

ANNEX C

**Maintenance**

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Tactical success on today’s battlefield demands that equipment be maintained, recovered, repaired, or replaced as quickly as possible. Good maintenance practices, forward positioning of maintenance units, effective repair parts and equipment replacement systems, and clear priorities for recovery and repair are vital. Likewise, sound theater policies on repair and evacuation as well as sufficient general support and depot repair and replacement facilities greatly contribute to battlefield success.

**PRINCIPLES**

Maintenance is a combat multiplier. Where opposing forces have relative parity in numbers and quality of equipment, the force which combines skillful use of equipment with an effective maintenance system has a decided advantage. It has an initial advantage in that it enters battle with equipment that is operational and likely to remain so longer. It has a subsequent advantage in that it can return damaged and disabled equipment to the battle faster. Gaining these advantages is the real purpose of a maintenance system.

Elements at all levels work together to ensure the attainment of the strategic goals and objectives. They must have the proper personnel, equipment, tools, and replacement parts. Personnel must be well trained in the theory and principles of systems and capable of diagnosing and correcting faults. Additionally, they must have immediate access to high usage repair parts.

Unit-level maintained and direct support maintenance units concentrate on the rapid turnaround of equipment to the battle, while general support maintenance units and depots repair and return equipment to the supply system. METT-T and command policy guide the type or level of repairs each unit performs; units do not strictly adhere to established repair time intervals.

The fixing function is central to tactical and operational success. A viable maintenance system is agile and synchronized to the combat scheme of fire and maneuver. It anticipates force requirements. A commander who has 65 percent of his tanks operational may wisely delay an attack if he can realistically expect the fixing process to have 90 percent ready within 24 hours. Alternatively, he can weight the battle by allocating replacement systems as discussed in Annex A.

The guiding maintenance tenets are:

- **Fix forward.** This enhances the ability to repair and return the maximum number of combat systems, at the earliest opportunity, as close to the using unit as possible.
- **Anticipatory support built on flexible levels of maintenance.** To maximize the number of combat systems available, maintenance leaders and managers anticipate the requirements for support and preposition that capability. The system does not lock maintainers into artificially divided levels of maintenance where they perform only repairs indicated by maintenance allocation charts. Rather, they perform necessary repairs within the limits of their capability (skills and test equipment) and the tactical situation.

The type and location of maintenance units that best support the tactical commander's requirements are a

prime concern of the theater logistician. A viable maintenance system complements the capabilities of the supply system. When equipment is in short supply or otherwise unavailable to support requirements, commanders use the maintenance system to offset the shortfall. As equipment becomes more technically complicated, it is easier to meet surge requirements by redirecting the maintenance effort than by influencing the supply effort. The proper mix of the type and location of the maintenance units best supports the tactical and operational commander's requirements. In addition, early arrival of essential maintenance capabilities is important in force projection operations to ensure deployed and prepositioned equipment is operational.

## **THE MAINTENANCE SYSTEM**

### **MAINTENANCE SUPPORT**

The Army maintenance program is a flexible, four-level system. The levels are operator/unit, direct support (DS), general support (GS), and depot. (Army aviation maintenance, discussed later in this annex, has three levels.) Each level has certain capabilities based on the skills of the assigned personnel and the availability of tools and test equipment. While these are distinct levels, there is flexibility built into the system due to overlapping capabilities. Maintainers do not lock themselves into rigid levels of maintenance. The maintenance levels used to repair a system or component are flexible. If a system or component is not repairable, it requires activity (replacing and discarding the item) at just one level. When properly integrated, the levels serve as a logistics multiplier, adding an extra dimension to the commander's action plan.

### **MAINTENANCE MANAGEMENT**

Strategic, operational, and tactical maintenance managers coordinate maintenance operations among the various activities. National strategic maintenance managers coordinate operations in industrial base and depot activities. Theater strategic and operational maintenance managers coordinate GS maintenance,

specialized repair/forward repair activities, and Directorate of Logistics operations. Tactical managers oversee operator/crew, unit, and DS maintenance operations.

