support area (BSA) whichever location can best complete the required maintenance.

### **DEFENSE**

3-13. Brigade defensive operations break the momentum of the enemy's attack while posturing to shift to the offense with little notice. The brigade conducts a static defense or varying degrees of a more mobile

dynamic defense against a variety of threats and in differing terrain. The tactical mobility of the BCT makes it well suited for the dynamic defense.

3-14. During the preparation of the defense, priority of protection goes to those units preparing positions and obstacles. Once the positions are prepared, priority shifts to protection of the reserve, BSA/trains and command post locations. Maintenance considerations for defensive operations include: planning to reorganize to replace lost maintenance capability, use maintenance teams well forward at maintenance collection points, plan to displace often, and emphasize recovery and retrograde of equipment that require extended repair time.

3-15. The FSC's field maintenance platoon takes all required steps to place as many weapon systems as possible in serviceable condition. Operators, crews, and field maintenance teams (FMT) perform any necessary repairs authorized at their level of repair. Once defensive operations begin the principles are the same as for the offense.

## **STABILITY OPERATIONS**

3-16. 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 civilian assistance missions to major peace enforcement missions. Because the logistic requirements in stability operations vary widely, mission analysis determines the proper maintenance capabilities required. Maintenance assets are allocated based on those requirements.

3-17. The key to success with stability 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 stability operations, the U.S. military will be assisting non-governmental organizations in providing the required level of support to the affected population. Multi-national support, host nation support, and support from non-governmental organizations may increase the demands on transportation, medical, food, water, and housing.

3-18. Host-nation support, contracting, and local purchase are force multipliers in many of these operations. Situations that lack optimal sustaining capabilities may require using other methods that augment or replace existing logistic capability. Contracting personnel should support or travel with the lead elements of Army forces if feasible. Nonstandard logistics may be employed for supply classes (such as I, II, III, IV, and IX), maintenance, repair, forklift support, fixed facilities, and mobile communications.

## **PEACEKEEPING**

3-19. When planning maintenance support during peace operations, logisticians must take into consideration factors such as hostile environment, joint or multi-national chain of command, support to multi-national forces, risk assessment, security of maintenance operations, and environmental impact.

3-20. Peacekeeping operations are most often conducted as part of a multi-national coalition. This presents new challenges for all commanders who could potentially support host nation's military, coalition force and commercial equipment. Beyond some of the special considerations noted here, much of the maintenance support for peacekeeping will not differ substantially from normal maintenance operations.

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*Note.* FM 3-07.31 covers the full range of peace operations (including peacemaking, peacekeeping, peace enforcement, preventive diplomacy, and peace building).

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## **HOSTILE ENVIRONMENT**

3-21. National policy may require the Army, either singularly or as part of a joint or multi-national Task Force, to conduct peace operations in politically sensitive areas of the world. At such times, regional combatants may disregard the peace initiative and continue sporadic or repeated armed struggle. Commanders must anticipate this and be prepared to provide maintenance support in hostile, potentially life-threatening situations.

### **LACK OF HOST NATION SUPPORT**

3-22. Since friendly forces must operate in hazardous and politically sensitive areas, commanders should never assume availability of dedicated host nation support during peace operations. Instead, they must plan for maintenance support using organic resources.

### **MULTI-NATIONAL SUPPORT**

3-23. Since the Army frequently conducts peace operations with other nations, maintenance managers 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 headquarters ensures logistics planners deliver timely maintenance support to customer units.

3-24. Maintenance managers must anticipate support to all friendly forces. To accomplish that task, they must contact higher headquarters as well as known supported 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.

### **DEFENSE SUPPORT OF CIVIL AUTHORITIES**

3-25. Defense support of civil authorities includes tasks that address the consequences of natural or man-made disasters, accidents, terrorist attacks, and incidents in the United States and its territories. Army forces conduct defense support of civil authorities' tasks in support of homeland defense only after civil authorities have requested assistance and the Secretary of Defense has authorized it. This is typically only when the size and scope of events exceed the capabilities or capacities of domestic civilian agencies. Defense support of civil authorities' actions is always subordinate to civilian authority control.

### **FOREIGN HUMANITARIAN ASSISTANCE**

3-26. 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.

3-27. Since humanitarian missions are conducted in either friendly or hostile environments, logistics planners must consider the situation and locate maintenance operations away from dense population centers. Planners must also identify maintenance sites that units can easily secure and defend, establish and secure lines of communication, coordinate with engineer support, enclose maintenance operations areas, establish entrance and exit control points, maintain responsive 24-hour perimeter security, and consider the impact on the environment.

### **DISASTER RELIEF**

3-28. In disaster relief operations, maintenance and logistics planners need to identify commercial vendors who can quickly supply the technical and repair parts support required and organize assets from other agencies, contractors, and local maintenance resources for economy of effort.

3-29. Planners must evaluate and prioritize repair of equipment for infrastructure, firefighting, law enforcement, medical, construction, power generation, organic, and equipment belonging to other military elements involved in the operation.

## **SECTION II – CONCEPT OF SUPPORT FOR ECHELONS ABOVE BRIGADE MAINTENANCE OPERATIONS**

3-30. Echelons above brigade maintenance support is provided through a combination of modular support units (sustainment brigades, combat sustainment support battalions, and SMCs), as well as forward repair

activities of the Army Materiel Command. These units are dependent upon the size and scope of overall TSC logistics operations.

3-31. The TSC provides centralized control and management of maintenance operations through the support operations section. The TSC maintenance operations provide the following:

- Field maintenance support to units on an area basis.
- Sustainment maintenance support to the theater by repairing end items, modules, assemblies, and components retrograded for repair and return to the supply system, under the direction of Army Materiel Command National Maintenance Manager.
- The distribution management center and materiel readiness branch of the TSC support operations section plans and manages maintenance support for the TSC. They establish policy, plans, and procedures for all theater maintenance support programs.

3-32. Maintenance information management at the TSC is accomplished through the retrieval of data from the Global Command Support System–Army (GCSS-Army), sustainment information systems, Sustainment System Mission Command and logistics information warehouse. This provides a theater maintenance database for the commander.

3-33. Sustainment brigades are the operational arm for the TSC composed of functional and multifunctional units. Sustainment brigades provide maintenance support to units in its area through the SMCs of the combat sustainment support battalions.

3-34. The sustainment brigade support operations materiel management section provides management of maintenance operations within the area of responsibility. The support operations office retrieves data from their sustainment information systems. Maintenance operations provide field maintenance to units and troops in its assigned area and backup support to the BCTs and other brigades.

## **COMBAT SUSTAINMENT SUPPORT BATTALION**

3-35. The combat sustainment support battalion is task organized to provide logistics support to brigade combat teams and support brigades. ATP 4-93, *Sustainment Brigade*, has more information about the combat sustainment support battalions. The combat sustainment support battalion provides the following capabilities in support of the brigade combat teams and support brigades:

- Ammunition lift platoons or modular ammunition companies assigned to the battalion operate an ammunition supply area or point which provides for the receipt, storage, issue, and reconfiguration of ammunition items.
- Transportation elements provide mobility of personnel and distribution of all classes of supplies. At the tactical level, the combat sustainment support battalion's transportation assets provide distribution capacity from the combat sustainment support battalion area to the brigade support battalion.
- A multi-capable supply company provides water purification and bulk fuel storage, capabilities no longer available within the BSB.
- A support maintenance companies may be requested to provide support for certain low-density commodities such as communications, electronics, and armament.
- Supply and services provide all classes of supplies and field service operations for personnel assigned to or transiting through the area of operations. Field services include clothing exchange, laundry and shower support, textile repair, rigger units, and mortuary affairs support.

## **LOCATION**

3-36. The combat sustainment support battalion normally operates from multiple locations within its assigned area of operations. The headquarters and headquarters company is located where it can best conduct mission command of its subordinate units. Factors affecting the position of units include the tactical situation, road network, availability of suitable terrain for force sustainment, security requirements, and location of other support activities.

## **BATTALION HEADQUARTERS**

3-37. The support operations section of the battalion headquarters keeps track of logistics issues of supported units through reports, visits, liaison, and briefings. The battalion headquarters must stay alert to potential mission changes and inform subordinate units of changes to instructions governing operations. It also performs maintenance management and staff supervision to ensure adherence to established policies.

## **SUPPORT MAINTENANCE COMPANY**

3-38. The support maintenance company provides field maintenance and technical assistance support to units at echelons above brigade on an area basis. Based on support maintenance company mission, it provides field maintenance teams, communications, electronics, small arms, radar, missile, welding, fabrication, recovery assistance to units within its area.

### **On-site Maintenance**

3-39. The support maintenance company can provide on-site maintenance upon request. This service is provided with the dispatch of properly manned and equipped maintenance support teams to a supported field maintenance collection point or to the site of equipment failure. All company elements provide personnel for on-site maintenance as directed by the maintenance control section and coordinated through the combat sustainment support battalion.

3-40. Maintenance support team NCOICs serve as technical inspectors to inspect and diagnose faults. They schedule equipment for repair, depending on workload, parts availability, the priority of the requesting unit, and the priority of the specific equipment to support current operations.

### **Records and Reports**

3-41. The company operates the SAMS-1E to manage maintenance and transmit data to the combat sustainment support battalion SPO. The combat sustainment support battalion support operations office transmits SAMS-2E data to the logistics information warehouse. The integrated logistics analysis program pulls the file from each individual SAMS-2E. The sustainment brigade's support operations office has visibility of maintenance operations by accessing the logistics information warehouse portal.

### **Workload**

3-42. Items repaired by the support maintenance company are returned to the supported units or the supported maintenance unit.

### **Liaison Visits**

3-43. The combat sustainment support battalion support operations office, 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 SMC commander makes additional visits to supported units to maintain good working relationships.

### **Technical Assistance**

3-44. Technical assistance is providing technical instruction and guidance to enable supported units to perform their mission more efficiently. Technical assistance may be provided formally by the Army Materiel Command Logistics Assistance Program maintenance assistance and instruction teams. The SMC commander may also provide assistance informally. Technical assistance includes visits by technical assistance teams made up of subject matter experts.

3-45. The assistance team's functions include determining the nature and scope of maintenance support required so that a properly manned and equipped maintenance support team can be sent to provide on-site maintenance. It discusses and resolves mutual maintenance support issues regarding personnel, equipment, or operational procedures and policies. They also provide assistance to the unit commander with the

evaluation of equipment condition, the effectiveness of the maintenance program, and develop remedial action to correct deficiencies.

### **Maintenance Check Points**

3-46. Field-level maintenance support can be set up at refuel points, rest stops, or attached to a convoy support center along heavily traveled routes. This is a practical method of providing efficient, roadside maintenance service. This element may consist of four to six mechanics equipped with a vehicle and cargo trailer carrying small, easily replaceable repair parts and BDAR kits.

3-47. While vehicles are being refueled, the maintenance element can assist the operator/crew in verifying preventative maintenance checks and services of their vehicles. Minor deficiencies/shortcomings can be corrected on the spot with available tools, repair parts, and BDAR techniques. Shortcomings that do not render the vehicle not mission-capable will be annotated on automated DA Form 5988-E (Equipment Inspection and Maintenance Worksheet) or manual DA Form 2404 (Equipment Inspection and Maintenance Worksheet). This form is given to the vehicle driver for action upon return to the unit.

## **SECTION III – CONCEPT OF SUPPORT FOR BRIGADE AND BELOW MAINTENANCE OPERATIONS**

3-48. Maintenance organizations provide a wide range of support to generate and maintain combat power to support combatant commander's mission accomplishment. This is accomplished through the functions of maintenance management and support operations, which provide critical aspects of logistics. Commanders, maintenance managers, and Soldiers must understand the sustainment warfighting function and how it enables operations.

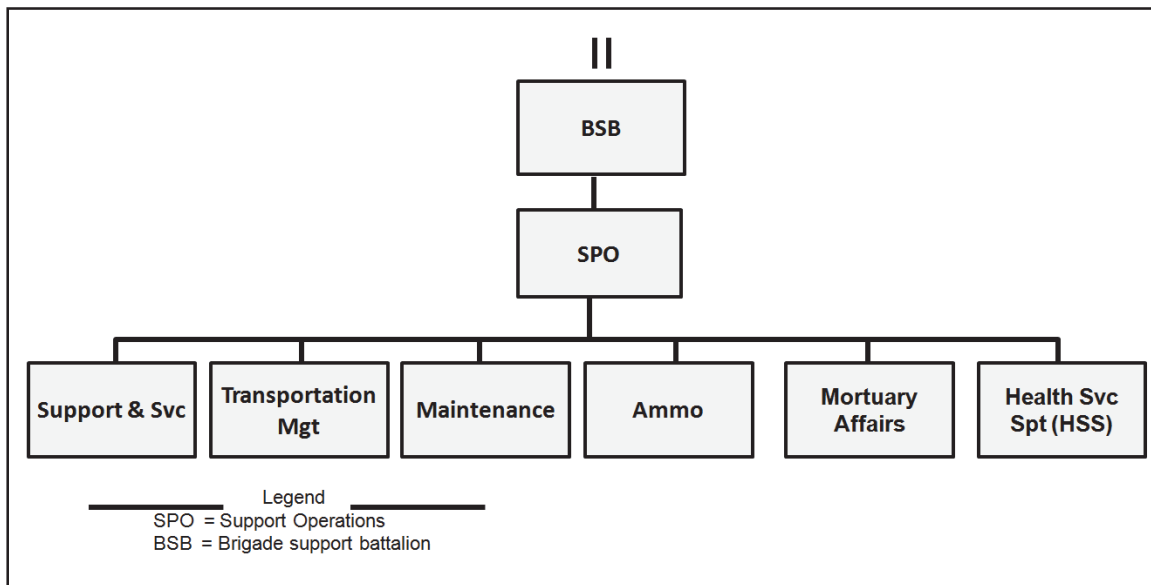
### **BRIGADE SUPPORT BATTALION**

3-49. The BSB commander is the senior logistician, logistics operator, and advisor for support to the BCT. The BSB may function in a highly dispersed manner, with some BSB elements close (in contiguous operating environment) to the maneuver units they support and others near or within the BSA. The BSB staff monitors and manages logistic operations through on-site supervision, recurring reports, and an array of digital information systems and other technological innovations.

3-50. The logistics structure of the BCT links to the TSC. The direct linkage between the BSB and the TSC remains in effect, even when the BCT is attached to a different division. When the brigade is attached to a division, the G-4 coordinates logistics priorities for the entire division. The BSB sends status reports to the brigade S-4 to keep the G-4 informed of the logistics situation. Because the attachment of BCTs to divisions is not permanent, logistics arrangements do not hinder the eventual detachment of the BCT from the division. Logistics augmentation required by the BCT is requested from the BSB SPO to the sustainment brigade's SPO.

### **SUPPORT OPERATIONS SECTION**

3-51. The support operations (SPO) section provides planning, preparation, and oversight of logistics and army health service support tasks during the execution BSB operations in the brigade's AO. The BSB SPO tracks the common operating picture for logistics within each formation and throughout the BCT to ensure timely delivery of required support at the decisive place and time. The SPO coordinates support for all units assigned or attached to the brigade. The SPO section works closely with the BSB S-3, brigade combat team S-4 and supported battalion S-4s to coordinate future support requirements and locations with supported units. The SPO's functions are generally include; transportation, maintenance, ammunition, mortuary affairs, health services support (except fires, battlefield surveillance brigade, and maneuver enhancement brigade), and distribution operations. Stryker brigade SPOs have an operations officer who provides direct oversight of the materiel management section in order to manage all classes of supply, less class VIII. (see figure 3-1 on page 3-8)



**Figure 3-1. Brigade support battalion SPO section**

3-52. The SPO possesses the situational ability to view combat power in the maneuver units. This allows the section to identify problems quicker, anticipate requirements, and allocate resources more efficiently. Sustainment System Mission Command provides the section the visibility of the logistics status from the BSB to echelons above brigade. This staff section serves as the point of contact for supported units. The duties and responsibilities of the SPO include the following:

- Conduct continuous logistics preparation of the battlefield.
- Submit logistics forecasts to external SPO/distribution elements.
- Coordinate and provide technical supervision for the BSB logistics mission including: supply activities, maintenance support and coordination of transportation assets.
- Coordinate logistics for units passing through the brigade area of operations.
- Develop maintenance support standing operating procedures.
- Monitor daily battle loss reports to anticipate future requirements.
- Recommend maintenance priorities to the BCT S-4.

3-53. The maintenance management personnel provide maintenance oversight of the FMC and FSC maintenance sections. They ensure integrated, automated maintenance management for combat vehicles, automotive, ground support equipment, communications electronics equipment and missile equipment. The maintenance management personnel also plan and forecast maintenance and related material requirements based on future operational plans and coordinate the disposal of enemy equipment. The duties and responsibilities of the maintenance management personnel include:

- Work directly with the brigade logistics support team for logistics assistance representative support.
- Coordinate external maintenance and recovery support when required.
- Recommend changes to maintenance support to facilitate the combatant commander's objectives.
- Coordinate FSR support as required or forecasted.
- Monitor brigade' Army materiel status system report and unit status reporting equipment readiness levels.
- Provide a common operational picture for use by the BSB Commander and Combatant Commander to make informed decisions.



3-54. The support operations office must collaborate with the S-1, S-2, S-3, S-4, and S6 to establish and manage the Sustainment System Mission Command network and database. The SPO must maintain supply point and maintenance data entered into the system. Specific Sustainment System Mission Command tasks for the SPO are:

- Set message handling tables to correctly route supply logistics messages.
- Set status thresholds for supply point items.
- Establish reporting times for subordinate field support units.
- Set support relationships to reflect which supply points support which units.
- Establish and set continuity operations pairing in accordance with guidance from the supporting G-4.

## **MAINTENANCE OPERATIONS**

3-55. The FMC provides field maintenance to units and equipment of the brigade not supported by an FSC. The FSC provides field maintenance and supply to its supported battalion or task force. The maintenance platoon can function consolidated or split based depending on METT-TC. The FMT from the FSC provides dedicated field maintenance and recovery capability to the supported companies.

## **LATERAL SUPPORT REQUEST**

3-56. The brigade combat team was designed to be lethal, mobile, and agile, thus it was given the necessary capabilities for self-sustainment during operations. At the BCT level, field maintenance organizations can access each other capabilities through the use of a lateral support request. The BCT has all the necessary field maintenance capabilities to support every commodity it employs. These field maintenance capabilities are found within the field maintenance platoon of the FSC and the FMC. By force design structure, the FMC has expanded capabilities for all common specialty sections (Automotive, Armament, Communications, Ground Support Equipment, Radar Repair, Electronics Repair, and Service and Recovery); the Missile support team is only authorized in the FMC when the supported units have missile equipment. These additional capabilities are aimed at supporting low density and specialized equipment maintenance within the BCT. The consolidation and management of common specialty capabilities in a central location enables the leveraging of low density resources. In peacetime, FSC field maintenance team low density military occupational specialties should be consolidated in the field maintenance company for efficiency, ease of training, and mentoring by the senior NCOs and warrant officers.

## **LOGISTICS SUPPORT TO THE BCT**

3-57. Accurately reporting the logistics status is essential to keeping units combat ready. Standing operating procedures should establish report formats, reporting times, and systems used within the command. The systems used may vary based upon availability and communications support but the types of information provided should be standardized across the command.

## **SECTION IV – CLASS IX REPLENISHMENT OPERATIONS AND TECHNIQUES**

3-58. Class IX replenishment operations are preplanned sustaining operations that allow combat forces to replenish routinely. A replenishment operation is a deliberate, time sensitive logistics operation. It can be conducted by the BSB to replenish its FSCs and by the FSC to replenish the combat loads of individual Soldiers and weapons platforms. These operations, which may be augmented with assets from the sustainment brigade, are quick and in-stride with the supported commander's battle rhythm. The purpose of replenishment operation is to replace stocks within a BCT or support brigade. This replacement may be either deliberate or hasty depending on circumstances. Typical logistic activities that take place include rearming, refueling, and fixing to meet immediate needs.

3-59. The most efficient re-supply of Class IX for tactical units is accomplished by logistics packages. Logistics packages are organized by the company supply sergeant under the supervision of the FSC commander and the distribution platoon leader; the headquarters company executive officer may be

directed to assist with this supervision based on METT-TC decisions by the battalion executive or commander. Logistics packages are organized for each company/separate element in the battalion on a replenishment cycle as determined by the needs of the units. Logistics packages are organized and dispatched as required by the tactical situation and logistical demands. The S-4 must plan and coordinate logistics operations to ensure they fully support the commander's tactical plans. The battalion's standing operating procedure establishes the standard logistics package and how the logistics mission is executed.

3-60. A combined arms battalion, fires battalion, reconnaissance squadron, or infantry battalion may echelon trains by locating the field trains with the BSB in the brigade support area and positioning the combat trains centrally within the maneuver/fires battalion assembly areas. However, when METT-TC conditions dictate such a minimal risk and the desire is to have the FSC closer (in contiguous) to its supported unit, the brigade does not form a brigade support area with unit field trains. In this case, the maneuver battalion establishes unit trains in the center of its assembly area. This technique is more efficient and extends the supported battalion's reach, since the modular BSB is designed to push replenishment to the supported battalion's FSC with distribution company assets.

## MAINTENANCE COLLECTION POINT

3-61. The *maintenance collection point* is a temporary location established within the battalion echelon for the collection of equipment needing or undergoing field maintenance. The purpose is to provide a static location for conducting field maintenance which allows the battalion unhindered movement during an operation. Once maintenance is complete the equipment rejoins the owning unit as rapidly as possible. The FSC commander must coordinate with the battalion S-4 for site selection. The maintenance collection point should be located in an area that facilitates effective radio communication with the FMTs and the owning unit. Consider METT-TC when selecting the site location, but generally locate the maintenance collection point as far to the rear as communications allows during defensive operations and as far forward as possible during offensive operations.

## FIELD SITE SELECTION AND LAYOUT

3-62. In a maintenance operation, the objective of a good layout is to facilitate the flow of work through the shop and to reduce movement of repair parts, tools, equipment, and personnel. Field environments seldom permit a unit to operate under ideal conditions. The layout must be defensible and consider METT-TC. Figure 3-2 shows an example of a typical maintenance company field site layout.

### SITE SELECTION

3-63. When selecting a field site for maintenance operations consider an area that is reasonably flat with good drainage, firm enough to permit parking and movement of heavy vehicles and equipment, and easily accessible to supported units.

3-64. Any terrain features in the area that facilitate unit defense must be considered in planning. Streams or marshes can provide flanking security. Hills can provide observation and facilitate fire on avenues of approach. Built-up areas inherently enhance mission support capabilities but may present a challenge for defending.

### LAYOUT

3-65. The following are the principles to consider when laying out an area: location, work sections within ready access to the external road network, supply storage areas close to a road to permit easy access for trucks, easy access of all maintenance shops, and recovery elements in the vicinity to facilitate support and movement of vehicles.

3-66. The maintenance control section and shop supply should be near the entrance to the company area. Ensure maintenance areas provide vehicle dispersion and that the area is capable of being defended, using the terrain's natural defense characteristics to augment the defense plan and unit capabilities.

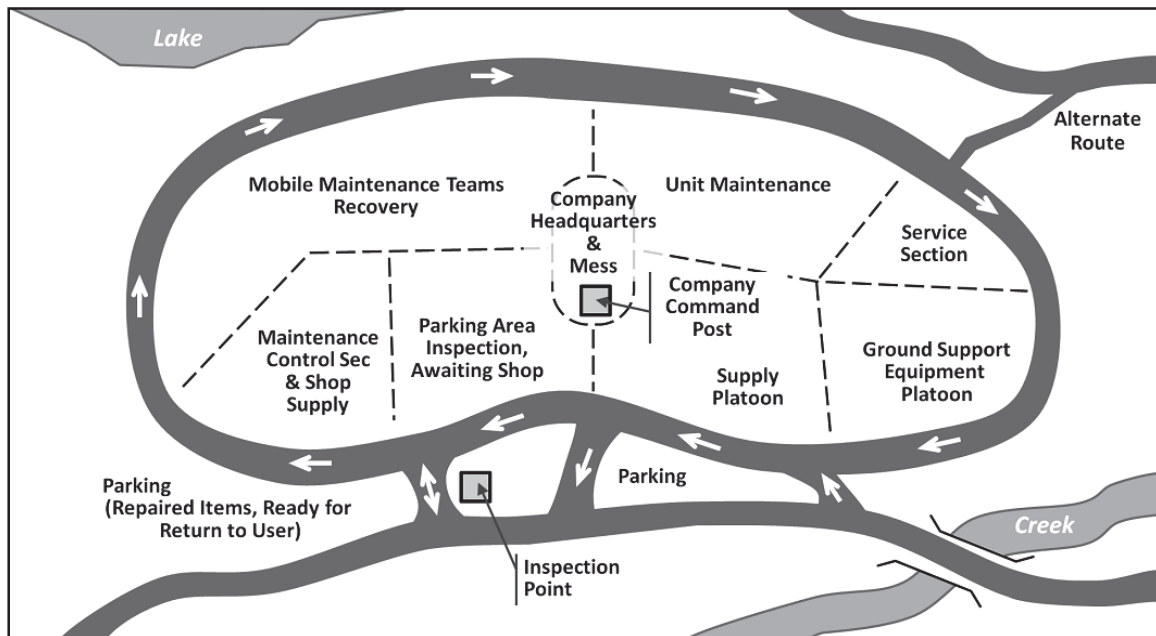


Figure 3-2. Maintenance company field site layout

## SECTION V – RECOVERY OPERATIONS

3-67. Recovery is the process of repairing, retrieving/freeing immobile, inoperative, materiel from the point where it was disabled or abandoned. Recovery prevents enemy capture of equipment and uses enemy equipment to support the United States and friendly forces intelligence collection. Damaged and inoperative equipment on the battlefield can strain dedicated recovery resources. To effectively support battlefield recovery operations, dedicated recovery assets should be strategically placed for optimum support of the operating environment. Commanders must emphasize the use of self and like vehicle recovery methods to the greatest extent possible. These practices will minimize the use of dedicated recovery assets for routine recovery missions. Recovery managers and supervisors must ensure recovery vehicles are used only when absolutely necessary. Dedicated recovery vehicles must be returned as quickly as possible to a central location to support the unit. In addition to its recovery mission, this equipment is often used for the heavy lifting required in maintenance operations. Recovery managers and supervisors must use all available resources carefully to provide sustained support.

### RESPONSIBILITY

3-68. The FSC has recovery assets located in the recovery section and field maintenance teams within the field maintenance platoon. The FSC commander along with the maintenance technician and the battalion S-4 track and manage recovery operations.

3-69. Field maintenance companies are responsible for recovering their own organic equipment and provide limited backup support with wreckers or tracked recovery vehicles when requirements exceed a supported unit's capability. They may also be tasked to provide recovery support on an area basis to units without a recovery capability.

### MANAGEMENT

3-70. The FSC commander, the maintenance technician, and supported battalion S-4 coordinate recovery operations supporting the commander's priorities by balancing the overall repair effort, available resources, and the tactical situation. The goal is timely return of equipment to operation with the least expenditure of

resources. The general principles that apply to the management of recovery operations are: manage, coordinate, equipment, location, and prioritize.

