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Revamping the Infrastructure That Supports Military Systems

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Materials and services constituting the industrial infrastructure that supports essential military capabilities come from sources in both private and public sectors.¹ Many people both in and out of government believe that a major revamping of the infrastructure's roles, processes, and governing regulations would significantly improve efficiency. Some also believe that restructuring the roles of the public and private sectors would help maintain the country's development and manufacturing capabilities for new weapon systems.

To explore policy issues relating to the infrastructure that supports military systems and communicate to the Department of Defense (DoD) collective thoughts on how to improve that infrastructure, RAND held a four-day workshop in August 1993. The workshop was attended by senior representatives from DoD, private industry, and nongovernment policy analysts. The overarching question for the workshop was

Should the public and private sectors change their roles in a fundamental redesign of the industrial infrastructure or should the nation pursue a more modest approach by modifying existing processes and regulations?

¹In this issue paper, *public sector* refers to people and organizations in the Department of Defense, i.e., both military and civil service personnel and organizations. *Private sector* refers to people and organizations in non-government-owned industry, i.e., privately owned, for-profit entities.

Revamping government, businesses, schools, etc., is the hot topic of the 1990s. A review of nonfiction, best-selling books and articles in *Harvard Business Review*, *Fortune*, and *The Wall Street Journal* reveals the extent to which radical redesign of institutions and business processes is being heralded as the only way to achieve breakthrough improvements in productivity. But the track record of achieving order-of-magnitude improvements is poor: For each successful restructuring effort, there is at least one unsuccessful attempt. Each participant in the workshop brought special knowledge and background that helped the group assess the merits of industrial infrastructure redesign.

Why Restructure?

At least three objectives are driving the restructuring process:

- To downsize the defense infrastructure to correspond to the downsizing that has taken place in the force structure
- To make the infrastructure more efficient by implementing new ways of doing business
- To make cuts in the defense infrastructure strictly as a means of saving money. Across-the-board cuts have already been made for such savings.

The military sees itself in an extremely vulnerable position. In military language, the "tooth to tail" ratio is deteriorating: The budget allocated to "shooters," to the

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fighting or weapon systems, is decreasing much faster than the budget for support of those systems. The Air Force is losing fighting strength as it goes from 25 active tactical fighter wings to about 13; the Army, from 18 active divisions to about 10; and the Navy, from 542 ships to about 420.² Workloads for repair and overhaul shops at both public and private facilities are being reduced, resulting in a mismatch between surge capacity³ and peacetime need. This imbalance is being complicated further by cost-reduction initiatives DoD has been considering to transfer many support functions from the public sector to the private sector, partly as a way of implementing new business techniques and partly to save money and shore up the dwindling private infrastructure.

Of paramount concern to the military, however, is whether the private sector can deliver under all conditions.⁴ The military recognizes that reduced military ownership and control of the support infrastructure would create a dependency on the private sector that could result in a less capable military, as well as potential for “charging what the market will bear.” Some in the government see restructuring as a way to reduce costs while shoring up an essential industrial capability. Private-industry executives see restructuring of the industrial infrastructure as a business opportunity.

Some military leaders see restructuring as a loss of government jobs, control, weapons, firepower, and capability—leading to the loss of an independent military able to respond to crises without support from the private sector. They contend that, if downsizing and restructuring are to occur, they should be implemented to adapt to a new international order and to produce effective *logistics*: a system of procurement, maintenance, and transportation capabilities that is necessary and sufficient to meet the uncertain needs of the warfighter. Instead of achieving greater effectiveness and efficiency, however, the government is in danger, proponents of this view argue, of impairing readiness to satisfy other agendas—including reducing

²The high numbers are from Caspar W. Weinberger, *Report to the Congress, Fiscal Year 1986*, Washington, D.C.: U.S. Government Printing Office (GPO), February 4, 1985, pp. 178, 136, and 155, respectively; the low numbers are from Les Aspin, Secretary of Defense, *Report on the Bottom-Up Review*, Washington, D.C.: GPO, October 1993, p. 28.

³The military is especially concerned with the ability of all support functions to quickly respond to increased workloads. Surge capacity is usually connected with increases in operational missions such as occurred during Operations Desert Shield and Storm (ODS/S) or, more recently, in Somalia.

