

# Improved Equipment Sustainment Is Critical to Army Transformation

Keeping the Army's equipment ready to go takes a lot of personnel and financial resources: 20 percent of the soldiers in a heavy division (almost as much as the supply and services, transportation, and medical personnel combined) and an estimated \$11 billion across the Army in fiscal year 2003. Even with these resources, the Army struggles to keep equipment availability at the standards thought to be necessary in a high-intensity conflict. Furthermore, today's standards are inadequate to support Objective Force operating concepts. The Army sees future battles as being fought by operationally mobile, widely dispersed units. To realize this vision, units must be small and often will not have secure lines of communication during surges of continuous operation or "operational pulses." These conditions necessitate high equipment availability and unit self-sufficiency for short but intense periods.

The Army's Transformation and new operational concepts put a premium on "equipment sustainability," the ability to keep weapon systems available during operations. Sustainability depends on the characteristics of the weapon system itself and of the logistics system. To get better sustainability in future systems, the Army needs both better equipment and improved logistics performance. Recent Arroyo Center research by Eric Peltz published in *Equipment Sustainment Requirements for the Transforming Army* examines these issues and recommends that the Army adopt a standard set of metrics for defining equipment sustainment requirements to drive the Army and its providers to comprehensive solutions for improved sustainability.

## **SUSTAINABILITY MUST IMPROVE TO MEET TRANSFORMATION GOALS**

The Army's goals for its Transformation, along with its emerging Objective Force doctrine, combine to create

the following four goals for high-level equipment sustainment:

- Higher equipment availability to sustain the combat power of small units and networked systems;
- Reduced maintenance "footprint" in maneuver units to improve deployability and operational mobility;
- Reduced equipment maintenance costs to increase investment in future capabilities; and
- Maneuver unit self-sufficiency during combat pulses to enable them to leverage information dominance through enhanced mobility.

The first three goals are important exclusive of the Objective Force; taking it into account, they combine with the fourth to be essential. For every new system, the Army should establish equipment sustainability requirements that will help achieve these goals. Table 1 lists metrics for defining requirements that will help determine how well each system helps achieve these goals.

The Army has focused much attention on making its weapon systems more reliable. However, while reliability can and should be substantially improved, the Army probably cannot reach its Objective Force sustainability goals solely by increasing reliability. For the platforms of the Future Combat Systems, a severalfold or even order-of-magnitude improvement in reliability would be needed to meet Objective Force sustainability goals if maintainability, fleet life cycle management, and supply support remained at current performance levels. Attaining such a revolutionary improvement in one generation of weapon system development is improbable. Thus the Army must take advantage of all potential means to increase its equipment sustainability.

**Table 1**  
*Each Program's Requirements and Metrics for Equipment Sustainability Should Reflect the Army's Combat Service Support Goals*

Transformation Goal	Equipment Sustainability Requirements	Candidate Metrics
<ul style="list-style-type: none"> <li>• Improve ability to sustain combat power</li> <li>• Improve deployability and operational mobility</li> <li>• Increase investment in future capabilities</li> <li>• Leverage information dominance</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain combat effectiveness</li> <li>• Maximize pulse availability</li> <li>• Minimize deployment footprint and maneuver force footprint</li> <li>• Minimize life cycle cost</li> <li>• Unit self-sufficiency during pulses</li> </ul>	<ul style="list-style-type: none"> <li>• Pulse operational availability                             <ul style="list-style-type: none"> <li>– Minimum</li> <li>– Average</li> </ul> </li> <li>• Maintainers/maintenance ratio by echelon</li> <li>• Maintenance equipment lift requirements</li> <li>• Total net present life cycle cost to “maintain”</li> <li>• Self-sufficiency pulse length</li> </ul>

**LEVERS TO IMPROVE SUSTAINABILITY**

The transformation goals explain why the Army wants to develop weapon systems with improved sustainability. The equipment sustainment requirements describe the sustainability performance needed. The design features of a weapon system program—including the design of both the system and its logistics support—indicate how the Army can get the desired performance. Design features of the program function as “levers” that weapon system developers can pull to get the level of equipment sustainability needed to meet the transformation goals. Four sets of design features are critical to determining the system’s sustainability: reliability, maintainability, fleet life cycle management, and supply support. The first two affect the sustainability of a weapon system solely through equipment design, and the last two

drive sustainability through both logistics system and equipment design (e.g., fleet commonality and spare parts policy). Figure 1 depicts these links.