3-71. Centralized management and synchronization of recovery operations at the battalion level whenever possible. This does not preclude delegation of recovery authority for specific operations to the BSB.

3-72. Recovery operations should be coordinated with the maintenance effort and commander’s priorities. Maintenance personnel repair equipment as far forward as possible within the limits of the tactical situation based on the amount of damage and available resources. Use maintenance time guidelines established by the commander to make repair-or-recovery decisions.

3-73. Use the right recovery equipment for the recovery mission. In general, wheel recovery systems should recover wheel; and track recovery systems should be used to recover track. However, wheel recovery vehicles may flat tow track vehicles that are under their weight, but any track flat-tow recovery of wheel vehicles should be avoided due to potential damage to wheel vehicle’s front steering components largely due to track vehicles pivot turn. When a unit has only limited assets, it is very critical to select the right recovery vehicle for the mission.

3-74. Keep recovery vehicles as far forward as the tactical situation permits. This keeps them available for immediate response as needed. The FSC Commander and the S-4 coordinate recovery and retrograde requirements and may request additional support from the BSB SPO.

3-75. 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 affects the priority when two or more like items must be recovered. As a general rule, always recover weapons systems before tactical vehicles.

**PROCEDURES**

3-76. There are four steps in equipment recovery. Table 3-1 outlines the steps for equipment recovery.

**Table 3-1. Equipment recovery steps**

<b>Action</b>
When the equipment operator and crew detect an inoperable condition, they should: <ul style="list-style-type: none"> <li>• Assess the damage and cause of the inoperable status.</li> <li>• Initiate action based on their analysis and the tactical situation.</li> </ul>
Operator/crew/field maintenance personnel use organic repair and recovery capability, including: <ul style="list-style-type: none"> <li>• BDAR techniques.</li> <li>• Self-like-vehicle recovery.</li> <li>• Assistance from other units on-site when unit-level recovery resources are insufficient or unavailable.</li> </ul>
Unit requests assistance from the FSC located in the BSA. requests must provide the following information: <ul style="list-style-type: none"> <li>• Unit identification.</li> <li>• Equipment identification.</li> <li>• Location (map coordinates, when possible).</li> <li>• Equipment fault.</li> <li>• Evaluation of on-site repair capability.</li> <li>• Repair parts required.</li> <li>• Organic recovery capability.</li> <li>• Tactical situation and security requirements.</li> <li>• Recommended route of approach.</li> <li>• Until equipment is recovered, the operator/crew must remain with the equipment and follow unit SOPs.</li> </ul>
Once the operator and crew initiate recovery procedures, they should: <ul style="list-style-type: none"> <li>• Take cover.</li> </ul>

**Table 3-1. Equipment recovery steps**

<b>Action</b>
<ul style="list-style-type: none"> <li>• Provide local security.</li> <li>• Wait for assistance.</li> <li>• Assist maintenance/recovery personnel on their arrival with the recovery action</li> </ul> <p style="text-align: center;">-----LEGEND-----</p> <p>BDAR = battle damage assessments and repair.  FSC = forward support company.  BSA = brigade support area.  SOP = standard operating procedures.</p>

## REPAIR AND RECOVERY CONSIDERATIONS

3-77. The key unit personnel responsible for developing the units repair and recovery plan are the BN S-4, the unit's maintenance technician, and FSC Commander. They develop a plan of action for repair and recovery of the disabled equipment based on the request for assistance.

3-78. Action Plan. The battalion S-4 and FSC Commander with the assistance of the maintenance technician develop an action plan that includes battle damage assessment; establish priority for support, tactical situation, workload, and availability of maintenance and recovery personnel.

3-79. The FSC Commander assigns the repair/recovery mission to the field maintenance platoon. At a minimum the field maintenance platoon's checklist will contain the following information: breakdown location/grid coordinates, cause of the breakdown, specific designation of required support (such as personnel by rank, military occupational specialty, equipment and quantity), and supply requirements (class I, III, V and IX).

3-80. The tactical situation should address movement restrictions, primary and alternate routes of march, individual clothing, equipment and Chemical, Biological, Radiological, Nuclear, and High-yield Explosive defense items, equipment and supplies to decontaminate the disabled vehicle, communication equipment availability (including applicable call signs, primary and alternate frequencies, and required reports), security/safety requirements, special instructions regarding the disposition of contaminated equipment, contingency plans, and any special tactical considerations.

## Special Considerations

3-81. Recovery personnel require special training of the following when recovering abandoned or unmanned equipment:

- Should be trained to identify the visual and physical indicators of Chemical, Biological, and Radiological and Nuclear contaminations.
- Should be trained to identify visual indicators for possible improvised explosive devices.
- Should be trained to scan for improvised explosive devices and react to suspect improvised explosive devices.
- Must wear mission oriented protective posture level four when chemical, biological, or radiological contamination is suspected.
- Must be trained to clear or disarm the weapons systems to prevent accidental discharge.

3-82. Once the maintenance recovery team discovers the equipment is contaminated, they immediately must initiate the appropriate report to their unit according to the unit's standing operating procedure and to the nuclear, biological, and chemical warning and reporting system. Before initiating the action to recover potentially contaminated equipment for repair, the commanders should coordinate with the higher headquarters to determine if an emergency condition exists and warrants the risks associated with such action. If the equipment cannot be safely decontaminated, destruction may be required.

### **Abandoned Equipment**

3-83. Once the recovery team 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 recovery team submits a situation report to the FSC Commander. The FSC commander may direct repair/recovery of equipment or it may send additional parts or personnel. The recovery team proceeds with repair/recovery as directed.

3-84. If the FSC commander cannot be contacted, the recovery team proceeds with the original plan or they modify it based on judgment, the commander's priorities, and the unit SOP.

3-85. During defensive operations, recovery teams recover equipment to a coordinated location. From there they coordinate its removal to the field maintenance point as the situation permits.

3-86. During offensive operations, recovery teams recover to the minimum service requirements. From that point, the BSB SPO is notified of the location of the equipment. In turn the BSB SPO informs the sustainment brigade. The sustainment brigade devises a recovery plan based on the guidance from the TSC and ESC. During catastrophic recovery and downed aircraft recovery operations, the BSB SPO may request a higher level of support from different units outside the BCT to accomplish the mission.

### **Recovery Destination**

3-87. There are many items that may influence the recovery team's ability to recover equipment to a destination such as the tactical situation, recovery vehicle requirements, workload, available resources at the field maintenance point, and the extent of repairs required.

### **Night and Limited Visibility**

3-88. Sometimes the tactical situation prevents access to disabled equipment. When that occurs, the FSC Commander 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.

3-89. 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 compromise light and noise discipline. When tactical elements are conducting night or limited-visibility operations, maintenance units must anticipate a potential increase in workload.

### **Foreign Materiel**

3-90. Responsibilities for recovery and retrograde of foreign equipment and materiel are similar to those for U.S. materiel. Capturing units must report the discovery of foreign materiel through intelligence channels. Items for which there is no disposition instructions should not be retrograded until it is coordinated with technical intelligence elements.

3-91. The capturing unit may be directed to retrograde the item to a maintenance activity 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 retrograding it, the unit may request recovery and retrograde assistance from the sustainment brigade, combat sustainment support battalion, or BSB.

### **Explosive Items**

3-92. The presence of ammunition and explosives often complicates recovery. Personnel must remain constantly alert and should presume abandoned items are rigged with improvised explosive devices. Exercise caution to prevent explosion, fire, or accidental weapon discharge. When unexploded ammunition is found or suspected, request assistance from an explosive ordnance disposal team.

3-93. If quantities of abandoned ammunition are found during recovery operations, leave the ammunition in place and notify the nearest explosive ordnance disposal unit immediately. Do not, under any circumstances, attempt to touch or move abandoned ammunition.

## SECTION VI – BATTLE DAMAGE ASSESSMENT AND REPAIR (BDAR)

3-94. Battle damage assessment and repair (BDAR) is the procedure used to rapidly return disabled equipment to the operational commander by field expedient repair of components. BDAR restores the minimum essential combat capabilities necessary to support a specific combat mission or to enable the equipment to self-recover. BDAR is accomplished by bypassing components or safety devices, Relocating parts from like or lower priority systems on the equipment, fabricating repair parts, or implementing a temporary repair, using substitute fluids, materials or components. Based on the unit's standard operating procedures and at the commander's discretion, anyone can perform BDAR depending on the extent of repairs required and METT-TC conditions. The commander decides whether or not to use BDAR instead of standard maintenance procedures. Expedient repairs may or may not return the vehicle to a fully mission-capable status. At the completion of immediate combat operations, qualified maintenance personnel will make repairs to restore the equipment to fully mission-capable 10/20 maintenance standards. The Army Regulation 750-1 is the regulatory guidance for BDAR.

3-95. Battle damage assessment is used to appraise 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 salvage collecting points and the transportation required to support recovery or retrograde. Mechanics concentrate on mission-essential maintenance only and the priorities established by the commander. For more information on BDAR and procedures refer to FM 4-30.31, *Recovery and Battle Damage Assessment and Repair*.

### BDAR INTRODUCTION

3-96. BDAR procedures apply to most operational levels (from the crew through field level maintenance) and depend on METT-TC, the extent of damage, time allowances, and available personnel with required skills, availability of parts, tools, and materials. Personnel performing BDAR must act quickly when possible to restore the vehicle to the combat-ready condition required and continue the mission or allow the vehicle to self-recover. BDAR procedures are non standard maintenance practices.

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*Note.* Whenever possible, standard maintenance should always be considered over BDAR.

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3-97. To be effective, personnel applying BDAR techniques should:

- Ensure standard maintenance practice is always the first consideration.
- Base decisions of using BDAR versus standard maintenance on the METT-TC.
- Provide an accurate assessment.
- Ensure economy of maintenance effort (use maintenance personnel only when necessary).
- Train multifunctional skills.
- Repair only what is necessary to regain combat capability.
- Remain flexible about repair priorities.

3-98. Commanders should address the use of BDAR in the logistics section of their operation order. This will provide the crews and maintainers with a clear understanding of when and at what risk level they are authorized to perform BDAR. Local command policy will direct the degree of BDAR to apply and when to use standard maintenance.

3-99. Maintenance assets will be heavily taxed on the battlefield. Because resources are limited (personnel, tools, and parts), it is imperative that maintenance resources are not wasted. Crewmembers must do repairs within their capabilities immediately rather than requesting maintenance personnel to do simple mechanical tasks.

3-100. Personnel shortages and battlefield casualties mandate that maintenance team members have some knowledge of other skills needed to achieve critical repairs. A lack of key repairmen must not deter a team from doing battle repairs. Whenever possible, on-the-job training or cross-training of personnel should be utilized.

3-101. On the battlefield, the objective is to return the system into battle with enough combat capability to get the mission accomplished. Cosmetic repairs are not necessary and are a waste of time and resources. If a broken item does not affect the ability to shoot, move or communicate, and does not pose a serious safety concern, it should not be repaired until the equipment is returned to maintenance where standard repair procedures can be performed.

3-102. Priorities of repair; a shortage of personnel, parts, and time; a chaotic battlefield environment; a change of mission; the lack of a weapon systems crew; and a host of unforeseen circumstances demand a flexible approach to BDAR. If specific repair techniques are not in the manuals, ingenuity can be the key to successful BDAR.

### **BDAR DEFINITIONS**

3-103. BDAR is a set of simple repairs that can be rapidly implemented on disabled equipment to turn it to operational condition in wartime by expediently repairing, bypassing, and restoring minimum function to essential systems with minimal resources used.

### **Short Cuts**

3-104. Shortcuts are inherent to BDAR. When the removal, installation and repair of components are not performed in sequence or to standard as outlined in the technical manuals, they are considered shortcuts.

### **Bypassing**

3-105. Bypassing consists of eliminating a device or component from the system in which it plays a role. For example, a damaged fuel filter can be bypassed allowing the fuel system to function in a degraded mode. In this situation the fuel will not be filtered which could lead to clogged fuel system components. Another example, is when an electrical switch is damaged it can be eliminated from the circuit by connecting the wires together to bypass the switch. In this case the circuit will remain active and may deplete battery power when the vehicle is not in use. Before attempting to bypass any component an assessment of the repair must be conducted to determine the risks associated with the procedure.

### **Expedient Repairs**

3-106. Expedient repairs are temporary in nature and more reliable repairs should be performed as soon as possible. Examples of expedient repairs include using safety wire to temporarily replace a broken exhaust hanger; using duct tape or bungee cords to secure a partially detached fender or section of slat armor.

### **Fabrication**

3-107. Fabrication involves using readily available materials and fashioning them by bending, cutting or welding them in the place of a damaged component. Examples include fabricating a radiator overflow reservoir using a suitable plastic container to temporarily replace the damaged overflow tank. A broken suspension tie rod can be temporarily repaired by welding metal stock or pipe to the damaged unit.

3-108. The metalworking and machine shop set is an authorized end item in field maintenance organizations. This shop set provides an all-purpose metal fabrication, reconstruction, and repair capability to support maintenance operations. The metalworking and machine shop set is critical to battle damage assessment and repair because it provides a means to rapidly restore equipment to a mission capable status.

### **Substitution**

3-109. In some instances repair parts serving a non critical function on the vehicle can be used to replace a critical component on the same equipment. As an example, a bad circuit breaker for the engine starter can



be replaced with a good breaker controlling internal lighting. This type of substitution can be used to quickly restore function to the starting circuit. Controlled substitution can be done to replace a bad starter. These substitutions may require some modifications for the application to work and additional time to prepare.

### **Controlled Exchange And Cannibalization**

3-110. Controlled exchange is the removal of serviceable components with the commander's authorization in accordance with AR 750-1 from unserviceable but economically repairable equipment for immediate reuse in restoring another like item of equipment to combat serviceable condition. The unserviceable component must be used to replace the serviceable component or retained with the end item that provided the serviceable component. Any part or component acquired through controlled exchange must be reported through the supply system to generate a parts demand. Regardless of the source used to acquire the repair parts, recorded demands establish proper stockage demand levels in the supply system. Refer to AR 750-1 for more information on, and regulatory guidelines for, controlled exchange.

3-111. Cannibalization is the authorized removal of components from materiel designated for disposal. Equipment that is extensively damaged and is not economically repairable is usually designated as salvage. In spite of the damage, many serviceable parts and components can be found. It supplements supply operations by providing assets not readily available through normal supply channels. Unlike controlled exchange, a serviceable part acquired through cannibalization from a salvage piece of equipment does not require an unserviceable part to replace the one removed. However, all repair parts needed to repair any piece of equipment should be recorded to establish a parts demand through the supply system regardless of how the part was acquired. Documenting all repair part demands ensures the supply system will establish needed demand. During combat, commanders may authorize the cannibalization of disabled equipment only to facilitate repair of other equipment for return to combat, no parts will be cannibalized for stockage. Costs to cannibalize and urgency of need should be considered in the determination to cannibalize. Cannibalization of depot maintenance candidate items, controlled exchange, or component parts by field organizations is prohibited. Refer to AR 750-1 and AR 710-2 for more information on cannibalization.

### **Fully Mission-Capable**

3-112. The term fully mission-capable means systems and equipment that are safe and have all mission-essential subsystems installed and operating as designated by applicable Army regulation. A fully mission-capable vehicle or system has no faults that are listed in the "not fully mission-capable ready if" columns of the TM/ETM XX-10 and XX-20 series preventative maintenance checks and services tables and AR 385-10 provisions that apply to the vehicle and/or system or its sub-system required by AR 700-138. The equipment must perform all tactical and combat missions safely and without endangering the life of the operator or the crew (AR 750-1).

### **Not-Mission Capable**

3-113. Not-mission capable means the damage to the equipment or failure of components rendered it inoperable (NOT READY/AVAILABLE) and expedient repair procedures will not restore the equipment to combat capable or combat emergency capable status (wartime only) requiring the application of standard maintenance and/or repair parts.

### **BATTLE DAMAGE ASSESSMENT**

3-114. The first and most important phase of BDAR is battle damage assessment. A quick and accurate assessment is critical in determining the extent of the damage and what is needed to make expedient repairs or to recover the equipment. A poor damage assessment can result in overlooked secondary damage or unnecessarily result in equipment recovery. Battle damage assessment must take place at the site of the breakdown. An accurate battle damage assessment determines the extent of primary damage and secondary damage to the subsystems and components including the type of repair and the risks involved. The assessment should also include an estimate of required personnel, time and materials required to perform expedient repairs.

3-115. Performing battle damage assessment on several pieces of damaged equipment should be accomplished using the “equipment triage” concept. This concept establishes the order in which battle damaged equipment will be repaired and whether spare parts acquisition through controlled substitution or cannibalization will be required. Major weapons systems should have top priority for repairs unless the immediate mission dictates otherwise.

### **Basic Rules Of Assessment**

3-116. Always consider the safety of the crew and personnel performing BDAR on a piece of equipment. The following safety checks are performed to identify any obvious hazards.

- Is there a round of ammunition in the gun tube?
- Is any ammunition in a critical state due to shock, fire, or physical damage?
- Have any combustibles such as fuel, hydraulic fluid, or oil accumulated?
- Does wiring appear to be safe? Could an arc occur to stored ammunition or leaking combustibles?
- Is the fire-extinguishing system operational? If not, station a crewmember in the vehicle—prepared either to use a handheld fire extinguisher or to operate the onboard fire extinguishing system manually. Station a second crewmember outside the vehicle with an additional fire extinguisher.
- For systems with built-in self-test procedures, has a functional/operator test been performed on those systems that appear undamaged?

3-117. Abandoned equipment, or equipment left unsupervised by friendly forces may have been booby trapped. Booby traps and improvised explosive devices present unique challenges when conducting damage assessments or recovery of abandoned vehicles. To ensure the safety of individuals during BDAR and recovery operations, carefully inspect equipment for evidence of tampering before attempting to perform repairs or move the equipment. Explosive ordnance disposal team must be requested to render safe any identifiable improvised explosive devices or booby trap.

3-118. Unexploded ordnance in the immediate area, on top, or inside the equipment should not be disturbed. Explosive ordnance disposal personnel must be contacted to dispose of the ordnance prior to BDAR or recovery operations.

3-119. If chemical, nuclear, or biological weapons were deployed in the area or transported on the damaged equipment, adopt the proper mission oriented protective posture level and check the area for contamination. The equipment must be decontaminated at designated decontamination sites prior to evacuation to the maintenance collection point.

3-120. Depleted uranium is found in several munitions and vehicle armor panels. Although depleted uranium poses a greater risk as a heavy metal poison than radiation poison, recognizing the hazard and adopting depleted uranium contamination reduction practices are extremely important. Placing a piece of cloth over the nose and mouth, covering any open wounds and good personal hygiene are sufficient measures to reduce particle ingestion and absorption. A radiac meter must be used to determine if depleted uranium is present in damaged ammunition or vehicle armor panels.

3-121. In the forward battle area an attempt should be made to move the damaged equipment to a covered or concealed position away from enemy fire. The distance to be moved will be determined by METT-TC. Be aware of loaded weapons, damaged ammunition, and damaged wiring which pose a safety hazard during battle damage assessment.

3-122. Familiarization with the operation of damaged equipment is extremely important to prevent further damage to the equipment or injury to personnel. During battle damage assessment and functional checks, only experienced individuals will operate the systems. The following battle damage assessment steps should always be considered for all damage assessments:

## Battle Damage Indicators

3-123. Battle damage indicators play an important role in battle damage assessment. Damage can occur as the result of enemy contact, accidents or mechanical failures. During an incident it may not be possible to focus on what just happened. However, immediate recognition and attention by operators/crewmembers is important because some battle damage indicators may not be apparent once the equipment stops functioning. For example, if the operator notices engine oil pressure dropping rapidly due to a perforated oil pan, the operator can pull over and turn the engine off before it seizes due to lack of lubrication. The oil pan when accessible can be expediently repaired and the crankcase refilled. This action will return the asset to operational status instead of requiring recovery and replacement of the engine.

3-124. Battle damage indicators include smoke, fire, unusual odors, unusual mechanical noise, leaking fluids, warning lights and alarms, and loss of mobility or system function. Most fluids have distinct colors and odors. Familiarization with the characteristic of each type of fluid is extremely important for quick identification of which system is damaged. Other battle damage indicators include loss of power, system function, control, or degraded system performance.

## Perform An Assessment

3-125. The senior Soldier present decides when and if BDAR is performed during combat. This decision is based on METT-TC and the appropriate risk repair level.

3-126. Do not attempt to operate systems or subsystems until the crew has performed an assessment to prevent further damage to equipment or personnel. For example, if all circuit breakers are tripped, including the main circuit breaker, the assessment process should lead to determining the best method or sequence required to restore power to the vehicle. This could be done by initially resetting the main circuit breaker followed by resetting the remaining circuit breakers one at a time. In the forward battle area, the crew must attempt to move the vehicle to a covered or concealed position to prevent additional damage. The best “rule of thumb” is to move the vehicle at least one terrain feature or one kilometer away from enemy contact.

3-127. If the vehicle is not self-recoverable, use any like or heavier class vehicle to recover the vehicle or to conceal it. If this is not possible, turn the turret (if the vehicle is equipped) in the direction of engaging fire to limit damage and provide return fire capability.

3-128. To enable a systematic assessment, crews and maintenance personnel should use the 11 basic steps to battle damage assessment. The 11 basic steps in this manual include:

- Visually inspect interior and exterior for damaged parts and systems.
- Visually determine if vehicle main systems appear to be operable.
- Perform equipment self-test function—using a built-in test, built-in test equipment, and a function test.
- Assess system performance (exercise each system if engine can be safely started).
- Determine which subsystems are affected.
- Determine if crewmembers can repair the damage. (Are enough crewmembers with the required skills available, and does METT-TC allow repairs at the current location?)
- Estimate the repair time (by crew and by a maintenance team).
- Estimate the number and type of repair personnel needed and the associated risk. Ensure command approval to perform repairs.
- Determine what materials are required.
- Determine what the vehicle limitations will be after repairing using BDAR or standard repair.
- Determine the recovery status—self/like/dedicated.

3-129. Based on METT-TC, the maintenance team uses the assessment check information to:

- Determine if the current risk repair level assigned is appropriate for the required repairs.
- Conduct tests with maintenance test equipment, if required.
- Perform additional vehicle operational tests, if necessary.

- Determine what must be repaired or replaced.
- Estimate repair times for each repair task.
- Determine the sequence and priority of the repair action.
- Determine the repair location and, if other than on-site, arrange for recovery of the vehicle to the repair site.

### **Battle Damage Assessment Guidelines**

3-130. This section gives guidelines for battle damage assessment. Use these guidelines to rapidly assess battle-damaged equipment and systematically determine which subsystems are affected, to include the time, personnel, and materials required for repair.

3-131. These guidelines will also assist in performing equipment triage. Equipment triage is the process used to decide the order that battle-damaged equipment will receive repairs. This determination is based on combat or combat support equipment, time, urgency, materials, and personnel required to do the required repairs.

3-132. Units can develop locally produced forms or checklists that best support authorized equipment and unit maintenance structure, and list personnel authorized by the command to approve BDAR actions based on the battle damage assessment. Consider the guidelines when assessing battle damage. These guidelines can be tailored to fit your specific vehicle.

3-133. BDAR may enable the equipment to either self-recover or continue the mission. The battle damage assessment will provide the commander with necessary information to make efficient decisions concerning whether to continue the fight or recover the equipment to the appropriate maintenance location.

3-134. Always report battle damage as soon as possible. Ensure that the damage is reported according to the local operating procedure.

### **Expedient Repairs**

3-135. On the battlefield equipment damage can occur through various means. Enemy contact contributes to the majority of the damage inflicted on equipment. Accidents are another source which often causes serious damage to equipment. Extensive use of equipment and poor maintenance practices can lead to premature failures from fatigued and worn out components leaving personnel stranded. During the battle damage assessment phase the extent of damage will determine if the equipment is a BDAR candidate or if it requires recovery assets. Always consider METT-TC conditions before attempting expedient repairs.

3-136. Maintenance assets will be heavily taxed on the battlefield. Because resources are limited (personnel, tools, and parts), it is imperative that maintenance resources are not wasted. Operators/Crew must perform expedient repairs within their capabilities immediately rather than requesting maintenance personnel to perform simple mechanical tasks. Most expedient repairs functions are not found in technical manuals. Flexibility and ingenuity is the key to successful BDAR.

3-137. On the battlefield, the objective is to return the system into battle with enough combat capability to accomplish the mission. Repair only what is necessary to restore function. Cosmetic repairs are a waste of time and resources. If a broken component does not affect the ability to shoot, move or communicate, and does not pose a serious safety concern, it should not be repaired until the equipment is returned to maintenance where standard repair procedures can be performed.

### **BDAR Tools And Equipment**

3-138. Special kits are available to support crew and maintainers to perform BDAR with access to basic issue items and components of end items. These kits are allocated to the crew, maintenance teams, and maintainers. This chapter provides general information about the BDAR kits and the national stock number for both crew and maintainer kits. BDAR kits allow repair in numerous areas—such as fuel, hydraulics, cooling, tires, electrical systems, and hull repair.

3-139. When possible, BDAR should first be performed by the crew using the crew/operator BDAR kit, basic issue items, components of the end item, and additional authorized list or on-vehicle equipment.

Maintenance personnel will have access to the same items available to the crew/operator, as well as additional components.

### Classification Of Battle Damage Repairs

3-140. All expedient repairs are classified based on the risk level associated with each repair. The risk levels are “High, Medium, and Low”. Repairs are also classified as temporary or permanent. Only a qualified maintenance inspector can classify the expedient repair as either temporary or permanent regardless if the operator/crew or maintenance personnel performed the repairs.

- Expedient repairs that may cause further damage to equipment or cause injury to personnel are classified as “High Risk” repairs. For example, a damaged or faulty neutral safety switch will prevent the vehicle’s engine from starting. Bypassing the switch will result in the engine starting in any gear which can lead to vehicle damage or injury to personnel. These types of repairs should only be performed in extreme emergencies and corrected at the earliest opportunity with standard maintenance.
- Expedient repairs that may cause further damage to equipment but poses no risk to personnel are classified as “Medium Risk repairs. For example, a hole in the radiator resulted in a coolant leak. After repairing the radiator there was not enough coolant or water to completely fill the cooling system. Potential exists for damaging the engine due to overheating but the condition should not pose a hazard to individuals in the crew compartment. Operating the equipment at lower speeds and loosening the radiator cap may minimize the damage and the cooling system must be replenished at the earliest opportunity.
- Expedient repairs that will not contribute to further damage to equipment or increase the risk to personnel are classified as “Low Risk” repairs. For example, a wiring harness on a vehicle chassis sustained cut wires. After splicing the wires together and insulating them the circuits should be restored. If properly spliced and insulated no further damage to equipment or risk to personnel should occur.

## SECTION VII – RETROGRADE AND RECONSTITUTION OPERATIONS

3-141. All Army commanders and maintenance managers within theater or CONOUS must ensure that unserviceable, economically repairable items, weapon system, critical items, intensively managed items, and automatic return items are returned to retrograde channels within the timeframes required by AR 750-1, AR 710-2, and AR 725-50.