⁴For example, during ODS/S, the Civil Reserve Air Fleet (CRAF), a commercial airfreight and air passenger mobilization commitment of private airlines, was used extensively for the first time. Now there is concern that, because of financial constraints in a very competitive civilian air carrier market, fewer airlines will be willing to provide services to the military as they did in ODS/S.

the deficit and meeting societal needs, such as preventing high unemployment—that are driving downsizing and restructuring.

Problems Identified

Most participants recognize the validity of two premises involved in government restructuring: that the military can learn much from business practices developed by private industry, and that competitive flexibility in choosing among suppliers is generally a good idea. Participants also stressed that the military is unique: *Supplying forces in combat is fundamentally different from the goals and tasks of commercial industry.* With a view to supplying forces in combat, the workshop participants identified five general problems with DoD’s current approach to restructuring.

The views expressed in this issue paper represent the authors’ thinking based on a plurality of opinions of the participants rather than on a consensus of all the participants on all issues. To encourage open discussion during the workshop, RAND agreed not to attribute to particular participants the positions reported in this issue paper.

Lack of Clear Guidelines

DoD is not providing clear guidelines on how to downsize the industrial infrastructure. Because the government position is unclear, the relationship between the public and private sectors is deteriorating and becoming increasingly, if not dangerously, adversarial. Such a relationship undermines the close collaboration necessary to ensure national security. At present, each sector has excess capacity and is fighting for a shrinking pool of work, compelling Congress to intervene in resulting destructive conflicts.

That DoD must move quickly to make further cuts in its infrastructure budget is also imperative. But there is concern that, without setting clear priorities and guidelines, the process of adjusting the infrastructure will not be methodical and goal-driven. To help establish a framework for discussion, participants ranked seven potential goals according to their importance in guiding the choice between public and private suppliers of logistics functions. By an overwhelming majority, the group agreed that responsiveness should be the first priority of decisionmakers: Guaranteeing sufficient support to meet the uncertain needs of the warfighter had to be the first concern. Cost was the second priority. Recognizing that cost control through competition among suppliers is generally a good idea, participants stressed that the purposes and objectives of the military in supporting combat forces in

a contingency set it apart from other businesses. Preservation of critical skills was the third priority.

Industrial Base Decline

The defense industrial base may be in danger of falling below a minimum threshold of capability. Critical capabilities that do not reside in any other part of the system—mainly design, engineering, and manufacturing capabilities—are deteriorating. The declining industrial base is illustrated in Figure 1, in terms of the number of active military aircraft production lines for both Air Force and Navy fixed-wing aircraft from 1950 and projected through the year 2000.⁵

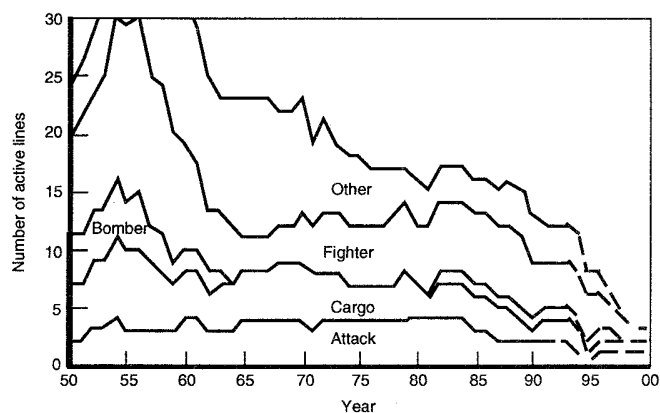


Figure 1—Number of Active Military Aircraft Production Lines

The preservation of critical capabilities is linked to the workshop's first-priority revamping goal, responsiveness, because preserving critical skills and technologies ensures *long-term* responsiveness. That is, by sustaining skills necessary to develop superior technology, DoD provides future warfighters with advanced weapon systems and thereby maintains a strong military posture. The nation must be assured of having future capabilities not only to design new weapon systems and technological insertions (upgrades and modifications) when they are needed, but also to restart production of older systems if more of those items are needed.

Some people in both the public and private sectors worry that insufficient attention is being paid to preserving the critical design and production capabilities that reside almost exclusively in the private sector. The budget cuts and downsizing that are affecting other elements of the defense structure are affecting the military-specific design capability of the U.S. industrial

base as well.⁶ The industrial base may be shrinking so drastically that it will not have sufficient capacity in the future to provide cutting-edge technology, to design weapon systems, and to manufacture those systems.

