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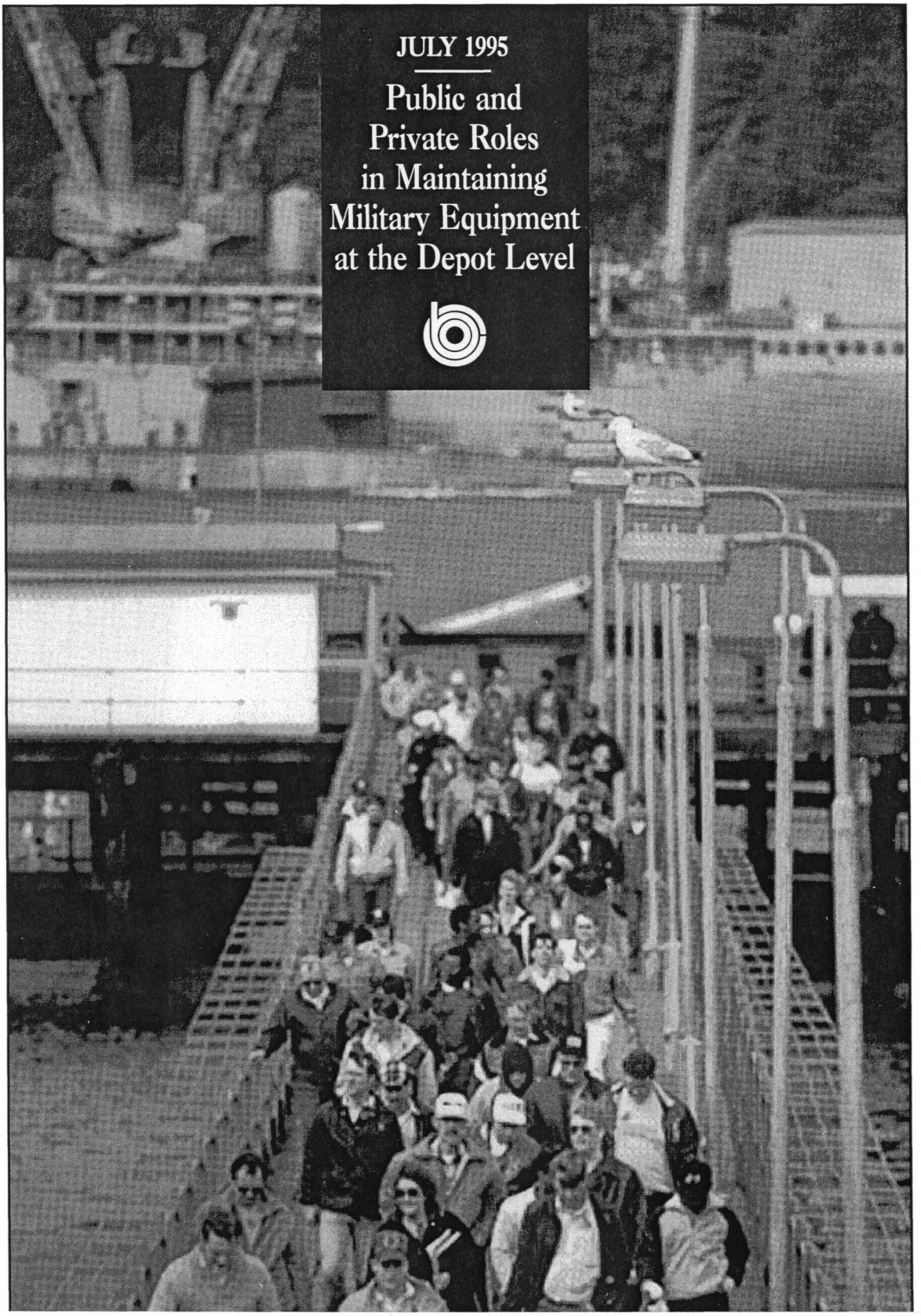

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Public and Private Roles in Maintaining Military Equipment at the Depot Level

PUBLIC AND PRIVATE ROLES IN MAINTAINING MILITARY EQUIPMENT AT THE DEPOT LEVEL

The Congress of the United States
Congressional Budget Office

NOTES

Unless otherwise indicated, dollars in the study are 1995 dollars and all years referred to are fiscal years.

Numbers in the text and tables may not add to totals because of rounding.

Cover photo shows workers leaving a ship repair site at the end of the day. (Photo courtesy of the U.S. Navy)

Preface

Controversy over public and private roles in U.S. society is increasing in intensity. That debate is particularly timely in the area of national security. With the collapse of the Soviet threat and declines in available resources, the Department of Defense (DoD) and the Congress are reexamining public and private roles that seemed appropriate during the Cold War.

Maintenance of military equipment at the depot level is one of the functions that merits review. Depot-level tasks consist of overhauls, repairs, and modifications that are performed at fixed industrial facilities. During the Cold War, an extensive system of public depots (facilities owned by the government and staffed almost exclusively by civilian employees of DoD) did most depot-level work because DoD assumed that it could not depend on private industry to provide the large surge in maintenance called for in Cold War scenarios. Yet the need for such a surge would be much less in the relatively brief regional conflicts for which DoD now plans. Moreover, during such conflicts, private industry would not be fully occupied with war production and might be able to handle most of the military's maintenance needs. Those considerations raise an important question. Could DoD achieve significant savings in peacetime and still obtain the high-quality, responsive support it needs for regional contingencies by relying more on private firms for depot-level maintenance?

This study was prepared in response to a request by Daniel K. Inouye, former Chairman of the Defense Subcommittee of the Senate Appropriations Committee. It examines alternative methods for determining the appropriate roles of the public and private sectors in depot-level maintenance. In keeping with the mandate of the Congressional Budget Office (CBO) to provide objective analysis, the study contains no recommendations.

Deborah Clay-Mendez of CBO's National Security Division prepared the study under the general supervision of Neil M. Singer and Cindy Williams. Drafts of the study benefited from an insightful review by Frank Camm of RAND and useful comments by Rob Jordan of the Logistics Management Institute and Michael A. Miller, R. William Thomas, Richard Farmer, and Frances Lussier of CBO. The author gratefully acknowledges the valuable assistance of Nathan L. Stacy. She also thanks the numerous DoD and industry officials who responded, frequently at short notice, to questions and requests for data.

Leah Mazade edited the manuscript, and Christian Spoor proofread the final document. Judith Cromwell produced the drafts of the manuscript. Kathryn Quattrone prepared the report for publication.

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Summary

A debate has been growing recently about what roles government and private institutions should play in U.S. society. The question of public and private roles is especially controversial in the area of national defense. Defense is an inherently governmental function in which military traditions of honor, public service, and hierarchical authority frequently supersede the incentives of the marketplace. Yet the strength of the U.S. armed forces derives in part from their access to goods and services--ranging from environmental cleanup to weapon systems--produced by private firms that are, in many cases, innovative and efficient.

Depot-level maintenance of military equipment--those overhaul, repair, and modification tasks that can be done most efficiently at central industrial facilities--is one of the functions in which public and private roles are being reassessed. In 1995, the Department of Defense (DoD) will spend almost $13 billion on depot-level maintenance. Approximately $9 billion, or 70 percent of the total, will go for work performed by 95,000 DoD civilian and military personnel working in 30 government maintenance depots. The remaining 30 percent will pay for maintenance provided by more than 1,200 private firms.

The Current Debate Over Public and Private Roles

DoD has divided depot-level maintenance between the public and private sectors in roughly the same proportion since at least the mid-1980s. That allocation was consistent, in the department's view, with Cold War scenarios that required public depots to maintain excess capacity in peacetime to handle the surge in maintenance and repairs that would occur during a prolonged conflict. In those scenarios, U.S. industry would mobilize fully for war production and might have little capacity to spare for repairs on military equipment.

During the Cold War, DoD argued that its depots were a "ready and controlled" source of maintenance for equipment essential to the services' combat missions. As such, the depots were necessary to protect against the risk that contractors might be either unable or unwilling to respond immediately to DoD's requirements for maintenance during a war. By using risk as the major criterion for allocating workloads to the two sectors, DoD was able to justify a large network of public depots. Those facilities had ample capacity, in peacetime, to conduct routine overhauls of major "end items" such as tanks, ships, and aircraft and to provide most of the repairs DoD needed on components. Because the military considered it too risky to rely on the private sector to maintain most mission-essential equipment, the relative costs of public and private production received little attention.

The collapse of the Soviet threat, however, has sparked controversy over the private sector's ability to meet DoD's requirements for maintenance. The risks of using private-sector contractors might be less severe in the regional conflicts for which the military now plans than they were in the Cold War scenarios. Depot-level maintenance during relatively brief regional conflicts would focus primarily on repairing components. The surge in maintenance on major end items would not reach its peak until the conflicts were over and DoD could return the damaged equipment to the United States. In addition, the nation's

defense industry would not mobilize fully for war production during regional conflicts. Those features of the current national security environment raise the possibility that DoD, with appropriate planning, could call on private industry to meet both the expected surge in repairs on components during the conflict and the surge in repairs on end items in its aftermath.

Some analyses (including the recent report by DoD's Commission on Roles and Missions of the Armed Forces) suggest that greater use of the private sector for maintenance could result in significant savings. Direct comparisons between the costs of public depots and private repair firms are fraught with difficulties. Nevertheless, the relevant economic theory as well as empirical studies dealing with a wide range of different industries supports the view that private production in a competitive environment is less costly than public production. That assessment is consistent with past and current DoD policies that restrict the role of public depots to the minimum required to ensure a ready and controlled source of maintenance.

DoD's Plans

Under DoD's current plans, the end of the Cold War will not change the share of DoD maintenance that goes to the public sector. Between 1991 and 1999, the department plans to reduce public and private workloads by roughly 30 percent each. Moreover, at least to date, DoD maintenance has shifted away from the private sector. Between 1991 and 1995, the amount of maintenance that DoD allocated to the private sector fell by 34 percent, but maintenance in the public depots fell by only 20 percent. Those declines, which threaten the survival of both public and private producers, intensify the debate over appropriate public and private shares of the work.

Overall, DoD's plans call for a more rapid decline in public than in private workloads between 1995 and 1999. But the department's ability to reduce the share of maintenance allocated to its public depots depends on an uncertain political process. In addition, the planned drop in the share of maintenance going to the public sector between 1995 and 1999 is not DoD-wide: it stems entirely from trends within the Department of the Navy. In contrast, the Air Force and the Army plan to increase the share of work they allocate to public depots during that time.

The Need to Analyze Public- and Private-Sector Roles

Changes in the national security environment and the battle for survival among maintenance facilities highlight the need for a clear analysis of public and private roles. Yet some observers considered such an analysis overdue even during the Cold War. Historically, each of the services has used the private sector in a somewhat different way. Those differences--which reflect accidents of history more than analysis or conscious decisionmaking--persist today. The Navy is comfortable, for example, in relying on private shipyards to maintain many of its surface ships, including some with combat missions. In contrast, both the Navy and the Air Force depend heavily on public depots for routine overhauls of frontline fighter planes and their engines, arguing that it is too risky to use the private sector to maintain that mission-essential equipment. (But at the same time, the private sector handles a large share of the repairs on components for those combat systems.) The pattern in the Army is mixed: the service maintains tracked vehicles in its own depots but uses the private sector for a large share of its maintenance on helicopters.

Those diverse patterns were possible under the umbrella of a DoD policy that asked the services to keep the capacity of their public depots to the minimum necessary to ensure a ready and controlled source of support but did not clearly set out how the services were to determine that minimum. To some extent, top-down constraints on the mix of public and private maintenance--including legislation limiting the percentage of work done in the private sector to no more than 40 percent--may have substituted for a careful analysis of what public- and private-sector roles should be.

Ideally, DoD would divide depot-level maintenance between the public and private sectors in the post-Cold War era to ensure high-quality, responsive support for U.S. forces, reduce the burden on the taxpayer, and balance fairly the different political interests involved. This study examined three methods that DoD might use to make that allocation.

- The first, the core method, represents DoD's current policy. It assumes that because of the risk that private contractors might not provide adequate support, public depots must have the capability to maintain the mission-essential equipment required in the Joint Chiefs of Staff's (JCS's) warfighting scenario.

- The second mechanism, public/private competition, would try to use competition on a level playing field to determine which producer--public or private--was the most cost-effective for each workload. By relying on impersonal market forces, that approach would free DoD and the Congress from having to decide how much maintenance should go to public depots.

- The third approach requires DoD to analyze workloads and then assign them based on the different kinds of tasks and market conditions for which public, private, and mixed public/private forms of production are best suited. That approach is the most complex, but it might offer the greatest potential for reducing costs while still ensuring responsive, high-quality support.

The DoD Core Concept

DoD's proposed policy for the post-Cold War era specifies that DoD depots must maintain minimum "core" capabilities. Under that policy, core capabilities reflect military necessity and can be identified without comparing public and private costs. According to a May 1994 policy statement by John Deutch, then Deputy Secretary of Defense, "CORE is the capability maintained within organic Defense depots to meet readiness and sustainability requirements of the weapons systems that support the JCS contingency scenario(s). Core depot maintenance capabilities will comprise only the minimum facilities, equipment, and skilled personnel necessary to ensure a ready and controlled source of required technical competence."

To lend concrete meaning to the core concept, the policy statement also laid out a multistep method for each of the services to use in determining core requirements. That method requires the services to identify the number and types of systems that are essential for the wartime planning scenarios outlined by the JCS, compute depot-level maintenance requirements based on those scenarios, and determine what size labor force in peacetime would provide sufficient capacity for the surge in maintenance needed to meet those requirements.

The Congressional Budget Office finds, however, that DoD's method is too broad to have practical value as a tool for oversight by the Congress or the Office of the Secretary of Defense. In several instances, the services appear to have adapted it to yield answers that are consistent with the views of senior military leaders. For example, when the Army's initial calculations produced estimates of workloads for electronic components that the service considered too low, the Army expanded the list of mission-essential components that it used. Similarly, the service based its core requirement on the workforce it would need to bring its equipment back into readiness within 17 months after the end of the first regional conflict in the JCS scenario. Although that approach might appear arbitrary (the Navy assumes a 24-month period), it yields a core requirement that validates allocating most peacetime maintenance to the public sector.

Had the Army focused on requirements for end-item maintenance during the regional conflicts, or allowed a longer period for repairing its equipment in the aftermath, it would not have been able to justify that allocation. Some people would argue that a desire to validate a large system of public depots is the reason the Army selected its approach. Although the Navy, the Army, and the Air Force applied the core method in different ways, each was able to justify the continued use of public depots for routine overhauls of major platforms in peacetime---even though the repairs needed on those platforms during an actual regional conflict would be limited.

The services' ability to adjust the DoD method to reflect the judgment of military leaders may not be undesirable. Indeed, that judgment may be a more valuable guide than the detailed, mechanical calculations on which the core estimates formally depend. The difficulty for Congressional and other overseers is that the different factors on which those judgments rest are not presented openly for evaluation. Instead, with the core method, aggregate outcomes are presented as if they were the automatic product of a large number of objective calculations, rather than the deliberate result of high-level, subjective decisions that might be legitimately reviewed and contested.

Another fundamental weakness in the core approach stems from the assumption that the military would incur unacceptable risks if it relied on the private sector to maintain the equipment required in the JCS scenario. That assumption leads the services to overlook some important questions. For example, it allows the Army to estimate its core requirement for public depots without examining the ability of the private sector to provide maintenance in the aftermath of a conflict. Moreover, in the case of repairs on components of mission-essential equipment, adhering to that assumption may not be feasible. As components become more reliable and the size of maintenance workloads declines, the services must increasingly balance the risk of relying on contractors for repairs against the cost of duplicating the capabilities of those contractors in public depots. The core method, which neglects costs and assumes that private maintenance is always too risky for mission-essential equipment, provides no guidance about how to make those judgments.

Public/Private Competition

Some analysts question DoD's focus on the risks of contractor support. They suggest that the relative ability of public and private producers to deliver high-quality maintenance at a low cost in peacetime should play a major part in determining how much of the maintenance workload those producers take on in the post-Cold War era.

Currently, the services assign workloads either to a specific public depot or to the private sector, where private firms may compete for them. DoD has used public/private competition in the past but only to identify the supplier that will take on a particular workload for the least cost and not as a tool to determine the overall share of work going to each sector. Yet if cost is the criterion, dividing the various tasks between the two sectors might not require a formal method. DoD could set up a level playing field for competition between public and private facilities and let the invisible hand of market forces resolve the difficult issue of public and private roles.

One of the obstacles to that approach is establishing a level playing field. DoD's *Cost Comparability Handbook*, which guides public depots in making their bids comparable with those of private firms, fails to consider some important factors. For example, a level playing field might be defined as one on which competition will identify the producer (public or private) that would prove least costly to the government as a whole. In that case, public depots should, like private firms, include an allowance for taxes and for a market return on capital in their bids. Another obstacle is DoD's current accounting systems: they are incapable of accurately tracking the costs of specific workloads. In 1994, DoD suspended further public/private bidding on the grounds that its accounting systems did not permit fair competition.

In time, DoD could improve its *Cost Comparability Handbook* and its accounting systems. Those improvements might enable public/private competition to play a useful part in controlling the costs of specific workloads for which competition among private firms is not possible. Even so, the Congressional Budget Office finds a number of reasons, given the fundamental characteristics of public and private enterprises, that public/private competition might not prove a satisfactory way to shape the overall roles of the two sectors.

One problem is that public/private competition can only determine the relative size of the two sectors if DoD and the Congress adopt a hands-off policy that permits workloads to shift based on competitive outcomes. Such a policy is likely, however, only as long as those shifts do not have a significant im-

pact on the level of work at any public depot. Because DoD depots are important local employers, decisions about closing them or reducing their size must be made as much in a political as in an economic forum.

Closely related to that problem is the one posed by so-called soft budget constraints. Managers of public depots who are concerned about maintaining levels of production or employment may have a strong incentive to underbid on contracts. Their depot will not go bankrupt if costs exceed the bid. Instead, taxpayers will cover the costs.

To cite a further difficulty, one of the major advantages of in-house production in public facilities relative to private production is that it avoids the risks and costs associated with the use of contracts. In-house public production is most likely to be cost-effective in the case of maintenance tasks for which contracting would prove difficult or costly. Such tasks would include those for which outputs are ill-defined, quality is difficult to specify or monitor, or requirements change frequently and the need to renegotiate inhibits timeliness. It could be self-defeating to use public/private competitions that require clearly written contracts to allocate those workloads.

A review of the economics literature dealing with the characteristics of public and private producers also prompts questions about the value of public/private competition. Although public production offers other advantages, little conceptual or empirical support exists for the view that, setting aside the costs of contracting, public producers can provide services more cheaply than private producers in competitive markets. In general, public producers labor under many disadvantages in their efforts to hold down costs, including the need to follow federal personnel regulations and to rely on the appropriation process for investment funds. Empirical studies of public and private production in a variety of different areas --ranging from hospitals to airlines--have commonly found that public production was from 20 percent to 40 percent more costly.

Finally, the question of allocating work must be considered both in the short run and over the long term. Although direct comparisons between the costs incurred by public and private maintenance facilities sometimes indicate that public production is currently less costly for particular workloads, those differences do not necessarily reflect any inherent advantage of public facilities. In the short run, public production may be less costly because DoD has traditionally assigned many of the largest and steadiest depot-level workloads to public facilities. As a result, public depots may now have the most experience and the best (or even the only) facilities for particular kinds of work. To identify appropriate long-run roles for the public and private sectors, DoD will need to look beyond the current structure of the repair industry.

Benefiting from the Strengths of Public, Private, and Mixed Production

Rather than rely on the core method or on public/private competition, DoD could allocate different maintenance workloads to public, private, and mixed modes of production on the basis of each mode's particular strengths. For example, DoD could evaluate and assign workloads by considering whether the characteristics of a task would make contracting risky or costly or would forestall competition in the private sector. Unlike public/private competitions, that approach acknowledges the advantage that in-house production offers as a controlled source that does not require contracts. At the same time, it permits trade-offs between the disadvantages of contracts and the potential advantages of private production (trade-offs that DoD's core method does not allow).

A very simple, general review of DoD's maintenance needs in the post-Cold War era suggests that the above approach, unlike the core method or public/private competition, could lead to a significant increase in the share of work that DoD allocates to the private sector. Neither the risks associated with the contracting process nor the limits on competition in the private sector, which are discussed below, appear to justify a dominant role for public production. Thus, some work could be moved to the private sector. Provided that the tasks DoD moves are those for

which competition in the private sector is possible and for which relatively standard contracts can be used, savings of 20 percent would not be surprising. If, as seems possible, 60 percent of the current public workload meets those criteria, shifting it to the private sector might reasonably be expected to save $1 billion annually in the long run. To ensure that DoD transferred 60 percent of its public workload, the Congress could limit the percentage of DoD's total workload performed in the public depots to roughly 30 percent.

The Risks of Using Contracts

DoD's core concept implicitly assumes that only public depots can provide the quality and level of responsiveness needed for weapon systems that will be used in the JCS scenario. Although that assumption may be valid for particular systems, it may not be an appropriate generalization. The Navy, for example, has successfully relied on private shipyards to maintain surface ships that would be required in a conflict.

Contracting for maintenance might be particularly difficult for DoD in wartime situations that suddenly impose unique and entirely unforeseeable repair and manufacturing tasks. (Arranging with established contractors to increase their level of output on routine tasks could be less difficult because the cost and technical requirements of the tasks would already be known and because firms that rely on DoD contracts in peacetime would have a strong incentive to be responsive in wartime.) The new tasks that arise may be small, although important in terms of the war effort; taking them on would force the prospective supplier to disrupt its normal commercial operations without promising significant profit. A large system of public depots is one way to provide DoD with the capability to meet those unforeseeable needs. Arguably, however, the core of skills and facilities that DoD would keep in its depots if that capability was the criterion would not be those that DoD requires to perform efficient, routine maintenance on major end items in peacetime.

