

# **CHAPTER ONE**

## **MAINTENANCE OVERVIEW**

### **1-1. MAINTENANCE CONCEPT**

Maintenance supports combat readiness and effectiveness of the Army by sustaining weapons' systems and equipment in a mission ready/operational condition as effectively, responsively, economically, and as far forward as the situation permits. Army maintenance keeps materiel in a mission capable condition, restores equipment to a serviceable condition, or updates and upgrades its functional utility through modification. Maintenance includes inspecting, testing, servicing, classifying, repairing, rebuilding, and overhauling. Maintenance is a service that is provided as part of the combat service support required to conduct and sustain combat operations.

### **1-2. MAINTENANCE MANAGEMENT**

The maintenance management process includes forecasting, scheduling, production control, quality assurance, technical assistance and the provisioning of repair parts. Inherent in the maintenance management responsibility is the obligation to provide a safe environment while conducting maintenance operations. This responsibility is as important during field or combat operations as it is for garrison maintenance missions. Safety concerns must be addressed in standing operating procedures (SOP) and operations' orders. Maintenance management policies and procedures are contained in the Maintenance Management UPDATE which includes AR

750-1, DA Pam 738-750, and DA Pam 750-35. Divisional units utilize the Standard Army Maintenance System (SAMS) to collect maintenance data and provide management information to each level of command. Repair parts management policies and procedures for both using unit and direct support (DS) maintenance units are found in the Unit Supply UPDATE.

### **1-3. THE MAINTENANCE SYSTEM**

The Army Maintenance System consists of four distinct levels of maintenance: unit, direct support, general support, and depot. Each level is unique and makes a different contribution to the overall system. Unit maintenance consists of those tasks performed by the operator and crew as well as mechanics assigned to the unit. DS maintenance is provided by modified table of organization and equipment (MTOE) maintenance units or tables of distribution and allowances (TDA) activities. DS maintenance is characterized by repair and return to the user. This support may be dedicated to certain customers or provided on an area basis. General support (GS) maintenance is located in echelons above corps (EAC) and performs repairs in support of the theater supply system. Depot maintenance is characterized by repair and return to the system at national level. Additional information regarding the maintenance levels and how they are organized is outlined in Table 1-1 on the following page.

Table 1-1. Levels of maintenance.