Legal Obstructions to Management Initiatives

Several obstacles hinder DoD's progress in making the system work. Examples include civil service personnel practices; contractual complexities and restrictions, such as Federal Acquisition Regulations (FAR); and statutory limitations on public and private maintenance workloads. The workshop focused on the last obstacle as a prime example of legal obstructions that impede redesign of a large segment of the infrastructure.

Congress has legislated minimum workloads—called the "core"—that the DoD repair-depot support structure must retain. As legislated, the core is intended to keep sufficient industrial capacity within the government to provide essential support for critical systems in case of national emergencies. To guarantee critical support during national defense situations, Section 2466, Title 10 USC, prescribes that at least 60 percent of funds spent on depot-level maintenance⁷ be performed by public depots. However, the legislation does not take into account that the public sector cannot always provide such support; there are examples of contractors providing exclusive support of critical weapon systems in combat zones.

Definitions by both Congress and DoD specify that the core must be under government control. For example, Congress defines *core* as "a ready and controlled source of technical competence and resources," and DoD defines it as the "minimum level of mission-essential capability."⁸ If a system is mission-essential, it requires public-depot support; if it is not, it is considered a candidate for competition in industry. The problem with both definitions is that key phrases—

⁶The current wisdom is to dismiss military-specific design capabilities by focusing all DoD attention on "dual-use technology," technology that has both military and scientific and/or business applications.

⁷Depot-level maintenance is the complete repair and refurbishing of components and end items that, by fiat, either cannot be, or are not, performed by operational military units.

⁸Congress defines *core* as "a logistics capability (including personnel, equipment, and facilities) to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements" (Sec. 2464, Title 10 USC). Similarly, DoD defines *core* as "the depot maintenance skill and resource base that shall be maintained within depot activities to meet contingency requirements. Core will comprise only a minimum level of mission-essential capability and must be under the control of an assigned individual DoD component or jointly determined DoD component" (DoD 4151.18 of 12 August 1992).

⁵Drezner, Jeffrey A., Giles K. Smith, Lucille E. Horgan, Curt Rogers, and Rachel Schmidt, *Maintaining Future Military Aircraft Design Capability*, Santa Monica, Calif.: RAND, R-4199-AF, 1992, pp. 26–27.

“ready and controlled source” and “mission-essential systems”—are subject to varying interpretations, and the definitions are not specific.

Both military and private-sector workshop participants voiced strong support of the notion of collaboration between the two sectors. For example, representatives from the military said they were convinced that one can get support from other places than just public facilities. In many cases, they said, it makes sense to rely more on private industry for support. One example was the use of commercial flights for the maximum transport of cargo, not only to save time and money but also to avoid wear and tear on military outsized aircraft, such as C-141s, C-5s, and C-17s.

Overemphasis on Competition

That competition can sometimes be harmful runs counter to current thinking but does not make the fact less true. Certainly there are benefits to competing noncore work in most situations, but the workshop took issue with uncritical acceptance of competition as the global solution to problems in military procurement. The view that competition is good 100 percent of the time is simply incorrect.

The main problem arising from frequent competition is that it destroys continuity of knowledge and skills. Competition occurs in the design, production, maintenance, and modification of systems—and, in many cases, maintenance contracts are routinely recompeted on an annual basis. When different firms win different functions and/or elements in a system’s life cycle, or when different firms win annually competed contracts, no continuity in management on a weapon system is achieved. If the original equipment manufacturer (OEM) does not always prevail in a recompeted contract, tremendous inefficiencies crop up in shifting the work, and technical knowledge never gets completely transferred. Although technical databases, blueprints, and videos help to capture processes and decrease discontinuity, not all the experience, knowledge, and skills—the human factors—can be entered into a database.

Unless the government has a sustained relationship with a contractor, the military-specific skills the contractor has developed may be lost, and future design capability can be jeopardized. In addition, as just mentioned, if the contractor that developed a system does not also act as the maintenance contractor, feedback concerning problems with the system is slow in getting relayed back to the OEM for subsequent product improvement.

Competition between public and private entities is of particular concern and has a major negative

consequence: It destroys cooperation. In past decades, government and the defense industry understood the importance of a synergistic relationship. Only through a sense of teamwork and shared responsibility is an effective logistics system achieved. Today, however, in part because of competition between the government and its own suppliers, and in part as a consequence of the layers of oversight, the relationship between government and industry has broken down. An intense adversarial relationship has evolved; ironically, such competition has resulted in more efficient public depots and has generated a threat to their survival.