In regional conflicts, unlike the broader Cold War scenarios, U.S. industry will not mobilize fully for war production. Moreover, in no way can DoD duplicate in its depots the scope and depth of the manufacturing and repair capabilities that are available in the U.S. economy as a whole. DoD already depends on those resources to repair many specialized components. The most versatile and responsive maintenance system might be one that, in the event of a major regional conflict, would give DoD immediate access to the maintenance capabilities of U.S. industry, including the capabilities of the large defense contractors.

The Potential for Competition

Contracting is most likely to outperform public production if competition exists among private firms. The absence of competition does not preclude a favorable outcome, however, since the bargaining power of the monopolistic provider may be counterbalanced by that of DoD, a single (monopsonistic) buyer. Nonetheless, the lack of competition may reduce the private sector's ability to provide services for the least cost and increase the risk of poor-quality or nonresponsive support.

DoD uses competition to a greater extent in the area of equipment maintenance than for other purchases of goods and services. In 1993, 66 percent of the funds DoD obligated for equipment maintenance were for contracts awarded on a competitive basis, compared with 50 percent for all purchases. In that year, DoD used competition most often for maintenance on airframes, engines, ship repair on the West Coast, and ground vehicles. The types of workloads for which it generally awarded contracts on a sole-source basis included fire-control systems, guided missiles, communications and radar equipment, and electronic components.

A brief review of DoD's workloads for airframes, engines, and ship repair suggests that many of the tasks that DoD keeps in its public depots are similar to ones that are already being handled competitively in the private sector. For example, 50 percent of the workload for fixed-wing airframes in Air Force depots and 36 percent of that workload in Navy depots are for cargo, tanker, surveillance, and patrol planes whose airframes are either directly derived from commercial airframes or have similar characteristics.

For other workloads, competition in the private sector is not yet established, but it could develop if DoD transferred its depot facilities and workloads to private hands. Those workloads are ones that are not closely related to commercial work and might require a significant investment in specialized skills and capital. Yet they are large and steady enough to be attractive to firms that have enduring relationships with DoD. Included in that category might be maintenance on airframes and engines for combat aircraft with large inventories and workloads, as well as routine and refueling overhauls of attack submarines. However, establishing competition and maintaining reliable support for those workloads in the private sector could require explicit DoD involvement in managing the private industrial base for that work.

Some workloads cannot be handled by the private sector on a competitive basis. Among them are tasks that are most efficiently performed by a single producer at any point in time and that also require specialized skills and capital (making it impractical to shift the workload to a new producer following recompetition for a contract). Examples might include work on aircraft with small inventories and unique requirements (like the F-117 fighter), repairs on components in cases in which it would be costly to duplicate the capabilities of the original equipment manufacturer (OEM), and inactivations of nuclear ships. In those areas, DoD cannot reap the full benefits of market solutions. But mixed arrangements--ranging from sole-source contracts with OEMs negotiated in accordance with DoD profit policies (similar, in effect, to a regulated monopoly) to government-owned/contractor-operated facilities--might still offer some advantage over the public depots.

Shifting from Public to Private Production

In the post-Cold War era, DoD may find that allocating a larger share of maintenance to the private sector can reduce its costs and yet still ensure high-quality, responsive support in major regional conflicts. But any effort to implement such a shift must take account of political realities as well. Increased reliance on the private sector may not be politically acceptable unless people see the process of transition as fair to the employees of government depots and to private-sector firms.

As noted earlier, DoD is limited by law to contracting for no more than 40 percent of its depot-level maintenance. The Congress could reverse that restriction and require DoD to allocate most of its maintenance to the private sector. Although that policy would increase the amount of excess capacity within the public sector, the Congress could use the Base Realignment and Closure Commission process to close any public depots that were no longer needed. Such an approach, however, could be perceived as unfair to public employees; some people might argue that those employees had never had an opportunity to prove that their facilities could compete for DoD's business. As an alternative, DoD might convert many of its operating depots to private ownership. An initial, fixed-price contract for specific workloads might make it attractive to private firms to purchase the depots, although the survival of each facility over the long run would depend on its ability to earn a market rate of return on its capital. The transition to private ownership could be made immediately through a public offering of stock or a private negotiated sale. Or it could involve an interim period in which the depots converted to businesslike operations under the auspices of a government corporation.

Any effort by DoD to rely more on the private sector for its maintenance is likely to impose some costs in the near term. DoD could incur one-time personnel costs of roughly $70 million for transferring a depot with 3,500 workers to private ownership. Other costs might arise from the need to purchase additional rights to technical data and to consolidate in DoD's remaining public depots any workloads that could not be handled in the private sector. Such a transition would also impose risks: in the short term, the risk of disrupting ongoing repair operations, and in the long run, the risk that comes from DoD's depending on a contractual relationship with its suppliers rather than having direct management authority.

Yet for a number of reasons, DoD might consider increasing the share of its maintenance done in the private sector. One reason is the opportunity for long-run savings, which could be on the order of $1

billion annually. Cost is not the only potential advantage, however. Competition in the private sector might push providers to improve the quality of the maintenance that DoD receives. Moreover, some people might argue that industrial activities should, as a matter of principle, be left in the private sector to the maximum extent possible. That same principle underlies DoD's core philosophy. The difference in outcomes stems from different views of DoD's needs and what the private sector can accomplish.

Chapter One

Introduction

The collapse of the Soviet threat and declines in the resources available for national defense have led the United States to rapidly decrease the size of its military forces. As that drawdown nears completion, policymakers are increasingly free to focus on fundamental questions about the roles and missions of the military services in the post-Cold War era. Among the issues to be resolved are the appropriate roles of the public and private sectors in maintaining military equipment at the depot level.

Depot-level maintenance consists of overhauls, repairs, and modifications that can be performed more efficiently at centralized industrial facilities than at each combat installation where military units train. In 1995, the Department of Defense (DoD) plans to spend almost $13 billion on such maintenance. It will spend over $9 billion, or approximately 70 percent of the total, for work performed by 95,000 DoD civilian and military personnel in 30 government-owned maintenance depots.[1] It will pay the remaining 30 percent for services that firms in the private sector supply.[2] In 1993, funds obligated by DoD for maintaining equipment went to more than 1,200 private contractors. (The number of contractors takes in those that perform maintenance at the organizational and intermediate levels as well as at the depot level, as discussed in Box 1.)

DoD has divided depot-level maintenance between the public and private sectors in roughly that same proportion since at least the mid-1980s. Under the department's current plans, the end of the Cold War will not change that pattern. (Between 1991 and 1999, DoD's plans call for public and private workloads to decline by roughly 30 percent each; see Figure 1.) The unchanged mix is consistent with departmental policies that emphasize the importance of a controlled, in-house source of maintenance for equipment essential to the services' wartime missions.[3]

Yet questions about the cost of that plan and the need for public depots in the post-Cold War era are fueling a growing controversy over public and private roles. Some industry advocates and independent analyses--including the recently released report of DoD's Commission on Roles and Missions of the Armed Forces--suggest that DoD place greater reliance on the private sector. In their view, that strategy would allow DoD to fulfill its requirements for high-

1. That employment figure includes overhead and production workers. As DoD completes the base closures announced in 1991 and 1993, the number of depots will drop to 24.

2. This comparison is based on the amount of money DoD spends in private maintenance facilities. A better comparison of the amount of repair work allocated to the public and private sectors might be based on the percentage of value added by private and public facilities. Value added includes the cost of capital and labor and excludes the cost of intermediate materials that are purchased from other suppliers (such as fuel and spare parts). If, however, purchased materials account for the same percentage of total costs in both sectors, comparisons based on total costs will accurately reflect the percentage of value added by each sector. Although analysts sometimes add to DoD's expenditures for private-sector repair the cost of the intermediate goods purchased by public depots from private manufacturers, that addition is not appropriate if the objective is to compare the size of the two repair sectors.

3. However, DoD's policies do not explain important differences among the services' plans. The Department of the Navy plans to increase its reliance on private contractors between 1991 and 1999. The Army and the Air Force, in contrast, plan to increase the percentage of their maintenance that goes to public depots.

Box 1.
Organizational-, Intermediate-, and Depot-Level Maintenance

Each service divides maintenance tasks for military equipment into different levels based on the complexity of the task and the kind of maintenance facility where that task is usually performed. In addition to maintenance at the depot level, those categories typically include maintenance at the organizational and intermediate levels.

Organizational-level maintenance consists of routine tasks (such as refueling) that form part of the integral capabilities of military units. Those tasks arguably belong in the public sector: they are performed almost exclusively by military personnel who would be deployed to any conflict with the weapon systems they support. (In the Gulf War theater, the Army relied on approximately 800 civilians employed by U.S. contractors to carry out a wide range of maintenance, but most of them were stationed at fixed locations in rear areas. Less than 1 percent of the civilians working in the theater for the Army accompanied units into Iraq and Kuwait.)[1]

Intermediate-level maintenance, which is usually performed by a mix of civilian and military personnel, comprises somewhat more complex tasks that are often done at a single site within each combat installation. Arguably, the portion of intermediate-level maintenance that is performed by military personnel who would be deployed in wartime might belong in the public sector.

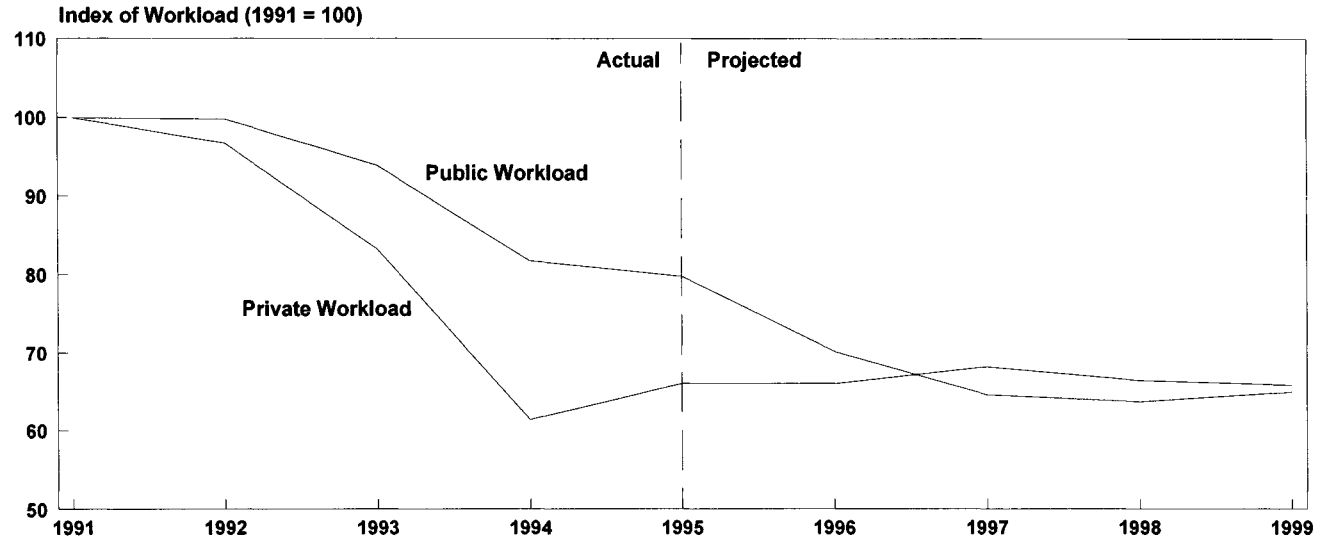
Depot-level tasks are typically more complex than either organizational- or intermediate-level work. Because they are performed by civilians working in industrial facilities in the United States, they could be more suited to the private sector than organizational- or intermediate-level maintenance. Nonetheless, the distinction between intermediate- and depot-level tasks is in many cases unclear. For example, tasks that are routinely done at the organizational or intermediate level are sometimes performed at a depot as part of a more extensive overhaul. Conversely, many tasks that are normally done at a depot (and defined by the policies of the military services as depot-level tasks) can, if necessary, be carried out at intermediate-level facilities.

In the past, the services have sometimes used intermediate-level facilities for depot-level work as a way to cope with shortfalls in funding for depot-level maintenance. More recently, a different trend has emerged: the services are deliberately consolidating work that was previously done at many intermediate-level facilities at the depots. As part of its new philosophy of regional maintenance, the Navy is moving some intermediate-level tasks and the military personnel who perform them to Navy depots. For its part, the Air Force has adopted a system for avionics and engines that has only two levels of maintenance (organizational and depot), moving what had previously been intermediate-level tasks to the depots. Despite the reduction in the number of repair sites, the Air Force hopes to hold its inventories of spare engines and avionics constant. To do that, it plans to emphasize rapid turnaround of work, in part by using commercial express delivery services.

The impact of these trends on the choice between in-house maintenance and contracting out work to the private sector is unclear. A reliable source of repairs for components of equipment is crucial during major regional conflicts. Moving additional component repairs to the public depots could reinforce the services' perception that they must have a controlled, in-house source for depot-level repairs. At the same time, the Department of Defense's current emphasis on shortening repair cycles and ensuring just-in-time delivery of necessary parts reflects trends that are well established in the private sector. In some cases, commercial sources of repair linked with commercial express delivery services might be able to provide the most rapid turnaround.

1. See George B. Dibble and others, *Army Contractor and Civilian Maintenance, Supply, and Transportation Support During Operations Desert Shield and Desert Storm*, vol. 1, *Study Report*, AR113-01RD1 (Bethesda, Md.: Logistics Management Institute, June 1993), pp. 2-4 and 2-5.

Figure 1.
Depot-Level Maintenance in the Public and Private Sectors Relative to 1991 Levels



SOURCE: Congressional Budget Office based on data from Department of Defense, *Defense Depot Maintenance Council Corporate Business Plan for Fiscal Years 1992-1997* (February 1993) and *Defense Depot Maintenance Council Business Plan for Fiscal Years 1995-1999* (February 1995).

NOTE: This figure uses direct labor hours as the index of public workloads and funding levels (in constant dollars) as the index of private-sector workloads. Direct labor hours provide a more accurate estimate of changes in public workloads than would funding levels because DoD changed the way it set the prices charged by public depots during the period shown.

quality, responsive support during regional conflicts and also significantly reduce the cost of depot-level maintenance.

Reassessing Public and Private Roles

With the end of the Cold War, the controversy over roles arises in part because military planning is now based on a scenario of two nearly simultaneous regional conflicts. Regional conflicts do not call for the same intensity or kinds of surges in depot-level maintenance that scenarios for the Cold War required. Those plans envisioned protracted combat against a well-armed enemy that would generate a large, sustained surge in needed maintenance at the depot level. Given that requirement, DoD chose to depend primarily on its public depots under the assumption that they were better prepared than private firms to maintain excess capacity in peacetime that would allow them to handle surges in wartime. (Moreover, in Cold War scenarios, U.S. industry would have mobilized fully for wartime production and might have had little capacity to spare for a surge in repair work.)

DoD viewed public depots as a "ready and controlled" source that it could rely on to maintain essential equipment if contractors proved unable or unwilling to respond quickly in wartime. That rationale allowed DoD to justify a large system of public depots with ample capacity in peacetime to conduct routine overhauls of pieces of major equipment, or "end items" (such as tanks, ships, and aircraft), and to perform most repairs on their components. The relative cost of public and private maintenance was of secondary importance.

DoD's current planning scenario, however, comprises two relatively brief regional conflicts. During them, depot-level maintenance would focus primarily

on repairing components of essential equipment. The surge in maintenance on major end items would not occur until the conflict was over and DoD could return the damaged equipment to the United States. Moreover, unlike scenarios for the Cold War, regional conflicts would not require the nation's defense industry to gear up fully for war production. Those factors raise the question of whether DoD could, with appropriate planning, call on private firms to meet the expected surges in repairs on components during the conflict and on end items in its aftermath.

Rising federal budget deficits give impetus to this debate. Although direct comparisons between the costs of public depots and private repair firms are fraught with difficulties, advocates of greater private involvement point to the economics literature, which suggests that typically, private production in a competitive environment is less costly than public production. Furthermore, maintaining equipment at the depot level is an industrial activity performed by a largely civilian labor force working at fixed locations throughout the United States.[4] The view that the private sector handles such activities most cost-effectively is consistent with the U.S. military's policy in other areas: at least since World War II, DoD has depended on private production to supply virtually all of the consumable goods (for example, food, clothing, fuel) and most of the spare parts and weapon systems that it uses.

The Political Side of the Debate

The intensity of the ongoing debate indicates more than concern about the most cost-effective and appropriate roles for the public and private sectors. It also reflects a battle for survival between public and private maintenance facilities. Since 1988, 11 public depots have been closed or earmarked for closure; the number of private firms that have gone out of business or left the defense industry is unknown. Pending decisions about additional base closures, the military services have moved some maintenance that was previously done in the private sector to public depots in an effort to keep those facilities operating at a relatively efficient level. But at the same time, declining orders for new equipment are forcing some of the large defense manufacturers that historically have had little interest in performing maintenance to seek a share of that work.

The initial impact of the defense drawdown has been to increase the public sector's share of the work in each service, which has contributed to dissatisfaction among representatives of industry. Between 1991 and 1995, the number of military personnel on active duty, one indicator of the size of U.S. military forces, dropped by 24 percent. During that same period, maintenance work at public depots fell by 20 percent, and work going to private firms fell by 34 percent (see Figure 1). DoD's plans for the 1995-1999 period call for the private sector's share of DoD maintenance to return to its 1991 level, but whether the department can carry out that strategy depends on an uncertain political process. DoD expects its total maintenance workload, public and private, to drop by an additional 11 percent between 1995 and 1999.

The ideal solution to this debate would be a clear policy regarding public and private roles that would ensure high-quality, responsive support for U.S. forces, reduce the burden on the taxpayer, and balance fairly the different political interests involved. This study examines three approaches to achieving that ambitious goal.

- The first, the so-called core method, represents DoD's current policy. It assumes that public depots must have the capability to maintain the equipment required in the warfighting scenario of the Joint Chiefs of Staff.

- The second approach, public/private competition, assumes that competition between public and private producers on a level playing field can determine the appropriate role for each sector. By relying on impersonal market forces, that approach would free DoD and the Congress from having to decide what each sector's share of depot-level maintenance should be.

4. In 1995, military personnel accounted for only 1 percent of the labor force assigned to DoD depots.

- The third approach would analyze the different kinds of maintenance tasks and market conditions for which public, private, and mixed public/private forms of production are best suited and assign work on that basis. Although the most complex, that approach has a strong conceptual foundation.

Evaluating these approaches requires a grasp of current public- and private-sector roles.

Chapter Two

Current Public- and Private-Sector Roles and Their Basis in Cold War History and Policy

The public and private sectors play a variety of overlapping roles in depot-level maintenance. That pattern reflects the influence of history as much as and perhaps more than it reflects the effects of Congressional and Department of Defense policies during the Cold War. It is unclear whether the sectors' traditional roles remain appropriate today. Nonetheless, understanding them and how they developed is critical in evaluating alternatives for the future because any major change in the allocation of maintenance to the public and private sectors will inevitably impose some risks and costs in the near term.

Roles of the Public and Private Sectors

The private sector performs about 30 percent of the military's depot-level maintenance. Moreover, the percentage of work done in the private sector is roughly similar for the Army, the Navy, and the Air Force (see Table 1). Underlying that similarity, though, are important differences in the role that the private sector plays in maintaining systems with different missions (for example, fighter aircraft, cargo aircraft, and combat vehicles), in maintaining the different parts of those systems (structures such as airframes and hulls, propulsion systems, and electronic components), and in performing different kinds of maintenance (modifications, routine overhauls, and damage repair). The level of resources devoted to depot-level maintenance also varies by type of weapon system. Aircraft and ships account for most of DoD's total workload, whereas ground systems account for less than 10 percent (see Figure 2).

Principal Workloads in the Public and Private Sectors

In most cases, the military services assign routine maintenance on established, frontline combat systems--some of the largest and steadiest of their depot-level workloads--to the public sector. Among the types of equipment that the military maintained primarily in public facilities during the 1990-1993 period were submarines, aircraft carriers, combat aircraft (fighters, attack planes, and bombers), and ground systems (including combat vehicles and artillery, automotive and construction equipment, and ordnance and weapons). The percentage of total maintenance for those systems that was performed in public depots ranged from 75 percent for fighter, bomber, and attack aircraft up to 97 percent for submarines. Within the individual services, other categories in which the military allocated at least 75 percent of the work to public depots were "other aircraft" in the Navy (including maritime surveillance planes, such as the P-3) and communications equipment in the Army.