### RETROGRADE OPERATIONS

3-142. Overseas commands retrograde materiel to support/staging bases within theater or CONUS. Retrograde cargo normally consists of unserviceable, economically repairable items and weapon systems destined for sustainment level repair. However, reclamation operations involve the removal of serviceable or economically repairable components, assemblies, and repair parts from end-items or large components classified as uneconomically repairable. Reclamation operations significantly reduce demands on the supply system. (See table 3-2 on page 3-22.)

### RESPONSIBILITY

3-143. The various areas of responsibility for retrograde operations are listed below:

- The TSC, in coordination with commodity commands, establishes the type, quantity, and condition of equipment for retrograde.
- The TSC develops and publishes criteria for maintenance units. Materiel managers identify retrograde items as far forward as practical to prevent unnecessary handling and shipment. The TSC coordinates and directs all retrograde shipments.
- When required, the TSC publishes updated lists of items to be retrograded with the quantity and destination of each. They also coordinate transportation requirements for retrograde cargo.

**RECLAMATION**

3-144. Table 3-2 gives an example of how materiel is reclaimed, based on the assignment of a serviceable, repairable, or uneconomically repairable condition code.

**Table 3-2. Material Reclamation**

<i>Serviceable Item</i>	<i>Repairable Item</i>	<i>Uneconomically Repairable Item</i>
The serviceable engine of an otherwise destroyed tank is placed back into the supply system.	The unserviceable yet repairable transmission of 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 designated as scrap through the property reutilization Office.

**SUPPORT PRIORITY**

3-145. Maintenance is concentrated on those weapons systems and materiel 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 moved directly to future planned support areas.

**EQUIPMENT RECOVERY**

3-146. Recovery is of the utmost importance to prevent enemy capture of destroyed equipment that cannot be repaired. The first method of choice is self- and like-vehicle recovery and should be conducted IAW published safety standards. Wheeled and tracked recovery vehicles are used at critical points to keep the route of march open.

3-147. Recovery equipment is critical to the support of retrograde operations. Its use must be controlled and coordinated. Recovery equipment should be marshaled at critical locations to keep routes open and to recover all materiel possible. Specific instructions must be provided for destruction of supplies and equipment.

**PLANNING**

3-148. Maintenance managers at all levels continuously plan maintenance support throughout the retrograde operation to keep the maximum number of weapon systems operational. Maintenance efforts should concentrate on “quick fix” items, using assemblies brought forward to facilitate rapid turnaround of weapon systems. Maintainers should seek commander’s authorization to use, controlled exchange and cannibalization.

**RECONSTITUTION OPERATIONS**

3-149. Maintenance is an essential element of reconstitution. 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.

**ASSESSMENT AND REGENERATION**

3-150. 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. 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.

## **SUMMARY**

3-151. The retrograde and reconstitution operation is designed to reduce demand on the supply system and to restore units to appropriate and adequate level of combat effectiveness.

## Chapter 4

# Maintenance Management

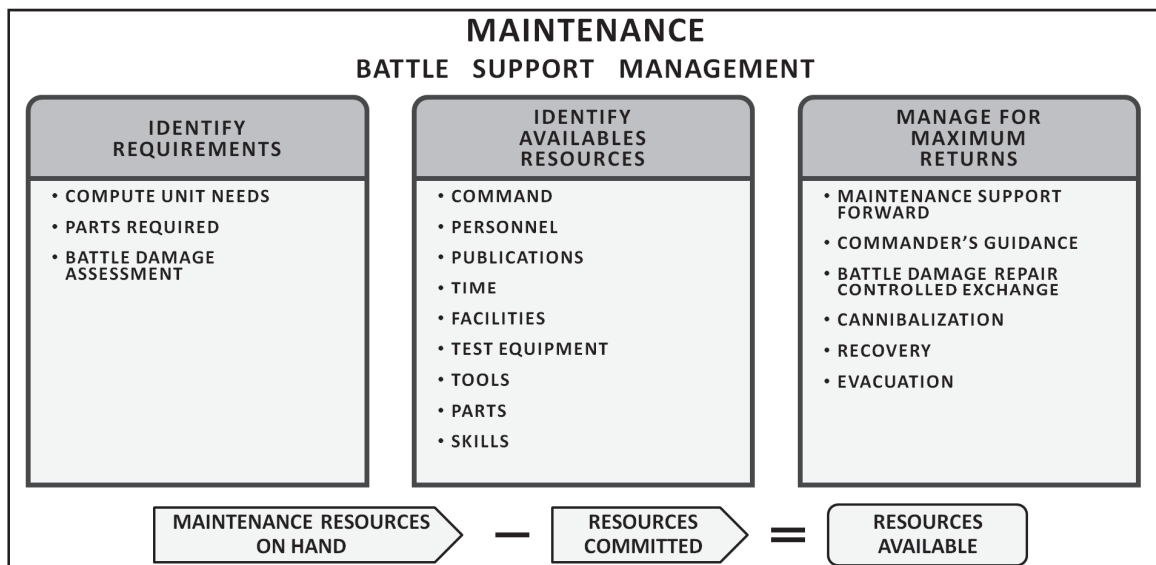
The nature of the modern battlefield demands maintenance systems to be responsive and able to return systems to operational status quickly and as near as possible to the point of failure or damage. This requires maintenance managers to closely coordinate and collaborate at all levels. This chapter describes the maintenance management processes, levels of management, maintenance control and internal management procedures for maintenance operations.

### SECTION I – MAINTENANCE MANAGEMENT PROCESSES

4-1. Effective maintenance management includes anticipating maintenance requirements, tracking, and analyzing maintenance reports, proper identification and diagnosis of maintenance faults, application of the appropriate maintenance capability, and class IX management. The proper allocation of maintenance units is essential in ensuring adequate maintenance support is provided to the force.

#### MANAGING BATTLEFIELD MAINTENANCE

4-2. 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. Figure 4-1 shows the basic concept for managing maintenance support. 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 a fully mission-capable status.



**Figure 4-1. Managing battlefield maintenance support**



## MAINTENANCE MANAGEMENT PROCESSES

4-3. The maintenance management functions include forecasting, scheduling, production control, quality assurance, technical assistance, resourcing repair parts, work loading/cross-leveling regional workload, and developing repairable programs to meet local, regional, and national needs.

4-4. Inherent in the maintenance management responsibility is the obligation to provide a safe environment while conducting maintenance operations. Maintenance management is as important during field or combat operations as it is during garrison maintenance missions. Safety concerns must be addressed in the SOP and operation orders.

## SUSTAINMENT MAINTENANCE

4-5. Sustainment maintenance structures and operations are based on requirements generated by the Army service component command and TSC, in coordination with the Army Materiel Command. Sustainment maintenance leadership will perform the following:

- Provide sustainment functional training to TSC maintenance/supply directorates.
- Assist the Army service component command and TSC managers concerning sustainment maintenance issues in order to optimize capabilities.
- Assist in planning and updating theater-focused maintenance support plans to capitalize on fixed base and mobile maintenance capabilities, including review of maintenance MOS proficiencies to support assigned missions.

4-6. The sustainment maintenance information management systems include connectivity with current maintenance and supply sustainment information system. They also recommend pre-assigned maintenance support routing identifier code instruction to TSC and ESC for in theater and strategic base in the continental United States and outside the continental United States integrated sustainment maintenance operations.

## SUSTAINMENT MAINTENANCE MANAGERS

4-7. The various maintenance management functions are classified as readiness and sustainment. Commanders are responsible for equipment readiness. Readiness maintenance managers at corps and lower echelons support commanders by managing operations to enhance equipment readiness. Readiness maintenance managers maximize combat readiness by coordinating repairs as far forward as possible for quick return to battle. Readiness maintenance managers are assigned to support battalions supporting brigade-sized units.

4-8. The Army Materiel Command sustainment maintenance office integrates sustainment maintenance for the total Army. The office recommends support structure to the combatant commander and implements policies and procedures that provide optimal sustainment maintenance support to unified land operations creating a seamless process, transparent to the user.

4-9. The National Sustainment Maintenance Management Office develops and implements business policies and procedures to provide optimal sustainment maintenance support to Army organizations. This activity integrates Total Army sustainment maintenance management by linking national, regional, and local sustainment maintenance programs through regional Army field support brigade elements. The National Sustainment Maintenance Manager also supports reserve component training and contingency operations and participates in the deliberate planning process with Army Materiel Command operational elements.

4-10. Regional and theater sustainment maintenance management offices manage the execution of sustainment maintenance requirements in a designated region or theater. They oversee local sustainment maintenance operations and evaluate their performance. Within United States there are two operational Regional Sustainment Maintenance Manager Offices; one in the East Region and one in the West Region. There are also sustainment maintenance manager offices in Europe, the Pacific, and Korea.

4-11. Local sustainment maintenance management offices manage the work loading of multiple Army sustainment maintenance units and activities. Typically, the local sustainment maintenance manager office

will be co-located with and support the materiel maintenance officer within an installation, staff, or for the National Guard, at a state surface maintenance management office.

4-12. Associate maintenance activities participate in integrated sustainment maintenance as work centers for designated local sustainment maintenance manager offices. In addition to executing their local workloads, associated maintenance activities perform regional integrated sustainment maintenance and national work as assigned. Associate maintenance activities report work they laterally transfer and receive to other integrated sustainment maintenance sites and other installations to their designated offices for control and tracking. Army commands designate which installations function as associate maintenance activities. These work centers are maintenance activities within the Army commands existing installation infrastructure.

4-13. Sustainment maintenance managers at corps and above focus on materiel management. They focus on fixing by repair, sustaining units, and supporting joint/multi-national equipment and standard Army systems. Sustainment maintenance managers are assigned to Theater and support commands. Managers use their maintenance knowledge, experience, and management interfaces to determine potential problems and to facilitate resolution of those problems.

## SECTION II – LEVELS OF MANAGEMENT

4-14. Maintenance operations must have careful direction, supervision, and management. These functions are accomplished at the company and higher headquarters levels. Higher headquarters element concerned with maintenance operations are the TSC distribution management center materiel readiness branch, the sustainment brigade maintenance branch and the BSB support operations readiness section. The chain of command and other supporting units provide technical assistance on request. Close coordination with the readiness branch, maintenance branch, and the battalion’s support operations office is essential.

4-15. Un-programmed requirements have a significant impact on the maintenance mission. The materiel readiness branch, maintenance branch, and the support operations office must identify known requirements in advance. Commanders and supervisors seek out information, predict future requirements, and assess requirements for their impact. Figure 4-2 shows the organizational chart for TSC.

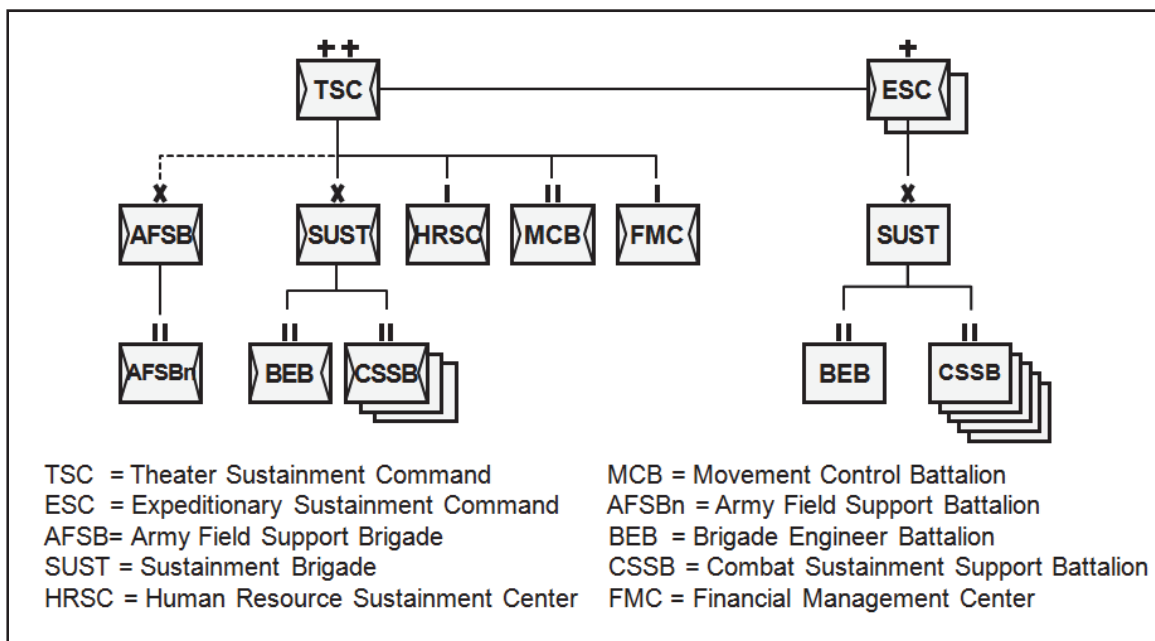


Figure 4-2. Theater sustainment command (TSC) organizational chart

## **TSC AND ESC DISTRIBUTION MANAGEMENT CENTER**

4-16. The distribution management center acts as the distribution management support element for the assistant chief of staff for support operations. It provides staff supervision to the TSC materiel readiness branch and Movement Control Agency. It synchronizes operations within the distribution system to maximize throughput and follow-on sustainment, and executes priorities in accordance with Army force commander directives.

4-17. The distribution management center combine materiel management and support operations into one robust distribution center. The distribution management center use total asset visibility and in-transit visibility to track shipments, establish priorities, and coordinate transportation. The distribution management center is the logistics execution control center in the TSC and sets sustainment priorities.

4-18. The SPO is the link between planning and execution of strategic-to-operational level logistics. The SPO, by exercising staff supervision over the distribution management center maintains visibility, capacity, and control of the distribution pipeline. Through the coordinated efforts of its internal branches, the distribution management center exercises control over logistic operations into, within, and out of the theater.

### **MATERIEL READINESS BRANCH**

4-19. The materiel readiness branch within the distribution management center is the maintenance manager for deployed Army forces. It is the link between the deployed forces and the support base. The materiel readiness branch maintains a close working relationship with the Army field support brigade to synchronize sustainment maintenance units for work loading. The materiel readiness branch may also support equipment of other services or multi-national forces. The materiel readiness branch performs integrated materiel management for automotive equipment, tactical wheeled vehicles, general-purpose vehicles, construction equipment, material handling equipment, power generation equipment, signal equipment, and aviation maintenance. It also coordinates the development of maintenance policy and programs; exercises staff supervision of sustainment maintenance operations; enforces priorities established by the Army service component command; assists in determining appropriate positioning of maintenance assets; conducts analysis of maintenance capabilities and requirements; makes recommendations to the commander; provides maintenance data reports; and supervises equipment modernization plan execution.

## **BRIGADE/BATTALION LEVEL MAINTENANCE MANAGEMENT**

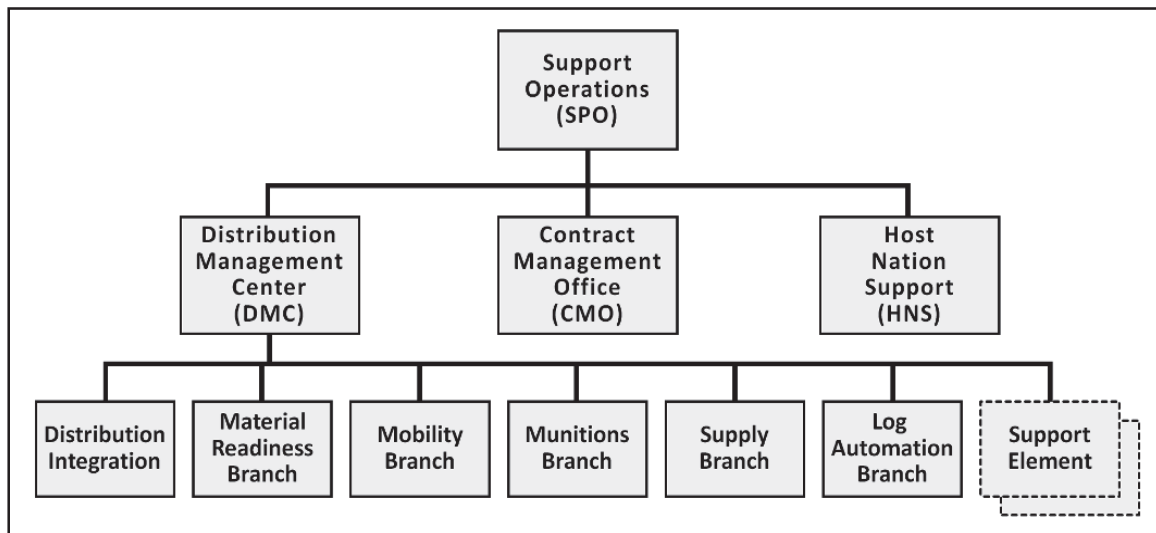
4-20. Commanders and maintenance managers will manage field maintenance per the procedures contained in this ATP, DA Pam 750-8, and DA Pam 750-3.

### **SUPPORT OPERATIONS OFFICE**

4-21. The Support Operations Office (SPO) coordinates all maintenance operations. It provides guidance on maintenance priorities, and sets objectives for production. The SPO coordinates and integrates the brigade's field maintenance mission and is a key element in maintenance data collection ensuring its units provide automated data and generate appropriate maintenance reports.

4-22. At the battalion level, the SPO office manages supported customer units. Also supervises, controls, and directs the operation of battalion units for field maintenance, recovery, repair parts supply, and technical assistance. The relationship between the support operations office and shop office is vital to mission success.

4-23. The combat sustainment support battalion and the BSB SPO advise the sustainment brigade on maintenance and repair parts supply matters. These include recommendations concerning personnel, facilities and equipment requirements, maintenance performance, repair parts supply status in addition to reporting the state of materiel readiness, deployment, and employment of battalion units. (See figure 4-3.)



**Figure 4-3. Theater sustainment command (TSC) support operations (SPO) section**

## COMPANY LEVEL MANAGEMENT

4-24. Maintenance management at company level is focused on each job. The maintenance mission is resourced and accomplished at company level. It is here that the assets of personnel, time, and repair parts must be managed most effectively to provide the best support possible with the resources available.

4-25. Many techniques used at battalion level also apply at company level, but they require a more personal, direct approach along with an immediate response to actual or anticipated problems. Effective management at company level requires leadership, production control, workload analysis, determining maintenance requirements, work simplification, work measurement, total quality management, quality assurance, and motivation.

### Production Control

4-26. Production control involves production planning, scheduling, proper routing and rerouting of work, attaining maximum production by keeping all shop elements working at or near capacity, and proper shop layout.

### Workload Analysis

4-27. Workload analysis is part of the overall production control process. It requires a continuous review of work in process as well as new work and it is a prime responsibility of the maintenance control sergeant. It helps prevent over commitment of resources with unrealistic priorities and deadlines.

### Estimating Maintenance Requirements

4-28. In order to forecast maintenance workload, the maintenance control sergeant of each maintenance unit maintains a current operations map and equipment density list. The operations maps show personnel the location of adjacent units, supply distribution points, aircraft landing areas, and denote field maintenance point locations. Equipment density lists keep personnel up-to-date on how much equipment is supported and where it is.

### Work Simplification and Measurement

4-29. Work simplification and measurement is applied in every unit. Work measurement standards are developed and applied to measure and compare work of repairers. Maintenance units engaged in similar types of operations. Units keep records that show production results on a week-by-week basis.

4-30. The most efficient repairs can be compared against the least efficient in terms of quality and quantity of production to obtain a mean or median for measurement of overall performance. Both the combat sustainment support battalion and BSB have information obtained from production reports of other units to permit comparison of production among units or individuals performing the same type of work. Work simplification techniques may, in themselves, uncover ways to improve unit layout to eliminate wasted effort and movement.

### **Total Army Quality Management**

4-31. Total Army quality management is a management technique used to supplement quality control procedures by motivating all personnel to produce high-quality work the first time. A functional total Army quality management program becomes evident when Soldiers display the motivation and initiative to inspect their own work and take immediate corrective action to resolve quality control problems. Total quality management should be applied in all units, at all times, in all functions. For more information on total Army quality management refer to AR 5-1.

### **Quality Assurance (QA) and Quality Control (QC)**

4-32. The objective of QA is to produce high-quality work the first time. A valuable QA program is essential for proper, effective, and efficient performance of any level maintenance mission. It covers all actions necessary to provide adequate confidence that materiel, data, supplies, and services conform to established technical and performance requirements. QA as a function must be separated from production control. This separation of QA and production control insulates QA from the pressures of meeting production at the expense of meeting standards. Persons assigned to perform the job of QA should be technically qualified and have additional training on QA techniques and procedures. Additional QA measures are provided in the form of technical and process-oriented assistance visits and inspections from higher HQ. Regardless of the source, QA focuses an independent set of eyes on products and processes to ensure standards are met.

4-33. Quality control is a separate and distinct function. It is a leadership function and must be applied to all aspects of unit operations, including initial, in-process, and final inspections. Persons performing QC functions must be trained and motivated to balance quality concerns with production concerns.

4-34. As equipment, requiring repair, works its way through a maintenance organization, it is subjected to a series of inspections, which demonstrate the interplay between QA and QC. Initial, in-process, and final inspections all represent opportunities for QA to overlay QC. This happens most frequently as the repair work nears completion. Repairmen/repair teams accomplish the tasks necessary to complete the job, subject to in-process QC inspections at both random and critical points in the work. Upon completion, a supervisor conducts a final QC inspection before sending the equipment for a final QA inspection. At each inspection point, QC directs corrections of the repairer's errors and positively reinforces the repairer's adherence to proper procedures. Similarly, QA personnel direct correction of QC shortfalls and positively reinforce adherence to standards by QC and production personnel. Technical manuals appropriate to various items of equipment are the basic tools of QA and QC. Thorough familiarity with DA Pam 750-8, AR 710-2, and AR 750-1 is required.

4-35. Supervisors exercise the QC concept by routinely inspecting work, directing the correction of errors, and consistently reinforcing adherence to proper procedures in garrison and field training. QA and QC results in Soldiers, supervisors, and leaders knowing proper procedures, correct standards, and most importantly, applying them in all processes. It is reinforced by an independent set of eyes assuring quality by validating achievement of the applicable standards. QA and QC pay off in the form of a high quality, more effective and efficient maintenance operation.

4-36. Supervisors must continually motivate personnel to perform to Army maintenance standards. Commanders and shop officers must develop incentive programs that reward superior performance.

### **REPORTING SYSTEMS**

4-37. 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

and maintain operational readiness standards. The Standard Army Maintenance System-Enhanced (SAMS-E) performs The Army Maintenance Management System functions at the field maintenance level, and in most locations within the sustainment maintenance level. (See figure 4-4.) These capabilities will be subsumed by the Global Combat Support System- Army as described in appendix B of this publication.

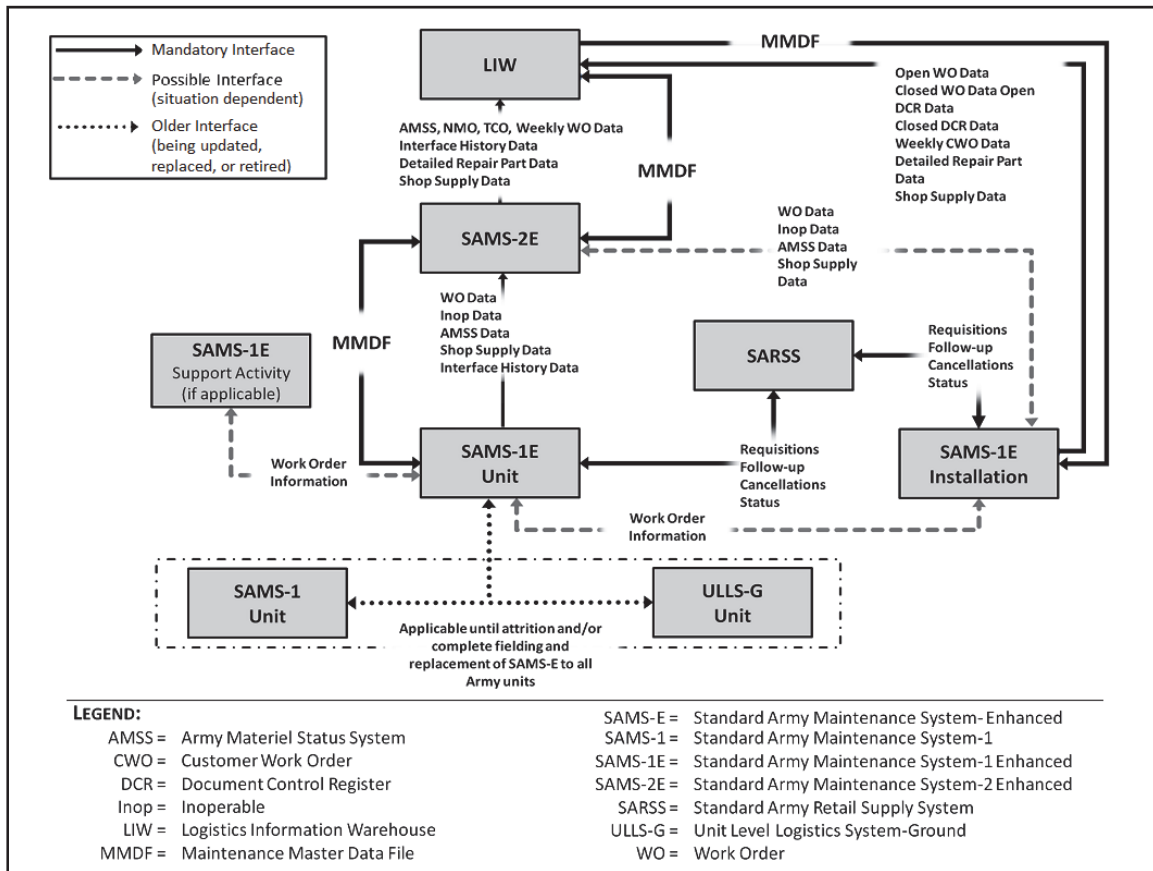


Figure 4-4. Data reporting

## MAINTENANCE CONTROL

4-38. Maintenance control is a critical element of effective maintenance management for shop operations and procedures. It directs and controls work in a maintenance shop in a manner that provides for maximum output of quality work.

4-39. A primary function of maintenance control is to reduce, and when necessary, correct overload conditions. While a maintenance section should always work at or near capacity, backlogs must be kept manageable. Overloads can be caused by poor management (at any level), lack of personnel, or continuous operations.

## PROCEDURES

4-40. In a maintenance shop, maximum production, effective use of personnel, facilities, and orderly progression of work depends on an efficient, effective maintenance control element. Maintenance units have a maintenance control section, commonly referred to as the shop office, to accomplish production control functions.

4-41. The maintenance control section normally contains a maintenance control officer, maintenance warrant officer, maintenance control sergeant and automated logistics specialists (specific numbers vary depending on the type of unit).

4-42. For operational purposes, the maintenance control section is usually organized according to the functions performed. The result is a maintenance control and shop supply element. Maintenance control elements carefully screen maintenance requests, assign work to various sections, maintain workload status in the shop section, improve operational procedures, and assist in determining parts requirements.

