ARMY RESEARCH DIVISION
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Issue Paper

MARCH 1994

Materiel Distribution: Improving Support to Army Operations in Peace and War

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Analyses examining Army materiel distribution in DoD have concluded that the process might benefit from applying modern industrial practices. This paper identifies problems in the DoD system, describes industry's practices, and suggests what DoD should do to improve its operation.

Problems with DoD Distribution

An ongoing Army study of DoD distribution reveals a catalogue of chronic problems. In previous conflicts, users of the system habitually reordered the same part or supply over and over. Backlogs swelled at both CONUS (Continental U.S.) and theater ports. Documentation about what had been shipped and received was, at best, incomplete.

Despite high-level attention and repetitive attempts to correct the problems, Operation Desert Storm showed they still exist. Over 25,000 containers shipped to theater had to be opened simply to determine contents and destination. Supplies were lost to the system, sometimes for months. Resupply of spare parts was ineffective. Equipment was deadlined, and some units received only minimal parts support. Troops were able to continue only because of what they had brought with them; because those quantities had been substantially increased above normal; and because of aggressive, dedicated, and labor-intensive efforts. After the Persian Gulf War, the Army studied the problems with materiel distribution (the Total Army Distribution Study) and developed a plan to resolve them. But the plan focused on the Army and in-theater delivery and took an incremental rather than a systemic approach.

Given the Army's problems with the distribution system, the question arises about how logisticians have been able to support U.S. forces in past conflicts. The United States has succeeded in the past because it could rely on logistic mass and personnel to work around problems. With enough stockpiled materiel and spare equipment, distribution problems become less critical. The United States has been fortunate to have a large enough military establishment so that not all elements become engaged in the conflict. Unengaged units provide a ready source of spare parts and equipment. For example, fewer than 8 of 18 divisions fought in Desert Storm. The uncommitted divisions could be—and were—called on for parts and equipment.

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Why Doesn't the System Work?

Backlogs and late and lost supplies are symptoms. The underlying causes of the distribution problems are many and complicated, but they group into four general categories: structural issues, user reactions, unresponsiveness to change, and low standards.

Complex, Segmented, and Unfocused Structure

The structure of the entire distribution process is complex and segmented. It is complex because it involves many nodes and organizations. Figure 1 depicts many—but not all—of the nodes, the organizations, and the data systems involved, and the measure of effectiveness at each node. The DoD UMMIPS (Uniform Materiel Movement and Issue Priority System) standards apply at each step, but they are only one of many measures at each node. The process is segmented because the functional aspects of distribution—e.g., storage, issue, transport—are divided among various organizations. Some fall to

regard as the most important measure—customer satisfaction. Some elements use time, others use percentage of fill, and still others use cost. The Army does measure customer wait time (called order-ship time) at the Department of the Army level. But it reports performance only by averages—not by individual shipments—and the data are of poor quality. However, the distribution process exists for only one reason: to place requested materiel in the hands of the warfighter. User (or customer) satisfaction should be the predominant performance measure. The desired standard is the right materiel in the right place at the right time, every time.

User Behavior

The users of the process also contribute to its poor performance. Because the process functions poorly, those involved have no confidence in it and take adaptive but entirely rational action to improve performance. For example, when the system responds