Table 1.
Share of Depot-Level Maintenance Performed in the Private Sector, by Service and Type of Equipment, 1990 Through 1993 (In percent)

Equipment	Army	Navy and Marine Corps	Air Force	All Services
Fixed-Wing Aircraft				
Fighter, bomber, and attack	n.a.	24	26	25
Transport and tanker	n.a.	58	51	51
Other aircraft	100	10	53	29
All fixed-wing aircraft	100	20	39	34
Helicopters	43	29	75	38
Ground Systems				
Combat vehicles and artillery	20	0	n.a.	18
Automotive and construction	12	0	1	9
Ordnance, weapons, and munitions	50	9	0	16
Other systems	4	81	38	44
All ground systems	19	22	34	22
Missiles and Electronic Systems				
Missiles				
Strategic	n.a.	100	28	59
Tactical	34	56	0	38
Electronic systems				
Communications	25	65	30	32
Avionics	37	33	26	30
Army or NAVSEA contract software support	100	100	n.a.	100
All electronic systems and missiles	36	44	27	36
Sea Systems				
Aircraft carriers	n.a.	23	n.a.	23
Submarines	n.a.	3	n.a.	3
Other ships	100	54	n.a.	54
Components and other systems	n.a.	23	n.a.	23
All sea systems	100	31	n.a.	31
All Equipment	35	30	36	32

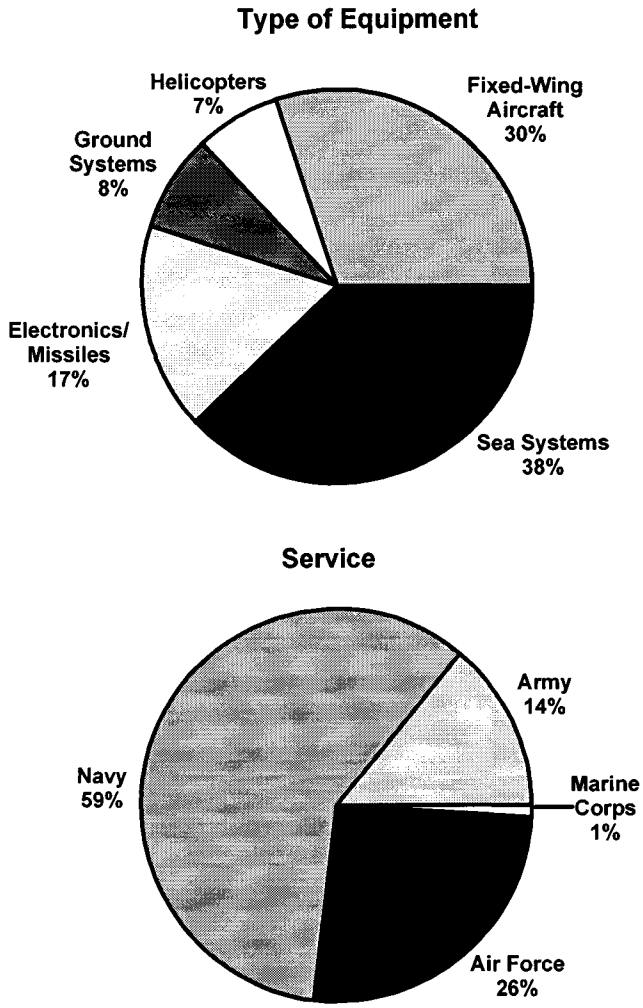
SOURCE: Congressional Budget Office based on data from the services provided to the Defense Science Board Task Force on Depot Maintenance Management, April 1994.

NOTES: Percentages are based on the cost of private and public workloads over the four-year period. Costs are grouped according to the service that managed the work. For example, Air Force helicopters maintained in Navy depots are included in data for the Navy.

NAVSEA = Naval Sea Systems Command; n.a. = not applicable.

Nonnuclear surface ships (other than carriers) and Army helicopters, both of which rely heavily on the private sector for repairs, are two important exceptions to the rule that frontline combat systems are maintained in public depots. In general, however, the platforms and major systems that the private sector routinely maintains are less closely tied to the central combat missions of each service. For example, the Navy's policy is to allocate maintenance on all support ships (such as tenders and ocean tugs) to the private sector but to perform at least some work on frigates and destroyers in its own shipyards.

Figure 2.
Distribution of Costs for Depot-Level Maintenance, 1990 Through 1993



SOURCE: Congressional Budget Office based on data from the services provided to the Defense Science Board Task Force on Depot Maintenance Management, April 1994.

NOTE: Costs are grouped according to the service that managed the work. For example, the cost of Air Force helicopters maintained in Navy depots is included in data for the Navy. The data include the costs of depot-level maintenance performed in both public and private repair facilities.

Among the systems for which the private sector performed more than half of the maintenance between 1990 and 1993 are transport and tanker aircraft and strategic missiles. DoD allocates 51 percent of the maintenance on transport and tanker aircraft to private facilities. But that figure understates DoD's use of the private sector to maintain its transport capabilities because it does not take into account the privately owned and maintained Civil Reserve Air Fleet. DoD plans to use those civilian aircraft for one-third of its wartime airlift. The private sector also performs more than half of the depot-level maintenance on "other aircraft" in the Army and the Air Force; that category includes executive jets in both services as well as training and surveillance aircraft in the Air Force.

Aircraft engine repair (which is not shown separately in Table 1) follows a pattern similar to that for aircraft. Engines with commercial counterparts (typically those used on executive jets and on cargo, tanker, and surveillance aircraft) are more likely to be maintained in the private sector than are other engines. Overall, however, DoD tends to use its own facilities for repairing engines. Thus, the public sector handles approximately 80 percent of engine repair in both the Air Force and the Navy. Even for engines with commercial equivalents, DoD relies on public depots for 66 percent of their maintenance.

Historical Origins of Current Roles

Analyses of the defense industry in the United States suggest that historical circumstance--rather than explicit planning or rational decisionmaking--played a central part in determining the roles of the public and private sectors in designing and manufacturing weapon systems.[1] A similar argument could be made

1. Jacques S. Gansler, *The Defense Industry* (Cambridge, Mass.: MIT Press, 1980), p. 35.

in the case of depot-level maintenance. In particular, historical factors help to explain why the private sector plays an important part in maintaining nonnuclear surface ships, a more modest part in maintaining aircraft, and a small part in maintaining ground combat vehicles.

Ship Maintenance. The Navy's use of the private sector to repair nonnuclear surface ships reflects the historical importance in the United States of a private shipbuilding and ship repair industry with both the capability and a very strong desire to do Navy work. Since the Civil War, U.S. shipbuilders have had difficulty competing in the world market for the construction of commercial ships. Although the demand for ship construction and repair increased dramatically during World Wars I and II, in peacetime, U.S. shipyards have relied on direct and indirect government subsidies. During the Cold War, the government gradually eliminated the programs supporting the construction of commercial ships, and the industry became more dependent on Navy work. (Since 1981, when the Congress eliminated funding for construction subsidies for commercial shipbuilding, virtually all new major ship construction in U.S. shipyards has been for the Navy.)

The complexity of modern combatant ships together with the Navy's limited requirements for new vessels means that only a small number of well-equipped shipyards are now able to compete successfully for new construction work. During the 1980s, some firms that were unable to maintain their status as construction yards joined the ranks of the roughly 40 shipyards that specialized in ship repairs and were capable of dry-docking large Navy ships. Today, those firms compete for Navy maintenance contracts in both the economic and political arenas.[2] The Congress's desire to balance support for public and private shipyards (reflected, for example, in a 1974 defense appropriation act that placed floors for that year on the level of funding for maintenance in both kinds of yards) has also helped to shape the Navy's allocation of work to the two sectors.[3] The existence of a ship repair industry with substantial excess capacity and a tradition of government support is arguably a major reason that during the Cold War, the Navy accepted a large role for the private sector in repairing its surface ships.

Aircraft Maintenance. In contrast to shipbuilding, aircraft production did not fully develop as a manufacturing industry until World War II. The allocation of repair work to public depots and of manufacturing work to the private sector evolved at a time when the private sector was struggling to create the capacity for mass production that the war effort required and was reluctant to take on maintenance tasks.[4] The distinction between private production and public repair should not be overemphasized, however. During the war, the aviation industry depended to a large extent on manufacturing facilities that were operated by private firms but financed and owned by the government.[5]

DoD's use of the private sector for aircraft repair increased following the war. According to Air Force historians, constraints on the construction of new public depots and shortages of skilled maintenance personnel drove the service's decision to start using contractor support in the late 1940s. The Air Force's logistics community accepted the decision only reluctantly; they "initially harbored severe misgivings" and "stood firmly opposed to the idea of using contract maintenance on the grounds that this was an unreliable and risky alternative."[6]

Despite those reservations, the Air Force rapidly increased its use of contractors. By 1958, contractors accounted for 56 percent of the maintenance performed for the Air Material Command in the United States. That figure held relatively steady for the next few years.

2. Clinton H. Whitehurst Jr., *The U.S. Shipbuilding Industry: Past, Present, and Future* (Annapolis, Md.: Naval Institute Press, 1986), pp. 68-70.

3. Department of Defense Appropriation Authorization Act, 1974; 87 Stat. 1028-1029.

4. Bernard J. Termena, Layne B. Peiffer, and H.P. Carlin, *Logistics: An Illustrated History of AFLC and Its Antecedents, 1921-1981* (Wright-Patterson Air Force Base, Office of History, no date), p. 93.

5. DoD has since divested itself of many of those assets, but according to one estimate prepared in 1980, roughly one-third of the plant and equipment used in producing military aircraft was still owned by the government. See Gansler, *The Defense Industry*, p. 288.

6. Termena, Peiffer, and Carlin, *Logistics*, pp. 149 and 92.

Ceilings placed on the number of civilian personnel continued to limit the capabilities of Air Force depots in the 1970s. At least partly because of those limits, contractors performed roughly 40 percent of the Air Force's total depot-level maintenance in 1975. The Navy, in contrast, allocated almost 80 percent of its depot-level aviation maintenance to its own depots in that year. The difference between the two services at that time appears to reflect differences in the capacity of their depots rather than in their maintenance philosophies. (The Navy, for example, withstood pressure by the Office of the Secretary of Defense to use contractors for more of its maintenance on the grounds that any increase would force the service to close one of its own depots.)

Military logisticians throughout the Cold War subscribed to the philosophy that frontline combat aircraft should be maintained in public depots to ensure reliable and responsive support. In the 1970s, because of constraints on resources, contractors maintained some second-line combat aircraft (including F-105 and F-4 fighters). Nevertheless, then as today, private firms played a much larger part in maintaining cargo and tanker aircraft than in repairing combat planes.

Ground Systems. The almost exclusive role that Army depots currently play in maintaining tanks and artillery is consistent with the Army's traditional use of public facilities for both production and repairs. At the onset of World War II, the Army depended in large part on its own arsenals (government-owned production plants operated by government employees) for manufacturing weapons. During the war, that pattern changed with the construction of a large number of government-owned/contractor-operated plants, or GOCOs.

Today, Army arsenals have a limited role in manufacturing weapon systems. (For example, a GOCO is the primary producer of tanks, and a private firm is the primary producer of self-propelled artillery.) Yet the private sector continues to have little involvement in depot-level maintenance on ground systems. Part of the reason for that pattern may be that, unlike ships and aircraft, tanks have no commercial counterparts. As a result, no commercial repair industry exists to compete with Army depots. Another explanation could be that the division of the Army's maintenance between the public and private sectors is influenced by the traditional capabilities and expertise of Army depots.

Special Roles that the Private Sector Plays

History has contributed to differences among the services in the degree to which they rely on the private sector to maintain different types of weapon systems. But technology and cost encourage some similarities in the kinds of tasks that each service allocates to private firms.

Support for New Systems. All of the services typically use the original equipment manufacturer (OEM) to maintain a new system while its design is being stabilized, its routine maintenance needs are being determined, and DoD's own depots are acquiring the necessary equipment and skills to maintain the system. Following that period of "interim contractor support," the services generally plan to maintain the new system in public depots.[7]

In some cases, however, the initial period of maintenance by the OEM becomes prolonged. That situation may occur if problems with performance or reliability lead to repeated changes in design or DoD has difficulty obtaining the resources it needs (sufficient facilities, skilled personnel, or technical data) to maintain the system on its own. For example, despite the Air Force's plan to use in-house capabilities for maintaining the B-1 bomber, the service continues to draw on the OEM for substantial support. In 1993, contractors provided almost 70 percent of maintenance on the B-1 airframe and nearly 80 percent of maintenance on the B-1's navigational avionics (electronic systems used for navigation).

7. Recent exceptions to this rule may include depot-level maintenance for the Air Force's B-2 bomber and F-117 fighter and for the Army's Target Acquisition and Designation System/Pilot Night Vision System (TADS/PNVS) and Mobile Subscriber Equipment (MSE). DoD's plans call for the OEMs to provide depot-level maintenance (and in some cases other maintenance as well) for those systems throughout their life cycle under a "contractor logistics support" agreement. But as the size of DoD's purchases of weapons declines, reducing the base over which the military can spread the cost of special tooling and maintenance equipment, DoD could decide to leave the maintenance of more major systems with the OEM.

Modifications and Upgrades. The private sector also plays a role in converting, modifying, and upgrading equipment (tasks that require many of the same capabilities as manufacturing the equipment in the first place). The Army's ongoing upgrade of M1 tanks to the M1A2 configuration is one example.

The private sector performs a larger proportion of DoD's workload for modifications and conversions than of DoD's routine depot-level maintenance. Nevertheless, the public depots that are responsible for routine maintenance carry out most modifications and conversions. In part, that allocation occurs because public depots find they can save money by combining modifications with routine maintenance. Estimates by the Air Force suggest that combining the replacement of the center wing box of the C-141 aircraft with routine maintenance reduces the hours of labor needed to replace the wing box by approximately 20 percent.[8] The Navy routinely combines overhauls of ships with modifications and upgrades.

Unanticipated Workloads. The services frequently call on the private sector to handle fluctuations in their maintenance workloads that might exceed what the workforce in the public depots could handle. They also use the private sector for unusual repair tasks that might disrupt the flow of work in the public depots or that might require the engineering capabilities of the OEM. For example, routine maintenance for the C-141 aircraft is usually done in a public depot. But when a significant number of C-141s were grounded as a result of cracks inside the structure of the wing, the Air Force engaged multiple contractors--both the OEM and specialized repair firms--to return the aircraft to service as quickly as possible. Because of the engineering skills of the OEMs, DoD sometimes uses them to deal with aircraft that need exceptional repairs as a result of fire, shifting cargo, or a history of problems that might otherwise qualify the planes as "hangar queens."

Private firms that specialize in repairs may also absorb fluctuations in the services' workloads that arise from unscheduled maintenance. For example, the Air Force divides its C-130 maintenance between Air Force depots and private repair firms, but the private sector receives 88 percent of unscheduled "drop-in" work and only 19 percent of scheduled maintenance. When the services choose to divide specific workloads between the public and private sectors, they commonly fill their own depots first and then allow private firms to compete for the remaining "overflow" work.

Component Repair. Component repair is another task that is frequently undertaken by private firms. Discussions of the appropriate roles of the public and private sectors in maintaining major platforms sometimes overlook this aspect of DoD maintenance. Yet repairs on components account for roughly half of all depot-level maintenance in the Air Force and about 40 percent of such maintenance in Navy aviation and the Army.[9]

Relatively little information is available about which general categories of components DoD is most likely to maintain in the public sector and which categories it maintains in the private. Anecdotal evidence indicates, however, that public depots are typically the source of repair for obsolete electronic components with small, uncertain demands for maintenance. At least when offered on an individual basis, such tasks could be unattractive to private repair firms.

In addition, it appears that public depots are likely to maintain components that are widely used in multiple systems (but are not in general commercial use), whereas OEMs are more likely to maintain components that are unique to a specific system or require special skills and equipment. Some Air Force experts suggest that this pattern explains why, in 1993, the private sector repaired 44 percent of Air Force navigational avionics components but only 15 percent of communications avionics components. Similarly, a review of 15 electronic warfare systems conducted by the Warner Robins Air Logistics Cen-

8. Coopers & Lybrand, *Preliminary Case Studies of Public Versus Private Competition* (Washington, D.C.: Coopers & Lybrand, July 1994), p. 10.

9. Component repair appears to be a much smaller portion of the total depot-level workload for sea systems. Comparisons between the services can be misleading, however, because of differences in where components are repaired (for example, on board ships rather than at depots) and in what constitutes a component. (Engines are components in the Army and end items in the Air Force and the Navy. At the same time, a radio that is an end item in the Army might be a component in the Air Force.)

ter found that five systems were being repaired only by the OEM and another two depended on the OEM for 75 percent to 95 percent of repairs.[10]

Analyzing the distribution of component repair by weapon system lends some support to the view that the private sector repairs many specialized components. For example, the private sector is responsible for 36 percent of the repairs on components used in fighter and attack planes in the Air Force but only 19 percent of the repairs on components used in cargo and tanker planes. One explanation is that the components used in current-generation fighter and attack planes are more likely to require the specialized skills and resources of the OEM. In contrast, repairs on components used in cargo planes demand resources that are widely available in the public depots.[11] Navy data, although incomplete, also support the idea that the private sector is instrumental in maintaining components used in fighter and attack planes.[12]

That pattern is especially striking because it is the reverse of that seen for airframe maintenance: the private sector is much less likely to maintain the airframes of fighter and attack planes than of cargo or tanker planes. (In 1993, private firms handled 17 percent of the airframe maintenance for fighter and attack planes in the Air Force and less than 7 percent of that maintenance in the Navy. But they handled 38 percent and 62 percent, respectively, of the airframe maintenance for cargo and tanker planes in those services.)

Decisions to depend on the OEMs to maintain components essential to a service's warfighting ability may be appropriate--and may become even more common in the future--as the increasing reliability of components and shrinking inventories of weapons reduce the size of maintenance workloads. When a workload is small, the cost of duplicating in the public depots the capability for repair that is already available through the OEM may not be justifiable.

The extent to which DoD relies on OEMs to repair components needs to be understood when evaluating arguments about DoD's inability to depend on the private sector to repair other essential equipment. DoD is most likely to use the private sector to maintain major end items (such as aircraft and engines) when the item is not central to combat operations and is similar to commercial equipment that the private sector already maintains. But for component repairs --the type of repair that will, in fact, be most essential during the kind of war that DoD is preparing for--that pattern is sometimes reversed.

DoD and Congressional Policies During the Cold War

Although history and the constraints imposed by cost and technology largely shaped public and private roles in depot-level maintenance during the Cold War era, DoD and Congressional policies also played a part. Policies issued by the Office of the Secretary of Defense (OSD) gave general guidance about the type of work to be allocated to the two sectors. Without specifying what the outcome might be for any particular weapon system, OSD also spelled out the kind of process that the services were to follow in determining the source of repair for each system. In addition, both OSD and the Congress have at different times placed overall restrictions on the proportion of work that the public and private sectors should each handle, perhaps because they were not entirely sanguine that general guidance would result in an outcome that they considered satisfactory.

10. The Warner Robins Air Logistics Center developed those data and provided them to the Congressional Budget Office in a memorandum from the Air Force's Office of Budget and Appropriations Liaison in December 1994.

11. An alternative explanation is that repairs on components used in cargo planes are more likely to be allocated to the public sector than repairs on components used in fighters because the wartime surge in flying hours (and thus in maintenance) is greater for cargo planes. The Congressional Budget Office lacked the data to evaluate that hypothesis, which was suggested by Air Force personnel.

12. In 1993, components used in F-14 and F-18 fighter planes accounted for approximately 30 percent of the repairs on components of aviation systems that the private sector performed for the Navy.

Guidance Regarding Appropriate Roles

DoD's policies during the Cold War consistently emphasized the role that public depots would play in delivering the surge in maintenance needed at the onset of a large-scale war. According to a joint statement by the services' logistics commanders in 1987, "The primary objective of the DoD depot maintenance community is to posture our depot maintenance capabilities to meet wartime mobilization surge requirements."[13] And a report issued by OSD in 1993 stated that "a principal justification for public depot maintenance was the need for ready, organic surge capacity to meet the immediate needs of operational forces while buying time for the private-sector production base to gear up for wartime demands. This large-scale, full-mobilization scenario drove policy, guiding the establishment of a substantial organic depot maintenance capacity and infrastructure."[14]

Yet OSD policies sought as well to encourage the services to use the private sector to the extent permitted by surge requirements. That principle was expressed in a 1982 DoD directive mandating that the capacity of public depots be "kept to the minimum required to ensure a ready, controlled source of technical competence and resources necessary to meet military contingencies."[15] The minimum workload needed in peacetime to support that capacity became known as DoD's Cold War "core" maintenance requirement. The relative costs of public and private maintenance in peacetime did not figure as an important factor in OSD policies, although the policies did specify that a service could keep more than that minimum amount of work at its depots if "no satisfactory private commercial source is available or in-house performance is more economical than contract."[16]

13. Joint Logistics Commanders, *Programs Objectives Summary, 1986-1992* (January 30, 1987), p. 1.

14. Office of the Deputy Under Secretary of Defense for Logistics, *Integrated Management of Department of Defense Depot Maintenance Activities*, vol. 1, *Study Results* (October 1993), p. 1-4.

15. Assistant Secretary of Defense for Manpower, Reserve Affairs, and Logistics, "Use of Contractor and DoD Resources for Maintenance of Material," DoD Directive 4151.1 (July 15, 1982).

16. Ibid.

Guidance Regarding the Decision Process

OSD recognized the limits of such general policies and called on each service to develop a systematic, quantitative approach for identifying its core maintenance needs. By 1982, that direction had evolved into a requirement that the services make decisions about the source of repair for each new system based on the answers to a structured series of yes-or-no questions (referred to as a decision-tree analysis). The different decision trees that the services adopted considered many of the same factors (for example, whether the system was essential to the service's warfighting mission, whether it had a high level of surge requirements, and whether public depots already had the capability to do the work).

Using formal, quantitative processes to calculate discrete requirements at a very detailed level and then totaling those requirements to determine aggregate levels is a technique common within DoD. Such processes have the potential to ensure that the organization systematically considers appropriate factors in making its decisions. In addition, studies of bureaucracies suggest that a formal process can protect those responsible for oversight from the accusation that they are not adequately monitoring outcomes; it can also protect those responsible for acting from outside organizations that try to influence decisions.[17] When organizations use formal, bottom-up decision-making processes like decision trees, aggregate outcomes do not appear to be the result of high-level judgments that might be reviewed and contested. Instead, they seem to be the product of an automatic, objective process that can be trusted to yield a fair and efficient solution.

DoD plans to continue using decision trees, and as a result, some of the limitations of that approach in the past are worth noting. One problem is that the implementation of decision-tree analysis could be uncertain. For example, in a 1990 study of 15 differ-

17. See James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York: Basic Books, 1989). Chapters 16 and 18 discuss how rules and standard operating procedures protect agencies from criticism. Other formal processes for determining requirements might include those that DoD uses to set the number of military officers and to determine the number of on-base housing units for military families.

ent weapon systems purchased by four Army commodity commands, the Logistics Management Institute "found no evidence that the decision tree had ever been used . . . most of the personnel did not know of the decision tree's existence."[18] Another problem is that even in cases in which an organization follows and documents the process, a great deal of room is left for judgment. In the eyes of some experienced practitioners, an organization can use decision-tree analysis to justify any outcome it desires for a particular system. If senior decision-makers do not like the outcome of an analysis, they can ask that it be redone. Moreover, anecdotal evidence suggests that uncertainty over the desired outcome has, on occasion, led to analysts' simultaneously preparing two contradictory analyses.

