Keeping the Army's Equipment Ready to Fight

A New Tool for Understanding Equipment Readiness

The Army Transformation places an increased premium on the Army's ability to efficiently keep its equipment ready to fight. The Army envisions relatively small but highly capable units that will deploy rapidly and then engage immediately in highly mobile operations. Because of the need to keep these units light enough for quick deployment and agile maneuver, their support structures must be lean. Yet these lean support organizations must still be able to repair broken equipment quickly. A unit with many weapon systems unable to fight or move will soon become ineffective and vulnerable.

The Army cannot realize this vision with today's weapon systems and support capabilities. Achieving the vision will require dramatic improvement in levels of both equipment supportability (i.e., reliability, maintainability, durability, and commonality) and support process effectiveness and efficiency. Such progress requires a detailed understanding of the factors that affect equipment readiness—both the causes of equipment failure and the contributions of each support process in repairing broken vehicles.

To help improve the Army's understanding of equipment readiness, RAND Arroyo Center researchers have developed a management and analysis tool that is the focus of a new report, *Diagnosing the Army's Equipment Readiness: The Equipment Downtime Analyzer* (EDA). The EDA enables Army managers to better understand and measure the impact of support processes and resources, equipment usage, and failure rates on readiness. Most important in preparing for the future, EDA data can help the Army evaluate equipment readiness performance in situations involving high operational tempo.

A NEW VIEW OF EQUIPMENT READINESS

The EDA links data from several maintenance and supply information systems to compile a day-to-day history of the status of each weapon system and every reported "deadlining" event— that is, each failure that causes a weapon system to become unavailable for use (i.e., not mission capable, or NMC). From

these daily histories, the EDA creates repair records that are used to calculate equipment failure rates and total "broke-to-fix" times as well as "broke-to-fix" process segment times and quality metrics for each echelon of support.

By archiving the daily NMC rate, the EDA can be used to view how well equipment performs in demanding operations. Because problems with equipment readiness generally occur during training exercises when equipment is used heavily, the daily NMC rate offers more insight than the monthly averages of readiness that the Army has relied upon in the past. This is because monthly averages combine readiness rates from motor pool idle time and exercise time.

The daily NMC rate reveals the turbulence in performance that can be obscured by monthly averages. Figure 1, for example, displays both monthly and daily NMC rates (shown by the horizontal bars and the jagged line, respectively) for one armor battalion's tanks from May 1999 until April 2000.
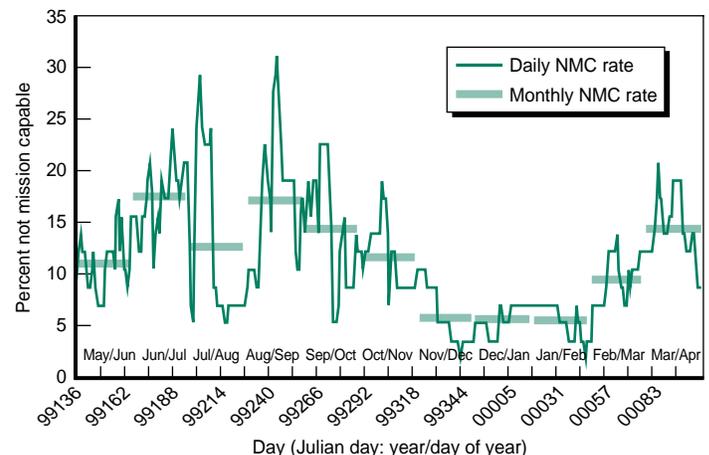

Figure 1—Daily NMC Rates Provide a Rich Portrayal of Readiness

In late July 1999, an exercise caused the battalion's daily tank NMC rate to increase from 5 to almost 30 percent in just four days. But once the battalion completed the exercise, it experienced just two tank failures during the remainder of the monthly reporting period, recovering to 94 percent readiness by early August.