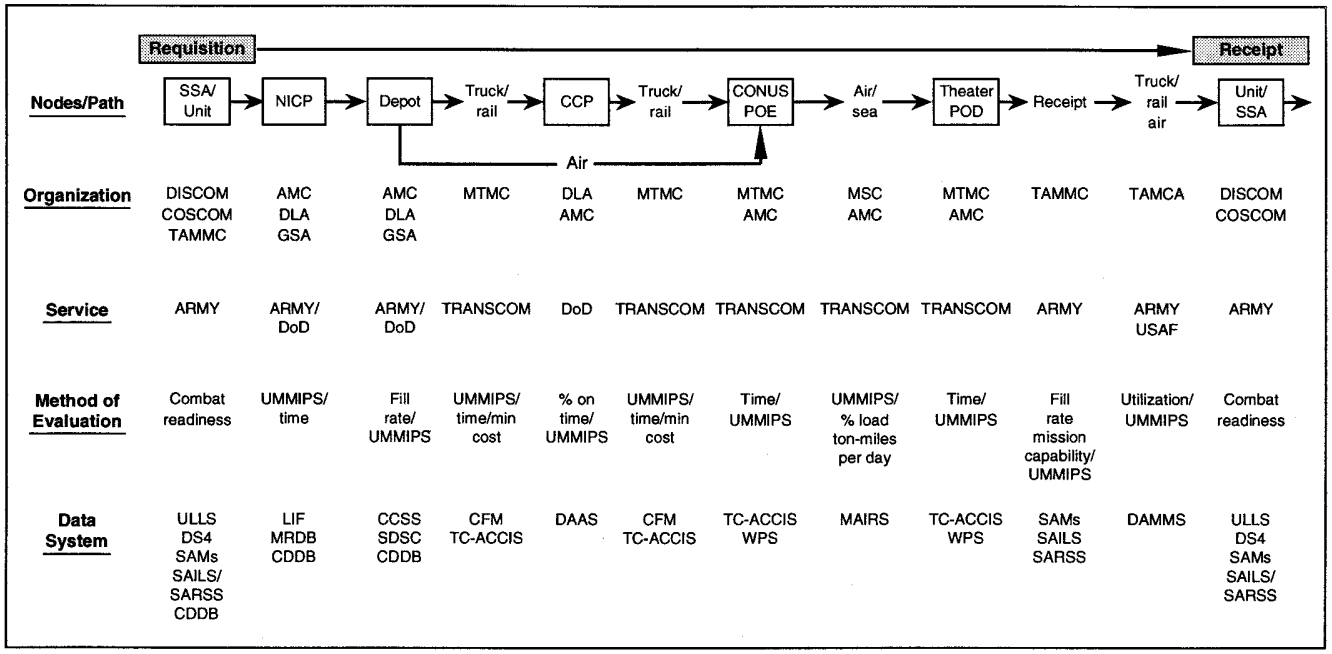

Figure 1—DoD Distribution Process

transportation organizations, others to supply agencies. Some functions occur within Services, and others belong to joint organizations. The process is a patchwork quilt of functions and responsibilities that optimizes component parts at the expense of system efficiency. It is not an integrated activity.

Furthermore, the distribution process has a fragmented focus. Many of the nodes measure performance differently, and none uses what many

slowly or when users move or cannot find their requisitions in the system, they resubmit requests, further clogging the system.

This maladaptive behavior drives up the cost of inventory and decreases capability. Inventory cost goes up because more items are requested than are needed. Simultaneously, the supply system, seeing more demands, stocks more items. The sluggishness of the system has the effect of increasing the length of the

pipeline and, hence, the number of items in it. All of this has the aggregate effect of raising the cost of a given capability.

Unresponsiveness to Change

The past few decades have seen major changes in the cost of some materials and transportation. Computing costs have declined even more rapidly while increasing capability. The cost of some of the materiel used in weapon systems has increased dramatically. Figure 2 reflects the cost increases in percent between generations of several weapon system components. The cost of helicopter engines between generations of aircraft with similar missions has almost quadrupled in a little over a decade, and ammunition costs for similar rounds have more than quadrupled in about the same amount of time. Modern weapon systems have greater capability, but that capability has been bought at a much higher cost.

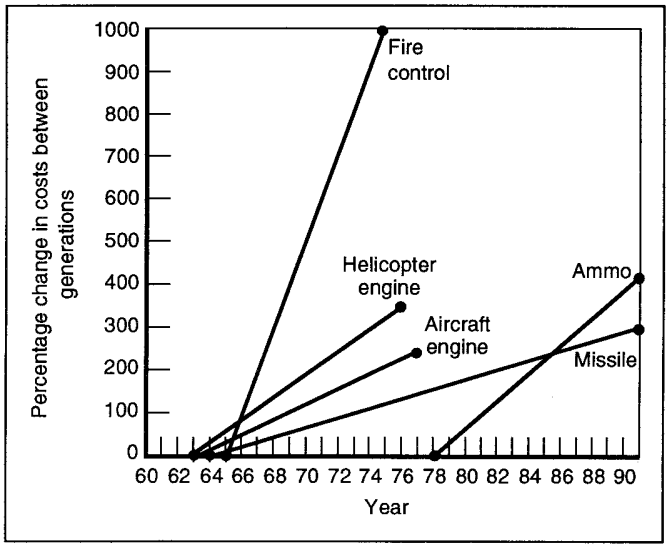

Figure 2—Cost Increases in Weapon System Components

While the cost of material has been increasing dramatically for some items, the cost of transportation has been decreasing significantly. Figure 3 displays the ton-per-mile costs for shipping by land, sea, and air. Shipping costs for all modes have dropped sharply. Twenty-five years ago, it cost more than twice as much to ship material by sea or truck as it does today. Air and rail shipment costs are also sharply lower.