## **OPERATIONS**

4-43. Maintenance control operations involve directing and controlling work flow. Maintenance control requires common sense, effective planning, close supervision, and prompt remedial action. It also requires the managerial tools to direct and control workflow through a maintenance shop in a manner that results in the maximum production of quality work.

## **COORDINATION**

4-44. The maintenance control section must effectively coordinate with the supporting supply support activity to ensure prompt availability of required repair parts and other maintenance supplies. The coordination steps include: schedule shop input, assign work to various shop sections to keep all shops working at capacity, carefully screening maintenance requests and inspection reports to ensure maximum repair. This may also involve shifting assets based on the availability of resources, capability of personnel, and shop capacity. The maintenance control section must keep abreast of the status and quantity of work in each section and minimize overloads, take corrective action when necessary, and aggressively pursue repair parts that are not available within the unit.

## **OVERLOADS**

4-45. A prime function of the maintenance control section is to take action to reduce backlog conditions in any of the sections. Supported units expect prompt repair and return of items taken into maintenance. Backlog conditions in any of the shop sections can seriously delay repair operations to the detriment of the supported unit's mission. Backlog conditions can result from: required workloads temporarily exceeding the available capacity of one or more maintenance sections; temporary loss of maintenance capability in the maintenance section; competing priorities due to tactical operations; and reactive instead of proactive maintenance management.

4-46. To avoid backlogs, adhere to the following:

- Distribute work among the various shop sections to keep all sections working at or near capacity. Routing is the sequence of repair operations that ensures complete repair of each item in the shortest time possible. Any interruption in the normal flow of work needs immediate attention.
- Quick identification of hard to procure items or items with long lead times. The maintenance control section should work with the available resources for assistance.
- Resolve the problem by rerouting work or supplementing the capacity of the backlogged section with personnel from other sections working below capacity. The battalion may also take action to realign missions, reduce workloads, or provide additional personnel.
- Analyze workloads during field operations. Available man-hours may be severely reduced by guard duty, defense operations, enemy attacks, weather, unit movement, set up, details, and so forth.
- Work with the chain of command to ensure necessary details are properly apportioned. Therefore, an overloaded section provides a few personnel for special requirements while another section that is not overburdened picks up the majority of the special duty.

## **MAINTENANCE CONTROL OFFICER**

4-47. For an effective maintenance control operation, the maintenance control officer must have a thorough knowledge of the mission of the entire company, be thoroughly familiar with capabilities/capacities of the individual sections, and keep informed of priorities assigned to supported units, expected workloads, shop progress, and maintenance supply status.

## **MANAGEMENT TOOLS**

4-48. Maintenance control requires a continuous flow of data from all maintenance elements in the company and the shop supply element. The control section serves as the center for the production control process.

## **PRODUCTION METHODS**

4-49. Production methods used include bay shop, job/bench shop, on-site maintenance, and production line operations. The method used depends on the type of materiel to be repaired and the personnel, facilities, and time available.

## **BAY SHOP**

4-50. The bay shop production method is used when a variety of jobs are performed in the shop or when the item being repaired is difficult to move. Under a bay shop method of operation, the equipment to be repaired remains in one shop location until work is complete. The Soldiers, tools, and equipment needed to do the work move to the equipment bay shop. Under a modified bay shop operation, personnel or equipment performing the same or similar jobs are grouped together in sections. The equipment to be repaired moves from one section to another at irregular intervals until the work is complete.

## **JOB/BENCH SHOP**

4-51. Job/bench shops are used to repair small items, items requiring a high degree of technical skill, or items requiring repair with equipment mounted in a shop vehicle. Work performed at stands or benches under maintenance shelters or in shop vehicles is considered job shop repair. Items repaired by this method include components, assemblies, small arms, fire-control instruments, fuel/electrical system components, electric motors, leather/textile items, communication/electronic equipment, and missile electronic items.

## **ON SITE MAINTENANCE**

4-52. On-site maintenance is usually performed by FMTs, recovery teams or contact teams to the maximum extent possible. There are several advantages to conducting maintenance at the equipment breakdown site. Some of the advantages include reducing equipment downtime, eliminating time and resources required for recovery, reducing the battlefield signature caused by recovery, and reducing the potential for increased damage during recovery. Whenever standard maintenance is not possible, expedient BDAR procedures should be applied to restore minimum system function.

4-53. All of the teams providing on-site maintenance are organized based on known requirements. Therefore, before being dispatched, they should be fully informed on the problem (including type of equipment, malfunction symptoms, and anticipated repair), location (route, and link-up point), and requesting unit, point of contact, frequency, call sign, enemy situation and current threat.

## **PRODUCTION LINE**

4-54. The production line is a production method primarily used by sustainment-level maintenance activities. The method is used to repair or overhaul several similar items when the repair sequence can be divided into a series of independent operations. Production lines provide the most efficient method for repairing a large volume of similar items when individual operations are not too complicated or time-consuming, and the item can be easily moved. The production line is a series of workstations through which similar equipment is passed. Work is performed in sequential order until the final product is repaired.

## **TECHNICAL INSPECTION**

4-55. A technical inspection of materiel is one of the most important aspects of maintenance operations. Inspections are essential for an effective maintenance program. Units should perform periodic technical inspections of its equipment to capture faults missed by operators and identify training deficiencies of both



operator and mechanic. Accurate initial, in-process, and final inspections are vital in maintaining efficient maintenance operations and ensuring quality repairs. In addition, material classification inspections are performed to determine the overall serviceability and reparability of equipment.

## **MATERIEL CLASSIFICATION INSPECTIONS**

4-56. 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 IAW maintenance expenditure level guidelines. The objective is the efficient, rapid return of the greatest amount of materiel.

Qualified maintainers inspect materiel in accordance with instructions and specifications in technical manuals, technical bulletins, and sustainment brigade directives. The inspection results establish the materiel's condition code (classification). A complete listing of condition codes are provided in AR 725-50.

### **Initial Inspections**

4-57. All equipment that comes in for maintenance action requires an initial inspection. This initial inspection or preliminary diagnosis is useful in determining if the operator/crew has been fulfilling their maintenance responsibilities. The inspection provides a basis to validate equipment faults, extent of work required, determine economical reparability, parts requirements, recommending further disposition, recommending financial-liability-investigation-of-property-loss action (when it appears that equipment damage or unserviceable condition is the result of misconduct or negligence, rather than fair wear and tear or battle damage), determining necessary maintenance tasks, and estimating required maintenance man-hours.

### **In-Process Inspections**

4-58. In-process inspections are necessary to ensure work is being performed properly. Maintenance supervisory personnel perform these inspections continually throughout the repair process.

### **Final Inspections**

4-59. A final inspection is performed after the work is completed. This inspection determines the adequacy of repairs and requires an operability test to determine serviceability and safety.

## **WORK FLOW**

4-60. Figure 4-5 illustrates a typical maintenance workflow for an item requiring field level maintenance repair. This workflow applies to all commodities. However, with slight modification it can be tailored for specific shop needs. It is important to note that the modified work flow retains the following key elements:

- Three QA and QC inspections, initial, in-process, and final.
- DA Form 5988-E should be routed back to the operator/crew.
- Readiness reporting at the point of fault identification until fault correction.

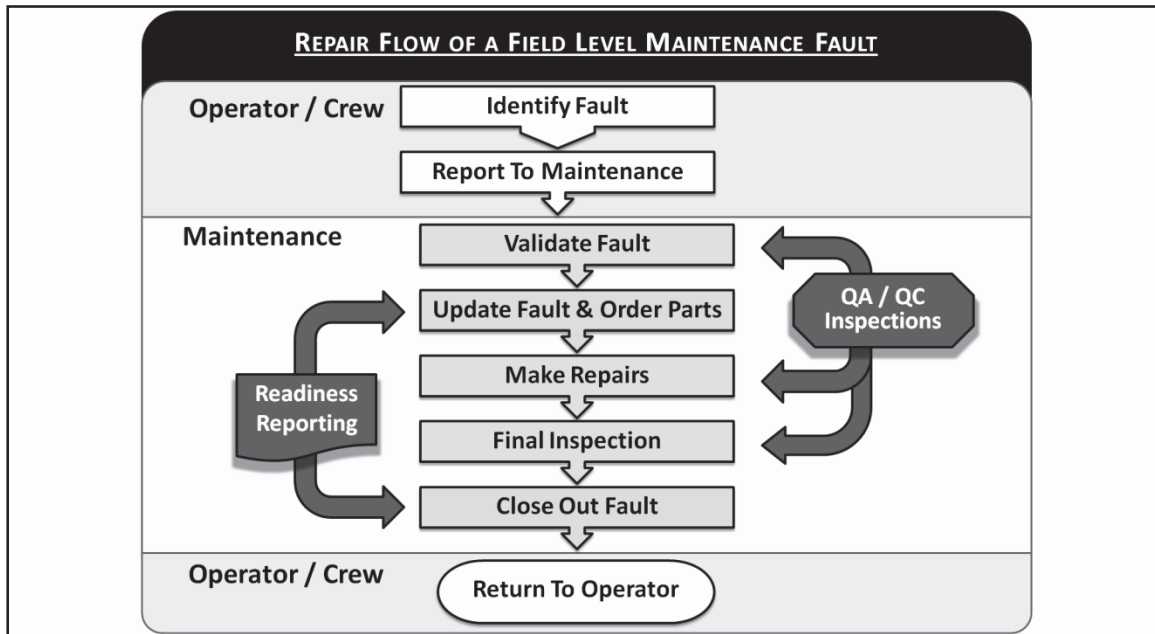


Figure 4-5. Field level maintenance repair flow chart

## SUMMARY

4-61. Maintenance management takes on a different personality at each level. The common denominator remains the ability to forecast, plan, and employ maintenance assets. By utilizing the proper maintenance management techniques the unit will be able to fulfill its maintenance requirements.

## Chapter 5

# Repair Parts Supply Operations

This chapter discusses supply support operations and repair parts supply. Repair parts supply support is a crucial part of all maintenance operations. Maintenance organizations require repair parts as well as tools and test equipment to execute their field and sustainment maintenance missions. Army supply policy governing supply support operations is found in AR 710-2. Repair parts used by units are found in the following two areas:

- Supply Support Activity.
- Maintenance Shop Supply.

The supply support activity performs all functions related to receipt, storage, and issue of supplies for the BDE, or within an assigned support area. Maintenance shop supply is the primary focus of this chapter. Shop supply obtains, accounts for, stores and replenishes supplies required for maintenance operations.

### **SECTION I – MAINTENANCE RELATED STOCKS**

5-1. Shop supply receives, stores, and issues class IX supplies required to support the maintenance mission. These stocks are governed by AR 710-2 and DA Pam 710-2-1.

5-2. Shop supplies in deployable maintenance organizations will always be operated and maintained separately from the supporting supply support activity or stock record account. Typically, these stocks will be stored and issued from vans, trailers, or other conveyances and will be managed for short notice deployments.

5-3. Shop stocks and bench stocks in non-deployable organizations should be stored separately from the supporting supply support activity and positioned for immediate access by maintenance personnel to achieve maintenance process efficiency in support of the organization, system readiness, and critical Army programs.

5-4. These maintenance related stocks for both field and sustainment levels of maintenance are found in the four following categories: shop stock, bench stock, combat repair team/field maintenance team stocks, and on-board spares.

### **SHOP STOCK**

5-5. Shop stock and bench stock may consist of repair parts (class IX), package petroleum (class III (P)), and other classes of supply needed to perform maintenance operations. Approval authority for shop stock is the unit commander; the approval authority for bench stock is the maintenance control officer, in accordance with AR 710-2.

5-6. Shop stock is managed by the maintenance activity maintenance control section office. Shop stocks are demand-supported repair parts and consumable items that are stocked by the modified table of organization and equipment, table of distribution and allowances, or joint table of allowances maintenance organization. These maintenance organizations provide services in response to requests from supported organizations in field commands to meet their commander's mission requirements, or in response to Army Materiel Command inventory managers to support Army sustainment programs.

5-7. Maintenance personnel request shop stock, repair parts and supplies from their supporting supply activity. These supplies are issued to the unit and are not part of an authorized stockage list.

5-8. Shop stock is used only by maintenance organizations for the purpose of maintaining the readiness of the supported units. Shop stock allows maintenance organizations to keep frequently used repair parts and expendable supplies to avoid repair delays and reduce the number of supply transactions.

## **BENCH STOCK**

5-9. Bench stocks are managed by the using maintenance activities/sections. Bench stock consists of low-cost consumables, repair parts, and supplies used by maintenance shop personnel at an unpredictable rate. The maintenance control officer determines stockage requirements based on the essentiality of the items that the unit is to repair.

5-10. Bench stocks typically consist of common hardware, resistors, transistors, capacitors, wire, tubing, hose, ropes, webbing, thread, welding rods, sandpaper, gasket materiel, sheet metal, seals, oils, grease and repair kits. The repair parts authorized for inclusion in bench stock are small arms repair parts controlled inventory items code "U".

## **FIELD MAINTENANCE TEAM STOCK**

5-11. FMT stocks are those shop and bench stock items in a field maintenance activity that are selectively positioned with the FMT in accordance with priorities and requirements to effect readiness of a specific supported unit. The FMT stock is a subset of the parent maintenance activity's shop supply (shop and bench stock) and is replenished based on maintenance actions executed in the FMT.

## **ON BOARD SPARES**

5-12. On board spares are repair parts carried on a platform or unit organic equipment authorized by the technical manual or the commander. On board spares are managed by the operator/crew. On board spares are considered consumed for accountability purposes and are not required to be accounted for within a LIS. The intended use for these items is to support the equipment on which they are mounted. If necessary on-board spares should be retrograded through the assigned supply support activity for sustainment repair and return to the supply system. For unique systems, such as the Warfighter Information Network-Tactical, Stryker Anti Tank Guided Munitions' vehicle and other platforms, brigade/division/battalion spares management is performed at the organic communications and electronic maintenance shop by the Electronic Systems Maintenance Warrant Officer and Ordnance electronic maintainers. This is an essential readiness function sustaining a multitude of platforms.

## **SECTION II – REPAIR PARTS MANAGEMENT**

5-13. Units are authorized to stock repair parts to support their maintenance mission IAW AR 710-2. One of the most serious maintenance management issues is the inability to immediately obtain required repair parts. To help reduce delays and prevent a zero balances, maintenance managers should check to ensure requests are filled out correctly with a focus on priorities and advice codes. Supervisors must perform regular follow-ups on all requests and ensure the correct part is ordered the first time, and that stock numbers/part numbers are validated in the current catalog prior to submitting requisitions.

5-14. Consider alternate sources of supply to fill high priority requisitions such as controlled exchange, cannibalization points, and local purchase, and if obtained, cancel or redirect open requisitions for what has been obtained, and also capture demands.

## **GENERAL REQUISITION FLOW**

5-15. Below are the key steps maintenance managers should be aware of in the requisition process for Class IX and other classes of supply.

- The mechanic or clerk enters the fault in SAMS-E. If the part is a stocked item in shop stock or FMT stocks, the part is issued against the vehicle fault and automatically a replacement part is requisitioned.

- If the part is not stocked, the parts requisition will be sent to the supporting Supply Support Activity. If the item is on hand, a materiel release order is issued to the unit and the item is placed into their parts bin. If the item is not on hand, the requisition is forwarded to the supporting materiel management team or TSC.

## **SUMMARY**

5-16. Repair parts supply operations are the cornerstone to maintenance operations. Without the proper parts, an item can remain not-mission capable for an extended period of time. With a complete understanding of which stocks are authorized a unit can significantly reduce repair time and increase their readiness rates.

## Chapter 6

# Test, Measurement and Diagnostic Equipment Calibration and Repair Support

The accuracy, sustainability and safety of Army weapons systems and personnel throughout the world depend on accurate and reliable measurements. The calibration and repair of test, measurement and diagnostic equipment ensures that the measurements made are traceable to national, international, or intrinsic standards of measurement. This chapter discusses the objectives, structure and employment of these resources.

### SECTION I – GENERAL OVERVIEW

6-1. Test, measurement and diagnostic equipment (TMDE) is defined as any system or device used to evaluate the operational condition of an end item or subsystem thereof to identify and/or isolate any actual or potential malfunction.

6-2. In general, TMDE refers to both general purpose and special purpose TMDE. TMDE-special purpose is developmental in nature for a specific weapon or support system. TMDE-general purpose can be used in a variety of applications and is normally procured as commercial off-the-shelf items. Types of TMDE range from torque wrenches in a toolbox to complex equipment supporting sophisticated weapon systems. The Army's TMDE program supports a number of technical parameters such as infrared, electro-optics, direct current, low frequency, microwave, radiation, detection, indication and computation, mechanical, hydraulics, and pneumatics.

#### COMMANDER'S RESPONSIBILITY

6-3. Commanders at all levels are responsible for their unit's TMDE readiness, and in accordance with AR 750-43, will appoint a calibration coordinator to interact on their behalf with their assigned TMDE support activity.

#### COMPANY TMDE CALIBRATION COORDINATOR

6-4. As designated by the unit Company Commander, the TMDE calibration coordinator is required to review the organization hand receipt to identify TMDE requiring support in accordance with technical bulletin (TB) 43-180. All TMDE calibration coordinators must be trained by the supporting area TMDE support team prior to executing the calibration coordinator responsibilities. They must ensure each item is placed on the support TMDE activity instrument master record file, turn in supported items, and ensure all items returned from the support activity have a DA Label 80. All TMDE changes which include additions and/or deletions are managed by the organization TMDE calibration coordinator.

#### TMDE PROGRAM OBJECTIVES

6-5. The objective of the Army's TMDE program is to ensure accurate and serviceable TMDE is available for Army use with measurement accuracies traceable to National, International, or intrinsic standards. Highly technical organizations consisting of military, civilian, and contractor personnel are responsible for calibration and repair of Army TMDE.

6-6. The integrity of the Army's TMDE calibration and repair support (C&RS) program is based on a hierarchy of traceable calibration accuracies. The accuracy of all calibrations can be traced up through the

Army TMDE support structure to the appropriate standard of measurement. Figure 6-1 on page 6-3, reflects the hierarchy of calibration traceability.

## **SECTION II – ORGANIZATIONAL STRUCTURE**

6-7. The size of the TMDE support activity and the expanse of its mission capabilities are dependent on the type and geographical dispersion of supported units. All TMDE support activities operate on an area or regional support basis. Military TMDE support teams are typically assigned to maintenance companies within Forces Command, ARNG, and selected Army service component commands.

### **LEVELS OF TMDE CALIBRATION AND REPAIR SUPPORT**

6-8. The following TMDE calibration and repair support levels are key to sustaining accurate and traceable measurements. They should not be confused with Army standard maintenance levels. This support provided by the Army may vary from one location to another because of the density, type of TMDE supported, and the criticality of the support mission. Some designated laboratories may have S- and very limited P-level capabilities. Other locations may have T- and S- level capabilities and comprise both military and civilian support elements.

#### **F-LEVEL SUPPORT**

6-9. All field/sustainment maintenance, facilities, owners, and users of TMDE provide F-level support as indicated in TB 43-180 and appropriate maintenance manuals.

#### **T-LEVEL SUPPORT**

6-10. Area TMDE support teams provide calibration and repair support for TMDE requiring secondary transfer level support within the assigned mission area. Where F-level support capability for general purpose TMDE does not exist T-level will provide that support. T-level support is typically provided by military, DA civilian, or contractor personnel operating from a mobile or fixed facility. All military Area TMDE support teams providing T-level support will be organized under a mobile equipment configuration for deployment purposes.

#### **S-LEVEL SUPPORT**

6-11. Area calibration laboratories provide calibration and repair support for TMDE measurement standards and designated items of TMDE within their assigned mission area that require secondary reference level support in accordance with TB 43-180. The area calibration laboratories are the principal support providers for T-level transfer standards.

#### **P-LEVEL SUPPORT**

6-12. The Army's highest support level for calibration and measurement accuracies provides support for measurement standards and selected items of TMDE requiring P-level support in accordance with TB 43-180. The Army primary standards lab, located at Redstone Arsenal, is the Army's only complete P-level support laboratory.

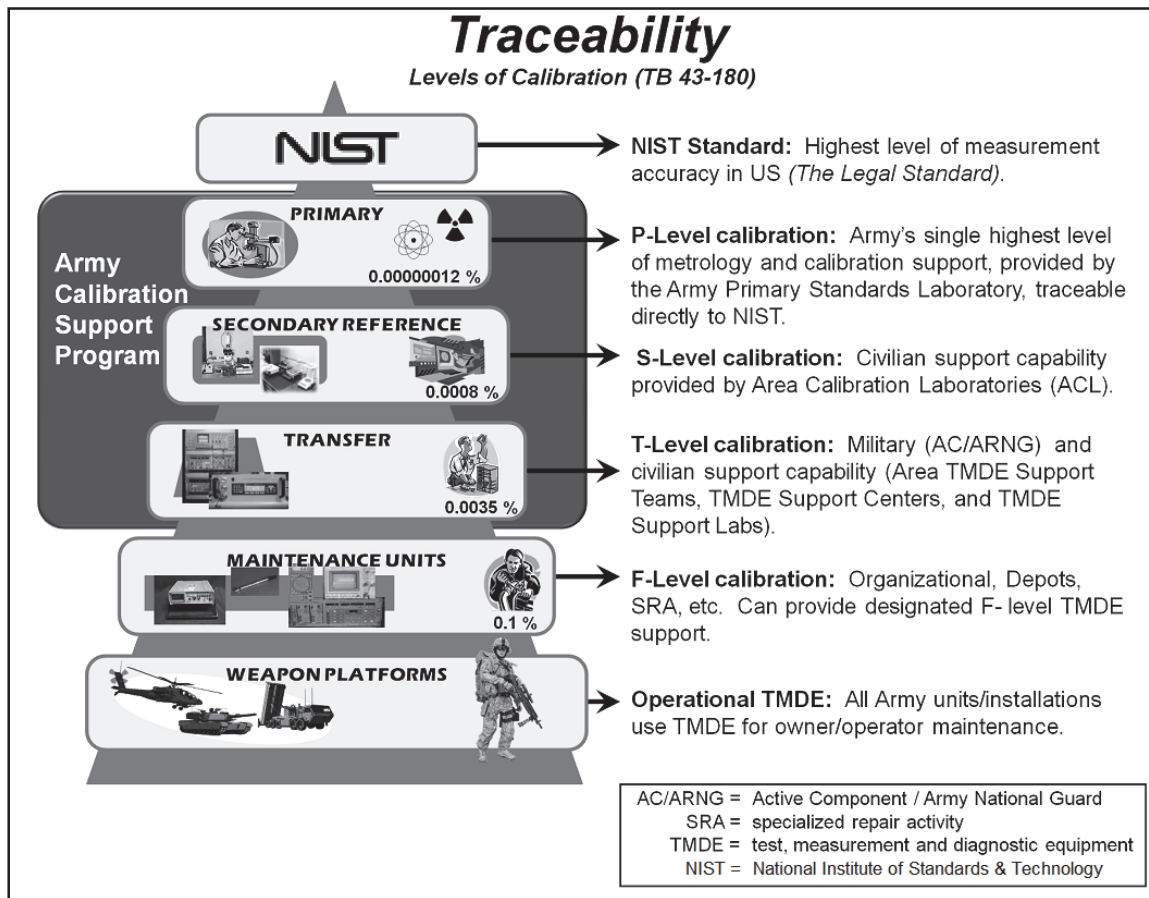


Figure 6-1. Hierarchy of calibration traceability

## MILITARY AREA TMDE SUPPORT

6-13. A modular networked approach to TMDE support will ensure all TMDE customers have a coordinating cell within their immediate command.

## TMDE CALIBRATION AND REPAIR SUPPORT EXPEDITIONARY OPERATIONS MISSION COMMAND

6-14. During expeditionary operations the geographic combatant commander will exercise theater mission command over all TMDE logistic assets in the current joint operation area. The geographic combatant commander maintenance cell of the sustainment directorate will direct the supporting Army service component commands and the theater sustainment command to develop a TMDE support concept of operation. This concept of operation will integrate the TMDE support capability within the GCC footprint into a modular construct that provides TMDE calibration and repair support to TMDE owners assigned to, moving into or through the area of responsibility of the geographical combatant command and or subordinate commands. Coordination should be maintained through each of the maintenance cells located within the G-4 or S-4 sustainment office of each command. A modular networked approach to TMDE support will ensure all TMDE customers have a coordinating cell within their immediate command. The higher headquarters needs to be completely aware of how to locate their TMDE support in theater for their units. Each higher headquarters can coordinate services based on the commander's priority and operational conditions. Continuous coordination must be maintained within the maintenance network from early force entry through combat operations including stability and sustainment operations.



## **THEATER SUSTAINMENT COMMAND (TSC)**

6-15. The TSC will establish a TMDE logistics area officer within the command staff. This TMDE logistics area officer will provide expertise and technical assistance to subordinate sustainment brigades that have calibration and repair support capability as well as TMDE owners. The logistics area officer will also coordinate with Army Materiel Command for backup or augmented support of TMDE services if needed. The liaison officer shall maintain oversight of calibration and repair support issues, metrics, and reports from subordinate commands to ensure TMDE services are appropriately work-loaded and adequate calibration and repair support assets are on hand to sustain the force in a dynamic environment. The logistics assistance officer shall be the primary coordinator with sustainment brigades that have calibration and repair support assets through the maintenance cell located in the headquarters of the sustainment brigade.

## **COMBAT SUSTAINMENT SUPPORT BATTALION**

6-16. The combat sustainment support battalions are subordinate units of the TSC. They consolidate functions previously performed by corps and division support commands and area support groups into a single echelon and provide mission command of the full range of logistics operations. Area TMDE support teams will fall under the mission command of the combat sustainment support battalion. Each Area TMDE support teams may be operationally controlled or administratively controlled by the combat sustainment support battalion based on the support mission provided by the combat sustainment support battalion commander. The area TMDE support teams will provide calibration and repair to TMDE owners assigned to the combat sustainment support battalion. Support will also be provided to units that require calibration and repair support within the sustainment brigade itself. One or more combat sustainment support battalions may be assigned to support the geographical combatant command area of responsibility. Combat sustainment support battalions that have a calibration and repair support mission will establish communication with each other at the G-4 staff level within the SPO or maintenance cell to provide a theater level calibration and repair support infrastructure. This communication linkage provides the supported commands with the necessary information and support to ensure that all supported units that require calibration and repair support within the geographical combatant command area of responsibility are made aware of where their support is located and how to interface with the area TMDE support teams for their required calibration and repair support. The loss of space-based communications through enemy disruption or denial attacks during deployed operations remains a major concern for organizations responsible for sustaining the U.S. forces. Leaders must be prepared to operate with alternative communications methods and networks. Short term losses of communications may be mitigated through alternative communications methods. The combat sustainment support battalion will maintain contact with the theater sustainment command to ensure the geographic combatant commander is able to continuously monitor calibration and repair support within the operating environment. This enables the geographic combatant commander to direct the calibration and repair mission according to the theater commander's intent and mission objectives. An electronic systems maintenance warrant officer assigned to the combat sustainment support battalion is responsible for providing management and technical support to the area TMDE support teams.

