Appendix B
Maintenance Performance Measures

B–1. General

The performance measures discussed in the paragraphs below were developed to assist the support maintenance unit commander and IMMOs in evaluating critical maintenance operations and in ensuring that overall performance meets Army standards. In accordance with paragraph 4–12, the use of manpower utilization rates in the management of maintenance operations is mandatory. All other performance measures are encouraged but optional. The optional performance measures will not be used for inspection purposes.

B–2. Manpower utilization rates

a. General. There are two utilization rates that are used to measure the effective use of maintenance personnel. The assigned utilization rate measures the percentage of direct labor man-hours assigned to the unit/organization that is recorded as total man-hours on all DA Form 2407 and/or DA Form 5990–E in a given period of time. The available manpower utilization rate measures the percentage of all of the direct labor man-hours actually made available to the shop office for work that is recorded as total man-hours on DA Forms 2407 and 5990–E for a given period of time.

(1) Direct labor is defined as time expended in performance of maintenance tasks required by the technical publication. Some maintenance personnel are required, by MOS or job title, to spend more than 50 percent of their productive time in direct labor duties. Other personnel, because of leadership, supervisory, or other requirements, are required to spend less than 50 percent of available time in direct labor duties. The total of all assigned and available direct labor must be considered.

(2) Indirect labor is work that contributes to the completion of work orders but does not include the performance of maintenance tasks required by technical publications.

b. Assigned manpower utilization rate. Assigned maintenance personnel includes all civilians, soldiers and contractors whose duties require that they accomplish productive labor. The total of the *possible* direct labor man-hour contribution from all assigned personnel in a selected period of time will be used. The percentage of this *possible* contribution from assigned personnel that are *actually recorded* as total man-hours on DA Form 2407/5990–E during a time period (for example, month, quarter, year) is the assigned manpower utilization rate. Assigned manpower utilization rate=total direct labor man-hours recorded on DA Form 2407/5990–E/total assigned direct labor hours contribution from assigned maintenance personnel.

c. Assigned direct labor man-hours. These are routinely reduced by other organizational requirements. Some of these are as follows:

(1) Military training (non-maintenance skill training).
(2) Alert duty.
(3) Organizational duties.
(4) Flight status.
(5) Personnel processing.
(6) TDY.
(7) Compensatory time off.
(8) Excused from duty.
(9) Ordinary leave.
(10) Sick leave (civilian).
(11) Medical absence (military).
(12) Personal affairs.
(13) Absent without leave (AWOL)/confined.
(14) Leave without pay.
(15) Job-related injury.
(16) Administrative leave.

d. Available manpower utilization rate. The total available time will be computed by subtracting organizational requirements identified in *c*, above, and other command-approved diversions of personnel from the total assigned direct labor man-hours described in *b*, above. This provides the net number of man-hours that are available and can be computed for appropriate time periods (monthly, weekly, daily, and so on). The percentage of the total available man-hours that are actually recorded as total man-hours on DA Form 2407/5990–E during a selected time period is the available man-hour utilization rate. Available manpower utilization rate=total direct labor man-hours recorded on DA Form 2407/5990–E/total available direct labor man-hours.

e. Man-hour utilization rate. When computing available man-hour utilization rate for National Guard TDA maintenance facilities such as an OMS, CSMS, and so on, subtract the time spent in military status (such as AT, preparation

for IDT performed during the normal work week, attendance at military schools, and other time lost to military training such as physical training) from the available man-hours.

B–3. Workload

Workload is the sum of the estimated man-hours required for work awaiting induction and to complete work in progress. The maintenance workload must be considered in materiel commodity areas (such as armament, aviation, automotive, CE, and so on) and is not normally managed in higher workload aggregations. This management technique parallels the typical organization of maintenance operations into platoons, shops, sections, and similar sub-elements. Higher aggregations of workload statistics for different commodities do not have management significance because maintenance skills, tools, repair parts, and other maintenance resources are often not transferable across commodity lines to reduce high workloads. Established time standards for tasks performed over time on a repetitive basis will result in more-accurate man-hour estimates to be used in workload computations. The task time standards should be reviewed and adjusted at least semiannually to assist commanders in detecting and responding to changes in a maintenance organization's workload.