The various management functions required result in the classification of maintenance management into two echelons--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 echelon managers maximize combat readiness by coordinating repairs as far forward as possible for quick return into the battle. Sustainment maintenance managers at corps and above focus on materiel management. They focus on fixing by repair, sustaining units, and supporting joint/multinational equipment and standard Army systems.

Readiness maintenance managers assigned to support battalions support brigade size units. Sustainment maintenance managers are assigned to theater and DA support commands. Managers use their maintenance knowledge and experience, along with aid from their management interfaces and CSS computers, to determine

potential and developing problems, and facilitate avoidance or resolution. Logisticians use numerous CSS management information systems to identify problems.

The MMC is the maintenance manager for deployed Army forces. It is the link between the deployed forces and the support base. The MMC maintains a close working relationship with the LSE. Theater-level GS maintenance companies may come under the LSE for workloading. Also, they may support equipment of other services or multinational forces. The commander of the LSE maintains a coordination relationship with AMC and other organizations providing assets to the LSE. This coordination ensures receipt of timely support from the CONUS base.

### **STRATEGIC SUPPORT**

The strategic base is the backbone of the maintenance system. At this level, maintenance supports the supply system by repairing or overhauling components or end items not available or too costly to procure. Maintenance management concentrates on identifying the needs of the Army supply system and developing programs to meet them. Strategic support also includes maintenance of prepositioned equipment.

### **OPERATIONAL SUPPORT**

The goal of the overall maintenance plan is to support the operations plans and objectives of the commander. Its primary purpose is to maximize the number of operational combat systems available to support the tactical battle. Commanders tailor and position maintenance units in the theater to best support this goal. Maintenance at the operational level supports the tactical battle by ensuring that the maintenance system supports campaigns and sustains theater forces. Through the judicious use of maintenance assets, the commander can alleviate shortages in the supply system or support unexpected requirements.

## **MAINTENANCE LEVELS**

### **OPERATOR/UNIT MAINTENANCE**

Preventive maintenance checks and services (PMCS) serve as the key to quickly identify potential problems. Operator/unit maintenance serves as the linchpin of the

The operational support plan ties together the requirements of the tactical units with the capabilities of the strategic base. The maintenance system both drives and supports the supply system. DS maintenance units meet tactical requirements through close support, while GS maintenance units alleviate supply shortfalls. Surge maintenance capabilities from all sources, including the industrial base, meet unexpected demands.

### **TACTICAL SUPPORT**

The nature of the modern battlefield demands that the maintenance system repair equipment quickly and at, or as near as possible to, the point of failure or damage. This requirement implies a forward thrust of maintenance into division and brigade areas. There the battle is more violent and the damage greater. Maintenance assets move as far forward as consistent with the tactical situation to repair inoperable and damaged equipment and to return it to the battle as quickly as possible.

The structure of maintenance units includes highly mobile maintenance support teams (MSTs). Teams provide support forward on the battlefield as directed by the DS maintenance company commander and maintenance control officer. They send people, parts, TMDE, and tools to forward areas as required and pull them back when no longer needed.

Battle damage assessment and repair (BDAR) may also be critical at this level. BDAR is the procedure used to rapidly return disabled equipment to the battlefield by expediently fixing, bypassing, or jury-rigging components. It restores the minimum essential combat capabilities necessary to support a specific combat mission or to enable the equipment to self-recover. BDAR is done by crews, maintenance teams, MSTs, and recovery teams.

maintenance system. It involves quick turnaround repairs by component replacement, minor repairs, and performance of scheduled services. Command emphasis

is vital to ensure an effective PMCS program. The program requires trained operator/crews and routine supervisory and implementing procedures. Ineffective command emphasis can lead to cursory PMCS programs that fail to correct deteriorating effects before they adversely affect readiness and combat capability and unnecessarily burden technical maintenance systems.