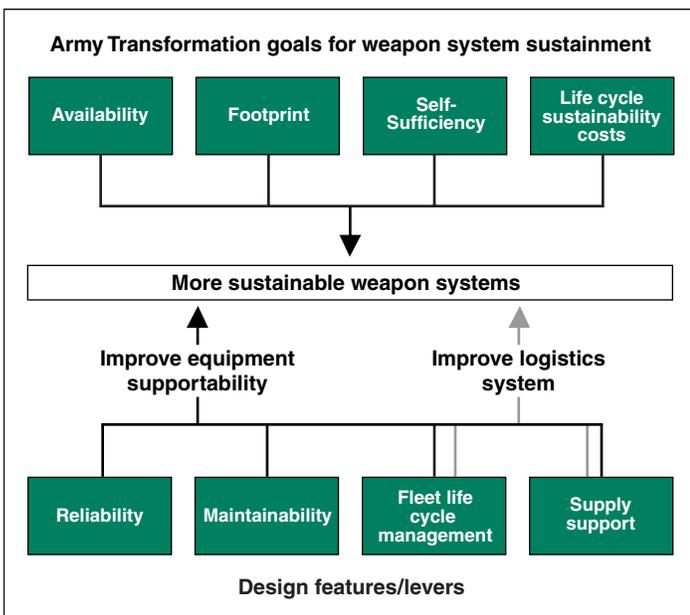
**Reliability** affects a force’s ability to accomplish missions (as defined in terms of mission-critical failures) as well as the resources (in terms of the maintenance costs and footprint for all failures) required to fix and sustain weapon systems.

**Maintainability** encompasses factors that affect the resources and time needed to complete repairs as well as capabilities that enable the logistics system to keep failures from affecting operations (e.g., prognostics).

**Fleet life cycle management** plans should describe how the Army will handle degradation from system aging and how it will design the system to accommodate upgrades in order to maintain equipment performance cost effectively at needed levels.

**Supply support** requirements reflect supply chain decisions that can be made specific to a weapon system program (e.g., spare part levels), the support concepts employed, and design decisions that improve the efficiency of support (e.g., commonality).

Just as metrics are needed to measure the contribution of sustainability to transformation goals, other metrics are needed to describe requirements for design features and to gauge their contribution to sustainability. For example, a metric for reliability associated with making equipment available during combat pulses is the average time between critical failures. Other reliability metrics pertain to the maintenance footprint and life cycle cost requirements. Examples of maintainability metrics are maintenance hours per maintenance action, the fraction of faults predicted, and the percentage of maintenance actions that the crew can perform. Such metrics should be used in a weapon system program to monitor whether a program is



*Figure 1—Design Levers Provide the Means for Achieving Needed Sustainability*

making the desired progress toward overall equipment sustainment requirements.<sup>1</sup>

Early in a program, the Army should determine the concept that most effectively balances these levers to achieve the overall equipment sustainment requirements. In effect, the selected concept represents a promise to achieve the requirements by using a set of specified program design features.

### **MAKE SUSTAINABILITY A KEY PERFORMANCE PARAMETER (KPP)**

Given the criticality of effective and efficient equipment sustainability to Objective Force operational concepts, the Army should consider designating a sustainability requirement as a KPP. This step would raise the importance of sustainability in future weapon system programs.<sup>2</sup> A KPP sets a threshold that a weapon system program must meet. When a KPP threshold is not met, a program faces a review for potential cancellation or significant change. By definition, a KPP should represent those performance needs fundamental to the warfighting benefit to be provided by the program, and, by policy,

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<sup>1</sup>These requirements often depend upon some performance assumptions for logistics processes that are beyond the program scope (e.g., very fast order fulfillment times for spare parts). It is critical to use appropriate values for these assumptions; otherwise, a program may satisfy design level requirements without meeting transformation goals.

<sup>2</sup>DoD uses KPPs as a management tool to ensure the successful development of weapon systems. According to DoD criteria, KPPs should be composite operational goals essential to mission accomplishment, technically and financially feasible, and assessable.

they should be high-level “composite” requirements directly related to operational needs.

Thus, a KPP designation could be appropriate for any of the sustainability requirements that are derived directly from transformation goals and operating concepts: assure availability during combat pulses, shrink maintenance footprint, lower maintenance costs, and enable self-sufficiency during operations. Conversely, a sustainability KPP should not be stated in terms of a single design feature, because this would constrain developers from fully exploiting possible tradeoffs.

### **IMPROVING THE ARMY’S EQUIPMENT SUSTAINABILITY REQUIREMENTS**

The Army should be able to markedly improve its equipment sustainability through a broad and balanced approach. Arroyo Center researchers recommend that the approach include the following four strategies:

- Develop a template for equipment sustainability requirements that can be adapted for all Army weapon system programs.
- Leverage all available design features.
- Designate one or more equipment sustainability requirements as a KPP.
- Adopt a broad array of tools, such as sustainability-focused award fee criteria, for improving sustainability, employing a “carrot and stick” approach that enforces program discipline while motivating maximum possible improvement.

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*RAND research briefs summarize research that has been more fully documented elsewhere. The research summarized in this brief was carried out in the RAND Arroyo Center; it is documented in Equipment Sustainment Requirements for the Transforming Army, by Eric Peltz, MR-1577-A, 2003, 174 pp., \$24.00, ISBN: 0-8330-3205-4, available from RAND Distribution Services (Telephone: toll free 877-584-8642; FAX: 310-451-6915; or Internet: [order@rand.org](mailto:order@rand.org)). Abstracts of all RAND documents may be viewed on the World Wide Web (<http://www.rand.org>). Arroyo Center URL: <http://www.rand.org/ard/>. Publications are distributed to the trade by NBN. RAND® is a registered trademark. RAND is a nonprofit institution that helps improve policy and decisionmaking through research and analysis; its publications do not necessarily reflect the opinions or policies of its research sponsors.*

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