## **AREA TMDE SUPPORT TEAM**

6-17. The area TMDE support teams are usually assigned to support maintenance company within the combat sustainment support battalion. Both Active and National Guard Area TMDE Support Teams are manned as 5 to 7 Soldier teams using sets configured to provide C&RS for the Operational Army. Each area TMDE support team is capable of providing field level calibration and repair support to any Army unit that owns and/or uses general purpose or selected special purpose TMDE within the two-level maintenance support concept. The area TMDE support team also has the capability to provide split-based type support to forward deployed units that require calibration and repair support. The supported unit that requires a split-based type calibration and repair support will need to coordinate that requirement with the supporting combat sustainment support battalion. The maintenance cell of the combat sustainment support battalion will coordinate with the area TMDE support team and provide the requested/required services. Reallocating calibration and repair support assets requires prior coordination to ensure other priorities for calibration and repair support are not left uncovered. The area TMDE support team must advise the combat sustainment

support battalion maintenance support operations of calibration and repair support issues, trends, metrics and workload analysis. This information is to ensure the sustainment brigade has an accurate picture of the state of calibration and repair support within the support footprint of the support teams within its command. Due to the unique design and mission essential requirement of the calibration and repair support team it is absolutely essential that each area TMDE support team remain unencumbered by the host or parent unit and allowed to perform its mission. The command hierarchy from tactical to strategic levels of command is responsible for the successful calibration and repair support mission and must maintain visibility of those area TMDE support teams under their mission command.

### **OTHER TMDE SUPPORT ACTIVITIES**

6-18. The Army's Table of Distribution and Allowances (TDA) calibration and repair support organizational structure is designed for flexibility relative to the theater mission requirements, while the capabilities to perform the unified land operations mission are contained at a single TMDE support activity. A carefully controlled network of TMDE support activities supports all levels of the operational and generating forces. The U.S. Army TMDE activity provides sustainment level calibration and repair support for all Army components and serves as a back up support for the Area TMDE support team's mission.

6-19. The ARNG TDA calibration and repair support is embedded in state-operated Combined Support Maintenance Shops. They provide field level support to TMDE owners within their state or region of responsibility.

6-20. The Combined Arms Support Command (CASCOM) Capabilities Development and Integration Directorate provide the requirements management support for all MTOE TMDE. CASCOM Capabilities development and integration directorate is the user representative for the area TMDE support team calibration and repair Soldier and ensures the area TMDE support team has the accurate quantity and allocation of calibration standards to execute the Army MTOE TMDE mission. CASCOM Capabilities development and integration directorate prioritizes calibration requirements for procurement on an annual basis with coordination between all key stakeholder organizations.

### **TACTICAL OPERATIONS MISSION COMMAND**

6-21. Throughout all operations, FORSCOM and AMC are responsible for providing all TMDE logistics assets in theater and advising sustainment commands on sourcing requirements. These assets include TMDE calibration and repair support mission functions provided by TDA and MTOE elements within the theater of war, to include the Army National Guard.

6-22. The number of area TMDE support teams required to support the overall calibration and repair support mission is based on the category and densities of supported TMDE and the geographic dispersion of supported units. Operational control for all technical aspects of the mission falls under the Area TMDE support team's parent maintenance unit. Where area TMDE support team elements are attached to a unit within a designated force, the unit of attachment exercises administrative control of the Area TMDE Support Team.

6-23. The U.S. Army TMDE Activity provides a TMDE liaison officer to the Army field support brigade to provide Army metrology expertise and technical assistance. The TMDE liaison officer coordinates and provides support to the TSC G-4 on all TMDE requirements. The TMDE liaison officer monitors and reports on calibration and repair support metrics, oversees evacuation of TMDE to higher levels of support, and provides the necessary coordination to establish and maintain comprehensive calibration and repair support coverage through interlocking combinations of civilian, contractor, and military TMDE Support Teams. In addition, the U.S. Army TMDE Activity coordinates with Army command G-4 staff on calibration issues which impact the area TMDE support team mission.

### **OPERATIONAL CONCEPT**

6-24. The U.S. Army TMDE Activity TMDE liaison officer is the central point within the area of operations for coordinating internal and external TMDE calibration and repair support technical and operational requirements. Each area TMDE support team will set up operations in the designated area and

provide one-stop TMDE calibration and repair support to all units within or passing through their area of support. The area TMDE support teams utilize U.S. Army TMDE Activity support for organic and customer secondary reference laboratory support.

6-25. Most area TMDE support teams maintain a split-based, mobile capability, to respond to selected TMDE calibration requirements within the divisional area for a limited timeframe and as determined by the elements of the Division G-4.

### **MISSION EQUIPMENT**

6-26. The MTOE area TMDE support team consists of two major equipment sets. The principal set is the fully mobile and environmentally-controlled calibration and repair facility. A dedicated tactical vehicle with power generation equipment provides for the facility's mobility and electrical power requirements. The facility houses calibration standards, ancillary TMDE, communications equipment, production control facilities, and workspace for repair functions. The TMDE support team mission can be supported from this single facility. In addition to the principal equipment set is a secondary equipment set consisting of a vehicle-mounted shelter with on-board power and environmental control systems. The shelter houses a limited calibration capability, (radiation, detection, indication and computation, torque meter, and oscilloscope standards) for use in a split-based mode of operations, where high densities of TMDE are located.

6-27. When used in a split-based mode of operations, the two-man mobile facility is dependent on the parent area TMDE support team's principal equipment set for repair functions and production control operations.

### **MODES OF OPERATION**

6-28. The MTOE area TMDE support team's equipment configuration allows the team to operate in a fully uploaded mobile mode or in a dismounted fixed facility mode of operations. Within the fixed facility mode of operations, the team may retain limited mobile calibration capability with the shelter-mounted set of equipment for special or split-base requirements. METT-TC considerations, as determined by the appropriate SPO, determine the mode of operations. The calibration standards allocated to the area TMDE support team provides a modular versatility for fixed facility and mobile calibration mission support.

6-29. The TDA TMDE support activities located in theater operate largely in the dismounted fixed facility mode of operation using calibration sets configured to support a wide variety of general purpose and select special purpose TMDE.

6-30. TMDE assets requiring secondary reference level calibration will be evacuated by MTOE and TDA units. This support will normally be provided from designated regional support centers external to the theater.

### **SUMMARY**

6-31. The TMDE calibration and repair support serves a vital role within the Army. Properly calibrated test and measuring equipment can accurately diagnose problems, reduce line replaceable unit failure and conduct maintenance to specified tolerances. From instruments used to control a helicopter's flight navigation to the targeting system on a tracked vehicle to the mechanic using a multi-meter to troubleshoot a faulty system, the Army ensures its weapon systems operate safely and properly through routine calibration of its Test, Measurement, and Diagnostics Equipment.

## Chapter 7

# Other Maintenance Activities

Each maintenance activity has special requirements and must be tailored to meet the commander's intent. This chapter will discuss those requirements for communication and electronics, missile systems, and Army watercraft.

### SECTION I – COMMUNICATION AND ELECTRONIC MAINTENANCE

7-1. Communication and electronic maintenance is directed toward ensuring that communications and electronics systems are operating to proper capability and integrity. Personnel with signal occupational specialties troubleshoot the entire signal system to determine problems within the system. This is normally identifying a faulty line replaceable unit and replacing the unit utilizing on-board spares. It includes submitting the faulty line replaceable unit to maintenance when repair exceeds the signal specialist capability. They also inspect service, lubricate, adjust, replace parts, and subassemblies. Signal specialist authorized maintenance tasks are generally indicated by a "C" in the third position of the source, maintenance, and recoverability code and "Crew" column of the maintenance allocation chart. After the Signal operator or maintainers have exhausted their maintenance capabilities, they evacuate the end item or line replaceable unit to the communications and electronic maintenance shop supporting their unit.

7-2. Maintainer communications and electronic maintenance efforts are focused on performing on and near platform, maintenance tasks or maintenance-related tasks within their capability. This capability is based on their institutionally-trained skills, assigned tools, available TMDE and authorized as indicated by an "F" in the third position of the source, maintenance, and recoverability code and "Maintainer" column of the maintenance allocation chart. The Ordnance communications and electronic maintainers perform repairs or replacement of the end item, line replaceable units, shop replaceable units, modules, subassemblies, subcomponent, circuit card assembly, plug-in units, repair parts, fault verification, troubleshooting assistance and applicable software upgrades. Maintenance-related tasks include technical inspections, warranty claims, spares management, serial number change documentation for administrative adjustment reports, packaging & shipment tracking and coordination with other maintenance elements such as a regional support center, forward repair activity, or brigade logistics support team. Upon completion of these maintenance actions, the item is returned to the user.

7-3. In order to fully understand the maintenance operation for communications and electronic equipment we must first understand the differences between military equipment, the activity providing support for this equipment, and the key personnel associated with the management process. This section will define the roles, responsibilities and procedures that are required to ensure communications and electronic systems are maintained and readily available.

## TYPES OF EQUIPMENT

7-4. The United States Army utilizes two different categories of equipment, life cycle managed, and non-standard equipment.

### LIFE CYCLE MANAGED

7-5. Also known as program of record items, life cycle managed items are procured military equipment items that follow the life cycle from procurement to fielding – sustainment – retirement. These items are designated with a line item number. Examples of this type of equipment are the single channel ground-air radio system, automated mission command systems, and night vision devices.

## NON-STANDARD EQUIPMENT

7-6. Non-standard equipment items are often referred to as commercial off the shelf items. This type of equipment does not usually go through the life cycle management process due to the urgent need of the unit to support its mission. Non-standard equipment is acquired through: rapid fielding initiatives, items received after submitting an operational needs statement, joint improvised explosive device defeat organization, secure communication item, or purchased by unit credit card or other funds.

## AREA MAINTENANCE AND SUPPORT FACILITY

7-7. The area maintenance and support facility provides logistical support for theater level non-tactical communications and information systems used in an overseas theater. There are currently two area maintenance and support facilities in operation: one in Europe and one in the Pacific that provide centralized retail supply and maintenance support for all NETCOM/9th SC (A) telecommunications material, and other communications and electronic material within the European and Pacific theaters of operation.

7-8. The area maintenance and support facility supports the defense satellite communications system, the LandWarNet portion of the global information grid, armed forces radio and television service, military affiliate radio system, and other theater unique communications or mission command systems. The area maintenance and support facility may also provide support to other U.S. military departments, Department of Defense activities, and other US government agencies or installations. The area maintenance and support facility may be operated directly by the U.S. Army or may be operated by a civilian contractor with U.S. Army oversight.

7-9. The area maintenance and support facility furnishes masts to provide scheduled and emergency backup maintenance and technical assistance and instruction at the communications and electronic facility or unit location that is beyond the unit's capability and authorization. The facility maintains an authorized stockage list of communications and electronic supplies, repair parts, approved stock record account to receive, store, and issue items on communications and electronic bills of material and approved stock of operational readiness floats. The area maintenance and support facility maintains the capability to provide a training base for specialized communications and electronic material, and to respond to emergency assistance request from supported units. It assists supported units in correcting faults found during performance evaluations and inspections to improve and maintain the operational availability of communications and electronic systems and equipment. Other support includes operating a module and printed circuit board repair section capable of repairing unserviceable equipment through the use of microelectronics repair methods and automatic test equipment. Finally, the area maintenance and support facility repairs peripheral material, such as power and environmental, when not supported by the facility engineer or other area support maintenance units.

7-10. The maintenance support team provides scheduled, emergency, or on-call mobile maintenance support to communications and electronic fixed facilities or other NETCOM/9th SC (A) units. Maintenance support teams are a functional responsibility of area maintenance and support facility and other authorized command maintenance organizations.

## THEATER LEVEL COMMUNICATIONS AND ELECTRONIC MAINTENANCE

7-11. NETCOM/9th SC (A) is responsible for maintenance support of all theater level communications assigned by both the Headquarters Department of the Army or the command information office and G-6. This responsibility includes:

- Organization and operation of all area maintenance and support facilities supporting OCONUS commanders.
- NETCOM/9th SC (A) maintenance support teams.
- Communications security logistic support units.

- Module and repair activities required for direct exchange of communications and electronic material and other electronics material as assigned.
- A Senior Electronic Systems Maintenance Warrant Officer is positioned at each vital CONUS/OCONUS geographic location to advise the G-6 and staff on all signal communications maintenance and readiness functions impacting network operations at the strategic, operational and tactical levels.

## **CORPS AND DIVISION HEADQUARTERS COMMUNICATIONS AND ELECTRONIC MAINTENANCE**

7-12. The core/division G-6 is responsible for monitoring the status and sustaining the division networks that comprise the LandWarNet. The division G-6, working closely with the division signal company, division headquarters battalion staff, division G-4 and the executive officer, ensures the critical network maintenance is performed and parts are available as needed for communications and electronic systems to remain operational. The Electronic Systems Maintenance Warrant Officer is a critical liaison on the corps/division staff reporting directly to the G-6. This warrant officer advises the G-3FM/G-4/G-6 on the maintenance readiness posture, new equipment training/fielding and facilitates all forms of maintenance support for all electronic, missile and signal communications assemblages within their formations. The Signal Systems Integration Oversight cell is staffed to perform these functions.

## **EXPEDITIONARY SIGNAL BATTALION**

7-13. The expeditionary signal battalion has sufficient organic supply and maintenance structure to handle normal logistical requirements in garrison or when the subordinate elements are in close proximity to one another during an operation. Companies, platoons, sections, and teams that are deployed separately will ordinarily receive logistical, maintenance, and spare parts support from the supported unit. Maintenance services and repair parts for unit-unique equipment may be provided by the supported unit or may require the deployment of battalion maintenance or maintenance support unit assets. Both the battalion and companies contain communications and electronic and communications security maintenance sections for these purposes. Direct coordination between the supported G-6 and S-6 and expeditionary signal battalion S-3 should be done to ensure the maintenance strategy is understood for each expeditionary signal battalion element. This direct coordination is performed by the Electronic Systems Maintenance Warrant Officer within the expeditionary signal battalion. The communications and electronic and communications security maintenance section supports maintenance on standard communications and electronic equipment, but primarily on Warfighter Information Network platforms.

## **DIVISION SIGNAL COMPANY**

7-14. The division signal company staff coordinate network performance and maintenance issues with the division G-6 through the division headquarters battalion staff. The division signal company has crew maintainers tasked with performing field level maintenance on organic signal assemblages. The executive officer of the signal company coordinates maintenance support for organic equipment and maintains oversight on the status of all logistical and maintenance matters within the company.

## **BRIGADE SIGNAL COMPANY**

7-15. The brigade signal company staff coordinates network performance and maintenance issues with the brigade S-6 staff. The brigade signal company has crew maintainers tasked with performing maintenance on signal assemblages. The executive officer of the signal company coordinates with the staff's warrant officer to facilitate maintenance support for organic equipment from the communications and electronic maintenance shop located in the BSB field maintenance company. The executive officer maintains oversight on the status of all logistical and maintenance matters within the company.

## FIELD MAINTENANCE

7-16. At the brigade level, the brigade S-6 ensures the critical network maintenance is performed and parts are available as needed for communication and electronic network systems to remain operational.

7-17. At the brigade level the BSB field maintenance company contains a communications and electronic maintenance section. Warrant officers and Ordnance electronic maintainers reside in the communications and electronic maintenance section and, if authorized, missile system maintainers are also collocated. The communication and electronic maintenance section provides technical inspections, troubleshooting and repair of communications equipment to expeditiously repair and return equipment to supported units. These maintainers perform repair or replacement of the end item, line and shop replaceable units, modules, subassemblies, subcomponents, circuit card assemblies, plug-in units, and conduct fault verification, troubleshooting assistance and applicable software upgrades. Maintenance-related tasks include warranty claims, spares management, serial number change documentation, packaging & shipment tracking and coordination with other maintenance elements i.e. regional support center, forward repair activity, or the brigade logistics support team. For all BCTs, each battalion has an FSC to provide field maintenance support and distribution of all classes of supply.

7-18. Each maneuver battalion within a brigade combat team has a battalion S-6 who is responsible for the integrity of the battalion's signal systems. The S-6 works in conjunction with the S-4, SPO and the FSC commander to develop a comprehensive maintenance plan (to include coordination for contractor field service representative) that is then incorporated into the maintenance standing operating procedures. This ensures that there are clearly understood procedures in place to enhance a positive maintenance posture.

7-19. The maneuver battalion has a supporting forward support company that provides limited communications and electronics repair. The battalion S-4 is the main logistics planner and the forward support company commander assists the S-4 in developing maintenance plans that are based on the battalion commander's guidance. The FSC commander also works with the battalion XO, S-4 and BSB SPO to ensure maintenance efforts are synchronized.

7-20. The FSC maintenance control officer has the following responsibilities: perform maintenance according to the maneuver battalion commander's priorities; monitor the status of equipment undergoing repairs and determine the status of the repair parts required to complete those repairs.

7-21. The FSC or the field maintenance company may not have the capability to repair or replace some communications and electronic equipment. In this instance the FSC must coordinate with the BSB SPO to request assistance from the field maintenance company.

7-22. At echelons above the brigade, the support maintenance company has a communications and electronics support section capable of providing field maintenance support to units on an area basis.

7-23. Most organizations at echelons above brigade have some assigned communications and electronic field maintenance capability assigned to the headquarters company or platoon.

7-24. Maintenance workflow is the same for communications and electronic equipment as with any other equipment in the Army inventory. Upon identifying a fault on a piece of equipment it is annotated on DA Form 5988-E or DA Form 2404. The form is then turned into the appropriate maintenance section for verification and repair. The maintenance section (battalion, company signal communications section or similar) verifies the fault and if possible repairs it. If the item cannot be repaired at their location, the maintenance section opens a maintenance request on automated DA Form 2407-E (Maintenance Request) or automated DA Form 5990-E (Maintenance Request) or use the manual DA Form 2407 (Maintenance Request) or DA Form 2407-1 (Maintenance Request–Continuation Sheet). The maintenance section opens the work order and sends it to the appropriate repair facility or requests for a support team to come forward and make the repair. The field maintenance organization is responsible for the equipment and will provide transportation for the repair and to maintain accountability: the work order can act as the hand receipt and must contain the noun, nomenclature, model number and the serial number of the equipment. The maintenance request for sensitive or secure items is vital for commanders to maintain property accountability and enforce command supply discipline. The automated Maintenance Request DA Form 2407-E or DA Form 5990-E or the Manual Maintenance Request DA Form 2407 or DA Form 2407-1 is required as supporting documentation for administrative adjustment reports when serial number changes

are required due to an authorized maintenance transaction and no actual loss or gain in property has occurred. DD Form 1149 (Requisition and Invoice/Shipping Document) and SF 153 (COMSEC Material Report), in conjunction with the DA Form 2407-E, are also routine documents processed by Ordnance maintainers required for sensitive or secure item property accountability. The communication and electronic maintenance shop completes this documentation for their supported units.

7-25. Unit commanders and organizational staff are able to receive status on the readiness of their equipment via reports from the Integrated Logistics Analysis Program or the supporting units SAMS-E.

7-26. Automated mission command systems may not be supported military personnel. Maintenance managers at each echelon must coordinate with the Communications and Electronic Life Cycle Management Command representative to ensure adequate maintenance support is in place for these systems. The brigade logistics support team is often the best avenue for coordinating support for these systems at the brigade level. Army Materiel Command logistics support teams may coordinate support at echelons above brigade.

7-27. Field maintenance for some automated mission command systems or non-standard equipment may be performed by contracted maintenance support provided by the life cycle management command for the item.

## **SUSTAINMENT MAINTENANCE**

7-28. Sustainment maintenance for communications and electronic equipment is the same as for any Army item. Sustainment maintenance units are Army Materiel Command assets that provide in-theater support as required for repairing, rebuilding, overhauling components and end-items, and returning them to supply system. Sustainment maintenance support for communications and electronic items is coordinated through the supporting maintenance organization to the supporting battalion or brigade support operations staff.

7-29. At the brigade level sustainment maintenance may also be coordinated through the brigade logistics support team. It is important that this team keep the supporting brigade support battalion apprised of sustainment maintenance activity to ensure no duplication of effort is ongoing.

7-30. At echelons above brigade, Army Materiel Command logistics support teams and elements may coordinate sustainment maintenance support. The Army field support battalion also provides logistics assistance support to units that do not have a brigade logistics support team, such as fires brigades, maneuver enhancement brigades, battlefield surveillance brigades, and sustainment brigades, as well as most functional brigades.

## **NON-STANDARD EQUIPMENT WORKFLOW**

7-31. Maintenance workflow starts with a fault on a piece of equipment being annotated on DA Form 5988-E or DA Form 2404. The form is turned into the appropriate maintenance section for verification and repair. The maintenance section verifies the item is not-mission capable and opens a maintenance request (DA Form 2407-E or DA Form 5990-E “automated”) or (DA Form 2407 or DA Form 2407-1 “manual”). The supporting field maintenance organization contacts the brigade logistics support team or the Army field support battalion to see if they have the available resources to repair the item. If not, coordination for the item’s evacuation is executed through the communications and electronics maintenance shop to the appropriate supporting maintenance activity. Before evacuation, ensure that the battalion S-4 and the maintenance control officer are informed.

7-32. It is possible that extended warranty may have been purchased for non-standard equipment items. In this instance the, the service provider may be able to replace the item one-for-one. Coordination with the AMC support representatives is necessary to ensure the appropriate service provider for the non-standard item is properly identified.

7-33. The supporting field maintenance organization is responsible for the equipment once it is submitted and has a valid work request. They will provide transportation for the repair. The work order can act as the hand receipt and must contain the name/model number and the serial number of the equipment.



## COMMUNICATIONS SECURITY MAINTENANCE

7-34. Communications security item maintenance will differ based on the type of equipment involved, facilities, support availability, and time considerations. Individual organizations are limited to diagnosis and fault isolation as authorized by the maintenance allocation chart. Field maintenance organizations are authorized to perform all maintenance tasks coded “C” (operator/crew/signal support specialist) or “F” (maintainer/radio communications security repairer MOS 94E) as outlined in the equipment maintenance allocation chart of the equipment technical manual. Communications security equipment is evacuated through maintenance channels from the unit to the first supporting maintenance unit to complete a total supply transaction and return a serviceable device to the user. The repair of communications security material is performed at sustainment level. Communications security controlled items and communications security maintenance activities must restrict access to personnel requiring only a valid need for access. Unsupervised or undetected access to c=secure maintenance facilities and items must be prevented IAW AR 380-40 and AR 190-51. Only personnel with a valid need-to-know, appropriate security clearances and required duties will be granted access to maintenance areas or access to internal components.

7-35. Sustainment maintenance on Army communications security material will be performed at an Army depot on maintenance tasks codes “D” and “H” as outlined in the equipment maintenance allocation chart. Only depot sustainment maintenance organization are authorized to perform the full range of maintenance tasks coded “C, F, H, L, D” as outlined in the equipment maintenance allocation chart.

7-36. Communications security equipment is evacuated through maintenance channels from the unit to the first supporting maintenance unit. Unserviceable classified communications security material will be evacuated through the communications security material control system. Unserviceable unclassified communications security material, including controlled cryptographic items, will be evacuated through the supply channels.

7-37. Army customers are required to submit requirements through the Communications Security Logistics Activity via the information systems security program when requesting a replacement for classified communications security equipment and/or controlled cryptographic items in accordance with AR 25-2.

7-38. Items procured under the National Security Agency Commercial communications security Evaluation Program will be fielded with a limited vendor warranty. All communications security equipment having a vendor warranty will be maintained and serviced by the original equipment manufacturer for sustainment support. Once the vendor warranty expires, all sustainment repairs will be transitioned to an Army depot for support.

## COMMUNICATION AND ELECTRONIC MAINTENANCE SCENARIOS

7-39. Two different categories are utilized in the Army, standard Army communication and electronic equipment and commercial off the shelf non-standard communication and electronic equipment.

### ARMY STANDARD EQUIPMENT

7-40. Typically a signal systems support specialist will be notified of a problem with communication and electronic mounted in a vehicle. The signal system support specialist will validate the operator preventive maintenance checks on the system using the appropriate technical manual and diagnostic tools to isolate and verify the fault. They will then replace the identified failed line replaceable unit. If a repair of the line replaceable unit is needed, the signal support specialist will notify the supporting field maintenance unit to open a work order.

7-41. The supporting communication and electronic maintenance shop perform repairs or replacement of the end item, line or shop replaceable unit, module, subassembly, subcomponent, circuit card assembly, plug-in unit, or part. It will also perform fault verification, troubleshooting assistance and applicable software upgrades. Maintenance-related tasks include technical inspections, warranty claims, spares management, serial number change documentation for administrative adjustment reports, packaging and

shipment tracking and coordination with other maintenance elements. Upon completion of these maintenance actions, the item is returned to the user.

### **ARMY NON-STANDARD EQUIPMENT**

7-42. In the case of non-standard communication and electronic equipment, the crew member will troubleshoot the equipment, and then identify the fault using the appropriate technical manual or equipment's commercial maintenance manual. After identifying the faulty component, the crewmember will replace it from on board spares or with a spare provided by the communication and electronic maintenance shop. This action is verified by the Electronic Systems Maintenance Warrant Officer and the specific Field Service Representative. As a standard practice, the faulty component is first evacuated to the supporting communication and electronic maintenance shop for processing through the appropriate repair facility. The most expeditious shipping method available, maintaining traceable accountability, must be used to include approved mail services or a courier. The exact means of evacuation of the equipment will be set by supporting maintenance organization and command policy.

## **SECTION II – MISSILE SYSTEM MAINTENANCE**

7-43. All maintenance management applications remain the same for missile maintenance companies as it is with any two level maintenance organizations. However because these units can be employed on an operational, strategic-theater or strategic national basis they receive support from support maintenance company assigned to the sustainment brigade or from organic maintenance.

### **TYPES OF MISSILE UNITS**

7-44. There are five basic types of missile units and each varies slightly. They are as follows:

- Air and missile battalion (Patriot) maintenance company.
- Air and missile defense composite battalion (Patriot/Avenger).
- Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System battery.
- Terminal high altitude area defense battery.
- Maneuver air and missile defense battalion (Avenger) maintenance detachment.

### **AIR AND MISSILE BATTALION (PATRIOT) MAINTENANCE**

7-45. The Air and Missile Defense Battalion (Patriot) conducts field maintenance on all assigned equipment using organic maintenance assets.

7-46. Patriot fire control and launching station operators are trained and equipped to perform a significant amount of crew maintenance. This includes detailed electronics testing, diagnostics, and repair. The Patriot battalion also has a field maintenance company that is employed with the battalion during any type of mission.

7-47. The patriot crews and the field maintenance company provides field level maintenance support to all assigned units and equipment to include automotive, ground support equipment, communications-electronic and missile peculiar systems. It also maintains an authorized stockage list of repairable exchange and shop stock.

7-48. Each Patriot automotive field maintenance team may collocate with a patriot battery and can provide maintenance support for automotive, refrigeration and power generation. The headquarters and headquarters battery automotive field maintenance team is responsible for automotive and power generation maintenance to the headquarters and headquarters battery of the patriot battalion.