Unit maintenance efforts concentrate on returning equipment to the user quickly enough to influence the outcome of a given task or mission. The operator or crew identifies malfunctions through the use of on-board sensors and visual inspections. Personnel make quick repairs by using on-board spares and tools.

Most units, organizations, and activities have organic unit maintenance personnel to perform unit maintenance on equipment assigned to or used by them to accomplish their mission. When METT-T permits, maintainers assigned to these units may also repair selected components to eliminate higher echelon backlogs and maintain technical skills. Mobility considerations and time available for repairs are the only factors which limit the organizational repair capability. Mobility requirements restrict the unit's ability to carry special tools, parts, and maintenance backlog.

### **DIRECT SUPPORT MAINTENANCE**

DS maintenance organizations consist of a base maintenance company augmented with maintenance support teams designed to support specific types of supported units. The composition of the supported units determines the type and number of teams assigned or attached to the base company. These teams directly support units on an area basis or dedicated basis. Those which support units on a dedicated basis accompany the supported unit as it moves around the area of operations. They receive repair parts and backup maintenance support through the nearest DS maintenance company.

DS maintenance units and maintenance teams expected to operate in forward areas must be as mobile as the supported customer. Maintainers in these units

focus on repair by replacement. If these units cannot repair equipment due to lack of time or specialized tools and/or test equipment, supporting teams from a higher maintenance echelon repair the equipment on site or evacuate it. As with unit maintenance elements, maintainers in DS maintenance units may repair selected components to eliminate higher echelon backlogs and maintain technical skills when METT-T permits.

### **SUSTAINMENT MAINTENANCE SUPPORT**

Sustainment maintenance support includes general support and depot maintenance levels. It consists of several different types of activities modularly designed to meet maintenance demands anywhere in the world.

General support and depot repair activities locate where they can best support the theater operations plan. They support the theater supply system through TOE/TDA units, host nation support, and contract personnel. These activities generally move into freed or semi-fixed facilities in the theater. They remain there for the duration of operations. While they are able to displace forward, it is a very time-consuming, labor- and equipment-intensive process. However, they can deploy platoons, sections, or teams as far forward as required to support the tactical situation. When deployed forward, the elements are attached to the nearest maintenance company, and all requirements pass through that headquarters.

#### **General Support Maintenance**

The primary mission of GS component repair activities is the repair of components for return to the supply system. Managers set priorities on the basis of the anticipated consumption rates of components. Sustainment maintenance managers determine consumption rates. Secondary repair missions include end item repair and repair of components in support of depots. The tertiary mission of GS maintenance elements is to provide backup support to DS maintenance units. They only perform this mission when no other assets are available and when the supply pipeline is sufficiently viable to accept the disruption in operations. GS maintenance activities also serve as training bases to develop specialized maintainers.

## Depot Maintenance

Depot maintenance supports the strategic level of war. AMC depots or activities, contractors, and host nation support personnel perform this level of maintenance in support of the supply system. They operate in fixed facilities in CONUS and the theater. Production-line operations characterize this support.

Normally, elements perform depot maintenance where it is most appropriate to support the force. This may be in the COMMZ, in CONUS, offshore, or in a third country. Such operations support the overall DA inventory management program. They are an alternative or supplement to new procurement as a source of serviceable assets to meet DA materiel requirements.

HQDA approves and AMC controls programs for depot maintenance. Army arsenals and depot maintenance facilities execute some approved programs. In other cases, the Depot Maintenance Interservicing (DMI) Program plays an important role in depot maintenance. The DMI Program's main goal is the efficient and effective use of DOD depots by using the Depot Source of Repair (DSOR) decision process. The DSOR decision process is a mandatory milestone in the Integrated Logistics System planning and an integral part of maintenance planning. The DSOR process normally results in agreements with the other military services. Agreements with other military services and contractual

arrangements with commercial firms carry out some depot maintenance programs. Strategic planners schedule repair programs to meet the needs of the supply system and the reparable exchange program. They also consider availability of repair parts and other maintenance resources.