| Unit  | Organizational Support  | Direct Support   | General Support  | Depot Operations  |
|-------|---|--|--|---|
| Who   | <ul style="list-style-type: none"> <li>User</li> </ul>  | <ul style="list-style-type: none"> <li>Direct support maintenance units</li> <li>Installation support maintenance shop</li> </ul>  | <ul style="list-style-type: none"> <li>General support maintenance units</li> <li>Installation support maintenance shops</li> </ul>  | <ul style="list-style-type: none"> <li>TDA activities</li> <li>Industrial-type activities</li> <li>Commercial contractors</li> </ul>  |
| Where | <ul style="list-style-type: none"> <li>Equipment location</li> <li>Organizational maintenance shops</li> </ul>  | <ul style="list-style-type: none"> <li>Mobile maintenance shops</li> <li>Fixed shops in installations or units</li> <li>Equipment location</li> <li>Division, corps &amp; echelons above corps</li> </ul>  | <ul style="list-style-type: none"> <li>Semi-mobile maintenance shops</li> <li>Installation maintenance shops</li> <li>Equipment location</li> <li>Echelons above corps</li> </ul>  | <ul style="list-style-type: none"> <li>Fixed plant -type facilities</li> <li>On site, on exception basis</li> <li>CONUS</li> </ul>  |
| What  | <ul style="list-style-type: none"> <li>Preventive maintenance checks and services</li> <li>Inspections</li> <li>Lubrication and cleaning</li> <li>Preserving</li> <li>Tightening</li> <li>Alignments</li> <li>Minor adjustments</li> <li>Replacement of unit level components &amp; assemblies</li> <li>Replacement of piece parts</li> <li>Evacuation of unserviceables</li> </ul> | <ul style="list-style-type: none"> <li>Diagnose and isolate equipment/components &amp; assemblies malfunctions</li> <li>Adjust, calibrate, and align components &amp; assemblies</li> <li>Repair defective end items and components</li> <li>Operate a repaired exchange activity</li> <li>Perform pollution evaluations of engine emissions</li> <li>Light body repairs</li> <li>Technical assistance</li> <li>Evacuate unserviceables</li> <li>ECOD</li> <li>Apply DS level MWOS</li> <li>Issue ORF</li> </ul> | <ul style="list-style-type: none"> <li>Diagnose and isolate equipment &amp; components &amp; assemblies malfunctions to the internal piece part level</li> <li>Adjust calibrate, align, and repair components &amp; assemblies</li> <li>Repair/modification of end items/components &amp; assemblies to the internal piece part level</li> <li>Heavy, body, hull, turret, frame repair</li> <li>Collection &amp; classification of unserviceable class VIII</li> <li>Evacuate disposable material</li> <li>Technical assistance</li> </ul> | <ul style="list-style-type: none"> <li>Overhaul of end items/components &amp; assemblies repairs requiring manufacturers tolerances</li> <li>Repair requiring special environmental facilities</li> <li>Nondestructive testing of used parts</li> <li>Inspections/modifications requiring extensive disassembly or elaborate test equipment</li> <li>Cyclic overhaul and special maint programs</li> <li>Manufacture of parts not otherwise obtainable</li> </ul> |
| How   | <ul style="list-style-type: none"> <li>Diagnosis &amp; isolation of malfunctions</li> <li>Use of built-in test equipment, simple go/no-go indicators installed instrumentation and external diagnostic/fault isolation devices</li> </ul>   | <ul style="list-style-type: none"> <li>Replacement of components &amp; assemblies and piece parts</li> <li>Provide highly mobile maintenance support teams</li> <li>Use of repairable exchange and operational readiness float</li> </ul>  | <ul style="list-style-type: none"> <li>Mobile maintenance support teams replacement of components &amp; assemblies and performance of repairs not requiring restoration to original manufacturers tolerances or specifications</li> <li>Operation of cannibalization point</li> </ul>  | <ul style="list-style-type: none"> <li>Wholesale level direct exchange</li> <li>Restoration of unserviceables to prescribed levels of serviceability</li> <li>Modernization of serviceable assets</li> </ul>  |
| Why   | <ul style="list-style-type: none"> <li>Sustain materiel readiness</li> </ul>  | <ul style="list-style-type: none"> <li>Support of user unit materiel readiness</li> </ul>  | <ul style="list-style-type: none"> <li>Support of installation/command/local supply stocks; operational readiness float stocks of DS units, and repair and return to user programs</li> </ul>  | <ul style="list-style-type: none"> <li>Support of overall supply inventory</li> <li>Support of GS units</li> </ul>  |

## 1-4. MAINTENANCE ALLOCATION CHART

The maintenance allocation chart (MAC) designates overall authority and responsibility for the performance of maintenance functions on an item of equipment. [It consists of six columns that provide the following:

- Group number - column 1 lists group numbers which identify components, assemblies, subassemblies, and modules with the next higher assembly.
- Component/assembly - column 2 contains noun names of components, assemblies, subassemblies, and modules on which maintenance is authorized.
- Maintenance functions - column 3 lists functions to be performed on items listed in column 2. Maintenance functions will be limited to and defined as follows:

Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing with prescribed standards.

Service. Operations required periodically to keep an item in operating condition.

- Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position or by setting the operating characteristics to specified parameters.
- Align. To maintain or regulate, within prescribed limits, by bringing into proper or exact position or by setting the operating characteristics to specified parameters.

Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measurement, and diagnostic equipment (TM DE) used in precision measurement.

Remove/install. To remove and install the same item.

- Replace. To remove an unserviceable item and install a serviceable counterpart in its place.

Repair. The application of maintenance services to restore serviceability to an item by correcting a specific fault, malfunction, or failure in a part, subassembly, module, end item, or system.

Overhaul. That maintenance effort prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications.

Rebuild. Consists of those services/actions necessary to restore unserviceable equipment to a like-new condition IAW original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment.

- Maintenance level - column 4 specifies the lowest level of maintenance authorized to perform the functions listed in column 3. This is done by listing a worktime figure in the proper subcolumn. This figure represents the man-hours required to do that maintenance function. The number of man-hours specified by the worktime figure represents the average time required to restore an item to a useful condition under field operating conditions. This time includes preparation time, troubleshooting time, and technical inspection/quality control time in addition to time required to perform the specific task. The symbol designations for the various maintenance categories and their relationship with the Army four level maintenance concept are as follows:

**C- Operator/crew .....(UNIT LEVEL)**

**O- Organizational Maint. ....(UNIT LEVEL)**

**F- Direct Support ..... DIRECT SUPPORT**

**H- General Support ..... GENERAL SUPPORT**

**D- Depot ..... DEPOT**

- Tools and equipment - column 5 names by code those common tool sets and special tools and test and support equipment required to perform the designated function.
- Remarks - column 6 lists references to the note page at the end of the MAC.