A bottom-up approach to determining public and private roles leads to another, more fundamental problem. What is practical or less costly in the short run, based on the current roles and capabilities of the public and private sectors, may drive decisions about individual weapon systems. As a result, the collective outcome of those decisions does not identify what roles the public and private sectors might play most effectively in the long run. For example, decision trees that take into account the ability of public depots to take on additional work (an appropriate short-run concern) encourage the services to respond to any excess capacity in public depots by shifting work there from contracts in the private sector. Similarly, workloads that have traditionally gone exclusively to one or the other sector will tend to go that way in the future because that is where the capabilities will be found. Decisions made on that basis beg the question of what capabilities DoD should try to maintain in each sector over the long run.

Guidance Regarding Aggregate Outcomes

During the Cold War years, the Congress and OSD placed formal and informal constraints on the share of maintenance work going to each sector. To some degree, those constraints may have discouraged analyses of alternative roles. Political considerations helped to determine how much work went to each sector as well as the level of work at individual depots. As a result, the services may have viewed major shifts in the shares of public- and private-sector depot-level maintenance as impractical.

Although the stated purpose of legislation has been to ensure that DoD has a "ready and controlled source of technical competence" to meet its needs in an emergency, the thrust of most Congressional action has been to support a dominant role for public depots.[19] (For example, the Department of Defense Authorization Act for fiscal year 1985 excluded core logistics functions from those commercial activities that were subject to public/private competition under the provisions of the Office of Management and Budget's Circular A-76.)[20] Moreover, current law, which modifies a provision first introduced in 1992, specifies that no more than 40 percent of the funds made available in a fiscal year to a military department or defense agency for depot-level maintenance and repair can be used for contract work.[21]

In contrast, the general thrust of OSD policies has been to ensure some minimum level of private-sector participation. During the 1970s, for example, OSD required the services to contract for at least 30 percent of their depot-level maintenance. Although the 30 percent rule did not apply to individual weapon systems, it did apply to broad categories of equipment, such as Army aircraft.[22] However,

18. Kelvin K. Keibler, Larry S. Klapper, and Donald T. Frank, *Army Depot Maintenance: More Effective Use of Organic and Contractor Resources*, AR803R1 (Bethesda, Md.: Logistics Management Institute, June 1990), p. 2-20.

19. Department of Defense Authorization Act, 1985; 98 Stat. 2514, 10 U.S.C. 2464.

20. Ibid.

21. See U.S. House of Representatives, *National Defense Authorization Act for Fiscal Year 1995*, Conference Report 103-701, to accompany S. 2182 (August 12, 1994). Although the so-called 60/40 rule is frequently cited in discussions of depot-level maintenance, the extent to which it has constrained the actions of the individual services is unclear. The wide variety of ways in which the military can measure the level of private-sector maintenance work (for example, it can include or exclude contractor logistics support, interim contractor support, the material purchased by public depots, and subcontracts let by public depots) may have helped to limit the impact of the rule.

22. Department of Defense, "Use of Contractor and Government Resources for Maintenance of Material," DoD Directive 4151.1 (June 1970), as cited in Frank Camm and others, *Resource Allocation in the Department of Defense*, R-2455-MRAL (Santa Monica, Calif.: RAND Corporation, October 1982), p. 34.

whether OSD was ever able to enforce that requirement is unclear. By 1982, it had revised its policy to require that the services only consider the private sector for at least 30 percent of their mission-essential workload and all of their non-mission-essential workload.[23]

In summary, historical circumstance, constraints imposed by costs or technology, and political pressures have shaped current public- and private-sector roles in maintaining military equipment at the depot level. Yet in the eyes of many analysts, DoD and the Congress have never satisfactorily resolved the question of what public and private resources are needed to provide responsive, cost-effective maintenance. In 1986, one naval historian noted that "a definitive answer to the recurring question of how naval overhaul and repair work will be apportioned between naval and private sector shipyards is long overdue."[24] Today, analysts addressing that problem must take into account a radically different national security environment. DoD's proposed solution, which is reflected in its revised policy on core depot-level maintenance, deserves close scrutiny.

23. DoD Directive 4151.1, July 15, 1982.

24. Whitehurst, *The U.S. Shipbuilding Industry*, p. 184.

Chapter Three

Core Depot-Level Maintenance

The Department of Defense's policy for depot-level maintenance in the post-Cold War period calls on the services to maintain a minimum "core" of capabilities in the public depots. The Deputy Secretary of Defense outlined that position in a May 1994 memorandum: "CORE is the capability maintained within organic Defense depots to meet readiness and sustainability requirements of the weapon systems that support the JCS [Joint Chiefs of Staff] contingency scenario(s). Core depot maintenance capabilities will comprise only the minimum facilities, equipment, and skilled personnel necessary to ensure a ready and controlled source of required technical competence."[1]

That new DoD dictum echoes the department's Cold War policies. The only conceptual difference is that the new policy places less emphasis on handling a surge in maintenance during mobilization and more weight on having a "controlled source" to ensure readiness. Today, "Core exists to minimize operational risks and to guarantee required readiness for these weapon systems [that is, the systems required in the JCS scenario]."[2] Although repair facilities no longer need to be able to gear up quickly to meet the demands of a broad, sustained conflict, DoD continues to assume that it would be too risky to use contractor support to maintain the frontline weapon systems required by the JCS's plans. That assumption allows DoD to base the core capabilities that its depots will maintain solely on JCS requirements. Missing from that equation are the capabilities of the private sector, the relative costs of public and private production, and the degree of difficulty in administering and monitoring contracts for different kinds of maintenance.

What Is the OSD Core Method?

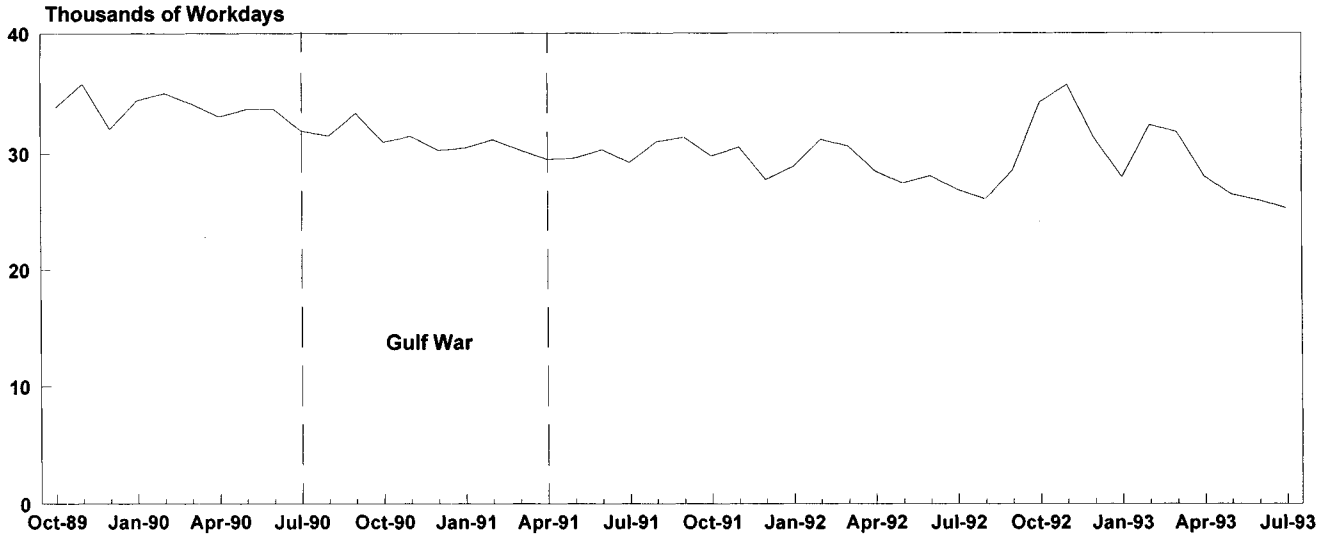
Critics point out that DoD's notion of core capabilities is extremely vague and somewhat tautological. (Since core capabilities are those that are kept within the DoD depots, any that are not kept there are by definition noncore.) To give the core policy an operational content, the Office of the Secretary of Defense outlined a multistep method for determining core capabilities. That method requires the services to identify the number and types of systems called for by the JCS scenario, compute depot-level maintenance requirements (measured in labor hours by type of skill) for those systems based on the scenario, and determine what size labor force would be needed (working on a wartime schedule) to get the work done. The number of hours of maintenance that the labor force would provide when working on a peacetime schedule is known as the peacetime core requirement.

The OSD method allows a service to add hours to its basic peacetime core requirement to ensure a cost-effective scale of operations for particular tasks. In addition, a service can maintain more than its basic peacetime core requirement to perform maintenance

1. Memorandum from John Deutch, Deputy Secretary of Defense, to the Secretaries of the Military Departments and others, May 4, 1994.

2. Memorandum from James R. Klugh, Deputy Under Secretary of Defense for Logistics, to the Secretaries of the Military Departments and others, November 15, 1993.

Figure 3.
Workload in Navy Shipyards, October 1989 to July 1993 (In direct labor workdays)



SOURCE: Congressional Budget Office based on data from the Navy used in John D. Keenan and others, *Issues Concerning Public and Private Provision of Depot Maintenance*, CRM 94-65 (Alexandria, Va.: Center for Naval Analyses, April 1994).

jobs won in public/private competitions, to handle a workload for which there is no private source, or to support a reserve (provided that the reserve can be rationally justified).

Formally, "core" refers to skills and capabilities rather than to specific weapon systems or workloads. As a result, not all of the peacetime maintenance associated with the equipment used in the JCS scenario has to be kept in the public depots. Individual program managers within the services make decisions about what peacetime workloads will go to the public depots to maintain core capabilities; they make those allocations system by system using a decision-tree analysis. DoD plans to develop procedures to ensure that those individual decisions are consistent with total core requirements.

How Do the Services Apply the Core Method?

Each service (with the Naval Sea Systems and Naval Air Systems Commands working separately) has tried to apply the OSD method to determine its peacetime core requirement. A review of those efforts indicates that OSD failed in its attempt to ensure a consistent interpretation of the core concept: the services each applied the method in quite different ways. Moreover, although each service's estimate of its core requirement appears to justify a large role for public depots, a close look at those estimates highlights some fundamental problems with the concept of core capabilities.

Sea Systems

The Naval Sea Systems Command (NAVSEA) provides a clear, well-documented description of its preliminary core calculations.[3] NAVSEA assumes that maintenance in Navy shipyards will drop off sharply during regional conflicts because the ships that are deployed will not be available for their scheduled maintenance. That assumption is consistent with the Navy's experience in the Gulf War (see Figure 3). A large part of the work that Navy shipyards performed during that conflict was on submarines that did not have to be deployed. Based on that experience,

3. Naval Sea Systems Command, Navy Shipyard and Supship and Field Activity Support Directorate, *Report of Naval Shipyard Core* (January 26, 1994). This document provides preliminary estimates that are subject to revision.

NAVSEA has concluded that "the requirement to surge resources to increase capacity in time of war is overall, minimal."[4]

Instead, NAVSEA anticipates only a brief surge in activity at the onset of the first regional conflict. That work would serve to deploy the ships that were in shipyards with their maintenance nearly complete and to position battle-damage teams in the war theater. Depot-level maintenance would reach its peak once both conflicts were over.

To calculate its core requirement, NAVSEA characterized each class of ship by its level of risk. A class was considered high risk if the private sector could not ensure competition for those ships' maintenance, if the number of ships required for the JCS scenario was close to the number in the fleet, or if maintenance for the ships required capabilities that were primarily available in Navy shipyards.[5] The command determined its basic core requirement by allocating the peacetime workload for high- and medium-risk ships to public and private shipyards based on their current capacity for doing the work--with the caveat that Navy shipyards would handle most of the high-risk ships and at least some medium-risk ships. NAVSEA included modifications, which are typically done as part of ship overhauls, in that peacetime workload. It allocated low-risk ships, which include frigates and auxiliary vessels, to the private sector.

NAVSEA focused on allocating its peacetime workload to the public and private sectors because it does not plan on a significant surge in maintenance during wartime. (Nonetheless, it satisfied the letter of the OSD method by assuming that over the two-year period following the conflicts, the surge in maintenance on ships used in the JCS scenario could be handled by increasing the hours worked by the shipyard employees who normally maintained those ships.)

NAVSEA's approach produced a basic core requirement of 26 million direct labor hours per year. (Direct labor hours are those that DoD can attribute to specific workloads. Indirect labor hours, in contrast, are an overhead cost that cannot be attributed to specific workloads.) To its basic core requirement NAVSEA added 6 million hours of its low-risk workload for purposes of "cost control"--that is, to help spread the overhead of the current depot structure over a broader base. It also added 7 million hours for inactivations of nuclear ships, which brought its total core requirement to 40 million direct labor hours for 1999. NAVSEA estimates that this requirement will equal roughly 60 percent of its total 1999 depot-level maintenance. In 1995, public shipyards will perform about 70 percent of NAVSEA's maintenance. Thus, if NAVSEA succeeds in reducing the capabilities of its shipyards to the core level, the share of ship maintenance done in the public sector will decrease.

NAVSEA's approach to the core method has some desirable features. It divides the command's peacetime maintenance between competing sectors without resorting to questionable assumptions about surge requirements and capabilities. It looks beyond military risk and considers economic risk by taking the extent of competition in the private sector into account.

Yet despite those merits, NAVSEA's approach cannot offer any insight into the public and private roles that might be appropriate in the long run. By allocating its workload largely on the basis of the current capabilities of the two sectors, NAVSEA begs the question of what capabilities each sector can and should maintain. Their current skills and facilities to a large degree reflect past Navy policies. The private sector, for example, will not develop or maintain the capability to undertake more overhauls of combatant ships than it expects to receive. A long-run strategy must consider not just the current structure of the industry but what it might become under different Navy policies.

Critics might also argue that NAVSEA's approach does not pay sufficient attention to the most likely risks in wartime. Although depot-level maintenance of ships will be of little importance during a conflict, a surge in the number of components needing repair would be expected. Today, private firms

4. Ibid.

5. NAVSEA identified large dry docks, the modernization and maintenance of complex combat systems, and nuclear ship fueling and refueling as capabilities available primarily in Navy shipyards. NAVSEA's concept of risk goes beyond the private sector's ability to provide high-quality, responsive support and takes into account the risk that the Navy might not get a competitive price because of a lack of competition in the private sector.

rather than Navy shipyards perform approximately 60 percent of the repairs on major components of Navy sea systems.[6] NAVSEA did not consider either public- or private-sector workloads for component repairs in calculating its core requirement. Yet in the current JCS scenario, a ready, responsive source of repair for the components essential to a service's warfighting mission may be more important than such a source for major platforms.

The Army

The Army based its core requirement on the labor force it would need to reconstitute its forces in the wake of two major regional conflicts, rather than on what it would need to maintain a ready force in peacetime or to sustain forces in wartime. Driving the Army's decision to focus on reconstitution was its recognition that its requirements for depot-level maintenance during regional conflicts would be quite limited.

The Army anticipates a selective surge in repairs at its depots during the transition to war as the depots finish work on end items that had been undergoing maintenance and fill supply pipelines by repairing components that had been in their backlogs. The depots would also help to sustain forces during the conflicts, focusing mainly on repairing components and meeting special requirements. Army depots would not increase their overall work schedules, however, until the first regional conflict had ended and worn and damaged equipment could be returned to the United States. The depots would then shift to a 60-hour work week for five months (a period that would extend past the end of the JCS scenario's second major regional conflict) to reconstitute a force adequate for a third regional contingency. Once that goal had been achieved, the depots would return to 40-hour work weeks until the force was totally reconstituted 12 months later. Most of the repairs would be done after both conflicts were over.

The Army determined its core capabilities with the above plan in mind. It started with the labor hours needed to carry out the repairs on mission-essential equipment that the JCS scenario would generate. Then it estimated what size workforce would be needed to accomplish those repairs over a 17-month period, working 60-hour weeks for five months and 40-hour weeks for 12 months. The Army's annual peacetime core requirement--the amount of maintenance that its depots must perform in peacetime to maintain core capabilities--is the number of annual labor hours that size workforce provides when working at peacetime rates.

The Army's peacetime core requirement is approximately 14 million direct labor hours per year, which is slightly greater than the number the service has programmed for its depots in 1999. Depending on the total level of funding for depot-level maintenance in 1999, the Army's need to keep approximately 14 million direct labor hours in its own depots could raise the public sector's share of maintenance above its current level.

One weakness of the Army's approach is its sensitivity to assumptions about the ability of public depots to provide a surge in labor hours and the time allowed for reconstitution. The Army could cut its peacetime core requirement almost in half by reconstituting the force in 24 months instead of 17 and requiring the depots to work 60-hour weeks for six months instead of five.[7] Arguably, the Army selected its assumptions because they yielded the "right" overall answer. That premise would be consistent with the way the service treated repairs on electronic equipment. When the initial list of mission-essential equipment yielded a small volume of such repairs, the Army modified the list to provide a more acceptable answer. (In calculating their core requirements, all of the services were aware that low estimates risked preempting decisions by their own senior managers about what, if any, depots to recommend for closure.)[8]

6. This figure is based on data for major components, such as engines and radars, whose maintenance is funded centrally within the Navy.

7. One reason that the Navy did not plan for a large surge in depot-level maintenance following a conflict is that it assumed a two-year period for reconstitution.

8. In some cases, the number and size of existing depots appear to determine what constitutes core workloads. In discussions with the Congressional Budget Office, Navy officials pointed out that decisions to close additional shipyards would reduce the amount of work that had to be included in the core requirement to spread overhead costs.

Another problem with the Army's core estimates is that even if the service assigned all of its peacetime maintenance to its own depots, it would be unable to maintain some of its core capabilities. Tanks and artillery require relatively modest amounts of maintenance in peacetime but could require extensive work after a conflict. As a result, the peacetime core requirements for tanks and self-propelled artillery are three and four times greater, respectively, than the Army's total peacetime maintenance requirements for that equipment.

The outcome is a mismatch: the total workload that the Army plans to assign to its depots in 1999 is close to the total peacetime core requirement, but the distribution of that work by broad commodity type (for example, ground combat vehicles, engines, and missiles) does not match the distribution of core requirements. In fact, only 61 percent of the Army's peacetime core requirement is matched by a planned workload for that same type of commodity. The Army could try to shift depot personnel with other skills into tank and artillery maintenance during reconstitution. But another--and arguably more practical--approach would be to call on the original equipment manufacturers and other private contractors to help in repairing those major end items.

The Army's effort to apply the core method points up the difficulties in using military risk to justify a dominant role for public depots in a scenario in which most of the needed maintenance comes in the aftermath of the conflict. Major end items that need only modest maintenance during regional conflicts drive the core requirement, rather than the repairs on components and special manufacturing that are most likely to demand rapid response in wartime. The core approach seems to provide detailed quantitative estimates that miss what really needs to be addressed.

The Air Force

Like the Army and the Navy, the Air Force calculated its core requirement under the assumption that it would need only a limited surge in maintenance during wartime. The Air Force expects the largest increase in repairs on major platforms to occur after the two regional conflicts are over. The total hours devoted to work on airframes would increase at the start of the conflict as depots either accelerated work schedules or omitted nonessential tasks to move out planes that had been undergoing maintenance. Because that surge would be both limited and brief, workloads for airframes would still be 67 percent below their levels in peacetime during the three-month period of the conflict in which those maintenance requirements would be at their peak.

In contrast, the Air Force expects that its repairs on engines and components during the conflicts would exceed their levels in peacetime. Engine repairs during the three months with the greatest requirements would rise to 121 percent of peacetime levels; component repairs would average 124 percent. Wartime requirements would vary dramatically by type of component, ranging from none (for components of training and simulation equipment) to more than twice peacetime levels (for instruments and components of oxygen equipment).

In determining its core requirements for repairs on engines and components, the Air Force followed the OSD method in a straightforward manner. It identified the repairs it expected to make on each type of engine and class of component, taking into account the number and types of planes involved in the JCS scenario and their expected sortie rates. It determined the peacetime core requirement based on the number of direct labor hours in peacetime that would permit the depots to meet the service's wartime needs for each type of component during the three months with the most expected repairs. (The Air Force assumed that during a conflict, its depots could operate at 1.6 times their peacetime level.)

Calculating the core requirement for repairs on airframes in that way would have justified keeping only 21 percent of the Air Force depots' current airframe workloads in the public sector. Perhaps because of that low figure, the service used a different procedure for airframes and determined a "readiness core" requirement. It took annual peacetime maintenance and modifications for aircraft required by the JCS scenario and divided them by a factor of 1.6 (the depots' potential surge in production during wartime). By using that approach, the Air Force produced a core requirement for airframes that was equal to 43 percent of its airframe maintenance in peacetime.

Those calculations yield a basic peacetime core requirement of 25 million direct labor hours. But the total requirement for the public depots rises to 29 million direct labor hours when the Air Force adds other work, including intermediate-level maintenance performed in its depots, maintenance from foreign military sales, work that is allocated to public depots based on public/private competitions, and work for which there is no private source (so-called last-source repair). Because the Air Force's core requirement is closely tied to the JCS scenario, the service expects the requirement to remain relatively constant in future years. However, the Air Force anticipates that by 1999, the share of maintenance done in the public sector will increase because that constant core requirement will be a larger portion of the Air Force's total workload of depot-level maintenance.

The way the Air Force has calculated its requirement appears to justify a major role for public depots over the long run, an outcome that is consistent with the service's traditional philosophy regarding maintenance. The treatment of maintenance for airframes, however, suggests that any process not yielding a result that agreed with the views of senior Air Force officials would have been replaced by a process that did. The core requirement for airframes--figured as the peacetime workload for the aircraft in the JCS scenario adjusted for the ability of depots to increase labor hours in wartime--does not translate into the size of labor force that the Air Force depots would need to perform peacetime maintenance while working a peacetime schedule or to perform wartime maintenance while working a wartime schedule. The Air Force may have adopted that arbitrary formula because it led to an estimate of core capabilities that, by itself, was judged acceptable.