When a logistics support element deploys to a theater, it may act as the command and control element for theater-level sustainment maintenance activities. As discussed in Chapter 3, the LSE is a flexible organization. Theater needs and shortfalls in the supply system dictate its capabilities and organization. The LSE may include theater GS maintenance companies, forward repair activities (FRAs), and specialized repair activities (SRAs) operating within the theater. FRAs are maintenance activities designed to provide limited depot repair support to the theater. SRAs repair components and return them to either the supply system or supported customers. SRAs have special tools and test equipment to repair/test components whose associated maintenance requires a high degree of training or specialized TMDE. FRAs and SRAs may employ military personnel, DOD civilians, contractors, or a mixture of all three. These units normally operate from fixed or semi-fixed facilities in the corps rear, theater base, or the CONUS support base.

## AVIATION

The objective of Army aviation maintenance is to ensure maximum availability of fully mission-capable aircraft to the commander. Aviation maintenance elements accomplish this goal by performing maintenance on all aviation items, including avionics and weapon systems, as far forward as possible.

The aircraft maintenance system consists of three levels--aviation unit maintenance (AVUM), aviation intermediate maintenance (AVIM), and depot maintenance.

The aircraft crew chief and AVUM unit comprise the first line of aircraft maintenance. AVUM units are

organic to aviation battalions and squadrons. They provide support as far forward as possible. Forward support teams perform on-aircraft maintenance tasks that require minimal aircraft downtime. AVUM elements also perform more extensive recurring scheduled maintenance tasks in rear areas. AVUM tasks include replacing components; performing minor repairs; making adjustments; and cleaning, lubricating, and servicing the aircraft.

The AVIM, or second level of maintenance, element provides one-stop intermediate maintenance support and backup AVUM support. It performs on-aircraft system repair and off-aircraft subsystems repair. AVIM

units also provide aviation repair parts to supported units. AVIM tasks normally require more time, more complex tools and test equipment, and higher skilled personnel than the AVUM element has available.

Depot maintenance is the third level of maintenance. Depot maintenance includes very detailed and time-

consuming functions. It requires sophisticated equipment and special tools, special facilities, and maintenance skills. Typical depot tasks include aircraft overhaul, major repair, conversion or modifications, special manufacturing, analytical testing, and painting.

### **ARMY WATERCRAFT**

Maintenance of watercraft used in Army water terminal operations poses problems and requires arrangements which are somewhat different from those for other types of equipment. Supporting maintenance facilities for watercraft must locate at or near the water's edge. Rather than echeloning along the forward axis of a theater as in other systems, these facilities generally spread out laterally along the

theater's rear boundary. Except for some inland waterway systems, their orientation is toward the rear. Watercraft units typically get support from civilian shipyards either in theater or in other countries. Also, given the Navy's/MSR's worldwide access to ship/watercraft repair capabilities, it may be efficient to use that network as well as current Army procedures for repair of Army watercraft.

### **SIGNAL-PECULIAR EQUIPMENT**

Maintenance for selected units has unique characteristics. Signal battalion companies may operate far from division or corps maintenance units. However, they must maintain exceptionally high levels of readiness. Combat electronic warfare intelligence battalions have highly complex, low density equipment. In such exceptional cases, the battalions rely on--

- An organic maintenance capability to perform diagnostics and minor repairs.
- On-board spares.
- Forward deployment of MSTs from rear areas by surface or air transportation.

### **REPAIR PARTS SUPPORT**

Class IX items (repair parts) consist of any part, subassembly, assembly, or component required for installation in the maintenance of an end item, subassembly, or component. They support the maintenance and repair functions performed throughout the Army on all materiel except medical materiel. They range from small items of common hardware to large, complex line replaceable units.

strategic, operational, and tactical levels of CSS are discussed in the following paragraphs.