B–4. Direct labor availability

Direct labor availability is the number of man-hours available per day in a shop or commodity area to perform productive maintenance tasks on work orders. Man-hours expended from this direct labor resource will be recorded in the "man-hours expended" field of the DA Form 2407/5990–E and summarized in the "total man-hours" field of the DA Form 2407/5990E. The direct labor availability will be projected by supervisors and managers for each shop or commodity area to ensure that the maintenance operation can accomplish expected workloads without excessive backlogs.

a. The direct labor availability for each shop or commodity area will be computed by using the manpower availability rate from paragraph B–2*d* and applying it to the total daily available hours that are projected for that shop or commodity area for the time period under consideration.

b. Direct labor availability is calculated as follows: Direct labor availability=manpower availability rate × total available direct labor hours (per day).

c. Rates and available man-hours will vary from unit to unit, shop to shop, and location to location and must be individually determined. All commanders and managers will ensure that these capabilities and rates are computed, updated, and used in the management of maintenance operations.

d. Management of the maintenance mission must be locally directed based upon projected workload and projected capabilities and capacities to accomplish that workload. Commanders and managers will take the steps necessary to address various problems that arise. For example, if a review of projected personnel gains and losses 90 days to 180 days out indicates an adverse situation is developing, the following alternatives should be addressed:

(1) Expediting the personnel replacement process.
(2) Borrowing personnel from other organizations.
(3) Using local contract or host-nation support.
(4) Shifting a portion of the workload to another organization that has excess productive capacity.

B–5. Efficiency rate

a. The efficiency rate is a measure of the skill proficiency within the maintenance organization. It is dependent upon establishment and maintenance of a set of task time standards that are representative of maintenance performance under the local situation. Inspectors will use the task time standards to estimate the man-hours required to complete each work order.

b. The efficiency rate is the man-hours estimated for a given work order (or the total of estimated man-hours for all work orders completed during a given period of time) divided by the man-hours that were actually expended to accomplish the work order.

c. The recommended management objective for the efficiency rate is 80 percent to 100 percent.

d. The efficiency rate will be calculated for the unit by including all of the work orders completed during the reporting period. It will be calculated for specific individuals on an "as required" basis to measure skill proficiency and thus identify training requirements.

e. The trend of the efficiency rate should be plotted for the previous 12 months. When a declining trend is observed, the following should be considered:

(1) Review the maintenance task standards for validity.
(2) Verify the effectiveness of supervision within the shops.
(3) Review the supported density list to identify new equipment for which MOS training may be required.
(4) Identify individuals who require additional training in certain skills or on certain equipment.
(5) Physical layout.
(6) Tool and TMDE availability.

(7) Amount of lag time spent waiting for tools and parts.

B–6. Backlog

a. The backlog will be computed for each commodity maintenance organization or shop. (See para B–3.)

b. Backlog is the overall measure of the direct labor resources required to complete the workload noted in paragraph B–3. The backlog will be expressed in 8-hour workdays and will be computed as follows: backlog (in workdays-)=workload/average daily direct labor availability.

c. The standard for backlog should be established at the local level based on the equipment supported and historical experience. The previous 12 months experience should be analyzed for trends. If an unfavorable trend emerges, the components of the backlog formula should be analyzed to identify the probable cause.

B–7. Turnaround time

a. Turnaround time is the overall measure of the duration of the maintenance cycle. It gives an indication of the responsiveness of the maintenance organization to its customers. Compute turnaround time by commodity and exclude initial rejects. It covers the period of time from acceptance of a work order to closeout. It does not include time awaiting customer pickup.

b. Turnaround time will be determined as follows:

(1) Identify the number of calendar days between the acceptance date and the closeout for each work order completed during the period.

(2) Arrange the work orders in ascending order based upon the number of calendar days.

(3) Remove from consideration the 25 percent of the total number of work orders with the highest number of calendar days.

(4) Calculate the average of calendar days for the remaining work orders.

c. The 25 percent of work orders with long times should be the subject of intensive individual attention to resolve their particular problems but should not be allowed to distort the average of turnaround time that is intended to be representative of normal operations.

d. Turnaround time involves the following three major components: maintenance delay time, supply delay time, and repair cycle time.