### **AIR AND MISSILE DEFENSE COMPOSITE BATTALION (PATRIOT/AVENGER) MAINTENANCE COMPANY**

7-49. The maintenance company has the same characteristics as the Patriot company above with the exception of an Avenger system support team and an Avenger automotive field maintenance team (which

replaces the Patriot automotive field maintenance teams). Both of these teams provide onsite field maintenance to the avenger battery and platoons which are normally spread throughout the operating environment. It is capable of providing radar, automotive and generator support.

### **JOINT LAND ATTACK CRUISE MISSILE DEFENSE ELEVATED NETTED SENSOR SYSTEM BATTERY**

7-50. The Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System battery is employed as a battery or as an independent subsystem as determined by METT-TC. It is used to provide a theater “long duration surveillance base piece” for theater surveillance. It provides overlapping coverage necessary to enhance the joint composite tracking process and enables tactical employment flexibility for other joint theater air and missile defense sensors and weapons. The Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System is also employed to provide integrated fire control support capability in direct or general support of systems and forces, including joint task forces and naval ships operating in littoral regions. It is also employed as part of cooperative and integrated capabilities that complement joint theater air and missile defense weapons and sensors system.

7-51. The battery is comprised of a Headquarters, Field Maintenance and Warfighting Protection Section along with an air and missile defense Planning and Coordination Cell, two Sensor Control and Sensor Sections and a Support Platoon.

7-52. The support platoon is responsible to maintain the battery’s bench stock, shop stock, system records, parts inventory, and provides helium support for the battery. The field maintenance section is responsible for providing maintenance of automotive, power generation, radar, and communications-electronic repair.

### **TERMINAL HIGH ALTITUDE AREA DEFENSE BATTERY**

7-53. The Terminal High Altitude Area Defense Battery has organic field maintenance capability and conducts field maintenance on all assigned equipment.

7-54. The battery consist of a headquarters, field maintenance section, fire control, radar, launcher and battery logistics operation sections. In addition there is a sensor platoon headquarters.

### **MANEUVER AIR AND MISSILE DEFENSE BATTALION (AVENGER) MAINTENANCE DETACHMENT**

7-55. The mission of the maintenance detachment is to provide field level maintenance support to the maneuver air and missile defense battalion. It provides all of the automotive, ground support equipment, communications-electronic and peculiar missile systems maintenance. The detachment normally deploys with the HHB.

7-56. The detachment is comprised of a headquarters, mechanical maintenance, recovery and Avenger maintenance sections. The mechanical maintenance section provides all the automotive, ground support and communication-electronic maintenance while the recovery section provides all the lift capabilities for the repair shops along with recovery of organic equipment. It also provides limited recovery and welding to supported units and assist with maintenance to maintenance evacuation support.

7-57. The Avenger electronic/missile field maintenance team is capable of breaking into six teams to provide contact system maintenance support to the avenger battalion. It also serves as an alternate net control station.

### **ARMY MATERIEL STATUS SYSTEM**

7-58. The materiel status report used for missile system readiness is the Army materiel status system. It can be submitted directly to the logistics information warehouse or through the servicing unit’s SAMS-2E box. Once submitted, the unit has the ability through logistics information warehouse to view their status for any errors. It is vital to submit as early as possible to allow sufficient time to correct any errors.

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*Note.* Prior to running the Army materiel status system, ensure a complete backup is performed by the clerk, once the data is purged it cannot be retrieved without the backup.

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## SECTION III – ARMY WATERCRAFT MAINTENANCE

7-59. The purpose of Army watercraft maintenance is to ensure safe, seaworthy, reliable watercrafts. Maintenance tasks include any action that sustains material in an operational condition, restores it to a fully mission-capable condition, or upgrades it through modification or product improvement. Maintenance tasks range from simple preventive maintenance checks and services of equipment to complex depot operations performed in fixed shops and facilities and categorized in the Army maintenance system as field level maintenance or sustainment level maintenance. For Army watercraft, field maintenance can be described as on-craft maintenance and repairs and return of subcomponents. Sustainment maintenance can be described as a combination of on and off-craft maintenance for assemblies and sub-assemblies and the majority of those tasks previously classified as depot level.

### ARMY WATERCRAFT CLASSIFICATION

7-60. There are multiple classes of Army watercraft vessels. The Army classifies watercraft vessels into the following classes.

#### CLASS A VESSELS

7-61. Class A vessels are self-propelled, self-sustaining with berthing and messing facilities. They accomplish their primary mission underway and are capable of tactical and operational sustainment near coastal, interisland and inland waterway service between two or more water terminals. Class A vessels routinely deploy in support of near coastal, interisland and inland waterway service operations. Class A2 vessels include the logistics support vessel, 800 series large tug, and flight III large tug 100 series; class A1 vessels include landing craft utility 2000 series. The landing crafts and large tugs are organized under the heavy boat company and the floating craft company.

7-62. The logistics support vessel is an independent unit and does not have any other sections within the organization other than the authorized crew; such as supply, field maintenance, or a headquarters section.

#### CLASS B VESSELS

7-63. Class B vessels are self-propelled, but not self-sustaining. They accomplish their primary mission underway in and around ports. Class B vessels are capable of tactical and operation support of logistical and harbor operations. They provide waterborne security, cargo and personnel transportation, perform fireboat duties when properly equipped and inter-harbor barge movements. Class B vessels include the landing craft mechanized, series 900 small tug, warping tug, and causeway ferry. Landing crafts and small tugs are organized under medium boat detachments and floating craft companies respectively; warping tugs and causeway ferries are organized as part of the modular causeway system under causeway companies.

#### CLASS C VESSELS

7-64. Class C vessels are neither self-propelled nor self-sustaining. They accomplish their primary mission in port and are capable of tactical and operational support of logistical and harbor operations, and/or waterborne cargo transportation when towed by a Class A towing vessel (Tugboat). They also provide waterborne support for maintenance and repair, or light and heavy lifts. Class C vessels include barge cargo, barge derrick, fuel barge, roll on/roll off discharge facility, and floating causeway.

### MAINTENANCE OPERATIONS

7-65. Operations personnel must continually communicate with maintenance personnel to manage and influence maintenance operations, and subsequently the operational posture of the organization. This information must flow smoothly between each level of responsibility. Operations and maintenance

information originates with the individual vessels. Vessels manage their operational and maintenance status and provide this information to the unit's vessel support office on a daily basis. The vessel support office consolidates the information, provides assistance and resources within its ability and provides the status to the harbormaster operations detachment. The harbormaster operations detachment was designed and intended to provide a battalion, transportation terminal or otherwise, with the ability and expertise to monitor both the operations and maintenance status of Army watercraft. The harbormaster operations detachment coordinates and monitors maintenance information with the vessel support offices and the supporting field maintenance organizations and provides this status to the battalion operations staff who then forwards the information to the sustainment brigade's theater opening element. The theater opening element contains the sustainment brigade's terminal operations and watercraft operations expertise. Other critical links for Army watercraft include the field maintenance support organization and the tank-automotive and armaments command's watercraft inspection branch. The latter organization is the unit's conduit to sustainment maintenance resources. All of these organizations must continually communicate and cooperate to insure vessel availability and ultimately, mission accomplishment.

7-66. Operational commanders determine the status of each vessel based on the mission requirements. Field maintenance managers (vessel chief engineers and support maintenance production control personnel) determine and manage the level of effort applied to a vessel based on the vessel's maintenance status. They will then prioritize maintenance actions into critical and non-critical systems.

7-67. Maintenance management and reporting is accomplished using the organic sustainment information systems and follows command standing operating procedures. For more detailed Army watercraft operations, see ATTP 4-15, *Army Water Transport Operations*.

### **WATERCRAFT FIELD LEVEL MAINTENANCE**

7-68. Watercraft field level maintenance is comprised of crew and maintainer level maintenance.

- Crew level maintenance is characterized by on-system maintenance and includes; inspect, test and service of watercraft components, modules, sub-assemblies, assemblies, and systems ensuring the vessels condition is maintained in good working condition. Crew level maintenance actions are performed by watercraft operators and watercraft engineers.
- Maintainer level maintenance is characterized by on/off-system maintenance and includes; inspect, test, service, adjust, replace, and repair of watercraft components, modules, sub-assemblies assemblies, and systems returning them to a serviceable condition. Maintainer level maintenance actions are performed by watercraft engineers. In some cases maintainer level maintenance actions are performed, in accordance with the applicable maintenance allocation chart, by a maintenance contractor using best commercial practices.

7-69. Field level maintenance is the responsibility of unit commanders, vessel masters and chief engineers. The makeup of a vessel crew is such that, it includes equipment operators as well as equipment operator/maintainers. For this reason vessel crews will be treated in the same regard as a ground based maintenance support team. All regulations, policies, apportionments, and allocations that apply to a maintenance support team apply to a vessel crew. For instance a vessel is authorized a shop stock and bench stock the same as an maintenance support team.

### **WATERCRAFT SUSTAINMENT LEVEL MAINTENANCE**

7-70. Watercraft sustainment level maintenance is comprised of below depot and depot level maintenance.

- Below depot maintenance includes: inspect, test, service, on condition cyclic maintenance, adjust, replace, repair, overhaul and rebuild of watercraft components, modules, sub-assemblies assemblies, and systems returning them to the supply system or by exception to the original user in a serviceable condition. Below depot maintenance actions are of an intensive nature, requiring maintenance man hours, typically beyond the capability of field level maintenance activities. This level of maintenance does not require dry-dock or shipyard facilities but in most cases does require tools and/or support equipment exceeding the authorizations of field level maintenance activities, and is routinely performed by the installation maintenance activity or through contracted maintenance support.

- Depot maintenance includes: inspect, test, service, on condition cyclic maintenance, adjust, replace, repair, overhaul and rebuild of watercraft components, modules, sub-assemblies assemblies, and systems returning them to the supply system or by exception to the original user in a serviceable condition. Depot maintenance actions are of an intensive nature, requiring dry-dock and/or shipyard facilities and are performed by a contractor using Best Commercial Practices IAW the language of a specific service(s) contract tailored to those repairs.

7-71. In accordance with AR 750-1, on condition cyclic maintenance is a depot level service. This service is required to meet numerous, vessel specific, federal statutory and regulatory requirements. While unscheduled below depot and depot level maintenance actions are not inherent to on condition cyclic maintenance they are routinely accomplished concurrently with on condition cyclic maintenance, taking advantage of both vessel availability as well as contracted facilities.

### **MULTIYEAR PHASED MAINTENANCE**

7-72. Multiyear phased maintenance consists of vessel surveys, multiyear inspections and shipyard maintenance periods required to meet statutory and regulatory requirements for vessels. By separating those actions that require shipyard maintenance from those that can be performed on-station, the new strategy will yield a reduction in shipyard evolutions.

7-73. Multiyear phased maintenance includes underwater hull inspections required to meet Title 46 Code of Federal Regulations requirements. Vessel surveyed to include all operating systems, annual underwater hull inspections for Army prepositioned stock wet stored vessels, dry-docking and vessel repairs to include extensive blasting and painting when required.

7-74. Inspections/maintenance for the American bureau of shipping's 5 year load line letter, quadrennial crane inspections, hull structural repairs, vessel system repairs exceeding field level capabilities that are best accomplished in a shipyard, deferred maintenance, application of engineering change proposal packages and modification work orders, American bureau of shipping certification, and provides a 90 day warranty.

### **ANNUAL PHASED MAINTENANCE**

7-75. Annual phased maintenance consists of interim vessel surveys and contracted maintenance to perform on condition maintenance pier side. By identifying functions that can be performed pier side at the normal station, vessels will be inspected and maintained more frequently and loss of operational availability will be reduced.

7-76. Annual phased maintenance includes annual watercraft inspection branch surveys inspecting entire vessel condition and operation of all vessel systems. As required, a conditioned based maintenance contract is generated for pier side repairs, either at military base or contractor's facility, dependent upon which location is most advantageous to the Army. Non-emergency repairs requiring dry-docking will be deferred to multi-year phased maintenance.

### **INSPECTIONS AND CERTIFICATIONS**

7-77. The third level of sustainment maintenance provides for national level oversight of user level regulatory annually required tests, inspection and certifications.

7-78. Units and field maintenance teams are responsible for initiating all regulatory (AR 56-9) required tests, inspections, certifications and correcting deficiencies preventing certifications of systems/equipment. Annual inspections are done during phased maintenance periods. The new on condition cyclic maintenance strategy will be implemented across the fleet based on the operational and/or storage status of the vessel type.

### **MAINTENANCE IN PORT**

7-79. When in port the determination as to the use of contracted support for field maintenance will be made by the unit commander based on priority and resource availability. When deployed a vessel master

and chief engineer are authorized to coordinate for contracted maintenance support for either level of repair. The use of locally contracted support should only be used to restore a vessel to a mission capable status, not to eliminate maintenance backlog. Contracted maintenance support is not to be used in lieu of organic crew support or support level if reasonably available.

### **UNDERWAY MAINTENANCE**

7-80. The vessel master and chief engineer are responsible for all maintenance while a vessel is underway. The crew performs all necessary field maintenance both scheduled and unscheduled to ensure safe and seaworthy operation. The chief engineer directs the maintenance effort to critical systems. These systems are necessary for the safe operation of the vessel and its ability to perform its intended mission. If required, the chief engineer may request authorization to conduct repairs that are normally performed by sustainment maintenance. They may also elect to defer some unscheduled maintenance until the vessel reaches a port where the crew can be augmented with resources from a support field maintenance organization. Repairs conducted underway that alter the configuration of the vessel/system must be restored to the approved configuration upon return to home station.

### **MAINTENANCE IN AN AWAY PORT**

7-81. When a vessel reaches port the maintenance effort is directed to restoring it to serviceability as determined by its mission profile. The chief engineer will have determined the maintenance burden prior to return or arrival at a port. They record all maintenance requirements and make an estimate of field maintenance requirements in terms of man-hours required. He must then manage the maintenance effort to bring the vessel to an operational status with regard to critical systems. If sustainment level maintenance tasks have been identified and can be deferred until arrival in port, coordination to affect these repairs will be made at the same time.

### **SUPPLY SUPPORT**

7-82. The crew of class A and B vessels are authorized stockage of shop stock and bench stock. Stockage of authorized repair items other than that will be held by the quartermaster supply platoon assigned to the port or installation. Management of loads will be in accordance with AR 710-2.

7-83. Availability and long lead times in procuring some class IX items for Army watercraft continues to be a challenge. Because of the age of on-hand vessels and the different manufacturers of those vessels, many unique parts have to be procured or manufactured through commercial means. Installation activities with watercraft units on station will maintain watercraft unique items. Repair parts for Army watercraft will continue to be held at unit, installation and national wholesale levels. Components and major end-item replacement parts must be intensely managed at all levels to maintain visibility throughout the distribution system to effect needed repair or replacement.

7-84. Figure 7-1 depicts the general flow of supply requisitions for vessels in port. Underway requisitioning processes depicted in figure 7-2 apply to landing crafts and large tugs operating independently or in a task force situation. Because the logistics support vessels are independent detachments, the difference between in port and underway requisitioning procedures will be the means of communication to the supply system. Under this concept the supply support activity support will be provided by a quartermaster support platoon assigned to the home port or installation. When a vessel deploys, the losing supply support activity will either provide the vessel an electronic copy of its authorized stockage items or electronically forward that information to the gaining supply support activity. The support maintenance organization will not have a tech supply and will be authorized only shop and bench stocks. All authorized repair parts will be held at the supply support activity level.

7-85. For new watercraft construction, replacement parts and associated components should be designed to limit packing and crating requirements allowing distribution managers to push and recover needed supplies to the battlefield. While not directly associated with Army watercraft maintenance transformation, components and end items should contain electronic tracking tags that enable serial number tracking and expedite delivery to sources of repair.

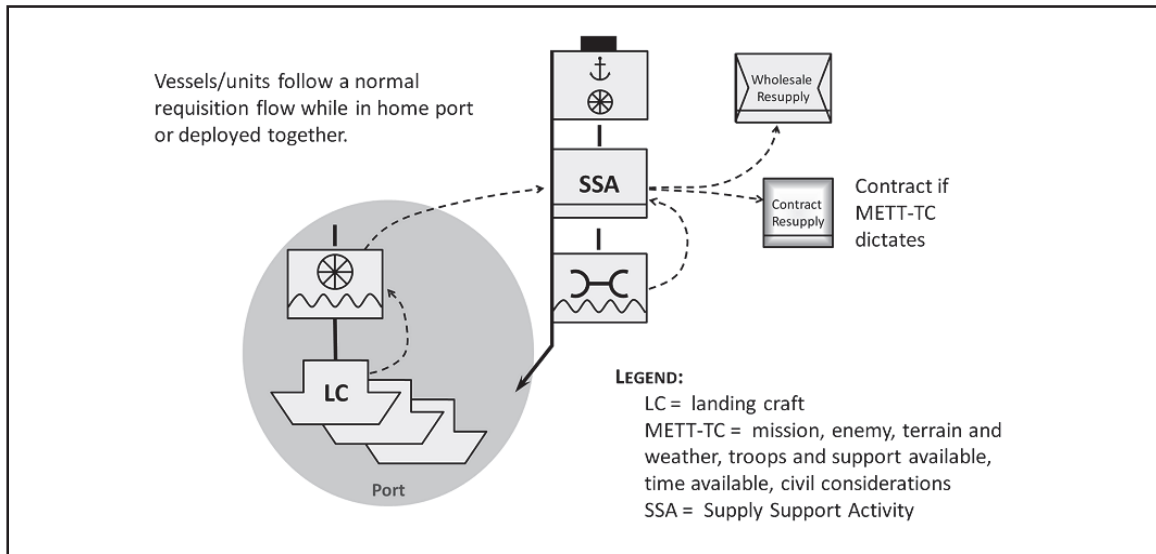


Figure 7-1. Supply requisition flow (port)

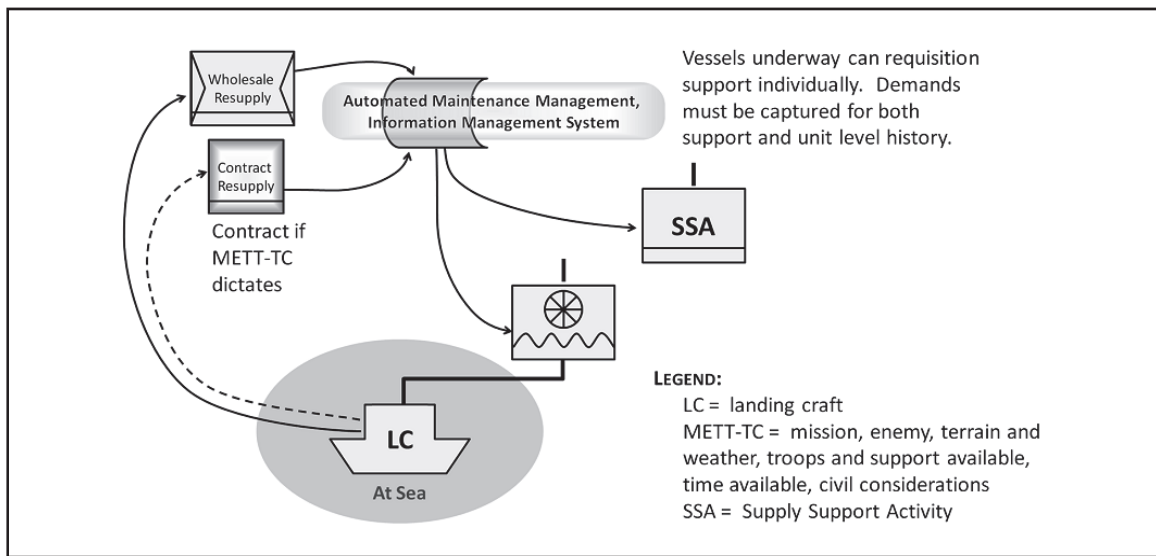


Figure 7-2. Supply requisition flow (afloat)

## SUMMARY

7-86. When planning for Army watercraft maintenance operations there are several units that have special requirements and capabilities. A good understanding of the unit's mission, organization, roles, functions, and support structure will maximize their employment.



## Appendix A

# Geographical Considerations for Maintenance Operations

Adverse environments encompass a wide range of geographies (desert, jungle, and mountainous terrain) and usually are accompanied by extreme weather conditions that will affect mission preparation and performance. Extreme heat, cold, humidity directly affects personnel as well as certain components of the systems maintained. This appendix discusses key areas that should be considered when operating in different environments.

## DESERT OPERATIONS

A-1. Maintenance support for desert operations requires an understanding of the environment. Temperatures vary according to latitude and season. In some deserts, day to night temperature fluctuation can exceed 70 °F. Desert terrain 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

A-2. Desert locations are seldom close to normal lines of communications. The effects of the environment (extreme heat and sand) on equipment are severe, requiring increased levels of maintenance to maintain readiness. Distances between units and lines of communication are long.

### CLASS IX SUPPLY SUPPORT

A-3. Demand for repair parts will increase due to harsh desert environmental factors 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, clamps, sprocket nuts, wedge bolts, and cleaning fluids for electronic equipment.

### TERRAIN

A-4. 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 routes of travel based on the 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.

A-5. Vehicles should be equipped with extra water cans, fuel cans, meals, air recognition panels, signal mirrors, and tarpaulin (to provide shade for the crew).

A-6. 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, sprocket nuts, and transmission shafts) must be checked for undue wear when completing before-, during-, and after-operation maintenance checks.

### HEAT

A-7. 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.

A-8. Commanders should be aware of which vehicle types are prone to overheating and ensure extra maintenance is scheduled for 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.

A-9. 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.

A-10. Severe heat increases pressure in closed 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.

A-11. 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° F, which will cause unstable flight unless projectiles are stored in an upright position.

## **RADIANT LIGHT**

A-12. Radiant light or its heat effect may be detrimental to plastics, lubricants, pressurized gases, some chemicals, and Infrared tracking and guidance systems. Items like Carbon dioxide fire extinguishers 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.

## **DUST AND SAND**

A-13. 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 semi-exposed 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.

A-14. 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.

A-15. Sand will also find its way into electrical 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.

A-16. Dust affects communication equipment such as amplitude-modulated radio frequency amplifiers and radio-teletypewriter sets. The latter is especially prone to damage due to their oil lubrication, so 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, special care should be taken to prevent dust from interfering with the Logistics system hardware computers, in particular non-standard hardware. Non-standard hardware is extremely sensitive to extreme environment, including excessive dust that can cause overheating.

A-17. 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.

A-18. 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.

A-19. 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 hygroscopic material. Those in use should be kept where free air can circulate around them and they should be purged in frequent intervals.

A-20. 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.

### **TEMPERATURE VARIATIONS**

A-21. 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.

A-22. Air and fluids expand and contract according to temperature. Ensure tire pressures are checked when tires are cold (not recently driven on). Do not exceed recommended pressure in as shown in the technical manual. 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 technical manual.

A-23. When using logistics system hardware computers, special care should be taken when using non-standard hardware to prevent heat related damage to the computer systems. Non-standard hardware has minimum and maximum operating temperatures that should be observed at all times.

### **STATIC ELECTRICITY**

A-24. 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.

### **WINDS**

A-25. The velocity of desert winds can be destructive to large, relatively light material (such as aircraft, tents, and antenna systems). To reduce wind damage, materiel should be given terrain protection and firmly picketed to the ground.

### **DESERT MAINTENANCE**

A-26. Establish a recovery and maintenance SOP before or immediately after arrival in-theater. The SOP should include field level maintenance recovery, expedient repair, 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), and security.

A-27. 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, which may require the recovery vehicle to perform a longer than normal tow.

A-28. The maintenance collection point should cover a large area to allow for dispersion of the supporting unit's equipment and inoperable weapon systems. An field maintenance team from the forward support company will normally be located at the maintenance collection point 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**

A-29. 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.

A-30. Locations. Operation of materiel in temperatures down to  $-10^{\circ}\text{F}$  presents a few problems. Conditions are similar to those in the northern portions of the CONUS during the winter. From  $-10^{\circ}\text{F}$  to  $-40^{\circ}\text{F}$ , operations become difficult.

A-31. Proper maintenance and training will prevent failures of materiel and injuries to personnel. When the temperature is below  $-40^{\circ}\text{F}$ , operations become increasingly difficult. At temperatures near  $-65^{\circ}\text{F}$ , the maximum efforts of well-trained personnel are required to perform even a simple task with completely winterized materiel.

A-32. Class IX Supply Support. 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.

A-33. 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.

## **COLD WEATHER MAINTENANCE**

A-34. Personnel must be aware of the importance of maintenance. 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.

A-35. 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  $-20^{\circ}\text{F}$ , 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.

A-36. 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.

### **BUILDINGS AND SHELTERS**

A-37. 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 man-hours 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.

A-38. 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.

### **LIGHTING EQUIPMENT**

A-39. Sufficient lighting 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**

A-40. 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.

A-41. 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.

A-42. 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 a cold weather injury to personnel. Maintenance personnel should carry extra gloves.

A-43. 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 a cold weather 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.

A-44. 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.

### **JUNGLE OPERATIONS**

A-45. 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**

A-46. 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.

### **CLASS IX SUPPLY SUPPORT**

A-47. Repair parts that deteriorate or wear out faster in the jungle environment must be identified. The shop stock/bench stock must reflect the increased turnover of these parts.

### **MAINTENANCE**

A-48. In the jungle, the Maintenance units operate essentially the same as in other operations. High humidity and temperatures in jungle areas increase maintenance requirements. Preventative maintenance checks and services on any items affected by moisture and heat is extremely important. The need for responsive maintenance support means the number of repair parts for immediate use must be increased.

### **TRANSPORTATION**

A-49. 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. Human portage is a basic means of moving supplies and equipment in jungle operations. However, this method, at best, is slow, laborious, and inefficient.

A-50. 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.

A-51. 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.

A-52. 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**

A-53. 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**

A-54. Due to terrain constraints, it may be necessary to disperse units over a wide area. Dispersion reduces the vulnerability however; it may cause problems with command, control, and local security. Since support units will be high-priority targets, they must have adequate protection against ground and air attack to ensure continuous operations.

### **CLASS IX SUPPLY SUPPORT**

A-55. 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 authorized stockage list (ASL), bench stock and shop stock. Typical high-consumption repair parts include tires, tie rods, transmissions, brake shoes, tracks and pads, final drives and winch parts.

## **MAINTENANCE**

A-56. 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. 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.

## **TRANSPORTATION**

A-57. 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.

A-58. When weather permits, use helicopters to move repair parts from the Supply Support Activity 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 OPERATIONS**

A-59. 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.

A-60. 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**

A-61. 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 FMTs or movement of equipment to field maintenance points. Maintenance units may take advantage of hard stands, overhead lift, installed communication systems, and maintenance facilities existing in their areas of responsibility.

## **CLASS IX SUPPLY SUPPORT**

A-62. 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.

## **MAINTENANCE**

A-63. Fixing equipment on-site is extremely important in urban operations. 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.

## **TRANSPORTATION**

A-64. 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.

## **NIGHT OPERATIONS**

A-65. Night operations use the same organization and require the same functions as daylight maintenance support. Commanders continue to effect internal adjustments of their maintenance assets to meet unique situations. 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**

A-66. 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 night maintenance SOP.