The current DoD distribution process does not take these dramatic cost declines into account. For example, certain elements of the distribution process seek to minimize transportation costs by delaying shipments to allow consolidation or by using slower but cheaper transportation. Saving transportation costs is a worthy goal and probably made good sense in an era when transportation costs were high relative to the cost of the materiel being transported, but it may not make sense today. Delaying the shipment of expensive components causes the system to stock more of them. Given the high cost of some components, the cost-effective decision may be to pay the transportation premium and move them rapidly.

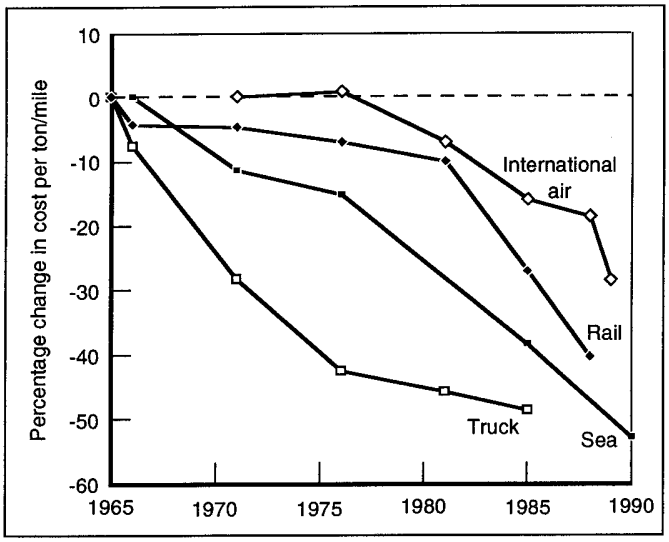

Figure 3—Declines in Commercial Shipping Costs

When a system does not have visibility of what it contains, efficient management is not possible. Thus, information is a key to efficient distribution. Knowing what is in the system and where it is allows operators to make timely decisions. The cost of storing and retrieving information has declined even more rapidly than the cost of transportation. Computing costs have fallen exponentially. A bit-per-second cost of $1,000 in 1950 dropped to $1 in 1960 and $.001 in 1990. And the ability to move information rapidly has increased exponentially. DoD distribution processes were designed long before such capabilities were widely available. When it is possible to track a specific engine literally minute-by-minute through the repair and return process, it may be possible to have far fewer of them in the inventory.

Distribution Standards Are Low

DoD has developed a set of standards pertaining to resupply operations. These standards vary by priority and by region. The table reflects these standards for three priority categories and three areas.

UMMIPS Standards
(in days from requisition to receipt)

Destination	Priority Designator		
	Highest	Middle	Lowest
	01–03	04–08	09–15
United States	5	9	22
Mediterranean	9	13	55
Western Pacific	10	14	65

The standard for shipment in the United States is 5 days for the highest-priority cargo, and 65 days for the lowest priority to the Western Pacific. Given that numerous commercial companies will guarantee overnight delivery in the United States and two days overseas, these standards do not seem challenging. And DoD is far from making progress. In 1959, the standard for high-priority shipment in the United States was 6 days, and low-priority shipments were allowed 20 days.

As unambitious as the standards are, DoD fails to meet them. An analysis of the pipeline performance showed that only 17 percent of the highest-priority shipments in the United States met the standard.[1] More than a third of the lowest-priority shipments overseas took longer than the maximum standard. However, these data reflect peacetime performance, and one might hope that the system works better in wartime.

Data collected from Operation Desert Storm indicate otherwise. It performed worse. High-priority shipments took an average of 30 days, or more than three times as long as the standard. The system does not ask for high performance, and it does not even get what it asks.