(1) Although the factors that comprise or influence these components are not always controllable, no corrective actions can be taken until the problems have been identified and traced to the probable cause. Maintenance shop officers are responsible for correcting those factors that they can control and for bringing to the attention of the chain of command those factors beyond their control.

(2) Commanders at the local installation level should establish a standard for the turnaround time measure. The trend of the turnaround time and its major components should be plotted for the previous 12 months. When an increasing trend is observed, the major components of turnaround time should be reviewed and analyzed as indicated in the following paragraphs.

B–8. Maintenance delay time

a. Maintenance delay time is the component of turnaround time that represents time spent awaiting a required resource other than repair parts—that is, the availability of facility space, tools, TMDE, and skilled personnel. It includes time awaiting initial, in-process, and final inspections and time awaiting induction into the shop.

b. Maintenance delay time is calculated using the same segment of work orders completed during the period as used to calculate turnaround time. It is determined by calculating the mean number of calendar days that work orders in the segment were carried in status codes indicating awaiting inspection, awaiting shop, or awaiting some action other than receipt of repair parts. It will also be expressed as a percentage of the total turnaround time.

c. Local commanders should establish a standard for maintenance delay time in terms of its percentage of total turnaround time. When an increasing trend is observed, the following should be reviewed:

(1) Availability and use of direct labor personnel.

(2) Inspection procedures.

(3) The ratio of direct labor personnel to work stations by shop section—balance labor among workstations.

(4) The adequacy of the quantity of tools and TMDE.

(5) The adequacy of lift and materiel handling equipment.

B–9. Supply delay time

a. Supply delay time is the component of turnaround time that represents time lost waiting for receipt of repair parts. It includes only that time when no further maintenance action can be taken due to a lack of repair parts. Time elapsed while repair parts are on order but other maintenance actions are, or could be, taken will not be counted as supply delay time.

b. Supply delay time is calculated using the turnaround time segment of work orders completed during the period. It is determined by calculating the average number of calendar days that work orders in the segment were carried in

status codes indicating no further action possible while awaiting receipt of repair parts. It is also expressed as a percentage of the total turnaround time.

c. The local commander should establish a standard for supply delay time in terms of its percentage of total turnaround time.

d. When an increasing trend is observed, the following should be reviewed:

(1) Requisition priorities.

(2) Reconciliation procedures.

(3) Authorized stockage list.

(4) Supply performance measures, including—

(a) Gross availability or fill rate.

(b) Average customer wait time.

(c) Requisition processing time.

(d) Receipt processing time.

B–10. Repair cycle time

a. Repair cycle time is the component of turnaround time that represents time spent in the shop undergoing inspection, repair, or service. It is the primary component that measures actual maintenance performance rather than detractors to performance as measured by the two delay time components. Repair cycle time is comprised of, or influenced by, several factors that are addressed separately below.

b. Because it is the only delay component that is subject to distortion by a small percentage of the total, the repair cycle time will be calculated using all of the work orders completed during the period. It will be determined by calculating the average number of calendar days that the work orders were carried in status codes indicating "in shop."

c. Installation-level commanders should establish standards for total repair cycle time by priority of the work order. When an increasing trend is observed, the factors affecting repair cycle time should be reviewed and analyzed as indicated below.

B–11. Backup support utilization

a. Backup support utilization is a measure of the extent of workload transferred to an organization charged with the responsibility of absorbing overflow workload.

b. Backup support utilization is a percentage calculated by dividing the number of man-hours estimated for all work orders accepted into the maintenance activity during the period into the number of man-hours estimated for work orders evacuated to backup support during the same period.

c. The installation commander should establish the standard for backup support utilization. The installation commander should consider the unit's capacity as stated in its MTOE. When an increasing trend is observed, the following items should be reviewed:

(1) The trend of workload acceptance to identify an increase in work coming in from supported units.

(2) The supported density lists to identify additional quantities supported.

(3) Direct labor availability to identify a decrease in labor capacity.

(4) Direct labor utilization rate to identify a decrease in effective use of personnel resources.

B–12. Maintenance float utilization

a. Maintenance float transaction time—

(1) Measures a factor that impacts upon repair cycle time and the efficiency of the maintenance float decision process.