It could be a mistake to conclude, however, that the Air Force's estimate of its core requirement is not a good one. The judgment of military leaders may be a more credible guide than mechanical calculations to the capabilities that DoD should maintain in its public depots. It seems, however, that the Air Force did not openly disclose the basis on which its estimate of the core requirement actually rests. If that is the case, the Congress has no way to evaluate the validity of that estimate.

The Air Force treats repairs on components somewhat inconsistently. As noted earlier, the private sector repairs some of the most sophisticated components of the services' frontline combat systems. But the Air Force's core requirement, like those of the other services, does not take into account mission-essential components that the private sector is currently repairing. The Air Force justifies such neglect by assuming that in wartime, firms in the private sector can surge to 1.5 times their rate of operations in peacetime. Yet by that criterion, almost all components could qualify for private-sector maintenance. The fundamental problem may be that the method for determining the core requirement does not emphasize costs. Therefore, DoD cannot use it to determine what repairs on mission-essential components should be left in the private sector for reasons of cost.

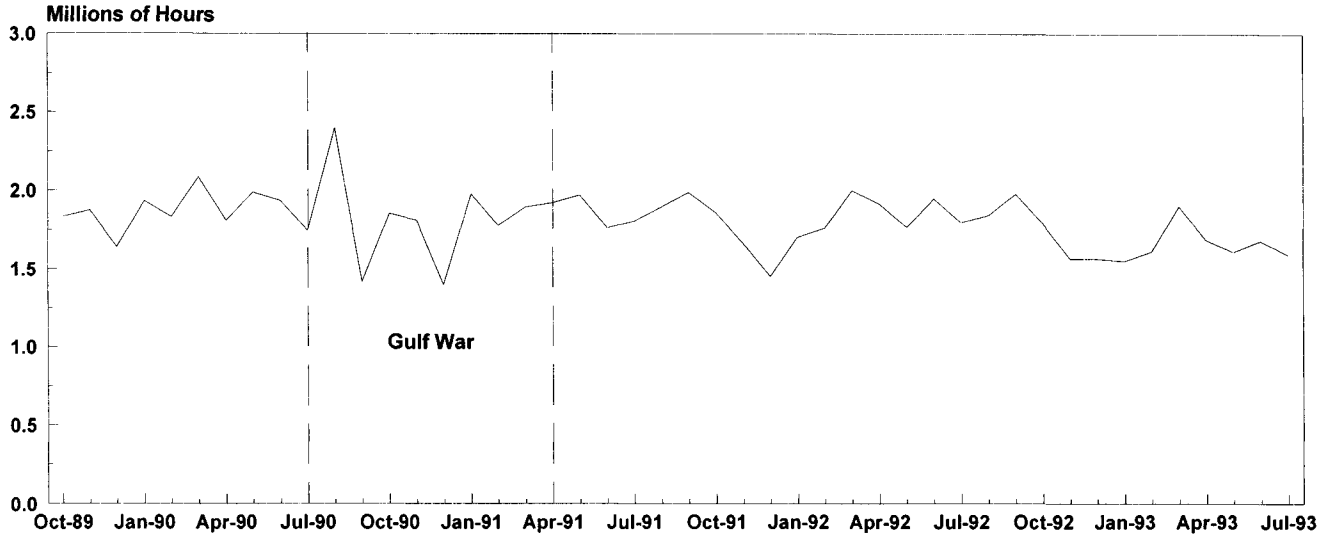
Naval Aviation

The Naval Aviation Systems Command (NAVAIR) also expects its maintenance on airframes to reach a peak (121 percent of the peacetime workload) after the major regional conflicts are over. However, the peak surge in maintenance on engines and components would occur during the conflict and would be substantially greater: 183 percent and 141 percent of peacetime workloads, respectively. Those estimates are consistent with the Navy's experience during the Gulf War, when a surge in the volume of engine maintenance caused some depots to expand operations (see Figure 4).

In retrospect, the Gulf War did not place heavy demands on the Navy's depots. But logistics managers at the time had no way of knowing how the conflict would develop, and they worked vigorously to fill pipelines. As a result, the way the depots responded during that conflict may be a reasonable guide to what more demanding scenarios would require.

Based on its experience in the Gulf War, NAVAIR estimated that its wartime workload would increase to 1.3 times its peacetime level. Consequently, the command calculated its wartime require-

Figure 4.
Workload in Navy Aviation Depots, October 1989 to July 1993 (In direct labor hours)



SOURCE: Congressional Budget Office based on data from the Navy used in John D. Keenan and others, *Issues Concerning Public and Private Provision of Depot Maintenance*, CRM 94-65 (Alexandria, Va.: Center for Naval Analyses, April 1994).

ment for maintaining the mission-essential airframes, engines, and components needed to support the JCS scenario by multiplying the peacetime maintenance for that equipment by a uniform workload adjustment factor of 1.3. (In reality, however, increases in workloads would differ by type of equipment.) NAVAIR determined the basic peacetime core requirement by dividing its wartime requirement by 1.6 (the assumed surge in labor hours provided by naval aviation depots in wartime). That calculation yielded a basic peacetime core requirement of approximately 8 million direct labor hours.

Unlike the Air Force, the Navy did not make a special allowance for a core requirement for airframe "readiness." However, it did add hours to its basic peacetime core requirement to bring small core workloads up to a size that the public depots could handle economically, to permit modifications and routine overhauls to be done concurrently, and to avoid sending uneconomically small noncore workloads to the private sector. For NAVAIR as a whole, those adjustments make up a large share of the total public requirement of 13 million direct labor hours. (The Air Force's adjustments were smaller because it assumed that the ability to work on one type of airframe or on one component within a commodity group translated into the ability to work on others. The Navy made a different assumption: if the JCS scenario called for a single E-2/C-2 aircraft, the service saw that as a requirement to maintain an economical workload for that aircraft in the public depots.)

The relationship between NAVAIR's estimated core requirement and the amount of work that the Navy actually plans to perform in its depots is unclear. According to DoD's most recently published plans, NAVAIR will devote approximately $1.2 billion to depot-level maintenance in 1999.[9] The Navy's own depots, which will perform approximately 9.5 million direct labor hours of maintenance, will receive about two-thirds of that total--less than the share they currently receive. Apparently, the Navy plans to reduce the proportion of work going to the public sector even though public workloads will be well below the service's core level.

9. Defense Depot Maintenance Council, *Business Plan for Fiscal Years 1995-1999* (February 1995).

What Are the Weaknesses of the Core Concept?

Finding inconsistencies and logical problems in the core calculations that each service uses is not difficult. Some of them are relatively minor matters that OSD could resolve through better guidance. But many of the difficulties that the services encountered in applying the OSD method reflect fundamental flaws in the core concept itself. As the Army's estimates show, the assumption that DoD cannot rely on the private sector to repair frontline systems lacks credibility when it is applied to maintenance requirements that will not emerge until a conflict is over.

Another fundamental problem is that trade-offs between the risk entailed in using private-sector contractors and the lower costs that such use makes possible are frequently necessary even for repairs on essential equipment. (That the services make such trade-offs is evidenced in the private sector's repair of components for mission-essential end items whose routine maintenance is kept in the public sector.) But because the DoD core concept does not consider costs and does not differentiate between degrees of risk, it cannot guide the services in making those trade-offs. Instead, the OSD method defines all items that are repaired in the private sector as noncore. Thus, even though repairs on components will account for much of the surge in depot-level maintenance during regional conflicts, the Navy, the Army, and the Air Force did not examine the extent to which they rely on the private sector for such repairs.

The core concept thus continues DoD's traditional emphasis on risk as the rationale for maintaining public depots. But some logistics managers--including some Air Force managers--suggest that cost should play a significant part in determining public and private roles in the post-Cold War era. Even if DoD cannot justify a dominant role for public depots on the basis of risk, it may be able to argue for one based on cost-effectiveness in peacetime. Moreover, if the cost of achieving required levels of quality and output is the criterion for allocating maintenance work to the two sectors, DoD might be able to rely on competition between public and private facilities to divide its workload fairly and efficiently. Those arguments deserve careful examination, but first, it is useful to review what economists and political scientists say in general about the different characteristics of public and private production.

Chapter Four

Characteristics of Public and Private Production

A well-established body of literature in the fields of economics and political science describes the different characteristics of producers in the public and private sectors and how those characteristics typically affect performance in different situations. That literature cannot answer questions about the relative costs and benefits of public or private maintenance for any particular depot-level task. But it can provide a conceptual framework for evaluating the conflicting claims made by advocates of public depots and industry lobbyists.

Goals and Constraints in Public Production

Definitions of public, private, and mixed modes of production focus on whether the government owns the capital (for example, facilities and equipment) that is being used and whether managers and workers are employees of the state. The mode of production matters because differences in type of ownership, management, and labor typically imply differences in goals and constraints and thus in performance.[1]

Through the political process and the government's ability to tax, public producers have access to resources that are not derived from the sale of goods to customers in an open market. Those resources allow public producers to adopt goals other than maximizing profits and minimizing costs, which are required for firms to survive in a competitive market. At the same time, the dependence of public managers on the political process for investment funds and other resources constrains their ability to organize production efficiently.

Of course, large corporations in markets with a limited amount of competition are also free to adopt other goals. Such firms must also rely on internal administrative controls rather than on markets to organize the various stages of production. Ultimately, however, a firm's dependence on revenue from sales of its products restricts the degree of freedom enjoyed even by a monopolist in the private sector.

The goals that public producers pursue reflect both the political environment on which the producer's survival depends and the producer's own organizational culture. Among the goals that are frequently identified with public producers are the following:

- Providing the highest quality of output
- Supplying the greatest level of output
- Obtaining the most modern technologies
- Being fair to suppliers, workers, and customers
- Offering continuity of employment to workers

1. For a summary of the strengths and weaknesses of market and nonmarket production, see Charles Wolf Jr., *Markets or Governments: Choosing Between Imperfect Alternatives* (Cambridge, Mass.: MIT Press, 1988).

- Supporting suppliers who may be small or disadvantaged businesses[2]

Many of those goals relate to issues of fairness. In comparison, minimizing the cost of producing a given quantity and quality of output may not have high priority for public producers, although it may be a goal. In the U.S. political environment, diverse, competing interest groups all have a voice, and according to some observers, no decision is ever final. In such circumstances, a public manager's need to show that decisions were made in a fair, nonarbitrary manner (following standard operating procedures and preestablished rules) frequently takes precedence over efforts to organize production in the most cost-effective manner.

Despite its simplicity, this view of public organizations helps to explain many of the traits typically associated with public production. It may, for example, help to account for civil service regulations that ensure fairness for job applicants and employees, and procurement practices that focus on the lowest bidder (rather than on judgments about the past performance of potential contractors, which might appear arbitrary).[3] In the case of depot-level maintenance, it could explain policies for rotating depot commanders to other positions to ensure equitable treatment at the cost of job continuity, and the use of formal processes (such as the method for determining core requirements) for justifying outcomes. Standard rules and operating procedures help to promote accountability in a sector in which market discipline is largely absent.

Public producers may be subject to reforms that are designed to make them behave more like private producers. Yet the distinctive characteristics of public production are likely to resist change to the extent that they reflect the political constraints and incentives facing the organization. One study of the federal procurement system found that contracting officers tended to award contracts based on price, a readily quantifiable and easily justified factor, even when they had the authority to use discretion and take past performance into account.[4]

In the case of depot-level maintenance, the Department of Defense has for decades tried to make public producers more businesslike through a revolving fund that requires customers of the depots to use appropriated funds to "buy" the depots' services (see Box 2 on pages 28 and 29). That approach can encourage more awareness of costs among both producers and users of those services. Yet as long as the political process imposes other goals (such as keeping specific depots operating or keeping a specified level of work at a depot) and as long as higher costs for depot-level maintenance lead to additional funding for customers, public depots are unlikely to focus as intently on using resources efficiently as do private firms in competitive markets.

In addition, there may be a limit on the extent to which it is desirable to make public facilities more businesslike. A publicly owned enterprise that is forced to compete against private producers on a level playing field might survive by behaving like a private firm and focusing on the efficient use of resources.[5] But efforts to make public producers behave exactly like private firms would, if successful, eliminate the advantages of public production as well as its disadvantages.

2. Some of those goals are addressed in Wolf, *Markets or Governments*, pp. 70-77.

3. James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York: Basic Books, 1989), p. 127.

4. Steven Kelman, *Procurement and Public Management* (Washington, D.C.: AEI Press, 1990), p. 125.

5. Evidence on this point is relatively limited, however. See Anthony E. Boardman and Aidan R. Vining, "Ownership and Performance in Competitive Environments: A Comparison of the Performance of Private, Mixed, and State-Owned Enterprises," *Journal of Law and Economics*, vol. 32 (April 1989). A government-owned enterprise whose behavior and survival depend solely on market forces is not an impossibility, but in the United States, government ownership of large enterprises is inextricably combined with political support. In situations in which the government has forced small groups of public employees who provide commercial activities to compete for survival (as in competitions managed under the Office of Management and Budget's Circular A-76), the result has been significant reductions in costs.

The Government's Make-or-Buy Decision

Despite what some analysts have termed the "special disabilities" of public enterprises, public or mixed forms of public/private production in some cases may be more cost-effective than private production. Of particular interest for this study are situations in which it is more cost-effective for the government to produce goods and services (such as depot-level maintenance) for its own use than to purchase them from private producers.

In some respects, the government is like any private firm facing a make-or-buy decision. Several factors may cause it to choose to perform work in-house: the cost of setting up and monitoring contracts is high relative to the actual cost of production (as is the case if quality or quantity of output is hard to measure objectively or if continual renegotiations are necessary to meet changing requirements); workloads are large enough so that the in-house producer can take advantage of economies of scale; and the work can be done for the least cost by using highly specialized capital and labor for which there are neither alternative sources nor uses.[6] Generally, small, erratic workloads for which outputs are ill-defined, or for which the quality of the work cannot be determined except by monitoring the process used to do it, are not well-suited to contracts.

Yet some important differences exist between the make-or-buy decisions of public and private producers. One difference is that the decision of public producers to contract for work usually shifts production from the public to the private sector. To the degree that private suppliers have both greater freedom and stronger incentives to use resources efficiently, contracting can be a particularly cost-effective alternative for public producers.

6. The relevance of these factors to DoD's decisions about depot-level maintenance is noted by Frank Camm, *DoD Should Maintain Both Organic and Contract Sources for Depot-Level Logistics Services*, RAND Issue Paper (Santa Monica, Calif.: RAND, August 1993). Oliver E. Williamson provides a more technical discussion of how these factors affect the way in which private firms organize production. See Williamson, *The Economic Institutions of Capitalism* (New York: Free Press, 1985).

The Private Sector's Ability to Produce at Low Cost

A large body of empirical evidence suggests that production by the private sector is less costly than public production if competition is possible among private producers. One review of 50 studies that compared public and private production found that in 40 of them, private production was less costly.[7] (Seven studies yielded ambiguous results, and three concluded that public production was less costly.) The 50 studies covered a wide range of fields including airlines, banking, bus services, fire protection, repairs of ocean tankers, housing, hospitals, refuse collection, and water and electric utilities. In those studies that provided estimates of the magnitude of savings, the difference in costs between the public and private sectors generally ranged from 20 percent to 40 percent.

Explanations of the private sector's advantage in production frequently point to better management and lower labor costs, both of which might in turn be attributed to the effects of competition.[8] In markets in which competition among private producers is not possible, little evidence can be found that shifting production from the public to the private sector yields significant savings.[9] The difference in costs typically found for public and private enterprises stems from differences in constraints and goals and not necessarily from ownership as such. The general literature on public and private production suggests that DoD should not expect to gain significant savings in its costs for depot-level maintenance from shifting work to the private sector unless competition exists among private firms for that work.

7. Thomas E. Borcherding, Werner W. Pommerehne, and Friedrich Schneider, *Comparing the Efficiency of Private and Public Production: The Evidence from Five Countries* (Zurich: Institute for Empirical Research in Economics, University of Zurich, 1982), as cited in Wolf, *Markets or Governments*.

8. Wilson, *Bureaucracy*, p. 351.

9. See John Vickers and George Yarrow, "Economic Perspectives on Privatization," *Journal of Economic Perspectives*, vol. 5, no. 2 (1991), pp. 111-132.

Box 2.
Strengths and Weaknesses of Public, Private, and Mixed Modes of Production If the Government Is the Customer

Although it is sometimes convenient to speak of the choice between public and private modes of production, a number of mixed forms include aspects of both the public and private alternatives. Each mode has its particular strengths and weaknesses. Outlined below are some of the characteristics that the government should consider in deciding which mode to adopt.

Private Production. In this mode, plant and equipment are privately owned, and managers representing the owner's interests hire and direct the labor force. Private production can be a cost-effective source of goods and services for the government if more than one firm competes for a contract and the cost of administering the contract and monitoring the contractor's performance is not excessive. Those conditions are usually met when the government purchases goods and services that are commercially available. However, tasks that require unique or highly specialized capital, labor, or knowledge can inhibit competition. Contracting can be costly or ineffective in ensuring adequate performance of work whose requirements are subject to frequent and sudden change or for which the government cannot clearly specify the quality of the output.

Private Production with Leased Assets. In this case, private producers work in their own facilities using specialized equipment that they lease from the government. That mode is likely to be a cost-effective alternative if the need for specialized equipment is the only obstacle to competitive private production. Private production with leased assets allows competition even for tasks that require unique equipment, provided that the equipment is mobile and the task does not require unique skills and knowledge (so that multiple contractors are able to bid in recompetitions for future contracts). However, it may not be appropriate for the government to supply general industrial equipment to private producers. Because the government's investment decisions depend on factors other than market forces, the government may not maintain the most cost-effective mix of equipment.

Production in Government-Owned/Contractor-Operated Facilities (GOCOs). Private firms may use their own labor, material, and management to produce goods and services for the government in government-owned facilities. Because that alternative depends on the political process rather than market forces to determine the number and types of facilities used, it can result in an inefficient industrial base. Nonetheless, if the contract for managing the GOCO is put out for recompetition periodically, such an approach can encourage the efficient use of labor and material. It may be cost-effective in cases that require highly specialized assets that are immobile. However, it could prove more costly than public production in situations in which only one contractor has the labor force and knowledge to operate a particular facility.

Production by a Regulated Monopoly. Typically, regulated monopolies are privately owned enterprises that have a monopoly franchise and are subject to legal regulations governing price, output, or profit. The government can use that approach as an alternative to public production if private production, because of economies of scale and the need for specialized resources, would lead to an unregulated monopoly.

Because regulation may limit the incentive of producers to produce for the least cost, this alternative is not attractive in situations in which competition would be possible. Nonetheless, regulated monopolies may have greater freedom than public enterprises to organize production efficiently. (Regulated monopolies, for example, can obtain capital in the private sector--rather than through the political process--and do not

The Public Sector's Inability to Contract Efficiently

The other difference between the make-or-buy decisions of public and private producers is that the same characteristics that make it hard for public producers to use resources efficiently also make it difficult for them to contract for goods and services. Public enterprises should choose to buy inputs more often than private enterprises do only if the government's disad-

need to abide by the same personnel policies as public employers.) A GOCO or a regulated monopoly that serves the government might be more likely than a purely private producer to have a long-term relationship with its customers. With such a relationship, the risk might be less that a GOCO or regulated monopoly would not respond to government needs in an emergency.

Nominally, most firms that specialize in producing goods and services for the military are privately owned. But those that use highly specialized capital and labor to produce something that only the Department of Defense (DoD) purchases share many of the characteristics of a GOCO or a regulated monopoly (including a long-term relationship with their customer or regulator). The government, for example, has both the ability and the desire to ensure that the Newport News Shipyard (now the only facility in the United States with the necessary skills and assets to construct nuclear aircraft carriers) earns a reasonable--but not excessive--rate of return on its investment.

Production by a Government Corporation. Government corporations are partially or wholly owned by the government, but they generally budget and operate more like private firms than like government agencies. Although their characteristics vary widely, in many instances they are free to follow private-sector employment policies, borrow in private credit markets, and set prices for their products based on market factors. Examples of government corporations include Amtrak and the Tennessee Valley Authority.

Government corporations commonly differ from private firms in several respects: their charters can specify goals other than earning the largest possible profits, they may be at least partially dependent on appropriated funds for their survival, and they are frequently subject to political pressures. Those features can reduce their ability and need to use resources efficiently. Yet such corporations offer the government the greatest degree of direct control short of public production. Moreover, their quasi-governmental status can protect them from some of the risks--such as strikes and bankruptcy--that purely private firms face.

Public Production. This mode of production occurs in a government-owned facility with a labor force that is employed directly by the government and is subject to the same rules and regulations that apply to other public employees. Managers typically depend on the appropriation process for resources. When the producer and the consumer are part of the same agency, public production allows direct control, without the need for negotiations or a contract. Public production can be useful in situations in which the agency's role in production provides it with indirect benefits (such as knowledge about the product) and contracts would be costly or ineffective. (For example, contracts are difficult to use if the government cannot easily specify the level and quality of output it requires or if the needed outputs change frequently and renegotiating contracts would inhibit timeliness.) Many of the situations in which public production is appropriate are those in which the government cannot effectively use competition among multiple producers, with its potential for reducing costs.

Revolving funds, such as the one that DoD currently uses for depot-level maintenance, incorporate some of the features of a government corporation and some of the features of conventional public production. Like a government corporation, the producer operating through a revolving fund prices its outputs and relies primarily on revenues from sales to cover the cost of production. But despite that businesslike feature, revolving funds resemble conventional public production because they rely on labor employed directly by the government and are unable to borrow in private credit markets. Moreover, in the case of the revolving fund that supports depot-level maintenance, both the producers and users of the maintenance services are ultimately part of the same agency (DoD). As a result, the relationship between customer and buyer goes beyond the merely contractual.

vantage in production outweighs its disadvantage in contracting.