A-67. 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**

A-68. 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.

A-69. With the present night vision technology, planners must anticipate built-in backlog each morning. They must ensure that the Maintenance Support Plan (Annex I, Service Support) provides timely support without interfering with or compromising the tactical plan.

## **PROCEDURES**

A-70. Using night vision devices, 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.

A-71. 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 technical manuals. The tactical commander must approve the use of subdued visible light.

A-72. 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. Support teams dispatched from support elements into areas farther forward should have night vision devices.



## **Appendix B**

### **Maintenance Management Information Systems (Ground)**

Maintenance management includes forecasting, distributing, scheduling, and controlling the production of maintenance workloads. Factors that impact on maintenance management are budget, supply, personnel, and property accountability. Automation greatly increases the ability of maintenance managers to manage the flow of maintenance data. This appendix discusses the automation systems and how they interface effecting maintenance management.

#### **FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW (FBCB2)**

B-1. The Force XXI Battle Command, Brigade and Below (FBCB2) system is the digitized mission command information system for mounted and dismounted units providing real-time information for brigade and below units.

B-2. Functionally, the FBCB2 system supports lower-echelon mission command tactical mission requirements including real-time SU for commander, staff, and Soldiers, shared common picture of the battlefield, graphical displays with friendly and enemy unit locations, target identification, integrated logistics support, and communications/electronics interfaces with host platforms.

B-3. A common operational picture is provided by collecting, integrating, and displaying a common picture of the battlefield that is consistent in both time and space at each user display. Software for the FBCB2 common operational picture allows the geographical location of individual Soldiers, weapons/platforms, command posts, and other operational facilities to be collectively presented on a display. Since the Army tactical internet is a true, seamless internet based on the worldwide internet model, it is possible to communicate each individual geolocation to every FBCB2-equipped user within the tactical internet.

B-4. The application of the common operational picture, with the enhanced capability to request maintenance support, results in more effective and efficient application of repair parts and FMT utilization. These efficiencies ultimately translate into reduced footprint for sustainment operations in the operational area.

#### **STANDARD ARMY MAINTENANCE SYSTEM-ENHANCED**

B-5. SAMS-E provides critical digital data for two critical areas of field maintenance; equipment information for the using unit and their respective maintenance personnel and management capabilities for the support operations and maintenance manager personnel.

B-6. SAMS-E provides consolidated maintenance and repair parts data and is generally located at the field maintenance teams, forward support companies, field maintenance companies, brigade support battalions, combat sustainment support battalions, separate battalions and brigades, sustainment brigades, support maintenance companies, and higher level materiel management organizations.

B-7. The SAMS-E application/suite consists of selected, SAMS-1, SAMS-2 and SAMS-I/TDA functionality and will provides the Army Maintenance Community (ground only) a means to transition (bridge) from the older maintenance management systems to the newer Enterprise Logistics Solution. The character preceding the "E" in the name "SAMS-E" is the functionality indicator to ease conversation with regards to functionality. The functionality indicator of "1" will be used for SAMS-1, "2" will be used for SAMS-2, and "I" for SAMS-I/TDA functionality.

## **PRIMARY TOOL**

B-8. In addition to automated SAMS-E reports, support operations sections may develop local procedures and reports to track maintenance status.

## **DAILY ANALYSIS**

B-9. The daily analysis of SAMS-E reports will reveal trends or situations requiring command or staff action. SAMS-E readily provides information on work orders greater than 30-60-90 day old, significant increases in shop input, excessive number of items awaiting parts, low production, excessive time in any status, and class IX requests with no status.

B-10. Corrective actions for these problems might include augmenting subordinate units with additional repair capability, cross training, revising maintenance time guidelines, and/or increased use of controlled exchange or fabrication.

## **DAILY TRANSFERS**

B-11. On a larger scale, the theater or expeditionary sustainment command keep abreast of the maintenance situation through its SAMS-2E. Daily/weekly transfers are provided by SAMS-1 activities to their supporting SAMS-2, who in turn transmits the data to LOGSA. This data can be accessed by any higher HQ or management entity to evaluate workload capabilities and the capabilities of maintenance units, cross-level maintenance resources and repair parts, establish maintenance priorities, direct retrograde and coordinate maintenance issues through the support operations section for resolution.

B-12. Maintenance data is also used by Training & Doctrine Command and the Army Materiel Command in analyses to determine manpower requirements and theater opening element structures, repair parts requirements, trends, equipment reliability, and force readiness. These analyses require accurately reported data.

## **REPORTS AND OUTPUTS**

B-13. All reports and outputs for the SAMS-1E can be found in AISM 25-L21-AHN-ZZZ-EM, SAMS-E End User Manual and DA Pam 750-8. All reports for the SAMS-2E can be found in AISM 25-L26-AHO-ZZZ-EM.

## **DATA TRANSFER FLOW**

B-14. Figure B-1 shows data flow between the various systems. Figure B-2 on page B-4 and figure B-3 on page B-5 show how data flows across echelons.

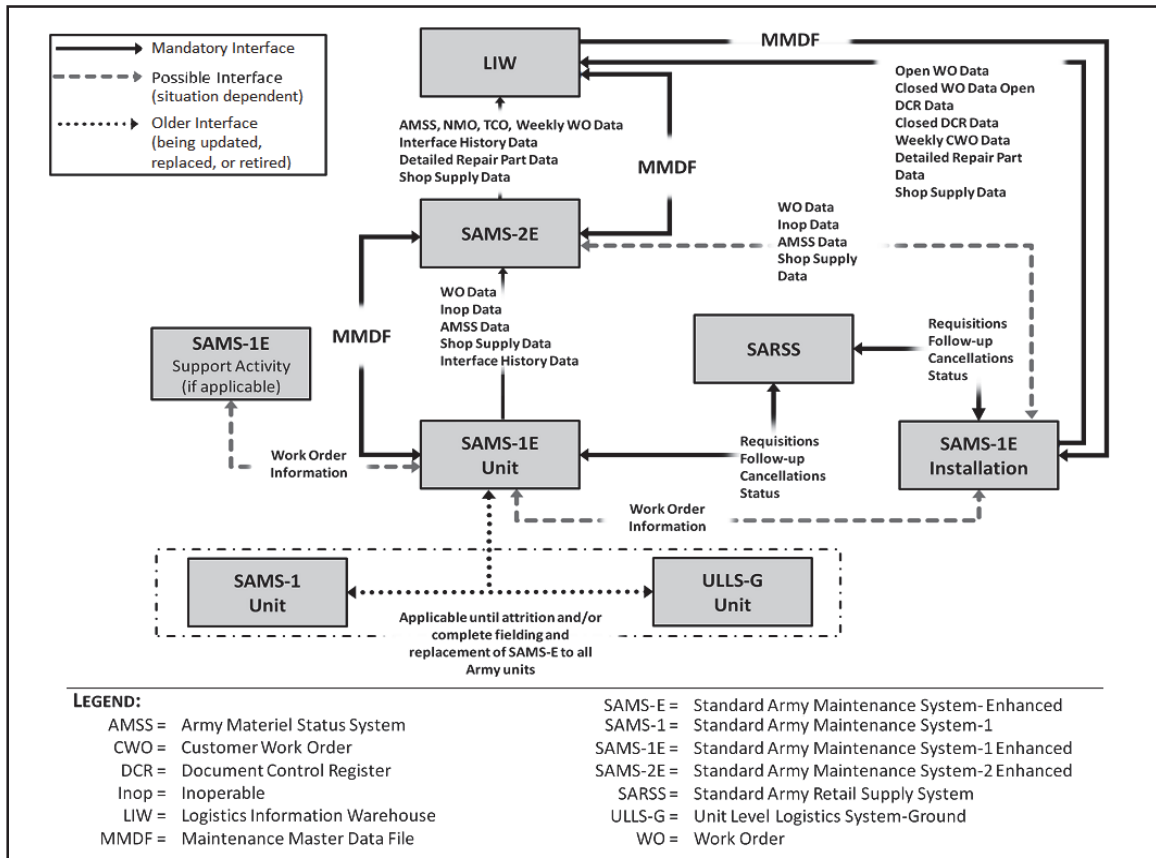


Figure B-1. Data transfer flow between logistic information systems

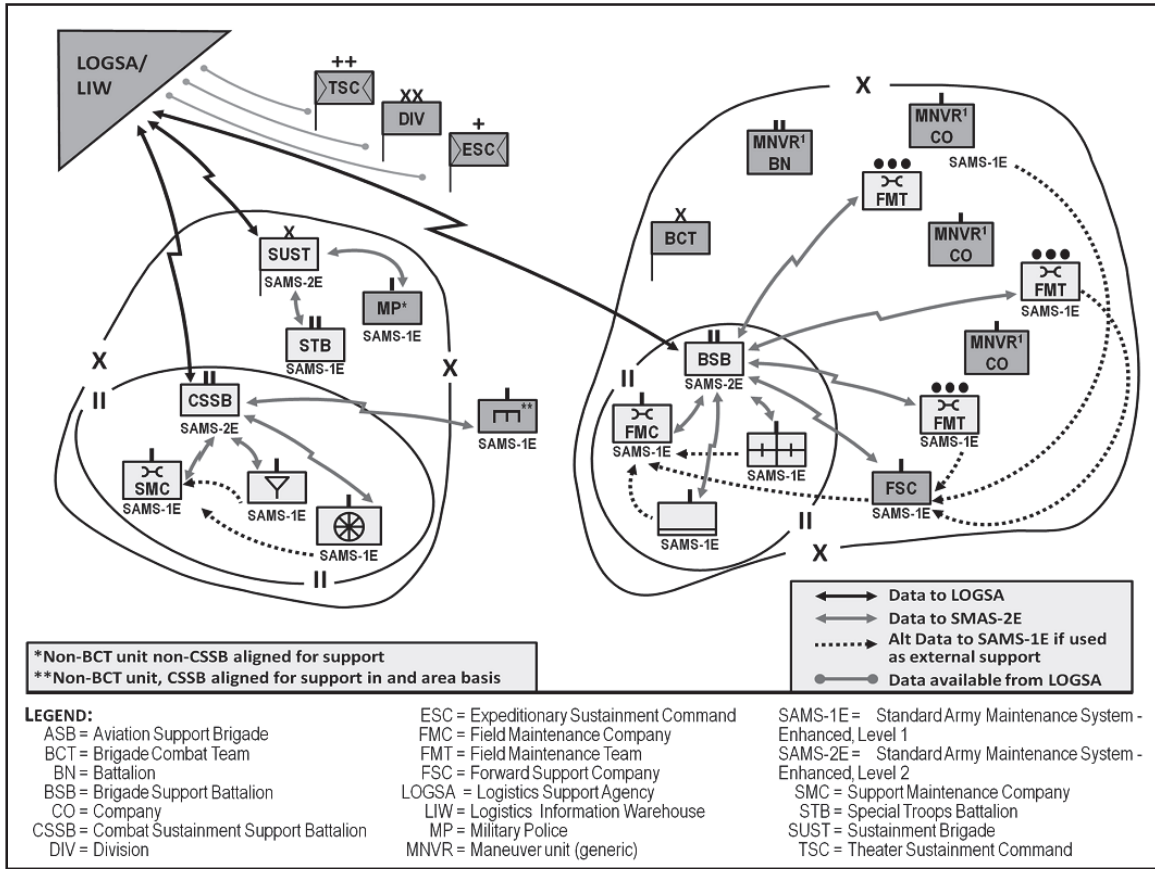


Figure B-2. SAMS-E data flow for brigade and below tactical units

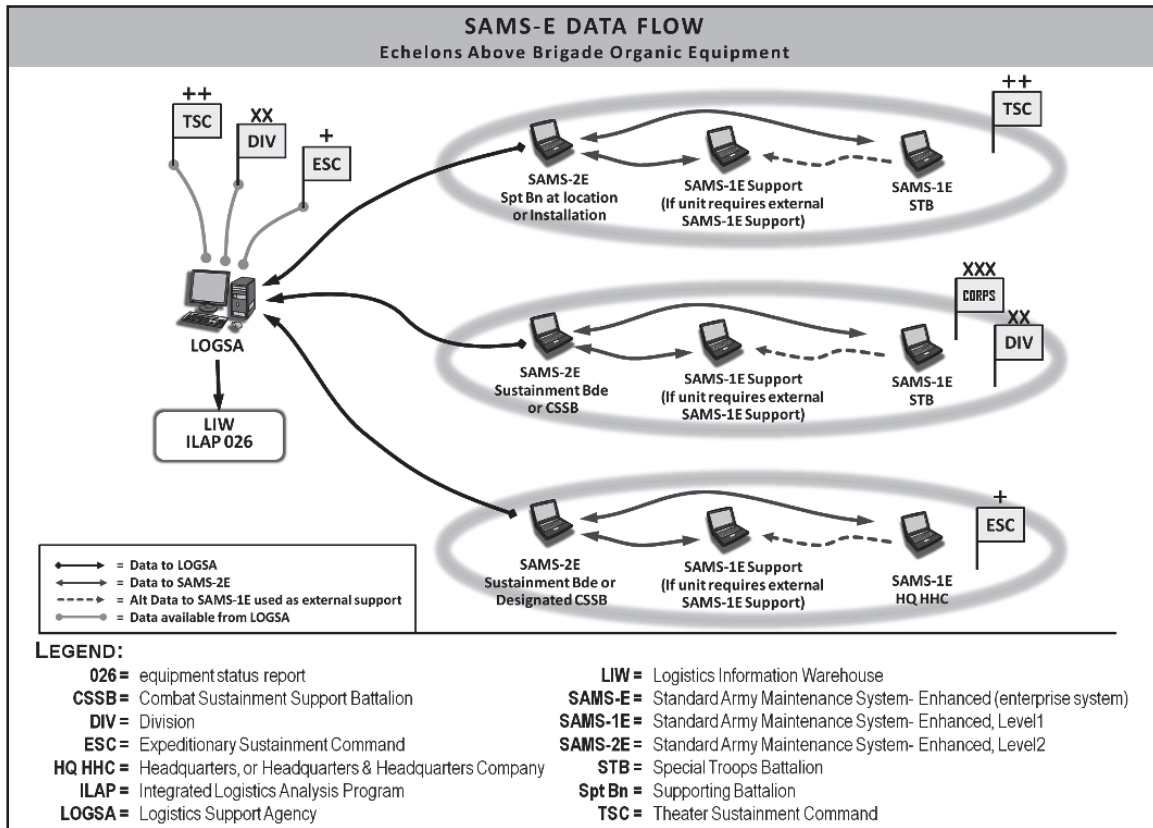


Figure B-3. SAMS-E data flow for echelons above brigade

## GLOBAL COMBAT SUPPORT SYSTEM-ARMY (GCSS-ARMY)

B-15. GCSS-Army will provide a modern, state-of-the-art, web-based Enterprise Resource Planning solution that will use DOD approved web services to facilitate the Department of Defense Instruction for Sharing Data, Information, and Information Technology services.

B-16. GCSS-Army will interface with joint logistics information technology systems to allow for mobilization, deployment, sustainment and redeployment of joint forces. Logisticians from tactical to national level will have complete situational awareness of Warfighter materiel requirements and in-transit visibility of supplies and services. GCSS-Army's updated business processes, software, integrated data environment and near real time data are key information enablers for the Total Army. It will provide functional Sustainment information and field services management from the Army's tactical and operational levels. It will support the requirements of the Secretary of Defense, combatant commanders, departments, and staffs.

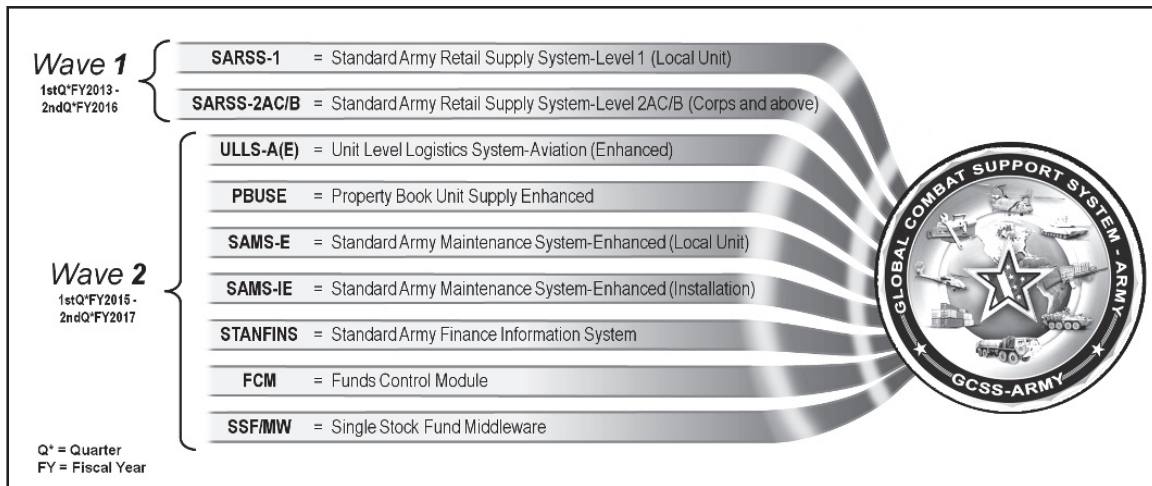
B-17. Enterprise resource planning is a cross-functional enterprise system driven by an integrated suite of software modules that supports the basic internal logistics processes. GCSS-Army is an enterprise resource planning system and provides a single maneuver sustainment picture through integration of sustainment information. Employment of GCSS-Army is inclusive of all tactical echelons. GCSS-Army will subsume the multiple standalone and overlapping sustainment information systems – for supply, property accountability, and maintenance – operating at the tactical and TDA Installation level of Army logistics and as identified in the capability production document. The capability described is the integration and modernization of the current tactical sustainment information systems into one overall multi-echelon, web-based logistics enterprise resource planning system with improved interfaces to mission command systems and to the wholesale level of Army and national supply. The impetus for the capability production document is general technology advancement in system's design, communications, and software

engineering in support of a comprehensive (including all Sustainment functional areas), highly responsive and modernized tactical information system that would enable the Army to retire the current tactical (retail) sustainment information system baselines.

**SYSTEM DESCRIPTION**

B-18. GCSS-Army is replacing a variety of current logistics information systems, and automated capabilities such as the standard Army retail supply system, the standard Army maintenance system, and the property book unit supply enhanced. It also replaces the fleet management system used by the U.S. Army reserve component to support equipment storage and maintenance for reserve units. (As seen in figure B-4). The army enterprise system integration program will link GCSS-Army—the Army’s field-level logistics information system—with the logistics modernization program—the Army’s national-level logistics system. GCSS-Army, Army enterprise system integration program and logistics modernization program will provide a single access point to the single Army logistics enterprise for external customers, such as the U.S. transportation command, the defense logistics agency, and original equipment manufacturers. The end state of single Army logistics enterprise will be characterized by:

- A single enterprise built around already defined and universally accepted processes that instill confidence through accuracy, reliability, and connectivity.
- Logistics processes that fully interact with operational and financial processes.
- Systems that can significantly improve capabilities to build combat power and manage readiness.
- Performance-based partnerships with industry.



**Figure B-4. Systems replaced**

B-19. GCSS-Army also interfaces with other information technology initiatives, including military and commercial communications infrastructure, to meet warfighter requirements:

- To have the right materiel, at the right place and at the right time.
- Operational Army/Generating Force/Sustaining Base Logisticians Requirements.
- The capability to anticipate warfighter requirements and to provide asset visibility and control along with timely and accurate management information.

B-20. GCSS-Army will be capable of supporting Army force generation processes, rapid force projection, and informing system life-cycle management decisions. GCSS-Army will also meet tactical financial requirements by providing an audit trail from financial transaction to originating logistics event and substantive evidence of general ledger account balances for financial audit purposes.

## **OPERATIONAL CHARACTERISTICS**

B-21. Operationally, GCSS-Army is best characterized as a logistic information system that is employed with equal effectiveness in garrison and on the modern battlefield. The emphasis on the Soldier role – denotes the word combat in the title of the system distinguishes GCSS-Army from the current line of tactical/retail logistics information systems supporting supply, maintenance and property book. In garrison GCSS-Army will allow commanders/staff/logisticians:

- To enable effective decision making and mission planning in combat operations through enterprise resource management.
- To effectively and efficiently manage equipment, monitor equipment readiness and take proactive measures to maximize on resources and ensure mission capable equipment.
- To originate more accurate and timely Sustainment business transactions to obtain materiel and services, to organize and display Sustainment data collected from these transactions and then collate and array it for more effective management of materiel and services resources by commanders and the logistics staff.
- To maintain situational awareness, in near real time, of supplies and services through tactical to national level In-Transit Visibility.

B-22. On the battlefield, the system will be employed as a Soldier function support tool that “builds combat power” through use of modern information system and communications technology. Nested in the enterprise architecture for battlefield information systems, GCSS-Army is closely linked to the automated mission command system through its network centric relationship with Sustainment Support Mission Command. The speed, complexity, and extended range of combat operations dictate the timeliness and quality of the response by the sustainment support system. GCSS-Army is the comprehensive tool for logisticians to orchestrate sustainment for these types of operations. GCSS-Army will meet the performance levels of the modular and future forces.

B-23. GCSS-Army is a functional logistical information management system with full financial capability that increases the productivity of the individual soldier and effectiveness of the unit. It will provide the logistics infrastructure required for military operations. The technical goal is to establish a seamless and interoperable enterprise network. The network involves the integration of communication software used by systems. GCSS-Army will interface with multiple current logistics information systems until it is fully fielded. The primary systems are Unit Level Logistics System - Aviation Enhanced, Property Book Unit Supply Enhanced, and Standard Army Maintenance System Enhanced.

B-24. GCSS-Army is the tactical level building block of our transformation to a single Army logistics enterprise, which provides information superiority through real-time visibility of personnel, equipment, and supplies anywhere in the distribution pipeline and within the operational environment. This transformation requires a seamless, integrated, end-to-end network. The result of implementing the single Army logistics enterprise is a merger of warfighter and business systems into a single, harmonious environment from the manufacturer to the foxhole, which is aligned with joint requirements. GCSS-Army will allow the Army to integrate the supply chain, obtain accurate equipment readiness, support split base operations, and get up-to-date status on maintenance actions and supplies in support of the warfighter. Because of the characteristics of the system, it will require managers to interact with the process in GCSS-Army to review and approve transactions generated by unit materiel requirements. Typically, these same processes were managed manually with a physical audit trail. GCSS-Army provides an automated audit trail that also provides visibility and interaction with all levels of execution and management.

## **PLANT MAINTENANCE OPERATIONS**

B-25. GCSS-Army provides an integrated and optimized Army logistics business environment. Plant maintenance (formally known as the motor pool, shop office, or production control) is one of the GCSS-Army capabilities used to notify, order, track, and report Army maintenance activities. GCSS-Army maintenance elements include:

- Maintenance Master Data. Data relating to individual objects (such as units, equipment, and materiel) that remains relatively constant over an extended period of time. Master Data is the key to data sharing for maintenance.

- Maintenance Planning. Schedules planned and preventive maintenance to ensure equipment readiness and labor man-hours are accurately accounted. Planning maintenance is critical for keeping equipment fully mission-capable. Part of the planning process is scheduling the creation of notifications for planned and preventive maintenance. Notifications are one of the primary means in GCSS-Army for tracking equipment maintenance.
- Maintenance Processing. Performance of the maintenance notification (fault), work order, and supply execution processes to complete maintenance activities. Processing maintenance work is normally initiated with a notification and is carried out with a work order. Work orders are the instructions for the performance of maintenance tasks.

B-26. GCSS-Army has numerous benefits for Army logistics. Some of the main benefits relative to plant maintenance are:

- Near real-time view of equipment status.
- Enhanced asset visibility, including near real-time availability of parts.
- Elimination of redundant entry and reworking of data.
- Automated notification of upcoming service/inspection requirements.
- Standardized maintenance plans that can be used across the Army.
- Permanent personnel qualification records available from unit to unit.
- Improved reporting for planning, execution, and readiness.

B-27. GCSS-Army will replace the current field level automated maintenance systems SAMS-E (AR 750-1), across all Army components (I, II, III), providing the capability to conduct field levels maintenance operations at all levels of a command. GCSS-Army will also replace the automated maintenance systems (SAMS-IE) utilized to conduct sustainment maintenance at theater maintenance facilities across the Army. The maintenance system functions consist of recording and documenting repairs, inspections and services performed on equipment, systems, components and end items. National level users, Army Material Command, U.S. Army Tank and Automotive Command Life Cycle Management Command, U.S Army Aviation and Missile Command Life Cycle Management Command, United States Army Communications and Electronics Command Life Cycle Management Command are (or will be) users of GCSS-Army. Roles and permission are being developed to support the unique business requirements for national level users; those business requirements enable national level users to sustain Material/Equipment Master Record type data. The national level users will have the ability to update equipment service/maintenance intervals, and equipment structure, type data in GCSS-Army.

## **MAINTENANCE FUNCTIONS**

B-28. GCSS-Army will support maintenance functions that consist of the following:

- Manage Maintenance. Manage equipment notifications, maintain equipment notifications, maintain work order, maintain work order register, manage task, maintain task, maintain scheduled services and maintenance data, maintain operational/historical information, update equipment record, manage man-hour accounting, maintain man-hour accounting.
- Maintenance Operations. Equipment management, equipment/vehicle dispatching, operational readiness float transaction. Create work order, create work order task listing, close work order task, close work order, perform corrective action, determine level of maintenance required, perform final inspection, enter notification, correct equipment notification, and perform quality inspection.
- Supply Management. Request repair parts, turn-in materiel including recoverable items, and manage shop stock, manage open orders register, maintain open and closed order register, issue repair parts, manage storage location, and manage materiel resource planning.
- Personnel Management. Create work center, update personnel data, maintain personnel qualification records, and maintain skills and qualifications data.
- Reports Readiness. Army materiel status system reports, equipment projection reports, non-mission capable reports, shop supply listing, review, aggregate logistics report, generate readiness reports.



- Interfaces. Common logistics operating environment information management service, Army enterprise system integration program, sustainment information systems, current financial systems (until subsumed), aviation logistics enterprise-platform and digital log book.
- Ad hoc queries. Custom reports.
- System Utilities. Receive equipment data updates, subscribe to information, receive safety of use message, post information, download aircraft sensor data, and manage outputs. Monitor equipment situation report - equipment view (maintenance cockpit).

B-29. The Equipment Situation Report is used to display a list of equipment for which a unit is responsible. Within GCSS-Army, the equipment situation report view is the maintenance cockpit which allows a user to perform 90% of their unit maintenance operation:

- Create a fault/notification and work order.
- Request repair parts.
- Dispatch a vehicle, print a DA Form 5988-E.
- View a service schedule.
- View equipment availability.
- View equipment usage.
- View shop stock on hand.
- View parts available at the supply support activity for work orders.
- Update service schedule.
- View and change weapon system/sub-system configuration.
- View serial number of vehicle/equipment requiring serial number tracking.
- Install/dismantle components (engines/transmissions).