(2) Is determined by calculating for the previous 12 months an average of the number of calendar days between the acceptance of the work order into the support maintenance activity and the customer receipt of the float.

b. The local installation commander should establish the standard for maintenance float transaction time. When an increasing trend is observed, the following items should be reviewed:

(1) The float decision process, to ensure that the decision to float is made as early as possible.

(2) The availability of float assets, to identify underused items or shortages.

(3) The demand recording process, to ensure that demands are being captured.

(4) The priority placed on work orders to repair float assets, to ensure that it matches the highest priority of supported units authorized these items.

B–13. Float utilization

Float utilization is computed as the number of work orders closed out using float divided by the total number of work orders less initial rejections. If you are not using the float, this factor will be low and should trigger management action to evaluate if equipment maintained as float should be retained.

B–14. Rejection rate

a. The rejection rate is the number of items being reprocessed into the shop for rework. This includes in-shop and final inspection rejections and customer rejections and returns for correction of the same problem within 30 days after close-out of the work order.

b. The local commander should establish the rejection rate standard.

c. If the in-shop rejection rate exceeds the standard, the shop officer should—

(1) Validate the inspection.

(2) Determine adequacy of leadership and supervision within the shops.

(3) Determine if procedures are correct. If not, submit recommended changes to TMs.

(4) Determine if new equipment or basic skills training is required.

(5) Determine if facilities are adequate.

d. If customer rejection or return rates exceed the standard, the shop officer should—

(1) Validate the inspection standards and skills.

(2) Determine if additional new equipment or basic skills training is required.

(3) Determine if repeated faults are a result of improper operation or unit maintenance.

(4) Determine if customer relations are the cause of the increased rejection rate.

Appendix C
Determination of Tactical Maintenance Augmentation Requirements for Military Mechanics During Peacetime Garrison Operations

C–1. Required documents

a. There are two Army MARC maintenance databases (AMMDB): use only the one for Direct Labor. This shows the maintenance military occupationsal specialties (MOSs) and the man-hours required annually to perform the scheduled and unscheduled maintenance tasks for each equipment item. These man-hour summaries are categorized by equipment LIN.

b. Data sources that show the MOSs and numbers of soldiers authorized in a unit/organization (TOE and MTOE).

c. Data sources that show the number of equipment items on hand in a unit/organization identified by LIN category.

d. Army total asset visibility.

(1) REQVAL.

(2) SPBS–R.

e. AR 570–4, which outlines Army policy for computing annual man-hours available (CONUS and OCONUS) in peacetime for soldier maintenance personnel. These numbers are called the peacetime mission availability factors (PMAF).

f. A document that reflects the man-hours and costs of a contract man-year for the MOSs to be augmented. The government contracting office that services the MACOM or the location under consideration should provide this document.

C–2. Procedures

a. Determine the on-hand equipment numbers and LIN categories by using the authorization document that is applicable for your unit/organization.

b. Determine the number of maintenance man-hours required for each equipment item within a LIN category in your unit/organization authorization document by using the AMMDB. Find the applicable LIN in the AMMDB. From the UNIT column, note the MOS and the number of man-hours required to maintain that LIN item. An example follows.

(1) Mission: Determine the number of man-hours (and funds) required to augment 63B mechanics in a unit motor pool to support the HMMWV.

(2) The AMMDB reveals that MOS 63B maintains the HMMWV, LIN T61494. It also reveals that 167.9 man-hours are required annually to accomplish all scheduled and unscheduled maintenance tasks on each HMMWV.

(3) You have 30 HMMWVs in your unit/organization. Multiply the number 30 by 167.9 for an annual requirement of 5,037 maintenance man-hours.

(4) Use the authorization document that shows the number of maintenance personnel you are authorized. You find authorizations for two soldiers of MOS 63B in the document. Multiply the number of authorized mechanics, two each, times the appropriate PMAF noted in paragraph C–1*e*. In this example, it is the assigned category of mechanical maintenance in CONUS/FORSCOM. Therefore, the PMAF is 1,392 man-hours per year per soldier. The total number of man-hours expected to be available annually, in peacetime, from the two authorized positions is 2,784 hours.

(5) Subtract your peacetime available man-hours (2,784), ((4), above) from your required man-hours (5,037), ((3), above). You find a shortfall of 2,253 man-hours.