### **OPERATING CONCEPT**

The degree of management of repair parts is proportional to the contribution they make to the operational readiness of the end items they support. The type and quantity of stocked items directly relate to readiness requirements. Responsibilities at the

The management of repair parts at the national strategic level normally depends on the general classification of the item rather than its end item use. Therefore, requisitions in support of a unit's maintenance mission go to more than one NICP or commodity command. When the end item is a major system (for example, an M1A1 tank), a program manager ensures that the CSS for that end item is effective and efficient. Therefore, units experiencing problems have a single point of contact to handle their concerns. At this level, supply requirements may drive the NICP manager to use depot maintenance to repair unserviceable assets to support supply requirements.

The operational level of supply focuses on providing repair parts and a level of stockage for items not sent to the theater by ALOC. Easing these supply requirements are serviceable assets generated by the sustainment maintenance of line replaceable units. These items become theater-generated assets that can offset a requirement to provide support from the strategic level of supply.

Repair parts for the tactical level support unit and DS maintenance missions. Organizations can stock a limited number of items on the prescribed load list (PLL) to support their maintenance mission. Normally, the number of lines is restricted to about 300; however, they should be demand supported and combat essential. The commander has some latitude to accommodate expected requirements and for other justifiable reasons. Mobility of PLL items is another consideration. The PLL should be 100 percent mobile on unit transportation. GS- and DS-level missile system maintenance units maintain the theater authorized stockage list (ASL) for all supported missile systems. They provide missile parts supply for the theater.

GS maintenance units maintain shop stocks to support authorized maintenance tasks. They requisition replen-

ishment stocks through their supporting MMCs and do not maintain ASLs. This does not apply to AVIM units.

### **CANNIBALIZATION AND CONTROLLED EXCHANGE**

The commander who owns unserviceable equipment decides whether to perform cannibalization or controlled exchange. Cannibalization is the authorized removal, under specific conditions, of serviceable and unserviceable parts, components, and assemblies from materiel authorized for disposal. Controlled exchange is the removal of serviceable parts, components, and assemblies from unserviceable, economically repairable equipment and their immediate reuse in restoring alike item of equipment to a combat-operable or serviceable condition. Commanders may use supervised battlefield cannibalization and controlled exchange when parts are not available from the supply system.

Commanders as close to the site of damaged equipment as possible make cannibalization and exchange decisions consistent with Army regulations and MACOM policies. They base their decisions on guidelines established at higher headquarters. Cannibalization is a major source of critical repair parts in a combat environment. Maintainers use it aggressively according to the command's established policy.

### **MAINTENANCE IN AN NBC ENVIRONMENT**

Logisticians avoid operating in a chemically contaminated environment whenever METT-T permits. Rather than conduct operations in a contaminated area, CSS units displace at the earliest opportunity, decontaminate their equipment, and resume support operations. Reduction in manual dexterity and effects of petroleum product spills on protective overgarments particularly degrade maintenance operations.

Avoiding contamination of equipment is easier than decontaminating it. Decontamination is time-consuming, and it may corrode and damage some types of equipment. Providing overhead cover for equipment and supplies significantly reduces liquid contamination of such material. Using units decontaminate their

own equipment within their capabilities. Equipment turned over to maintenance personnel is as free of contamination as the using unit can make it. Using units establish standing operating procedures for recovery, handling, and decontamination of their own equipment.

When using unit personnel are not able to decontaminate equipment, they mark the equipment with the type and the date/time of contamination. If feasible, they mark the specific areas of equipment contamination to alert maintenance personnel of the danger. They also segregate contaminated material. When using units cannot decontaminate damaged or inoperable equipment that is critical to the battle, materiel managers consider equipment replacement.