Failure of Information-System Development

Information management is key to implementing many of today’s new and improved business practices. The military logistics system, however, is impeding just such implementation because data systems are neither integrated nor interoperable; information-system development in support of service-unique requirements has been halted; movement toward an “integrated DoD-wide standard information system” is unlikely to occur; services remain parochial; and the Joint Logistics Systems Center (JLSC) has made little progress in achieving its goals and reports to too low a level in the DoD to give those goals high enough priority for expeditious realization.

To compensate for the unresponsiveness and uncertainty of logistics processes, the military has traditionally relied on its masses of stock. Very different threats and greatly reduced budgets call for a new way of doing business. The critical logistics processes need to be reengineered to provide support to each DoD activity while reducing dependence on wholesale and retail inventories. Implementation of some of the changes depends on information systems and access to good data.⁹ Information and data systems can significantly improve logistics operations while reducing costs. Investments in information resources allow DoD to trade off the more expensive inventory, maintenance, and transportation processes of a logistics system for relatively low-cost data availability.

⁹It is useful to make a distinction between information systems and data systems. A *data system* is an organized collection of data that may be physically colocated or separated, for use by decisionmakers either directly or through information systems. An example of a data system is “total asset visibility,” which allows transporters, item managers, and other decisionmakers to know the current location of all tracked assets. An *information system* is a decision-support aid containing an algorithm that converts data into information to be used by a decisionmaker. An example of an information system is a “readiness-based sparing” algorithm that takes in different types of data, including expected usage, failure rates, funding profiles, and indenture relationships, and provides a list of recommended buys to achieve a projected availability level.

The JLSC was chartered to deal with these issues and eliminate the duplication of information-system development, but it has not been effective in achieving its objectives. Despite its good intentions and outstanding talent, the JLSC is ineffective for a number of reasons. Workshop participants expressed the view that the existing charter is inordinately broad and poorly constructed. It has focused on achieving savings in the development of information and data systems rather than on providing information systems and data access that would enable order-of-magnitude (high-leverage) improvements in logistics processes. The JLSC has failed to recognize the legitimate differences between the services' information needs by insisting on a "single" system and "migrating" all services and agencies to that single system. A good argument can be made for the view that a single system cannot provide the flexibility needed by individual services to meet new situations.

Guiding Principles

The current DoD policy for restructuring lacks focus and a coherent plan. Restructuring is occurring both through government initiatives—e.g., the JLSC initiative to restructure information systems—and governmental inaction—e.g., the private-sector defense industrial base is consolidating and reorganizing with little participation or guidance from the military (their largest customer).¹⁰ Before additional steps are taken, a clearer understanding of why changes are being made and what the effects of initial steps have been must be achieved.

DoD infrastructure-revamping policy should reflect how best to support the goal of maintaining a first-class fighting force for the country. To determine how best to reach this goal and manage change for a new environment, the workshop concluded that DoD needs to develop and apply a strong, coherent set of guiding principles to help integrate the complex array of factors, clarify options and trade-offs, and provide criteria for making decisions. Such principles would reflect DoD's main priorities and would allow DoD to arrive at an appropriate policy for adapting to the new business and international environment as well as to national security needs.

The candidate principles the workshop generated are as follows:

- Optimize the public and private infrastructure for (1) responsiveness, (2) affordability, and (3) preservation of critical capabilities—in that order.
- Reserve to government only the activities it needs for readiness (including a hedge against market

failures) or for technical competence to execute "essential governmental functions," such as weapon system configuration management.

- Sustain design and engineering capabilities by funding R&D directly—rather than indirectly through maintenance-contract overhead accounts.¹¹
- Establish contract categories, for example:
 - Niche systems (specialized or small systems) should typically go to the private sector because the economies of scale do not warrant a government presence.
 - Systems such as diesel-engine overhaul for which the private-sector base is large should typically go to the private sector; in this category, competition is sufficiently adequate to preclude concerns about market failures.
 - Large military fleets should typically use a mixed strategy (retaining some degree of public technical competence)¹² because the systems are central to any military operation and the government has the largest stake in continued maintenance.
 - Activities for which warranties are not enforceable or for which no private base exists should go to the government as supporter of last resort.
- Compete when possible, but increase the viability of long-term relationships with responsive, reliable firms to ensure continuity and decrease military risk. Make past performance a competition criterion. Although having performance as a criterion is not prohibited by law, many in the DoD are reluctant to emphasize such performance for fear that it will impede "full and open competition." Avoid as much as possible direct competition between the public and private sectors.
- Award on best value, which is a combined consideration of risk to forces, quality, and cost.
- Form a high-level advisory panel to recommend specific changes to the charter of the JLSC. The JLSC's goal should continue to be the development and implementation of improved business practices. In the near term, the panel needs to focus on making the existing services' data systems more interoperable and on defining an architecture for future information- and data-system development. It should also take the lead in a service-participative effort to identify and redesign high-leverage,

¹¹In any case, OEMs frequently do not win maintenance contracts because of their high overhead.