From the Equipment Situation Report, users are able to monitor the equipment assigned to a Unit and assess many of the transactions that are used to perform the daily maintenance tasks in GCSS-Army. Below are some of the processes launched from the Equipment Situation Report.

### **DISMANTLE/INSTALL WEAPON SYSTEM**

B-30. This process facilitates managing and tracking serial number/item unique identification tracked items. The remove/replace process is required when replacing a component in an end item or larger assembly. By performing this process all related maintenance actions which have occurred at the component level will be transferred with the component providing a historical record of maintenance and operations which have occurred.

- The Maintenance Supervisor, Maintenance Manager, and/or Unit Supply Sergeant initiate the movement of equipment that results in the dismantling and/or the installation of a weapon system.
- The maintainer uses the appropriate training materials for dismantling and/or installing components of a weapon system from the specified functional locations structure.
- Supervisors and/managers are informed when the process is complete. Must also contact the property book officer if the weapon system configuration maintenance was performed due to a property book requirement. The property book office must check the financial accuracy of the property book transfer and the weapon system configuration maintenance that was completed.

### **DISPATCH EQUIPMENT**

B-31. The dispatching process in GCSS-Army provides a validation check of the operator's equipment qualification and whether any sustainment training is current and has not expired, IAW AR 600-55. This automated process within GCSS-Army sends an approval request to the responsible commander for an unqualified operator, expired qualifications, an exception, such as extended or off-post dispatch, or a restriction. In addition, an automated request can be sent to the commander requesting circle X approval for not-mission capable equipment. The commander or designated representative through GCSS-Army can approve or disapprove the request.

- Alert Dispatch Notification (A) type of notification used to create an alert dispatch for multiple pieces of equipment and track equipment usage during the alert.
- Once a requirement for dispatch is identified, the user launches the Equipment Situation Report to print the Equipment Maintenance & Inspection Worksheet DA Form 5988-E.
- An equipment dispatch notification is launched to create a dispatch notification for the piece of equipment. The equipment dispatch is a type of notification used to create an individual equipment dispatch for one-time use and track equipment usage. This enables the user to enter the required information (purpose, date/time, status) for the equipment to be dispatched. The DA Form 5988-E must be distributed to the operator to perform the preventive maintenance checks and services. This process also allows the user to determine if the operator is qualified to operate the equipment.
- After the necessary approvals (if necessary), a DA Form 5987-E (Motor Equipment Dispatch) is printed and given to the operator to utilize the equipment.

## **MAINTENANCE PLANS**

B-32. Perform this transaction when you need to activate a deactivated maintenance plan. Maintenance plans can be used to merge the records of specific service items, intervals, task lists, and measuring points that generate a recurring maintenance schedule. The maintenance schedule parameters and system monitoring requirements are established in the maintenance plan. The monitoring of this maintenance event schedule is based on the counter and date requirements.

## **PROCESS ARMY OIL ANALYSIS PROGRAM'S O1 NOTIFICATION - NORMAL LAB RESULT**

B-33. Use these transactions to change an oil sample notification by entering normal lab results and completing the notification. Use these transactions to display a list of open notifications that have resulted from scheduled maintenance plans. The resulting list of notifications is displayed in change mode, which allows you to locate the appropriate notification, drill-down to make changes by entering oil sample data, putting the notification in process, and printing the oil analysis request.

- An oil sample notification will be created by a maintenance plan for regularly scheduled Army oil analysis program samples or created manually for special requests.
- To initiate the notification process and to print DA Form 5991-E (Oil Analysis Request), use the equipment situation report to display a list of all the notifications, filter the list to show only the O1 notifications, and enter the required information of how the oil sample was taken. Print all the required notifications.
- Oil sample is taken, the sample is tested at the lab and lab results are returned.
- When normal results are returned from the lab and the results have been entered in the notification, the oil sample notification has been completed.
- When problems results are received from the lab, the recommendation and reason for action identified on the DA Form 3254-R (Oil Analysis Recommendation and Feedback) is entered in the notification.
- Follow the maintenance notification & work order process to create a maintenance notification and work order to replace the engine or transmission.
- For abnormal results, an oil sample notification remains open until normal results have been received (resample) or lab results are received indicating a problem and the engine or transmission needs to be replaced.

## **NOTIFICATION AND WORK ORDER PROCESSING**

B-34. A notification is a non-financial transaction in GCSS-Army that is used to report a problem, request work, or record an event or activity. It includes what is currently known as a fault. The work order captures time (man hours) and material costs for maintaining equipment. It includes operations which specify the maintenance actions needed to complete the work and the material components required to complete repairs. A work order equates to the DA Form 2407-E. Creating the work order automatically puts the notification in process; work orders created from a notification are directly linked.

- In creating a PM notification, enter a description of the maintenance action, set the notification priority and identify how the issue was found. All information known about the piece of equipment should be entered onto the notification.
- Create the maintenance work order. This puts the notification in process.
- The information entered in the notification copies into the work order. Note: also, the information entered in the notification defaults into certain fields in the overall completion confirmation for the work order.
- Add the work order operations (tasks) that must be performed to complete the maintenance action.
- Material is issued to a work order from the Equipment Situation Report. The information for the goods issue copies from the work order into the goods issue transaction. When checking for material availability for a work order, if the item is not in stock, material requirements' planning uses the reservation to create a purchase requisition to order the material.
- To technically complete the work order, all materials have to be issued to the work order, time confirmations have been entered and all codes and activities required have been entered.

### RECEIVE MATERIALS AT UNIT

B-35. Use this transaction to display the inbound deliveries ready for pick-up at the supply support activity. The inbound delivery process begins with staging the goods at the supply support activity for the unit, in the unit customer bin, or initiation of shipment to the unit via transportation and ends when the goods receipt posting is made via interactive processing or Automatic Identification Technology. This process includes the subsequent put away of the material at the Unit and also the increase in the Unit's material stock quantity. When the material is ready for pick up, the user will use the automatic identification technology device or a desktop application to post a goods receipt. The unit's inventory is increased by the posting of the material goods receipt.

### PHYSICAL INVENTORY - SHOP STOCK

B-36. Use this transaction when you must inventory all items assigned to your unit's storage location and to create physical inventory documents. Generate documents based on your provision storage location. Items are assigned to a physical inventory record in GCSS-Army. Performing physical inventory operations allows the maintainer to manage proper inventory levels of shop stock items that sustain the unit's equipment to perform assigned missions.

- **Prepare Physical Inventory:** Covers creating a physical inventory document and printing the physical inventory document, which is the count sheet for counting inventory. The physical inventory document is used throughout the entire process and it assigns materials to a physical inventory within a storage location.
- **Perform Physical Inventory:** Covers completing physical counts, entering counts for each physical inventory document, listing inventory differences to review discrepancies, recounting and changing an inventory count.
- **Post Physical Inventory:** Covers posting a physical inventory document, why it must be posted and what the posting does.

### MANAGE BENCH STOCK

B-37. Bench stock refers to low cost, high use consumables class II-IV and IX items used by maintenance personnel at unpredictable rate (ex. common hardware, repair kits) bench stock materials must be maintained for the unit to ensure material availability. Use this transaction to change bench stock material requirements planning type and safety stock requirements. Safety stock is considered the quantity of stock that is maintained to fulfill demand and is used to prevent material shortages. The maintainer will have the ability to verify the current on-hand balance of bench stock materials in GCSS-Army and effectively consume bench stock materials. The current bench stock level must be verified in GCSS-Army prior to consumption. This value is used to determine the amount of the bench stock material that is to be consumed. A goods issue must be posted to consume the material inventory. The next material

requirements planning run replenishes the bench stock material if the bench stock inventory falls below the safety stock level requirements.

## **FORMS AND REPORTS**

B-38. There are a number of reports within GCSS-Army; all of which can be downloaded into Excel format. Some of the current reports within GCSS-Army are: open/closed notification/work orders (faults), equipment status report (026 Report), open/closed document control register, usage report, service schedule, parts received not installed, equipment maintenance & inspection worksheet DA Form 5988-E, equipment dispatch DA Form 5987-E, alert dispatch DA Form 5987-1-E (Alert Motor Equipment Dispatch), oil analysis request DA Form 5991-E, and the equipment status report.

- Equipment maintenance & inspection worksheet DA Form 5988-E: the purpose of this form is to document faults or shortcomings discovered during preventive maintenance checks and services or other maintenance activity inspections and the actions taken to correct a fault or a shortcoming.
- Equipment dispatch DA Form 5987-E: this form is used to capture the operator usage and equipment usage information when a piece of equipment is dispatched for one-time use. The alert dispatch DA Form 5987-1-E allows you to capture multiple equipment operators and equipment usage events when a piece of equipment is alert dispatched.
- Equipment status report: This report is used to monitor equipment records and parts. It displays the reportable and non-reportable equipment that had been deadline including status, work order, and deadline aging information. Maintainers are able to identify the notifications and work orders for equipment undergoing repairs and monitor material requirements, quantity ordered, received, on hand, and issued to the work order.

## **RECORD MAN-HOURS**

B-39. Use this process to account for direct man-hours in GCSS-Army performed at the work order level. A supervisor or manager has the ability to account for indirect man-hours against a work center using the cross application time sheet transaction codes.

## **MAINTAIN PREVENTIVE MAINTENANCE SCHEDULE AND RECORD**

B-40. The service schedule process in GCSS-Army allows the ability to create and assign a service schedule to equipment/vehicle. Services that are performed and entered into GCSS-Army become a permanent record on the equipment master record.

## **GENERAL TASK LIST**

B-41. General task lists are required when a new major assembly or sub-assembly is delivered into inventory or an existing major assembly does not have a task list defined. Perform these transactions when you need to maintain a general task list. This includes verifying if a general task list exists or updating an existing general task list when a modification is required. Use these transactions to display a list of general task lists in change mode and to change a general task list. From the results, you are able to drill-down to change a general task list. General task list can be modified to meet the specific maintenance requirements of the associated material or National Item Identification Number.

## **EQUIPMENT TASK LIST**

B-42. Equipment task lists are used to identify the unique maintenance tasks that must be performed on a particular piece of equipment. Perform this transaction when a piece of equipment has maintenance requirements that are unique and must be defined specifically for that piece of equipment. This includes verifying an equipment task list or changing attributes in an existing equipment task list. Also, use these transactions to display a list of equipment task lists and to change attributes for a single equipment task list. Initially you will search and display a list of equipment task lists. Then from the resulting list, you will identify, select and make changes to a specific equipment task list. Equipment task lists can be maintained to meet the specific maintenance requirements of the associated piece of equipment.

## FUNCTIONAL LOCATION TASK LIST

B-43. Functional location task lists are used to identify the unique maintenance tasks that can be performed for on a particular piece of equipment installed in a functional location. Use functional location task list that are not necessarily unique or being tracked for that piece of equipment. This functions like the equipment task list. Functional location task lists can be maintained to meet the specific maintenance requirements of a component in the location.

## NOTIFICATION/FAULT/WORK ORDER END TO END PROCESS

B-44. The process is explained below:

- The operator conducts a preventive maintenance check and services at the platform.
- The operator identifies both not-mission capable faults at the platform; the faults are annotated on the Maintenance Inspection Work Sheet DA Form 5988-E by the operator.
- The Maintenance Inspection Work Sheet DA Form 5988-E is turned into the section; the inspection work sheet is reviewed by maintenance section NCOIC for completeness.
- After the Maintenance Inspection Work Sheets has been reviewed by the section NCOIC, the faults are entered into GCSS-Army, creating a notification for each fault identified on the maintenance inspection work sheet.
- The maintenance section NCOIC assigns mechanics with-in his/her section Maintenance Inspection Work Sheets DA Form 5988-E to verify the faults/notifications identified by the operator and to identify the action required to correct the fault/notification.
- Faults/notifications that are corrected by the mechanics requiring no repair parts are corrected. The man-hours required to conduct the repair are accounted for on the Maintenance Inspection Work Sheet DA Form 5988-E.
- Repair parts are identified for faults/notifications that cannot be corrected. The NIIN is annotated on the Maintenance Inspection Work Sheet by the mechanic verifying the fault/notification. The information from the Maintenance Inspection Work Sheet is entered into GCSS-Army by the Motor Sergeant, Shop Foreman or the Parts Record Clerk creating a work order for any fault/notification requiring man-hours to be accounted for or to request repair parts.
- GCSS-Army will verify if the repair part is on the requesting units Shop Stock or the supporting supply support activity. If the repair parts are on the units Shop Stock GCSS-Army will notify the user that the material is on hand. If the repair parts are on the supporting supply support activity Authorized Supply Listing a pick ticket will be created by the supporting supply support activity to process the pick ticket creating a materiel release order.
- After the material is picked and place in the requesting units bin or shipped to the unit, the requesting unit has visibility of what class IX parts have been placed in their bin or shipped.
- The requesting unit receives the repair parts from the supporting supply support activity and process the material by receiving item and issuing the material to the work order.
- The material is than issued to the mechanic for installation onto the vehicle/equipment. After the installation has been completed the mechanic turns in the Maintenance Inspection Work Sheet DA Form 5988-E in to the motor sergeant, shop foreman or parts record clerk.
- The notification/fault can be updated in GCSS-Army by the Motor Sergeant, Shop Foreman or Parts Record Clerk. The notification/fault and work order is than cleared and closed in GCSS-Army.

## DISPATCHING

B-45. Dispatch according to the following:

- The motor sergeant, shop foreman or parts record clerk has the ability to create a dispatch for the vehicle/equipment in the location.
- After the operator has completed before operations preventive maintenance checks and has completed all the unit requirements to dispatch a vehicle/equipment.

- The motor sergeant, shop foreman or parts record clerk selects the vehicle/equipment from the maintenance cockpit, selects the dispatch button, enters the return date and time, reason for the dispatch, the operators name or ID number and “Save” the data.
- GCSS-Army checks to verify if the individual is qualified to dispatch the vehicle/equipment by verifying that the individual meets all the training requirements identified in AR 600-55 (Commanders Interview, Accident Avoidance). An automated notification will be generated in GCSS-Army and forwarded to the commander for individuals not meeting the requirements outlined in AR 600-55, allowing the commander to approve or disapprove the request for dispatch.
- For not-mission capable vehicles/equipment an automated notification will be generated in GCSS-Army and forward to the commander only, allowing the commander to approve the vehicle/equipment for limited operations.
- An automated notification can also be sent with-in GCSS-Army to the commander, executive officer given them the capability to approve a normal dispatch if local SOP requires commander or executive officer approval.

### **VEHICLE/EQUIPMENT PREVENTATIVE MAINTENANCE CHECKS AND SERVICES**

B-46. Vehicle/equipment preventative maintenance checks and services will be accomplished in a number of ways via manual (DA Form 5988-E or DA Form 2404) or a digital log book. Operator conducts preventative maintenance checks and services at the platform on a DA Form 5988-E or DA Form 2404):

- Field maintenance team NCOIC reviews platform inspection work sheet, assigns inspection work sheet to field maintenance team to verify or repair the notification.
- The field maintenance team verifies repair parts required for platform, annotate on inspection work sheet and turn into field maintenance team NCOIC.
- The field maintenance team NCOIC review information on the inspection work sheet before given the inspection work sheet to the field maintenance team records/parts clerk.

### **DIGITAL LOG BOOK**

B-47. The digital log book and the mobile defense solution will provide the capability to create and update notifications and work orders, record, receive, and transmit notifications and part information, and update equipment status. Additionally, digital logbook will have the capability to maintain equipment configuration and usage information. The digital logbook will also provide automated dispatch functionality, interactive electronic technical manual and sensor monitoring system actionable information and will allow the digital log book user to monitor and maintain maintenance management information. The digital log book (or mobile defense solution) will provide limited planned disconnected maintenance support operations capability for field maintenance teams when required to disconnect from network source.

B-48. The digital log book application operating on the maintainer’s (mechanic’s) computer, maintenance support device will provide the maintainer the ability to enter notifications, request parts, and facilitate a host of other maintenance related functions. The digital log book application will allow managed and automated synchronization of information between the digital log book and the common information management service, service oriented architecture environment which will connect to the GCSS-Army expeditionary contracting command and R3. The digital log book and mobile defense solution software will support maintenance functions that consist of:

- Manage maintenance: Manage equipment notifications, maintain equipment notifications, maintain work order, operational/historical information, update equipment record, manage man-hour accounting, and maintain man-hour accounting.
- Maintenance operations: Create work order, create work order task listing, close work order task, close work order, perform corrective action, determine level of maintenance required, perform final inspection, enter notification, correct equipment notification, perform quality inspection.
- Supply management: Request class ix repair parts, turn-in class ix recoverable parts, issue repair parts, manage maintenance stock forward deployed.

- System utilities: Setting up communication connection, receive equipment data updates, subscribe to information.

### **ARMY MATERIEL STATUS SYSTEM REPORT IN GCSS-ARMY**

B-49. GCSS-Army will produce equipment readiness reports for ground, missile and aviation, and watercraft required for the monthly equipment readiness report. Daily, GCSS-Army will produce near real time reportable equipment readiness data that will be available 24/7 at logistics support activity. On the 15th of each month GCSS-Army will produce the Army materiel status system report that contains reportable equipment readiness data and respective supporting commander's comments. Reports will be made available 24 hours following the end of the report period. Report period begins at 16th of each month and end on 15th of each month. Commanders will have the ability to enter commander's comments throughout the reporting period and up to 24 hours following the end of the reporting period. The commander will not have the ability to change the reported data. GCSS-Army provides the capability to rollup reporting battalion equipment status and process to the unit readiness officer to include in monthly unit status report.

### **WATERCRAFT MAINTENANCE OPERATIONS**

B-50. Watercraft maintains specific forms, documents, and records required as a result of that type of vessel being maintained/operated and federally regulated. For example, engine department uses two documents for maintenance, DA Form 4993 (Harbor Boat Engine Department Log for Class A and C-1 Vessels), and DA Form 5273 (Harbor Boat Deck and Engine Log for Class B Vessels), while the deck department uses two documents for operations, DA Form 4640 (Harbor Boat Deck Department Log for Class A and B Vessels), and DA Form 5273 for class B vessels. These documents are used generally for one year at a time (up to 3 years maximum) and maintained for 3 years after last entry. They are daily records of crew availability, strength, usage, hourly readings and operations. Equipment master data is also recorded in these logs books. The maintenance forms (engine department logs) record faults and deferred maintenance, shop repairs and records of inspection, notes and daily equipment operational recordings; these are verified by watch officers and the chief engineer. Many of the fields used in these documents are already mapped to fields in the GCSS-Army data base. The operational forms (deck department logs) are required by code of federal regulations and the maintenance forms are used as both input and supporting documentation. The primary difference in these documents is the type of daily entries; the deck department log includes operational conditions, weather, sea state, loads and usage data. The GCSS-Army maintenance operation system will support watercraft maintenance operations requirements.

## Appendix C

# Maintenance Allocation Chart

To ensure balance in the maintenance system, it is important that responsibilities of each maintenance level be kept in perspective. It is a tactical necessity for owning units to perform preventive maintenance. The maintenance allocation chart designates overall authority and responsibility for the performance of maintenance functions on an item. This appendix discusses the functions and effects modularity had on the maintenance allocation chart.

### OBJECTIVES

C-1. 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.

C-2. As of the date of this publication, most technical manuals have yet to be updated to reflect the change to two level maintenance. Refer to AR 700-82, *Joint Regulation Governing the Use and Application of Uniform Source Maintenance and Recoverability Codes*, table D-1. Figure C-1 on page C-2, gives an example you will see in old outdated technical manuals. Figure C-2 on page C-3, displays an updated view of a two level maintenance compliant technical manual.



MAINTENANCE ALLOCATION CHART									
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 Test Replace Repair Overhaul	0.2 0.2 4.5	0.3				35 37	A
06	ELECTRICAL								
0601	Alternator	Inspect Test Replace Repair Overhaul	0.2 0.2 2.0	8.0					B
0602	Voltage Regulation	Inspect Test Replace Repair Overhaul	0.2 0.2 2.0	0.2 1.0					
0603	Motor Starting	Inspect Test Replace Repair Overhaul	0.2 0.2 2.0	2.4				48	

\*\* Worktimes are included in OMWR

\*C = Operator or Crew  
 O = Organizational  
 F = Direct Support Maintenance  
 H = General Support Maintenance  
 D = Depot Support

**Figure C-1. Example of Maintenance Allocation Chart (Legacy)**

- Each column of the maintenance allocation chart gives pertinent information to all users of the maintenance allocation chart. An explanation of each column is listed in the following paragraphs.
- Column 1 - Group Number: Listed 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.
- Column 4 - Maintenance Level: Specifies the lowest level of maintenance authorized to perform the function listed in Column 3. Under the two-level maintenance system, field level maintenance is authorized to perform all functions listed as C, O (until deleted by an update), and F. Below depot sustainment level maintenance activities are authorized to perform any function listed as H, and depots are authorized to perform and function listed as H and D.
- Column 5 - Tools and Equipment: Names, 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 maintenance allocation chart.

**FIELD MAINTENANCE  
TSEC/ST-34  
MAINTENANCE ALLOCATION CHART (MAC)**  
Table 1.MAC for TSEC/ST-34

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tods and Equipment Reference Code	(6) Remarks Code
			Field		Sustainment			
			Crew	Maintainer	Below Depot	Depot		
			C	F	H	D		
00	TSEC/ST-34	Inspect Service Replace Test Repair Repair Repair Overhaul	0.1 0.2 0.4 0.3	1.0	2.0	2.0 10.0	1 1,2 1,2,3,4,5 1,2,3,4,5,6,7,8 1,2,3,4,5,6,7,8	A B C, D E F G, H I J
01	Power Unit, STP-34	Inspect Test Repair Repair Repair	0.1 0.3	1.8	2.0	2.0	1,2 1,2,3,4,5 1,2,3,4,5,6,7,8	A E F G, J H
0101	Print Circuit Board, TP-34							
010101	E-EBCI	Inspect Replace Test Repair Replace		0.1 0.5 0.5		1.0 2.0	1,3 1,2,3,6, 7,8 1 1,2,3,4,6,7,8	A A I G
010102	Switching Assembly	Inspect Replace Test Repair	0.1 0.5	0.1 0.5		1.0 2.0	1 1 1,2,3,6,7,8 1,2,3,4,6,7,8	A H
02	Logic Unit, STB-34	Inspect Test Repair Repair		1.0	2.0		1,2 1,2,3,4,5	A E F

Figure C-2. Example of two level Maintenance Allocation Chart

**LOCATION**

C-3. The maintenance allocation chart is found in equipment technical manuals that contain field-level (-12, -13, -14, -20, -23, and -24) maintenance procedures. Some recently fielded; highly complex weapon systems have separate manuals for the maintenance allocation chart. In those instances, the technical manual has the same first eight digits as other series manuals, followed by “maintenance allocation chart.”

**FUNCTIONS**

- There are many functions that are essential to ensure that equipment sustains its service life. Maintenance functions are defined in the following paragraphs.
- **Inspect-** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination. This includes scheduled inspections, gauging, and evaluation of cannon tubes.
- **Test-** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis such as load testing of lifting devices and hydrostatic testing of pressure hoses.

- **Service-** Operation required periodically to keep an item in proper operating condition; e.g. to clean, preserve, drain, paint, or to replenish fuel, lubricants, chemical fluids, or gases.
- **Adjust/Align-** To maintain or regulate an item, within prescribed limits, by bringing it into proper 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 of TMDE used in precision measurement. Consists of comparisons of two instruments, one of which is in certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
- **Remove/Install -** To remove and install the same type of item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, replacement part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
- **Replace -** To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the maintenance allocation chart and assigned a maintenance level shown as the third position code of the Source, Maintenance, and Recoverability code.
- **Repair -** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.
- **Overhaul -** To restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul does not normally return an item to like new condition.
- **Rebuild -** Consist of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing tolerances.

# Glossary

## SECTION I – ACRONYMS AND ABBREVIATIONS

<b>BCT</b>	brigade combat team
<b>BDAR</b>	battle damage assessment and repair
<b>BSA</b>	brigade support area
<b>BSB</b>	brigade support battalion
<b>ESC</b>	expeditionary sustainment command
<b>FMC</b>	field maintenance company
<b>FMT</b>	field maintenance team
<b>FSC</b>	forward support company
<b>GCSS</b>	Global Combat Support System
<b>METT-TC</b>	mission, enemy, terrain and weather, troops and support available, time available, civil considerations
<b>MTOE</b>	modification table of organization and equipment
<b>QA</b>	quality assurance
<b>QC</b>	quality control
<b>SAMS-E</b>	Standard Army Maintenance System-Enhanced
<b>SMC</b>	support maintenance company
<b>SPO</b>	support operations
<b>TDA</b>	Table of Distribution and Allowances
<b>TMDE</b>	test, measurement and diagnostic equipment
<b>TSC</b>	theater sustainment command

## SECTION II – TERMS

### **fully mission-capable**

Systems and equipment that are safe and have all mission-essential subsystems installed and operating as designated by applicable Army regulation. An FMC vehicle or system has no faults that are listed in the “not fully mission-capable ready if” columns of the TM/ETM XX-10 and XX-20 series preventative maintenance checks and services tables and AR 385-10 provisions that apply to the vehicle and/or system or its sub-system required by AR 700-138. The equipment must perform all tactical and combat missions safely and without endangering the life of the operator or the crew. (AR 750-1)

### **\* maintenance collection point**

A temporary location established within the battalion echelon for the collection of equipment needing or undergoing field maintenance.

## References

Field manuals and selected joint publication are listed by new number followed by old number.

### REQUIRED PUBLICATIONS

These documents must be available to intended users of this publication.

ADRP 1-02, *Terms and Military Symbols*, 24 September 2013.

JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 8 November 2010.

### RELATED PUBLICATIONS

These documents contain relevant supplemental information.

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Most Army doctrinal publications are available online: <http://www.apd.army.mil/>.

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JP 3-0, *Joint Operations*, 11 August 2011.

AR 25-52, *Authorized Abbreviations, Brevity Codes and Acronyms*, 21 February 2014.

AR 220-1, *Army Unit Status Reporting and Force Registration - Consolidated Policies*, 15 April 2010.

AR 700-137, *Logistics Civil Augmentation Program*, 28 December 2012.

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None.

## REFERENCED FORMS

Most Department of the Army (DA) forms are available online at: [www.apd.army.mil](http://www.apd.army.mil).

DA Form 2028, *Recommended Changes to Publications and Blank Forms*.

DA Form 2404, *Equipment Inspection and Maintenance Worksheet*.

DA Form 2407, *Maintenance Request*.

DA Form 2407-1, *Maintenance Request–Continuation Sheet*.

DA Form 2407-E, *Maintenance Request*. (Available from SAMS-E).

DA Form 3254-R, *Oil Analysis Recommendation and Feedback*.

DA Form 4640, *Harbor Boat Deck Department Log for Class A and B Vessels*.

DA Form 4993, *Harbor Boat Engine Department Log for Class A and C-1 Vessels*

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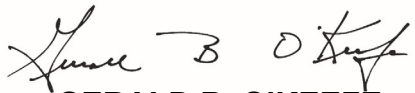
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14 April 2014

By order of the Secretary of the Army:

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