In the defense area, some experts estimate that contracting, evaluation, and enforcement absorb between 20 percent and 40 percent of all procurement spending.[10] (One study found that the process of competitive source selection absorbed from 5 percent to 10 percent of a program's total costs before any

10. John D. Donahue, *The Privatization Decision* (New York: Basic Books, 1989), p. 109.

production was undertaken.)[11] The costs of contracting are likely to be greatest for contracts to develop or produce new weapon systems; they are likely to be less for purchasing goods and services that are commercially available or for purchasing the same goods and services repeatedly, which allows standard contracts to be used. Estimates by the Navy, based on data from public/private competitions, indicate that the cost of contracting for depot-level maintenance for aviation systems ranges from 3 percent to 5 percent of the value of the contract.[12] The accounting firm Coopers & Lybrand suggests that it cost DoD approximately $4.3 million to conduct a competition for the $62 million contract to replace the center wing box on C-141 aircraft.[13]

The government's contracting practices, in addition to being more costly than contracting practices in the private sector, may also discourage the long-term relationships that encourage suppliers to respond quickly to, and in some cases anticipate, the needs of their private customers. The appropriate mix of public and private production in both depot-level maintenance and other areas is likely to depend in part on the success of efforts to reform the federal procurement system.

Choosing Among Public, Private, and Mixed Alternatives

The current economics literature emphasizes that the choice between in-house and contract sources of production is a choice between imperfect alternatives.[14] In some cases, the least imperfect solution is one that combines elements of both public and private production. For example, if the only factor limiting competition was the need for specialized equipment, the government might lease the equipment to private producers. Other mixed arrangements include government-owned/contractor-operated facilities, regulated monopolies, and government corporations (see Box 2).

It is not possible to determine solely on the basis of conceptual arguments whether in-house public production, a contract with a private firm, or some mixed arrangement is the least imperfect alternative for any particular maintenance task at the depot level. It is possible, however, to identify some of the factors that DoD needs to consider in allocating workloads to public, private, and mixed facilities.

Attractive candidates for private-sector contracts might include workloads for which DoD could develop and use standard contracts, for which outputs would be easy to evaluate, or for which competition in the private sector was possible. Other workloads for which contracting might reduce costs include those that private firms can combine with either new production or with commercial repair work. The difference between the costs of in-house and contract alternatives will vary widely depending on the specific task. Nevertheless, a difference of 20 percent (net of contracting expenses) over the long run for workloads with the above characteristics would not be inconsistent with the general empirical literature that compares public and private production.[15]

DoD could try to analyze its workloads in terms of those characteristics and then allocate them on that basis to either a public, private, or mixed producer. That approach would have a stronger conceptual foundation than the mechanical core calculations that the department has adopted. Such analyses would, however, be difficult to conduct. Moreover, they would involve subjective judgments that could leave their results open to challenge. Might not direct competition between public and private producers be a much simpler and at least equally fair and effective way to determine which sector was best suited for which workload?

11. Ibid.

12. John D. Keenan and others, *Issues Concerning Public and Private Provision of Depot Maintenance*, CRM 94-65 (Alexandria, Va.: Center for Naval Analyses, April 1994), p. 23.

13. Coopers & Lybrand, *Preliminary Case Studies of Public Versus Private Competition* (Washington, D.C.: Coopers & Lybrand, July 1994), p. 4.

14. Williamson, *Economic Institutions of Capitalism*.

15. Keenan and others, *Issues*, p. 23, and Donahue, *The Privatization Decision*, p. 216.

Chapter Five

Public/Private Competition

Traditionally, logistics managers in the Department of Defense have assigned depot-level workloads either to a public depot or to the private sector.[1] Competitive bidding, when it has occurred, has been primarily among private firms for work assigned to that sector. DoD has had some experience, however, with competition between public and private producers. The public/private competition program originated with the 1985 Defense Appropriations Act, which required the Navy to test the effectiveness of competition for assigning overhauls of its ships.[2] The Congress later extended public/private competitions to naval aviation, the Army, and the Air Force. As of December 31, 1993, the military services had awarded 300 maintenance workloads with a value of approximately $3 billion using public/private competition.[3]

The primary goal in those competitions has been to get a good price for specific depot-level tasks. Some advocates of public/private competition, however, suggest that DoD could use an expanded program to determine the overall roles of the public and private sectors in maintenance at the depot level. DoD could simply set up a level playing field for the competitions and then allow the invisible hand of market forces to resolve the difficult issue of roles. Proponents of that approach might argue that it offers fair, efficient outcomes and at the same time frees DoD and the Congress from having to make explicit decisions about how many and what kinds of depot facilities DoD should maintain.

The proposal, however, runs counter to the current trend in DoD policy, which promotes the use of public depots to ensure minimum maintenance capabilities for essential equipment rather than least-cost production. In May 1994, then Deputy Secretary of Defense John Deutch discontinued public/private competition, stating that in the near term, "databases and financial management systems in the military services are not capable of supporting the determination of actual cost for specific workloads." Yet even if DoD's accounting systems were improved, the Congressional Budget Office finds a number of reasons, based on the nature of public and private production, that competition would be unlikely to provide a good solution to the question of appropriate roles.

Inherent Difficulties in Public/Private Competition

One fundamental difficulty is that public/private competition can be used to determine public- and private-sector roles only if DoD and the Congress

1. In many instances a service will divide a task (such as the overhaul of a particular airframe or repair of a particular component) into two workloads, assigning one to a DoD depot and the other to the private sector.

2. Department of Defense Appropriations Act, 1985; 98 Stat. 1907.

3. Statement of Donna M. Heivilin, Director, Defense Management and NASA Issues, National Security and International Affairs Division, General Accounting Office, before the Subcommittee on Readiness of the House Committee on Armed Services, published as General Accounting Office, *Depot Maintenance: Issues in Allocating Workload Between the Public and Private Sectors*, GAO/T-NSIAD-94-161 (April 12, 1994), p. 10.

adopt a hands-off policy that permits shifts in workload in response to competition. Such a policy may be possible only as long as the competitions do not have a significant impact on the level of work at any particular public depot.

Large public depots are important local employers, and the allocation of work to the various depots and to the public and private sectors is a matter of Congressional interest. Thus, as a practical matter, the decision to close or reduce the size of a public depot must be made in a political as well as an economic forum.[4] Unless DoD closes public depots that cannot compete, shifting workloads to the winners of individual competitions may simply reduce the base against which the public depots allocate their fixed overhead and increase the apparent cost of the workloads that remain. DoD estimates that the fixed overhead costs for one of its depots typically range from $50 million to $100 million annually.[5]

Another difficulty is that one of the most important advantages of in-house production for government enterprises--avoiding the costs of the contracting process--is lost when the choice between in-house and contract sources involves a formal competition. As noted in the previous chapter, in-house production of goods and services for use by the government is most likely to be cost-effective when contracting proves difficult or costly (because outputs are ill-defined, quality is difficult to specify or monitor, or requirements change frequently). It would be self-defeating to use formal competitions that require clearly written contracts to allocate work in those situations. To identify the appropriate sector for those tasks, DoD may need to conduct explicit analyses that compare the costs and benefits of in-house production with those of the contract process and private production.

Public/private competition might raise costs in the private sector over the long run by encouraging an adversarial rather than cooperative relationship between DoD and its suppliers. In the private sector, such cooperative, long-term relationships encourage suppliers to invest in specialized capital assets (for example, fixtures that are designed specifically to support F-15 airframes during overhauls) that reduce the cost of production. The desire to protect a long-term relationship can also discourage suppliers from taking advantage of the purchaser in the short term (for example, by demanding large payments for any modification to a contract). Some officials within DoD as well as in industry believe that direct competition between DoD depots and private firms will damage those valuable relationships because of the private firms' fears that DoD will favor its own depots unfairly.[6] Those fears may be accentuated by the differences in the accounting systems and the incentives of public and private producers. Irrespective of whether competitions are fair, the belief of industry officials that they are not could have a negative impact on DoD's long-term relationships with its suppliers.

Using Public/Private Competition Appropriately

The difficulties noted above apply to proposals to use public/private competition as a routine measure to determine the overall roles of the public and private sectors. They do not rule out benefits from public/private competition on specific occasions. For example, competition between the sectors might be useful in specific situations that involved specialized skills or capital and in which the choice was between public/private competition or no competition at all. Such a situation might occur if DoD had the right to operate its own repair facility using technical data provided by the original equipment manufacturer but was unable to purchase the data rights needed to set up dual private sources. In other cases, public/private (and public/public) competition for particular workloads might encourage individual depots to reduce their costs.

4. That difficulty also limits the department's ability to close depots in response to public/public competitions.

5. Office of the Under Secretary of Defense for Acquisition and Technology, *Report of the Defense Science Board Task Force on Depot Maintenance Management* (April 1994), p. 17.

6. Toyota is one of several Japanese firms that abandoned competition between in-house and contract sources because of the negative effect that competition had on their long-term relationships with suppliers.

Interpreting the Results of Competitions

Despite the constraints that restrict the ability of public producers to manage resources effectively, public depots have won just under half of the workloads that DoD has allocated through competition and more than half of the dollar value of that work.[7] But how should that evidence be interpreted? Does the fact that each sector wins some competitions mean that the competitions are fair? Is something about depot-level maintenance unique, so that even in a competitive environment, a large role for public production can be justified on the grounds of cost?

A Level Playing Field

Some observers suggest that a level playing field for public and private bidders is possible provided that public and private bids each consider the same cost elements and both sectors use accounting rules that evaluate costs in the same way. In an effort to level the playing field, DoD distributes its *Cost Comparability Handbook*, which spells out the adjustments that public depots need to make to render their costs comparable with those of private firms. The adjustments that the handbook addresses (such as adding unfunded civilian retirement and subtracting the value of the time that military personnel spend on nondepot duties) typically account for a small percentage of the total amount of bids.

Yet the DoD handbook fails to deal with some of the most important differences between public and private costs. It takes account of depreciation, for example, but does not require public depots to consider the cost of taxes or the cost of having resources tied up over time (that is, a market rate of return on capital). If a level playing field is one on which competition will identify the producer (public or private) that produces with the mix of resources that is least costly to the government as a whole, then public depots should include income taxes and a return on capital in the bids they prepare. DoD logistics managers do not ordinarily consider those costs, but ultimately the taxpayer must pay for them.[8]

The extent to which omitting taxes and a return on capital leads DoD to understate the cost of maintenance in public depots depends on the current value of DoD's depot facilities. DoD's estimate of the value of its depots was roughly $32 billion in 1991, a figure apparently based on historical acquisition costs. But that estimate could far exceed the current value of those assets. A more conservative and potentially more realistic estimate is on the order of $8 billion to $10 billion. (That estimate is based on DoD's investment pattern from 1986 to 1993 with an allowance for depreciation.)[9] If one uses an economywide nominal pretax rate of return on capital of 10 percent, the resulting calculation suggests that DoD understates the cost of the maintenance performed in public depots by almost $1 billion annually.[10]

An even more basic problem is that public producers may have a much greater incentive than private producers to bid below their actual costs. If a private firm underbids on a contract and wins it, stockholders and, indirectly, the management of the firm suffer a real loss. A public manager, however, may be more concerned about maintaining levels of production or employment than about covering costs with receipts. Even with the current revolving fund, if a depot's revenues fall below its costs, the solution

7. Statement of Donna M. Heivilin, April 12, 1994.

8. The Federal Reserve takes those factors into account when it sells banking services in competition with private providers by including a pretax rate of return on capital (equal to 8.6 percent in 1993).

9. From 1986 to 1993, DoD invested approximately $5 billion (in 1995 dollars) in buildings and equipment for its depots. Investment in depot buildings averaged approximately $200 million annually, and investment in depot equipment averaged $350 million. To estimate the current value of DoD's depot assets, the Congressional Budget Office assumed that those figures reflected DoD's historical investment pattern. Annual expenditures of $200 million per year on buildings, assuming straight-line depreciation over 50 years, would lead to a steady-state building inventory with an estimated value of $5 billion. Annual expenditures of $350 million per year on equipment, assuming 20-year straight-line depreciation, yield a steady-state inventory of equipment of $3.5 billion. Those estimates exclude the value of land and the value of special tooling paid for with procurement dollars.

10. Jane Gravell, *The Economic Effects of Taxing Capital Income* (Cambridge, Mass.: MIT Press, 1994), pp. 294 and 295. The author estimates that the real pretax rate of return on capital in the United States is approximately 7 percent. If inflation is figured at 3 percent, the nominal pretax return is then 10 percent.

will be either additional appropriations to cover the shortfall or a general increase in prices spread over the services' revolving fund as a whole.

Weaknesses in DoD's current accounting methods accentuate the incentive problem. Because DoD cannot identify the total costs of individual workloads, no reliable way exists to determine whether managers' bids are realistic. Even after a depot completes a task, there is no way to know whether it met its cost targets through real economies or simply shifted costs to other workloads. When Navy depots won a competition for maintenance on some of the service's F-14 fighters, not only were costs higher than projected but the accounting system indicated that costs for the F-14s that were part of the competed workload were 21 percent lower than costs for other F-14s--even though the depots performed the maintenance for all of the aircraft in the same repair lines, sharing the same resources.

DoD could certainly overcome the weaknesses in its accounting systems, and it could include an allowance for income taxes and profits in its *Cost Comparability Handbook*. But the differences in the incentives faced by public and private producers probably cannot be overcome without destroying the fundamental differences between the two modes of production. Moreover, the ability of both public and private bidders to win competitions based on cost is not necessarily evidence that the playing field is level. It might indicate instead that the expected advantage of the private sector in cost-effective production is sometimes more than offset by an uneven playing field.

Advantages of the Public Sector

Although in general the results of public/private competitions are suspect, public depots are currently able to perform some tasks for a lower cost than either the original equipment manufacturer or private firms that specialize in repairs. The Air Force's program for replacing the center wing box on C-141 aircraft is one such example. The accounting firm of Coopers & Lybrand, in reviewing that program, concluded that however misleading the bid estimates may have been, the public depot that won the competition was, in fact, the least-cost source. That finding raises some legitimate questions about differences in the costs of public and private production. Why and in what situations might public facilities produce at less cost than private ones?

Because experience with a particular maintenance task can result in lower costs, the public sector is likely to have an advantage, at least in the near term, for tasks that in the past have been done only in that sector. Coopers & Lybrand, in explaining why the Air Force depot was the least-cost source for the C-141 wing box replacement, cited the inherent advantage that arose from having responsibility for C-141 maintenance for over 20 years.[11] Similarly, a review by the General Accounting Office of competitions for work other than ship repair found that the private sector won 10 of 15 workloads that had originally been performed in that sector and the public sector won 28 of 41 that had originally been done in that sector.[12]

Public depots may also have an advantage because they are large, integrated facilities that in some cases have the latest and most specialized repair technologies. That notion is consistent with the economics literature, which suggests that in-house producers of a good or service will typically use more highly specialized capital and production processes than do other suppliers. (Those suppliers in many instances try to reduce their risk by using general industrial assets and processes that may be less efficient but have more alternative uses.)[13]

In the case of depot maintenance, DoD's policies appear to accentuate that difference between in-house and other suppliers. For items that are repaired in both sectors, DoD's practice is to fill the public de-

11. Coopers & Lybrand, *Preliminary Case Studies of Public Versus Private Competition* (Washington, D.C.: Coopers & Lybrand, July 1994), p. 1.

12. Letter from Donna M. Heivilin, Director, Defense Management and NASA Issues, National Security and International Affairs Division, General Accounting Office, to Daniel K. Inouye, Chairman, Subcommittee on Defense of the Senate Committee on Appropriations, GAO/NSIAD-93-292R, September 30, 1993, p. 11.

13. Oliver E. Williamson, *The Economic Institutions of Capitalism* (New York: Free Press, 1985), p. 32. Of course, failing to consider the full cost of capital might encourage DoD depots to carry investment beyond the point where it is cost-effective.

pots first and then contract for the overflow work. For many of those workloads, DoD uses contracts for indefinite quantities, including so-called requirements-based contracts, that permit it to vary the quantity of work over a wide range. Such variable workloads might not justify specialized investment regardless of the sector that handles them. Today, relatively few repair firms in the private sector approach the DoD depots in levels of employment and specialized assets. But a private sector characterized by larger firms with better facilities would be likely to emerge if DoD decided to contract for its largest, steadiest maintenance tasks.

Public depots may gain another advantage from their large, steady workloads. In many cases it is cost-effective to carry out modifications and routine depot-level maintenance at the same time. Because the services keep routine maintenance for many systems in the public depots, assigning modifications to the depots as well is sometimes the most cost-effective approach. That factor suggests that allocating individual workloads to the sector that can handle them for the least cost today will fail to identify the most cost-effective roles for the public and private sectors over the long run. That premise applies whether the current least-cost producer is identified through formal competition or through analysis.

In looking at the long run, the appropriate question may not be whether public depots currently have the most experience and the best facilities (or perhaps the only facilities) for particular kinds of work. It may be better to ask whether private industry or mixed enterprises, working with DoD in a long-term relationship, might be able to develop even less costly production processes for many maintenance tasks and still provide the quality and responsiveness essential to the military. Neither the mechanistic calculations underlying DoD's core policy nor the invisible but uneven hand of public/private competition addresses that difficult question.

Chapter Six

Benefiting from the Strengths of Public, Private, and Mixed Production

Rather than relying on the core method or on public/private competition, the Department of Defense could divide its maintenance work among public, private, and mixed modes of production in a way that takes advantage of each one's particular strengths. DoD would evaluate and assign its workloads based on whether they had characteristics that would forestall competition in the private sector or make contracting risky or costly. That approach would take account of the advantage public production offers as a controlled source that does not require contracting (an advantage that public/private competition negates). But at the same time, it would permit trade-offs between the disadvantages of contracting and the advantages of private production in a competitive environment (trade-offs that the DoD core approach does not allow).

Although such an approach is conceptually sound, it would depend on complex and necessarily subjective judgments about the costs and benefits of allocating individual workloads to one sector or the other. In so doing, it would lack the superficial appearance of objectivity that the mechanistic core method and public/private competition enjoy. Moreover, the wide latitude that this approach would offer the services (the organizations best qualified to analyze those costs and benefits) makes its consistent application problematical.

In the past, the Office of the Secretary of Defense and the Congress have tried to provide oversight and ensure consistency by imposing constraints on the shares of each service's maintenance going to the public and private sectors. If OSD and the Congress wish to maintain such constraints in the future, they could base them on a broad analysis that would identify, in aggregate terms, the shares of its maintenance workloads that DoD might appropriately allocate to public, private, and mixed modes of production. The services, with their more detailed knowledge, would be free to determine (within those overall constraints) which workloads should go to each mode. The Congress might specify an overall share for DoD as a whole, or it might specify allocations based on broad classes of work (for example, fixed-wing cargo planes). Because the mix of maintenance work differs among the services, however, it would be inappropriate to require them to use public, private, and mixed production in the same proportions.

What kind of a division of maintenance might such a broad analysis suggest? In the sections that follow, the Congressional Budget Office (CBO) reviews DoD's maintenance needs in the post-Cold War era at a very general level. That review suggests that allocating workloads based on their characteristics would increase the share of work done in the private sector on a competitive basis and decrease the share done in public facilities. In today's national security environment, neither the risks of relying on contractual relationships, the indirect benefits that DoD gains from being involved in depot maintenance, nor the peacetime costs of public versus private maintenance appear to justify a dominant role for public production.

The Risks of Relying on Contractual Relationships

The requirement that DoD maintain a "ready and controlled source" of maintenance reflects concern about the risks of relying on contracts with private firms. The fear is that private contractors might not provide the quality of work necessary to support a ready force in peacetime and might not respond in a timely way to DoD's rapidly changing needs in wartime. No definite conclusion is possible, but the presumption that only public facilities can provide the needed level of support for equipment required by the Joint Chiefs of Staff's scenario does not appear to be well-founded.

Quality and Timeliness in Peacetime

Concerns about the quality and timeliness (which may be viewed as a component of quality) of maintenance performed by contractors in peacetime do not necessarily stem from a conviction that private firms are intrinsically less competent than public depots. Rather, such concerns may arise because contractors, as private firms, are more intent than public facilities on holding down costs. As a result, DoD may have to monitor private firms more carefully than it would the public depots to ensure quality.

In general, DoD may be able to mitigate the risk of poor-quality work by contractors (including slippages in schedules) if it can specify clearly in the contract the quality of work it requires and if it can easily determine when that level of quality has been achieved. Moreover, private contractors may strive on their own for quality, even if it is difficult to measure and becomes evident only after the fact, if they benefit from a long-term customer relationship that depends on their reputation for good work. (The concept of "total quality management," with its emphasis on doing jobs right the first time, originated in the private sector.)

The available evidence, much of which is anecdotal or based on expert judgment, gives some support to the idea that DoD can obtain high-quality maintenance by using contracts. One study conducted by the Center for Naval Analyses examined the percentage of time that ships were free from mission-degrading failures in equipment. It found no difference between ships maintained in the public and private sectors.[1] Moreover, officials from the Naval Sea Systems Command (the organization with the most experience in relying on contractors to maintain frontline weapons) have expressed equal satisfaction with the quality of work done in public and private shipyards.[2] In the past, the Navy has questioned the wisdom of moving its missile workload to a central location within DoD, arguing that it had obtained high-quality service from the private sector.

For original equipment manufacturers (for which maintenance work is of secondary concern), the reputation of their firm and its products may be an especially important factor in ensuring quality. But specialized repair firms also appear to be aware of the advantage in being known for quality work. One recent advertisement for a firm specializing in aviation maintenance consisted of quotations from letters of commendation from the Navy, the Army, and the Air Force. The letters noted the firm's "uncompromising standards," "first-rate maintenance team effort," and "pro-active quality consciousness."

Yet some areas of concern remain. Anecdotal evidence suggests that both public and private maintenance facilities can experience problems when they first take on a particular workload. Because getting the best price for a job in the private sector requires periodic recompetition for the work, tasks that are handled on a competitive basis by private firms might be moved more often than work done in public facilities. DoD could overcome the need for new contractors to start up repair lines by maintaining dual sources for each workload and allowing those sources to compete for the larger share. That approach could, however, sacrifice economies of scale.