¹²For example, the Navy contracts out competitively all but a small portion of the depot maintenance for F/A-18s, reserving for a Navy depot sufficient workload to ensure Navy-controlled repair capability.

¹⁰An important addition to the debate now fomenting in Congress is contained in an unpublished RAND draft by Dennis Smallwood entitled "Preserving Important Rivalries as the Military Aircraft Industry Consolidates."

common processes to achieve the long-term goal of implementing improved business practices.

Recommendations for Research to Inform Decisions

To make informed decisions on restructuring issues and guidelines, the government needs empirical evidence. Following are research questions that may yield findings to help inform the debate in Washington:

- Why is it believed that shifting more maintenance work to the private sector would save money? Does the empirical evidence sustain this hypothesis?
- How much excess capacity exists today? How much will exist at the end of the decade?
- Does depot work help maintain R&D skills? How do maintenance activities affect contractors' ability to continue to do forward-looking research? Do maintenance contracts generally go to OEMs? How much of a premium (if any) should the government pay for future R&D capability, and what is the best way of funding R&D? Economic analyses are needed of the level of funding for contractors and how the level of funding affects their ability to invest in high-tech advances.
- Similarly, does maintenance work keep a forward-looking, modernized production capability in industry?
- What are the pros and cons of directing maintenance and modification business to the prime contractor of a weapon system?
- Are there data on productivity trends, especially in private versus public enterprises? What do they show?

Workshop Participants

Dr. Marshall H. Bailey, Admiral Donald R. Eaton, Lieutenant General Trevor A. Hammond (Retired), Mr. Robert Horne, Brigadier General Dennis K. Hummel, Mr. Robert Keltz, Mr. Michael Mitchell, Mr. Gary M. Molinari, Mr. Robert F. Murphy, Mr. Gene H. Porter, Mr. Al Rand, Lieutenant General Vincent Russo (Retired), Major General Joseph K. Spiers, Major General Ronald C. Spivey, Mr. Gary Thurber, Dr. Stan Weiss, Dr. Albert D. Wheelon, Lieutenant General Kenneth R. Wykle, Dr. Charles J. Zwick.

RAND: Dr. James Thomson, Dr. George L. Donohue, Dr. Abraham S. Becker, Dr. Morton B. Berman, Dr. Marygail Brauner, Mr. Robert M. Brown, Dr. Frank Camm, Ms. Mary Chenoweth, Dr. David Chu, Mr. Jeffrey Drezner, Dr. John Dumond, Dr. John Folkson, Dr. Donna Fossum, Dr. Jean Gebman, Dr. Kenneth Girardini, Dr. John Halliday, Dr. Nancy Moore, Mr. David Oaks, Dr. Raymond Pyles, Dr. Marc Robbins, Mr. Wayne Walker, Ms. Laura Zakaras.

- What are the advantages and disadvantages of public as opposed to private competition? Case studies of public and private competitions would help DoD develop guidelines for when the supplier and customer should and should not compete.
- Why do contractors sometimes fail to deliver on a maintenance contract? Could such defaults have been prevented? What did the government do in those instances? When workload has resided in the private sector and the firm defaults, how should the military best protect itself?
- How do private firms with large-volume and highly efficient logistics systems, such as United Airlines and Federal Express, decide what maintenance to do in-house and what to contract out? Are there scale thresholds at which it is more economical to do in-house maintenance? Is cost or value the driver? What criteria can be developed for when to contract out maintenance?
- How do foreign air forces, such as those of Canada, Australia, Turkey, and Israel, maintain their U.S.-made aircraft, and how effective are those maintenance approaches?

The time is right for major changes in the way the U.S. military supports and sustains its systems. These recommendations, taken together, should help set the context in which productive change can occur.

George Donohue is Vice President and Director of Project AIR FORCE. Marygail Brauner is a senior member of the RAND research staff. Both authors wish to thank RAND colleagues for their contributions to this issue paper.

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