These variations in the daily NMC rate provide a much more detailed understanding of the effects of equipment usage on readiness than the monthly average NMC rate of 12.5 percent. The monthly figure reflects neither the low equipment readiness during a period of moderate to high usage nor the availability of the tanks if called upon for use.

THE EDA POINTS TO THE SOURCES OF LENGTHY EQUIPMENT DOWNTIMES

EDA metrics are designed to help the Army understand whether support process capabilities (and if so, which), failure rates, or both are driving equipment readiness. Figure 2 offers an example of the kind of detailed repair record made possible by the EDA.

By providing in-depth visibility into the total "broke-to-fix" process, the EDA helps identify the true causes of this tank's lengthy 19-day downtime. The bar at the top of the figure breaks
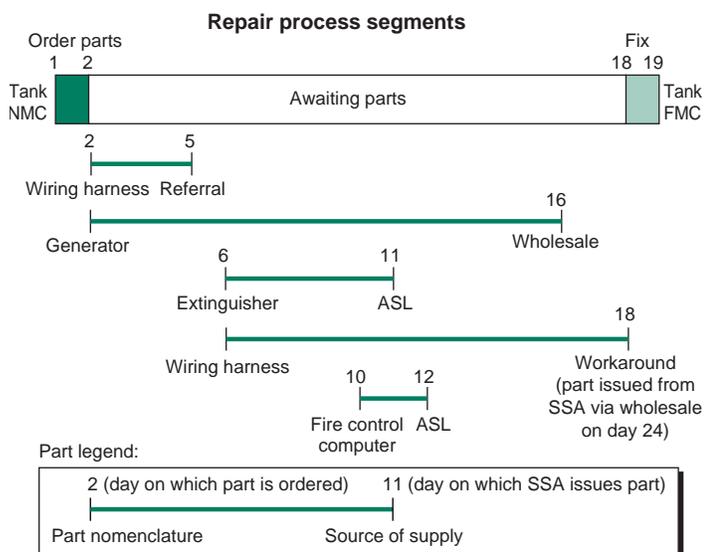
down the repair process into three parts: diagnosis and ordering parts, awaiting parts (AWP), and fixing the fault(s). Most of the repair time for this tank was spent awaiting parts—from day 2 until day 18—but that is just part of the story.

The EDA also reveals the effects of process interactions, which show that in some cases awaiting parts time really reflects maintenance problems and vice versa. For this repair, the data beneath the horizontal bar provide each part's order date, issue date, and source of supply. Each day on which parts were ordered represents an "order cycle." The second wiring harness was ordered as the result of receiving the wrong one the first time; the late extinguisher order resulted from delayed identification of a part need; and the tank's fire control computer was provided to another tank. The causes of these multiple order cycles are typical of those commonly seen, which include controlled exchange ("cannibalization"), diagnostic errors, progressive maintenance, requisitioning errors, and order fulfillment problems. Further, the second time the wiring harness was ordered, maintenance decided to stop waiting for an issue from supply on day 18 and satisfied the need through a "workaround"—that is, by finding an alternative means of completing the repair even though the part had not been received from the Army's supply system. The EDA combines such detailed histories to produce both repair process and failure rate metrics at any level of aggregation from an individual tank, or even a tank part, through the entire Army fleet.

THE EDA WILL HELP THE ARMY FOCUS CONSTRAINED RESOURCES FOR GREATEST IMPACT

The EDA allows logisticians and those engaged in acquisition and recapitalization to examine which improvements will most likely lead to higher equipment readiness. Several organizations are already making use of the prototype data and metrics available through the EDA. The Army's G-4, in conjunction with the Combined Arms Support Command (CASCOM) and the Ordnance Center and School (OC&S), has laid the groundwork and obtained funding for the inclusion of EDA capabilities in the Army's future Global Combat Support System–Army.

To further improve the Army's ability to understand equipment readiness, the EDA can be expanded as better data become available in such areas as equipment usage, maintenance work time, training schedules, customer wait time, repair quality, repair costs, and scheduled service execution.

Repair process segments

Figure 2—Linked Maintenance and Supply Data Create Detailed Repair Records