Industry Distribution Practices

High-performing U.S. firms may offer some approaches to solving distribution problems. Some involved in the DoD distribution process believe industry approaches will not apply to DoD problems because industry faces very different problems and much lower volume. That lower volume, they argue, makes it easier to track items in the system. Industry does face different challenges, but in many ways its volume and problems compare with those of DoD. First, commercial enterprises are "at war" every day, albeit economic war. In an environment where attracting and retaining customers constitute victory, there are no respites. Second, individual companies process greater volume than the DoD does. During the height of the Persian Gulf War, DoD was processing 35,000 requisitions a day for the theater. The daily average for DoD in 1991 was 65,000. On an average day, United Parcel Service ships 11.5 million packages, and Federal Express moves 1.5 million. Of course, a single requisition could represent many packages, but in terms of tracking items in a system, the two are comparable.

Furthermore, many companies use a combination of their own system and commercial shipping companies to achieve highly responsive performance. They routinely guarantee overnight delivery in the United States. One large heavy-equipment manufacturer, for example, receives 78,000 parts requests a day, maintains a spare parts inventory of over 470,000 line items (some of which are identical to DoD parts) and guarantees 48-hour delivery in the United States or to an air or seaport, or the customer does not have to pay for the part. It meets the 48-hour standard 99.8 percent of the time.

Many companies, then, operate a distribution process that is in some respects as challenging as DoD's (and some would argue that it is more difficult) with respect to volume, if not environment, and do so much more effectively. What enables them to do so?

Why Industry's System Works

Commercial organizations have improved their distribution processes through a combination of organizational and technological change. Important to note is that the reorganizations had to occur to take fullest advantage of the technological innovation. Improvements in either area alone might have yielded marginal benefits, but major gains required effort in both. Organizational change included a focus on customer satisfaction, a single authority for the entire distribution process, and a streamlined organization. Technical change focused mainly on information systems and processing.

Industry differs from DoD in that it operates to make a profit, but it also differs because its distribution system focuses on a single goal—a satisfied customer. Customers are satisfied when shipments arrive quickly, reliably, and as cheaply as possible. If a company cannot match the service of other firms, customers can simply take their business elsewhere. Loss of customers quickly reflects on profit and loss statements, the ultimate measure for commercial activities. Commercial distribution operations may have subsidiary measures of merit, but they focus primarily on customer satisfaction.

In even sharper contrast to the DoD, many commercial distribution operations can have a single agency in charge of the entire process. Focusing on the single goal of customer satisfaction, that agency can modify or eliminate anything in the system that does not contribute to that goal. Technological innovations apply systematically rather than functionally. Thus, the

[1]MILSTEP Highlight Table, Total Pipeline Performance Analysis, November 1992.

distribution system operates as exactly that—a system focused on a single goal. The result is a simple, integrated, and focused operation.

Industry has effectively used technological innovation, but it has done so in conjunction with organizational changes that allow it to derive the maximum benefit from the technology. For example, Portland General Electric streamlined its procurement process and added electronic data interchange. The company reduced processing time from 15 days to one-half of a day and lowered its processing cost from $90.00 per order to $10.00. The company estimates that had it applied only the electronic data improvements, it would have achieved efficiencies of about 10 percent. Put another way, automating cumbersome procedures may make them faster but no less cumbersome.

What Should DoD Do?

DoD should study industry distribution models carefully and selectively use or adapt them. Initial steps would include putting one agency in charge of the DoD elements involved in distribution, from requisition to receipt, and altering their goals so that they are systemwide and they focus on satisfying warfighter needs. Then the process would require rigorous review to ensure that all subordinate elements and procedures worked toward achieving that goal. Technology can assist with many of the problems, but the system should be reengineered first to determine which steps can be eliminated, automated, or combined; which technologies are needed; and which of those offer the largest gain.

Next, DoD should establish reasonably high standards of performance for each distribution element and measure the performance of each element against the standard. But the standards should not be measured against averages. **All** failures to meet the standards must be pursued until the reasons for the failures are identified and eliminated. The changes suggested here are neither incremental nor evolutionary. They are fundamental, systemic, and revolutionary. Certainly, they will not be easy to implement. The greatest challenge may be integrating the commercial approach into the theater environment. However, unless these changes are made, the United States may find itself unable to pursue its interests wherever it needs to because it cannot provide its forces the logistical support they need.

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