1. John D. Keenan and others, *Issues Concerning Public and Private Provision of Depot Maintenance*, CRM 94-65 (Alexandria, Va.: Center for Naval Analyses, April 1994), p. 7.

2. This view was expressed to the Congressional Budget Office in a briefing by representatives of the Navy, September 15, 1994.

Another risk to quality may arise when the OEM performs repair work with the same resources that it uses in new production. The Navy moved submarine overhauls to its own shipyards in the late 1970s and the 1980s in part because of delays in schedules that emerged in the private sector when demands for new ship construction increased.[3] However, that problem may not reflect any intrinsic difference between public and private production. If DoD believed that the cost of maintaining private facilities dedicated to repairs was justified, it could restrict its maintenance contracts to those facilities. A more fundamental problem that the Navy's experience highlights is that responsiveness, like low cost, may be difficult to obtain in the private sector unless DoD is able to maintain a competitive environment.

Wartime Surge Capability

The ability of public depots to increase production by moving to two or three shifts in wartime may not, by itself, justify a large role for those facilities. As noted earlier, the limited surge in maintenance on major end items during regional conflicts will derive from efforts to complete work rapidly on equipment that is already undergoing maintenance. A system that emphasizes rapid turnaround by using multiple shifts in peacetime might be better suited to meet that requirement than a single-shift peacetime operation with slower turnaround.[4] If a primary rationale for public depots is their ability to accommodate a sudden surge in workload, DoD could probably move routine scheduled maintenance of major end items--ships, tanks, and aircraft--to the private sector.

For those items that will require a surge in maintenance during a major regional conflict--including engines and some mission-essential components--the evidence about the relative surge capabilities of the public and private sectors is ambiguous. DoD has maintained public depots in part because it believes that, unlike firms in the private sector, the depots can maintain excess capacity in peacetime expressly for surge purposes. As an empirical matter, however, it is not clear that the public sector intentionally burdens itself with that kind of capacity to meet wartime needs. According to one industry expert, the private-sector standard of operations is 1.3 shifts.[5] That level does not differ greatly from the pattern in public depots, where small swing shifts are common. Moreover, current Air Force policy assumes that private producers are able to surge to 150 percent of their peacetime workload whereas public depots are able to surge to 160 percent. The difference is not large, given the degree of uncertainty that surrounds such estimates.

DoD finds it cost-effective to rely on the private sector to handle fluctuations in its workload in peacetime, and that fact suggests that the private sector has a great deal of flexibility. Moreover, to the degree that private repair firms use the same resources for their DoD and their commercial work, they might find it easier than a public depot would to absorb changes in the military's workload.

Nevertheless, one factor that limits the flexibility of outside contractors is the need to renegotiate contracts as requirements change. DoD has tried to overcome that difficulty by adopting forms of contracts that leave room for future negotiation or change. For example, the services and private firms have entered into some basic ordering agreements setting the hourly rates that will be charged for maintenance. When the service has a job that falls under the scope of an existing agreement, it can simply place an order for the work. Or the services can use indefinite-quantity contracts that specify a fixed price for different tasks but allow the service to determine the amount of work to be provided.

3. Naval Sea Systems Command, Naval Shipyard and Supship and Field Activity Support Directorate, *Report of Naval Shipyard Core* (January 26, 1994), p. 5.

4. Because passenger and cargo planes and cruise ships do not produce revenue while they are undergoing maintenance, private owners of those assets place a high premium on rapid turnaround. Commercial airlines typically require major repairs on airframes and engines to be completed in approximately three weeks. In contrast, overhauls of military aircraft generally take from two to six months, although part of the difference reflects the more extensive nature of the overhauls. See Phil Fox, *Analysis of Naval Aircraft Depot Core Maintenance Capabilities and Naval Aviation Industrial Base Issues* (Patuxent River, Md.: Naval Aviation Depot Operations Center, March 1994), p. 21.

5. Jacques S. Gansler, *The Defense Industry* (Cambridge, Mass.: MIT Press, 1980), p. 173.

Those flexible forms of contracting are already in wide use for maintenance work. In 1993, orders placed under basic ordering agreements and indefinite-quantity contracts accounted for 26 percent of the funds DoD obligated for maintaining its equipment. Modifications of existing contracts accounted for another 59 percent of obligated funds. Only 15 percent of obligations went toward new contracts.[6]

Flexible contracting arrangements may be most effective in situations in which DoD and its suppliers have long-term, cooperative relationships based on mutual trust underpinned by shared interests. When such relationships can be established, the general proposition that in-house producers are more responsive than contractors to changing requirements may be outweighed by the greater freedom that private contractors have to reallocate resources in response to their customers' needs.

More generally, if DoD can determine in advance the requirement for a surge in production, it may be able to contract with the private sector to maintain the capacity needed for that surge. DoD already has such arrangements in some areas. Many Army ammunition plants, for example, are owned by the government but are operated by private firms under contracts that call for them to maintain surge capabilities.

Risks Imposed by the Use of Voluntary Contracts

The private sector may have the capabilities that DoD would require in wartime, but a risk remains that contractors might not respond adequately in specific cases because DoD would be relying on contracts rather than direct commands. Anecdotes from the Gulf War reveal instances in which the private sector responded well (by shutting down commercial production and working seven-day weeks). Yet they also note occasions on which DoD turned to its own depots after the private sector apparently failed to respond.[7] Supporters of public depots point as well to the risk that a strike could limit the ability of private firms to perform the needed tasks.

Those risks may not be decisive, however. DoD already depends on private manufacturers to produce almost all of the equipment and supplies that it will use in wartime. Moreover, the legal safeguards that are designed to keep contract disputes or strikes among defense manufacturers from jeopardizing national security also apply to repair firms. Title I of the Defense Production Act of 1950, for example, allows the President to require acceptance and performance of contracts "necessary or appropriate to promote the national defense."[8] That authority, which the President has delegated to the Secretary of Commerce, does not require a declaration of a national emergency. In addition, the Labor-Management Act of 1947 (the Taft-Hartley Amendment) authorizes 80-day court injunctions to halt or prevent strikes that "if permitted to occur or to continue will imperil the national health or safety."[9]

Such legal remedies cannot, however, overcome the risk of delays in wartime that could occur if DoD had to negotiate with private repair firms. By using flexible contracts with explicit provisions for a surge in production during a regional conflict, DoD could partially offset that risk for standard repairs that the department foresees might increase in wartime. Yet new and entirely unforeseeable requirements are likely to emerge in any conflict. They might be small jobs that are important in terms of the war effort but that would force the prospective supplier to disrupt its normal commercial operations without promising significant profits. In such circumstances, having to negotiate voluntary agreements with private producers (rather than simply ordering a public depot to undertake the task) may be especially risky.

A large system of public depots with diverse manufacturing capabilities might enable DoD to meet those unforeseeable needs. But the core of skills and resources that DoD would keep in its depots if those

6. These figures are based on contracts for maintenance at the organizational, intermediate, and depot levels.

7. Office of the Deputy Under Secretary of Defense for Logistics, *Integrated Management of DoD Depot Maintenance Activities*, vol. 1, *Study Results* (October 1993), pp. 2-14 to 2-17.

8. 50 U.S.C. 2071; 64 Stat. 799.

9. 29 U.S.C. 178, 179; 61 Stat. 155, 156.

needs constituted its criterion might be quite different from those required to conduct efficient, routine maintenance on major end items in peacetime. Furthermore, today's wartime scenarios differ from those developed during the Cold War in that they do not call for full-scale mobilization of the nation's industrial sector. Because U.S. industry in general, and the OEMs in particular, will not be fully occupied with war production, their resources could be available to DoD for maintenance work. Even though OEMs are generally not a cost-effective source of repairs in peacetime, it might be cheaper to turn to them in wartime than to maintain excess capacity in peacetime.

Rather than try to maintain its own industrial repair base, DoD might consider whether it needs additional safeguards to ensure immediate access to private industry when necessary to promote national security. For example, as a cost of doing business with the military, DoD could require OEMs to agree to provide specific industrial resources in an emergency. That approach might give DoD broader and more versatile support in wartime than the current system of public depots, which cannot duplicate the scope and depth of the manufacturing and repair capabilities available in the private industrial base.

Indirect Benefits from DoD's Role in Depot-Level Maintenance

Public depots may, by their nature, produce some indirect benefits that private contractors cannot. For example, the experience that DoD logisticians gain in public depots may provide them with the knowledge they need to be smart buyers of maintenance services. Public depots may offer a training ground for military and civilian personnel who would be deployed to the war theater to repair equipment as members of battle-damage teams. Public depots may also allow a closer relationship between users and maintainers than would be possible with contractors. Finally, some analysts argue that public depots may be the "last source of repair" for obsolete equipment with small, erratic workloads that would not interest private producers.

Each of those arguments appears to have some validity. But how much weight should they get, or, alternatively, how much public capability would they justify? In many cases, the benefit is something that DoD might be able to secure in other ways. For example, DoD/industry exchange programs could create smart buyers by rotating DoD civilian and military personnel through private firms. Private firms could provide their own battle-damage teams, or, if DoD wanted more direct control, the military might enlist employees of those firms (many of whom have past military experience) in the Selected Reserve. Finally, to encourage contractors to take on small, erratic workloads for obsolete components, DoD could contract with a private firm not for each individual component but to maintain the capability to do a wide range of those workloads (with additional payments based on the work the contractor performs). Maintaining that kind of capability in the private sector may be expensive, but maintaining it in the public sector may not be any less costly.

The Peacetime Cost of Public, Private, and Mixed Production

Even when contracts can be written to ensure both quality and responsiveness, the cost of private production might exceed that of public or mixed production for some workloads. Higher costs could result because of the expense involved in negotiating and monitoring those contracts or because economies of scale or scope, coupled with the need for specialized capital or skills, might restrict effective competition among private firms. The absence of competition does not preclude a favorable outcome, since the bargaining power of DoD as a single (monopsonistic) buyer may counterbalance the power of a monopolistic provider. But a lack of competition may reduce the cost advantage offered by the private sector while increasing the risk of poor-quality or nonresponsive support.

Economic Risk for Current Private-Sector Workloads

A review of the funds that DoD obligated for equipment maintenance in 1993 offers some insight into the extent of competition in that area and the types of contracts that the department uses for maintaining its equipment. Of the $3.8 billion that DoD obligated for maintenance during 1993, 66 percent was for contracts awarded competitively (rather than to a sole source), and 71 percent was for work based on a fixed price rather than on the costs that a contractor ultimately incurs (as in cost-plus or time-and-materials contracts).[10] DoD appears to use competition for equipment maintenance contracts somewhat more than it does for purchasing goods and services in general: only 50 percent of all DoD's purchases in 1993 resulted from competitive solicitations.[11]

Over 90 percent of the funds obligated for equipment maintenance went for work in 12 categories of federal procurement (see Table 2). DoD's ability to get a competitive price for maintenance work in any one of those categories may differ based on three factors: the percentage of dollars awarded noncompetitively, the percentage obligated to the four firms with the largest dollar value of awards (a measure of the degree of industry concentration), and the percentage awarded on a cost-plus or time-and-materials basis.

To determine the relative degree of cost risk (the risk that DoD might not get a competitive price from the private sector for its maintenance work), CBO ranked the 12 categories by those factors (see Box 3). The categories with the highest risk based on at least two factors are maintenance of fire-control equipment, guided missiles, and electronic components. Categories with the lowest risk based on at least two factors are maintenance of airframes, engines, surface ships on the East Coast, and training devices. The lowest-risk categories include some of the largest workloads that DoD contracts out. Of the dollars obligated for maintenance in the 12 categories in 1993, 60 percent was for work in the lowest-risk categories, and 10 percent was for work in the highest-risk categories.

The extent to which DoD's current contract workloads are subject to competition, however, may not accurately indicate whether the work that remains in its depots could be put out for bid in the private sector. Workloads for airframes and ship repairs may

Table 2.
Funds Obligated by the Military Services for Equipment Maintenance, 1993

Commodity Type	Millions of 1993 Dollars	Percentage of Total
Airframes and Structural Components	1,217	32
East Coast Ship Repair	552	15
Communications and Radar	296	8
West Coast Ship Repair	254	7
Training Devices	227	6
Aircraft Components	223	6
Small Craft, Floating Docks, and Related Equipment	200	5
Guided Missiles	176	5
Ground Vehicles	139	4
Electronic Components	103	3
Engines and Components	81	2
Fire-Control Equipment	66	2
Other	222	6
Total	3,756	100

SOURCE: Congressional Budget Office based on data from individual contract action reports in the Federal Procurement Data System.

NOTE: These figures include obligations for equipment maintenance at the organizational and intermediate levels as well as at the depot level.

10. CBO derived these figures from the individual contract action reports in the Federal Procurement Data System. The figures include maintenance at the organizational and intermediate as well as at the depot level. CBO excluded some equipment codes (including the one for laundry and dry-cleaning equipment) that were not clearly related to military needs. The most important excluded category was for maintaining commercial automatic data processing equipment.

11. Department of Defense, Directorate for Information, *Prime Contract Awards for Fiscal Year 1993*, PO3 (no date), p. 35.

Box 3.
Maintenance Workloads in the Private Sector by Level of Cost Risk and Risk Factors, 1993

Cost risk, or the likelihood that the Department of Defense (DoD) will not get a competitive price for a maintenance task, depends on a number of factors. Among them are whether DoD can select the contractor through a competitive process, how many competitors there are, and whether the department can pay a fixed price for the work. The figures below are based on dollars obligated during 1993 for equipment maintenance at the organizational and intermediate levels as well as at the depot level.

Absence of Competition		Industry Concentration		Use of Cost-Type Contracts[a]	
Commodity	Percentage Not Awarded Competitively	Commodity	Percentage Awarded to Top Four Firms	Commodity	Percentage Awarded
Highest Cost Risk					
Fire-Control Equipment	95	Fire-Control Equipment	91	Ground Vehicles	83
Guided Missiles	92	Guided Missiles	75	Fire-Control Equipment	63
Communications and Radar	63	West Coast Ship Repair	69	Guided Missiles	46
Electronic Components	59	Aircraft Components	68	Electronic Components	43
Medium Cost Risk					
East Coast Ship Repair	41	Small Craft, Floating Docks, etc.	60	West Coast Ship Repair	27
Small Craft, Floating Docks, etc.	40	Ground Vehicles	59	Communications and Radar	27
Aircraft Components	33	Engines and Components	51	Small Craft, Floating Docks, etc.	26
Training Devices	32	Electronic Components	50	Airframes and Structural Components	26
				Aircraft Components	24
Lowest Cost Risk					
Engines and Components	24	Training Devices	44	East Coast Ship Repair	19
Airframes and Structural Components	23	Communications and Radar	42	Training Devices	12
West Coast Ship Repair	4	Airframes and Structural Components	39	Engines and Components	3
Ground Vehicles	3	East Coast Ship Repair	38		

SOURCE: Congressional Budget Office based on data from individual contract action reports in the Federal Procurement Data System.

a. Cost-type contracts are those awarded on a cost-plus or time-and-materials basis.

appear to be relatively low risk because DoD has already assigned to the private sector those jobs for which competition is most easily arranged. Similarly, workloads for maintenance on fire-control equipment, missiles, and electronic components may appear to be high risk simply because the services may rely on the OEM in the private sector to maintain the most specialized equipment on a sole-source basis. The fact that the Air Force keeps a larger percentage of its workload for components of cargo air-

craft in the public depots than it does components for fighter and attack planes supports that view. Also potentially misleading is how much of the work goes to the top four firms--since the number of firms in the private sector depends on the level of work that DoD provides.

Because repairs on airframes, aircraft engines, and ships account for a significant share of the current maintenance in public depots, a review of the potential for private-sector competition for those workloads is particularly useful. Some of the ships and airframes that DoD now maintains in its depots are similar to those already being handled competitively in the private sector. For those workloads, the feasibility of a competitive private sector has already been demonstrated. For other tasks now being done in the public sector, a competitive private sector, although not now in evidence, might be expected to develop if DoD released the work. Finally, some workloads, particularly those that can be done most efficiently by a single producer using specialized knowledge and capital, cannot be handled in the private sector through competition.

Public Workloads Similar to Those Handled by a Competitive Private Sector

In some cases, the private sector has already demonstrated that it can sustain a competitive industry for repairs on equipment that DoD currently maintains in the public sector. Examples might include workloads for engines and airframes of cargo aircraft (and for airframes of tankers or surveillance planes with similar characteristics and large workloads) and for maintenance on surface ships (excluding nuclear ships and carriers). This type of work appears to account for between 30 percent and 40 percent of the maintenance on airframes, aircraft engines, and ships that DoD now performs in its aviation depots and shipyards. (However, the ability of the private sector to handle such work competitively over the long run does not mean that it has all of the skills and equipment to take over that work in the near term.)

Contrary to what some DoD analyses suggest, wide use of an airframe or engine in the commercial market is not necessary to ensure competitive sources of maintenance in the private sector. Competitive bidding simply requires that multiple firms have access to the skills and equipment needed to provide the maintenance for DoD. In some cases, DoD may have more leverage as the only customer than as one customer among many.

Airframes and Engines. Airframes and engines similar to those maintained in the private sector account for a significant share of the work in public aviation depots. Cargo, tanker, or surveillance planes that either are directly derived from commercial airframes or have similar characteristics (and large workloads) make up slightly more than 50 percent of the maintenance on fixed-wing airframes that Air Force depots performed in 1993. Three types of aircraft (the C-130, the C-135, and the C-141) account for 78 percent of the Air Force's in-house workload for cargo, tanker, and surveillance airframes. Similarly, cargo, tanker, and patrol planes (primarily the C-130 and the P-3) make up 36 percent of the Navy's in-house workload for fixed-wing airframes.

Engines and engine accessories used on cargo, tanker, and surveillance planes account for 36 percent of the maintenance performed by Air Force depots on engines and engine accessories in 1993. About 25 percent of the maintenance on engines done in Navy depots in 1993 was on engines that are either equivalent to or derived from commercial engines. Among the DoD engines that are derivatives of commercial engines but are maintained in public depots are the TF33 (used on the C-141 and the B-52), the TF34 (used on the A-10 and the S-3), the T56 (used on the C-130 and the P-3), and the F108 (used on the C-135). Both the size of those workloads and their similarity to work that is already being handled through competition in the private sector suggest that if DoD decided to contract for that maintenance, a competitive private industry capable of doing the additional work would develop.

If DoD gave more of that engine and airframe maintenance to the private sector, what kinds of firms would do the work? Much of it would probably be absorbed by existing firms that specialize in maintenance and that would expand to accommodate it, by additional repair firms that would come into being, or by OEMs that maintain separate repair

facilities--with their separate rates of overhead. The facilities that the OEMs use to produce new aircraft have large amounts of excess capacity, but they also have high overhead rates to support engineering and design capabilities that maintenance does not generally require. As a result, even though the OEMs are often the sole source in the private sector for maintaining the fighters and bombers that they build, they have had little success in bidding for competitive maintenance contracts.

Firms that specialize in repair rather than manufacturing commonly win competitive contracts from DoD for maintaining airframes and engines. In 1993, the largest dollar awards for airframe maintenance went to Dyncorp and Pemco Aeroplex; both firms specialize in repairs. DoD also relies heavily on specialized repair firms (including Ryder Aviall, Aerothrust, and Chromalloy Gas Turbine Corporation) rather than the OEMs for contract maintenance on engines.

Ships. The Navy's analysis of the risks associated with contracting for different types of ship maintenance identified only two classes of ships--carriers and nuclear attack submarines (SSNs)--with an "absence of an assured competitive private sector."[12] It assumes that competition is possible for all other classes of ships. Based on that criterion, from 1993 through 1995, about 30 percent of the funds spent in public shipyards from the Navy's Ship Depot Maintenance Program (a category that excludes modernizing and inactivating ships) were for maintenance for which a competitive private sector exists. In some analyses, large-deck amphibious ships are also considered noncompetitive because they are beyond the capacity of many dry docks. If they are excluded, the percentage of work in the public shipyards for which DoD would have found a competitive private sector becomes 25 percent.[13]

What proportion of future public workloads will be tasks that cannot be handled competitively in the private sector? According to the Navy's plans, public shipyards in 1999 will devote 28 million direct labor hours to maintenance on or inactivations of carriers and SSNs, tasks for which the private sector cannot ensure competition. That figure is equal to 70 percent of the public shipyards' planned 1999 workload. If one counts large-deck amphibious ships as well, the percentage rises to roughly 75 percent.[14] Those estimates suggest that the Navy could use competitive bidding to assign from 25 percent to 30 percent of its planned public workloads to firms in the private sector.

DoD could shift additional overhauls of surface ships to private shipyards without stretching the capacity of that sector because both construction and repair yards are operating well below their potential. One estimate puts the excess at nearly 100 million direct labor hours, which is more than twice DoD's total planned public workload.[15] Shipyards that specialize in repair rather than construction might absorb much of DoD's work. In 1993, two repair firms, Metro Machine Corporation and Norfolk Shipbuilding and Drydock Corporation, received the most government funding for maintenance on the East Coast. On the West Coast, the two firms with the largest awards, Southwest Marine Incorporated and Continental Maritime, were also repair yards.

Shipbuilders could also play a role, however. In 1993, the major East Coast shipbuilders (Newport News, Ingalls, General Dynamics, and Bath Iron Works) were among the eight East Coast firms that received the most DoD funding for maintenance. Because shipbuilders handle both construction and repairs in dry docks on an individual basis and not on

12. Naval Sea Systems Command, *Report of Naval Shipyard Core*, p. 9.

13. An alternative assessment offered by a senior naval officer in a September 1994 briefing of CBO is that a competitive private sector exists for all work except dry-dock repairs for large-deck ships whose home port is on the West Coast, overhauls of nuclear-powered aircraft carriers, and nuclear refueling and disposal of reactor vessels for submarines. The potential for private-sector competition for the maintenance work now being performed in the public sector would be greater under that assessment, which assumes that Electric Boat and Newport News could compete, as they have in the past, for routine overhauls of submarines.