The MAC is found in the 9-series technical manuals at the 20, 30, and higher levels. Some of the

recently fielded, highly complex weapons systems have published a separate manual for the MAC. In those instances, the technical manual has the same first eight digits as other 9-series technical manuals followed by MAC. For example, the MAC for the M1 tank is TM 9-2350 -255 -MAC. Table 1-2 provides an example of a MAC.







### 1-5. BATTLE DAMAGE ASSESSMENT AND REPAIR

The purpose of battle damage assessment and repair (BDAR) is to return disabled combat equipment rapidly to the operational commander by

repairing, bypassing, or rigging components expeditiously to restore the minimum essential systems required for the support of a specific combat mission or to enable self-recovery.

These repairs will be temporary and may not restore full performance capability. Battle damage assessment (BDA) is a procedure to determine what is damaged, whether it is repairable, what assets are required to make the repair, and where the repair should be made. Battle damage repair includes any expedient action that returns a damaged part or assembly to a mission capable or limited mission capable condition. Actions taken for BDAR may in-

Table 1-2. Maintenance allocations.

| MAINTENANCE ALLOCATION CHART   |   |   |   |                   |     |     |   |   |   |
|--|---|---|---|-------------------|-----|-----|---|---|---|
|  |  |  |  |                   |     |     |   |  |  |
| Group Number   | Component Assembly  | Maintenance function  | Maintenance level*  |                   |     |     |   | Tools and equipment   | Remarks   |
|  |   |   | C   | O                 | F   | H   | D |   |   |
| 05<br>0505   | COOLING SYSTEM —CONT<br>Fan Tower Assembly  | Inspect<br>Test<br>Replace<br>Repair<br>Overhaul                                  |   | 0 2<br>0 2<br>4 5 | 0 3 |     |   | 35<br>37  | A   |
| 06<br>0601   | ELECTRICAL<br>Alternator  | Inspect<br>Test<br>Replace<br>Repair<br>Overhaul                                  |   | 0 2<br>0 2<br>2 0 |     | 8 0 |   |   | B   |
| 0602   | Voltage Regulator   | Inspect<br>Test<br>Replace<br>Repair  |   | 0 2<br>0 2<br>2 0 | 0 7 |     |   |   |   |
| 0603   | Motor, Starting   | Inspect<br>Test<br>Replace<br>Repair<br>Overhaul                                  |   | 0 2<br>0 2<br>2 0 |     | 2 4 |   | 49  |   |

\*\*Worktimes are included in DMWR

\*C - Operator or crew  
O - Unit maintenance  
F - Direct support maintenance  
H - General support maintenance  
D - Depot maintenance

elude shortcuts in parts removal or installation, installation of components from other vehicles that can be modified, utilization of parts serving a noncritical function on the same vehicle, bypassing of noncritical components, expeditious cannibalization procedures, fabrication of parts, and use of substitute fuels, fluids, or lubricants. While anyone on the battlefield can perform BDAR, unit and DS mechanics and technicians in addition to their specialty are trained in assessing battle damage.

The operator/crew performs initial battle damage assessment and repair damage if possible. The commander makes the decision whether or not to utilize **BDAR** in lieu of normal maintenance procedures. Since it may not be possible to train BDAR techniques in peacetime using actual equipment, the best

substitute is to train system-oriented mechanics to understand the theories and principles associated with weapon systems. BDAR manuals provide a single document for each weapon system that contains techniques that have proven effective. They are not meant to be all inclusive and are no substitute for an experienced mechanic who understands how a weapon system moves, shoots, and communicates. The BDAR manual is applicable for operator, unit maintenance personnel, DS maintenance personnel, and GS maintenance personnel. Manuals have been developed for major weapons' systems and are issued with the normal complement of technical manuals. BDAR manuals have the same first eight digits as other 9-series technical manuals associated with a weapons system. For example, the BDAR manual for the M1 tank is TM 9-2350 -255-BD.