14. These figures account for the total public workload, including modernizations, refueling overhauls, and ship inactivations. They assume a 1999 inventory of 55 SSNs. Reductions in planned inventories of SSNs would lessen both the total maintenance requirement for public shipyards and the percentage of that requirement associated with noncompetitive workloads.

15. Office of the Under Secretary of Defense for Acquisition and Technology, *Report of the Defense Science Task Force on Depot Maintenance Management* (April 1994), p. 16.

a production line, those that perform maintenance or modifications in many cases are able to do that work in the same facilities that would otherwise be used for construction.

One factor that limits competition for ship maintenance is the desire to keep ships near their home ports during repairs. Crew members usually stay with their ships to work on routine maintenance tasks while the ship is being overhauled. When the Navy sends ships away from their home ports for overhauls, it bears the costs of moving the ship and of housing and feeding sailors at the maintenance site, as well as the costs imposed by lowered morale among sailors who may be separated from their families. Because of those factors, the Navy restricts competition for ship maintenance that takes less than six months to shipyards in the ship's home port area. It opens competitions to other shipyards only if there are fewer than two competitors in the ship's home port area.[16]

An alternative approach that might better ensure competition would be for the Navy to open the competition to all bidders on a particular coast, identify how much it was worth to keep the ship in its home port area for a particular maintenance task, and then add that amount onto bids from outside the home port area. Some such cost differential would be appropriate even for maintenance lasting more than six months. (In competitions for maintenance on the East Coast, the Navy currently adds the cost of moving ships to the bids of shipyards located outside the ship's home port area. It does not, however, make an allowance for all of the personnel costs associated with the move.)

This approach has several advantages. It would permit the Navy to keep work in a ship's home port in situations in which the port can support only one shipyard and that shipyard--because of the erratic nature of local work or its small scale--is somewhat more expensive than other yards on the same coast. It would also provide a strong incentive for shipyards to establish capabilities in home port areas. At the same time, the approach would allow work to move away from the home port in cases in which the area has more than one shipyard but the best local bid, even after allowing for the disadvantages of moving the ship and crew, is not as attractive as the bid offered by a more distant yard. To encourage further the development of competition in home port areas, the Navy might expand its current program of leasing floating dry docks in home ports to ship repair firms.[17]

Work That Might Have the Potential for Competition

DoD has other maintenance tasks that might be able to elicit competition in the private sector but for which that potential has not yet been demonstrated. Such maintenance includes workloads that are not closely related to commercial work and that might require a significant investment in specialized skills and capital, but that are large and steady enough to be attractive to firms with enduring relationships with DoD or for which the specialized assets are mobile and can be provided by DoD through a lease. Effective competition can exist even if economies of scale dictate that only one firm does the work at a time--provided that the experience the firm gains in fulfilling that contract does not rule out credible competition for subsequent contracts.

Airframes and Engines. Examples of aircraft maintenance that might fall into this category are routine depot-level repairs on airframes for established combat aircraft with large inventories. (Those aircraft might include the A-6, the A-10, the AV-8B, the B-52, the F-14, the F-15, the F-16, and the F/A-18.) Routine maintenance on the engines of combat aircraft that have large inventories and workloads (such as the F100, the F110, the F402, the F404, the J52, and the TF30) might also be able to support competition in the private sector.

16. If two competitors in the ship's home port area cannot be found, the Navy opens the competition to firms in the nearest adjacent home port. If two competitors still do not appear, the Navy opens the competition to firms on the entire coast.

17. In 1991, the Navy leased or had planned to lease 12 dry docks to private firms. To keep the playing field level between producers that provide their own dry docks and those that lease them from the Navy, the cost of such leases should cover the full cost of maintaining the dry dock plus a market return on the capital. In the current market, however, the market value of dry docks--and thus the cost of using that capital asset--may not be very great.

In 1993, four basic types of aircraft--the A-10, the B-52, the F-15, and the F-16--accounted for one-third of the maintenance on fixed-wing airframes in Air Force depots and half of the workload for engines and engine accessories. Three types of aircraft--the A-6, the F-14, and the F/A-18--accounted for 39 percent of the maintenance on fixed-wing planes in Navy depots. The engines associated with those aircraft (the J52, the F110, the F404, and the TF30) accounted for 49 percent of the Navy's public-sector workload for engines.[18] However, DoD is reducing its inventories of some aircraft with large maintenance workloads (such as the A-6), and consequently, those workloads might not attract private firms. Small numbers of aircraft needing maintenance are likely to appeal to private producers only if they already have the skills and capital required for that work.

Independent repair firms that are not affiliated with the OEM have, in many cases, limited experience with these combat aircraft and their engines. Nonetheless, the history of public/private competition for DoD maintenance suggests that those workloads may attract multiple private bidders. In competitions for standard depot-level maintenance for the F-14 in 1988 and for the paint and corrosion control program for the F/A-18 and the workload for the J52 engine in 1993, two private firms bid for the contracts in addition to the public depots that won the competitions.[19] The opportunity to compete for contracts that offer large, steady workloads would probably generate even more interest, particularly if DoD had the option to extend the contract for additional years and agreed to lease the specialized equipment needed to perform the maintenance to the winning bidder.

Despite the differences between combat and cargo aircraft and engines, the skills and resources required for maintaining them overlap substantially. One of the arguments that DoD has used to keep CFM56 engines--a commercial derivative--in public depots is that the equipment and skills required to maintain that engine are similar to those required for the F108 series of engines used on fighter aircraft. The Air Force's experience with Korean Airlines demonstrates that firms other than the OEM can maintain fighter planes. Although the Air Force uses its own depots to maintain F-15 fighters in the United States, many of its F-15s overseas are maintained by the Korean firm. Costs may initially be higher as repair firms gain expertise, but over time, competition among firms in the private sector may lead to innovations in repairs and significant reductions in costs.

Allocating workloads for aircraft and engines through competition could pose some difficulties, however, even after the private sector had established the capabilities necessary to do the work. Because of the costs of moving workloads and the risk that a new repair line might run into problems, DoD might choose to rely on two firms for each type of aircraft and reward the producer that had the lowest costs with a greater share of the work. But even with the workloads concentrated in that way, private facilities might be less integrated than current DoD depots. Firms might subcontract for special tasks, such as the repair of composite materials, rather than handle them alone. That kind of approach could lead to more efficient use of specialized capital assets; it might also, however, make DoD dependent on a complex series of private contractual relationships.

Obtaining the cooperation of OEMs is another hurdle that DoD would face in establishing competition for maintaining these aircraft and engines. Public depots depend on OEMs to provide the knowledge required to maintain new systems that are moving from interim contractor support to maintenance at the depots. Transferring skills and knowledge from an OEM to a private repair firm that the OEM might view as a competitor for maintenance work would be more difficult. In many cases, DoD now purchases technical data rights under arrangements that permit their being used only by public depots.

The potential problems noted above reinforce the point that "privatization cannot manage itself. . . . Smart reform requires careful oversight of privatized

18. This figure reflects the total workload for those engines, some of which are used on other aircraft as well.

19. See enclosure 5 in the letter from Donna M. Heivilin, Director, Defense Management and NASA Issues, National Security and International Affairs Division, General Accounting Office, to Daniel K. Inouye, Chairman, Subcommittee on Defense of the Senate Committee on Appropriations, GAO/NSIAD-93-292R, September 30, 1993.

programs."[20] DoD's greater involvement in managing the nation's industrial base for repairs and maintenance could be one of the costs of relying more on that base to maintain its frontline combat systems. It might be possible to approximate a private, competitive solution for many of those workloads. However, the more the government becomes involved in the industrial base, the more likely it is that the solution will share some of the characteristics of a mixed mode of production.

Ship Maintenance. Two other maintenance tasks for which competition does not currently exist but might develop are routine and refueling overhauls for nuclear attack submarines. Routine submarine overhauls account for approximately 17 percent of the Navy's planned 1999 public workload, and refueling overhauls make up another 13 percent.

Even over the long run, only a limited number of private firms would compete for this work. Currently, Newport News and Electric Boat are the only private shipyards with the skills and facilities required for routine overhauls. Refueling overhauls, which remove and replace the core of the ship's nuclear reactor, are now done only at Navy shipyards, in part because they require special containment vessels and cranes that can remove the core.[21] More generally, firms wanting to enter the nuclear field face high barriers. As a result, if the Navy leased or sold the shipyards and specialized equipment that it uses for that work, the two private firms that already have the ability to work on nuclear ships might be in the best position to acquire those assets.

A market with only two suppliers may still yield a competitive outcome in situations in which the purchaser (in this case, DoD) enjoys the bargaining power of a monopsonist. Yet the fact that nuclear capabilities constitute a unique and crucial element in the defense industrial base could severely hamper competition. To protect that base, the Navy might feel forced to ensure that each shipyard capable of repairing or constructing nuclear ships received at least some minimum level of work and earned a reasonable rate of return in the long run.[22]

The distinction between public and private ownership is unclear in situations in which a nominally private firm makes a large investment in skills and capital that are valuable only to DoD and to which DoD cannot afford to lose access. In that case, the economic benefits from shifting work to the private sector would be those that could be obtained by moving from public production to what is--in effect if not in name--a regulated utility. Those benefits might not be any greater than those DoD could obtain by using a government-owned/contractor-operated facility or a government corporation to maintain nuclear ships.[23]

It may not be possible to create a fully competitive private-sector solution to the problem of nuclear ship maintenance. But moving maintenance for both submarines and nuclear-powered carriers to the private sector has other benefits. As long as ship maintenance is in the public sector and ship construction is in the private sector, the United States will have to bear the cost of maintaining a qualified industrial base for nuclear work in both places.

With only a limited amount of new shipbuilding planned, DoD could significantly reduce the cost of either maintaining or reconstituting the capabilities needed for construction by assigning more of its maintenance to the construction shipyards. (According to Newport News, a shipyard can maintain at least 90 percent of the skills and qualifications required for constructing nuclear submarines by performing overhauls.)[24] In situations in which the level of new production is not high enough to justify keeping a skilled labor force together, assigning repair work to the firms with responsibility for production

20. Testimony of Donald F. Kettl, University of Wisconsin-Madison, before the Senate Committee on the Budget, March 7, 1995.

21. The Puget Sound, Norfolk, and Portsmouth naval shipyards are each capable of this work. Pearl Harbor is scheduled to develop the capability.

22. Earmarking construction funds to ensure the survival of private shipyards that DoD regards as valuable national assets is, in effect, a recognized practice. See Eric Rosenberg, "The Navy Is Sailing on a Sea of Industrial Policy," *Defense Week*, June 13, 1994, p. 2.

23. Britain recently converted shipyards performing nuclear maintenance from public facilities to government-owned/contractor-operated plants. One of those yards is now managed by the U.S. firm of Brown and Root.

24. John Birkler and others, *The U.S. Submarine Production Base*, MR-456-OSD (Santa Monica, Calif.: RAND, 1994), p. 137.

may make sense.[25] An estimate by RAND suggests that assigning additional overhauls to Electric Boat could reduce the cost of reconstituting the submarine production base by one-half.[26]

Workloads That Cannot Support Competition

Some maintenance workloads simply cannot sustain competition. Among them are tasks that can be performed most efficiently by a single producer using specialized skills and specialized, immobile capital. Government-owned/government-operated facilities like DoD's current depots are one of the imperfect options available to deal with that type of work. In some of those cases, however, one of the mixed-mode options outlined in Chapter 4 (such as GOCOs, government corporations, regulated monopolies, or negotiated sole-source contracts with private firms) could offer DoD some of the advantages of private markets. But unless some safeguards are developed, allocating those workloads to the private sector could lead to monopolistic behavior and inadequate government controls.

Sole-source contracts with an OEM (negotiated in accord with DoD's profit policies) may be an appropriate solution for components or aircraft if workloads are small, the OEM has the skill and the resources, and the cost of duplicating those capabilities is large. Indeed, that approach may become the norm for avionics systems as increases in reliability reduce the need for repairs. Maintenance by the OEM may also be the most cost-effective solution if DoD decides to procure only a small number of a specialized aircraft (such as the F-117 or the B-2). Although GOCOs are also an option, government ownership of physical assets is of little help if maintenance requires specialized knowledge that is embodied in the labor force of the firm that produced the good. (For example, DoD maintains the F-117 fighter in a GOCO, but the government does not get any special negotiating advantage from that arrangement because it cannot credibly offer the work to another firm.)

Inactivating nuclear ships is an example of shipyard work that does not appear to offer an opportunity for competition. A single location with specialized facilities, including a disposal site, is the most effective configuration for that work. In such circumstances, the government's ownership of the assets or its regulation of prices and the return on capital may be necessary to protect against monopolistic behavior. A GOCO arrangement, with firms bidding for the right to operate a government-owned facility, might still provide DoD with some of the benefits that competition offers. Over the long run, however, meaningful competition for management of a GOCO is only possible if the firm that operates the facility does not gain a great advantage over other bidders in future competitions. If a substantial risk exists that the incumbent operator would gain such an advantage, a government-owned corporation or a regulated monopoly, either of which can give DoD the flexibility that a nonfederal workforce offers, may be attractive alternatives to a public depot.

Implications for Roles and Costs in the Long Run

Any effort by DoD to allocate its maintenance workloads to take advantage of the strengths of public, private, and mixed production will be based, at least in part, on subjective judgments. Nonetheless, the preceding review suggests that such an approach could reduce workloads in the public sector significantly and increase the use of private and possibly mixed modes of production. Those changes in turn might produce substantial savings.

Over the long run, the private sector's ability to provide the level and type of maintenance support that DoD requires at a lower cost than the public depots is likely to depend on the potential for competition among private firms. From that perspective, the overhauls of surface ships and repairs on cargo and tanker airframes that are currently being performed in public depots would be among the logical first candidates for allocation to the private sector. Over

25. The two areas to which this argument seems to apply are construction of nuclear ships and armored vehicles. See "Perry Says Depot Work for Tanks, Subs Could Be Transferred to Private Sector," *Inside the Pentagon*, May 27, 1993, p. 13.

26. Birkler and others, *The U.S. Submarine Production Base*.

the long run, the private sector might also be able to sustain competition for maintenance of combat aircraft and engines with the largest workloads, and for submarine overhauls and refueling. Together, those workloads account for roughly 80 percent of the repairs on airframes and engines that DoD now performs in its depots and 60 percent of the ship maintenance done in its shipyards. For those tasks that DoD cannot offer to firms in the private sector through a competitive process, it could pursue mixed arrangements that might offer savings compared with maintenance in public facilities.

Although estimates of the potential long-run savings from greater reliance on the private sector are necessarily uncertain, the discussion in Chapter 4 suggests that savings of 20 percent would not be surprising in cases in which competition in the private sector is possible and relatively standard contracts can be used. If 60 percent of the current public workload met those criteria, shifting it to the private sector might reasonably be expected to save roughly $1 billion annually in the long run. To ensure that DoD transferred 60 percent of its public workload, the Congress could limit the percentage of DoD's total workload performed in public depots to roughly 30 percent.

Chapter Seven

Shifting from Public to Private Production

As the preceding analysis of the Department of Defense's depot-level maintenance indicates, allocating work based on the different strengths of public, private, and mixed production could significantly increase the share of maintenance that is done in the private sector. Yet even if that analysis is valid, it will be irrelevant unless it can accommodate political realities as well as military risk and costs. The nation may not find it acceptable to depend more on the private sector for maintenance unless the process of transition is perceived as fair both to the 95,000 employees of government depots and to private-sector firms. The discussion that follows outlines different ways in which DoD might make that transition if it decided to increase the share of maintenance done in the private sector.

Reassign Workloads and Close Public Depots

DoD could increase the private sector's share of maintenance by starting to contract out more work. That policy would raise the level of excess capacity within the public depots, and DoD could then rely on the Base Realignment and Closure Commission (BRAC) or a similar process to close those depots that it would no longer need. Private industry might support that approach, particularly if the closed DoD depots were not made available for reuse as private maintenance facilities. But many people would see it as unfair to public employees. Those employees, it might be argued, had never had an opportunity to show that their facilities could compete successfully for DoD's business in an open market.

Another drawback to this approach is that stopping repair work in a depot could prove an unnecessary and costly disruption for DoD in situations in which continued operations, albeit under private ownership and management, would be the most cost-effective solution. Based on DoD's past experience in closing bases, shifting workloads to the private sector and shutting down depots would involve significant up-front costs. Analyses conducted by the staff of the Commission on Roles and Missions of the Armed Forces assume that the up-front costs associated with closing a typical depot are on the order of $500 million. (Those costs would vary widely, however, depending on the particular depot.) That figure is generally consistent with the findings of the model that DoD uses to estimate the costs of base closures. In addition to up-front costs, DoD might initially have to pay more for its maintenance as private-sector firms learned to handle the new workloads.

Immediately Privatize the Public Depots

A second approach would be to convert an operating depot to private ownership through a public stock

offering or a negotiated sale. The agreement could include a fixed-price contract for specific maintenance tasks, with a minimum guaranteed workload that would decline over time according to a preestablished schedule. The continued operation of the facility for the duration of the contract could be a condition of the sale. If environmental problems restricted DoD's ability to sell a depot outright, the prospective new owner could purchase a lease from DoD that included an option to buy once environmental remediation was under way.

Employees of DoD depots might find privatization a more attractive alternative than depot closure because they would have an opportunity to seek employment in the private facility. In contrast to closing a depot, immediately privatizing it would also provide the military with an experienced source of maintenance while buying time for other private firms to develop the capability to compete for those workloads. (However, private firms that already owned repair facilities and would have to compete against the newly privatized facilities might prefer that DoD close rather than privatize its depots.)

Although DoD's up-front costs under this approach might be less than under a base closure, they could still be substantial. Among those expenses would be the cost of separation payments to employees, the cost of transferring to the remaining public facilities any work that DoD did not want to go to the private sector, and the cost of purchasing rights to proprietary data. (Such purchases would be necessary if DoD owned the right to use data in its own depots but not the right to provide the data to private firms.)

This approach could also create costs for the federal government by unnecessarily prolonging the operation of some inefficient facilities. Even after they were sold, facilities that did not produce efficiently would continue to operate for the duration of the initial maintenance contracts. The federal government would ultimately bear the cost of those operations, since prospective purchasers would take those costs into account in calculating what they should bid for the facility and for the accompanying initial maintenance contracts. In some cases, the government might receive little if any up-front revenue from the sale of a depot and would be forced to pay high prices for the maintenance performed under the initial contract.

Prepare Depots for Privatization

A third approach, similar to the one that the Congress mandated for the uranium enrichment program in the United States, first converts the public operation into a government corporation and then sells the corporation to the private sector.[1] In that model, the government corporation is an interim step while the facility converts to commercial management and accounting practices and demonstrates its viability and market value (or lack thereof) to potential purchasers. According to experts on privatization in other countries, government enterprises can be more easily and more profitably converted to private ownership if the enterprise is already in a corporate form.[2] Without that step, the government might find that private firms were unwilling to purchase DoD depots even if the accompanying initial maintenance contracts were quite generous. In the case of the United States Enrichment Corporation, the Congress considered that interim step necessary even though the facilities were already operating as government-owned/contractor-operated plants.

Adopting commercial accounting and management practices might call for several major changes for the former DoD depots. For example, to make a depot comparable with a private firm, the Congress might require it to lease its facilities from DoD at an estimated market rate and make payments in lieu of taxes to the Treasury. The Congress might also require the depot to raise capital for future investment

1. Energy Policy Act of 1992, Title IX, "United States Enrichment Corporation," as codified in Title II of the Atomic Energy Act of 1954; 42 U.S.C. 2297.

2. Statement of Tony Dale, Budget Manager, New Zealand Treasury, before the House Committee on the Budget, March 1, 1995.

in private financial markets without government guarantees. In addition to those requirements, it might leave the depot's management and labor free, as they are in the private sector, to negotiate wages and the terms of employment.[3]

To ensure their viability during the transition, the former public depots might initially be granted a DoD contract with some level of guaranteed workload (at a fixed price). That level might decline over time according to a preestablished schedule. After a brief transition period (perhaps three years), the government would transfer ownership of each depot to the private sector through a public stock offering or a negotiated sale. At that point, the continued operation of the enterprise would depend on its ability to earn a market rate of return.

Because this transition approach would allow depots to establish a track record in competitive markets, it could provide a smoother transition to private ownership (and a better chance for the facilities' long-run survival) than would the depots' immediate sale. But the strategy has a substantial risk: the second step might never be taken. Unique facilities that would not be subject to competition (such as those for inactivating nuclear ships) might appropriately remain government-owned corporations. But in situations in which competition is possible, privately owned enterprises appear to be more efficient than publicly owned ones.[4] No matter what the charter of the corporation might say, the government's ownership of it increases the potential for appropriating money to cover losses and for introducing political goals. The risk that the government would continue to own and operate the facility might be greatest in the case of those depots that were unable to earn an adequate rate of return.

3. Some adjustments could be necessary to ensure fairness. For example, in the case of the United States Enrichment Corporation, established in 1993, federal employees who agree to transfer to the corporation can choose to remain under the federal retirement system.

4. See Anthony E. Boardman and Aidan R. Vining, "Ownership and Performance in Competitive Environments: A Comparison of the Performance of Private, Mixed, and State-Owned Enterprises," *Journal of Law and Economics*, vol. 32 (April 1989), pp. 1-33.

Why Consider a Transition?

The transition to greater use of private maintenance would involve risks and costs for DoD even if an effort was made to keep existing depots in operation as private facilities. The one-time costs for personnel associated with privatizing a typical depot employing 3,500 people would be about $70 million. (Personnel costs would be even greater if DoD transferred some of the workload from that depot to another public facility and had to bear the costs of transferring and training new employees.) Depot closures and, to a lesser degree, privatizations would also pose short-term risks because they could disrupt ongoing maintenance programs. In addition, the transition from a public to a private or mixed mode of production--however it was achieved--could entail long-term risks in that DoD would be dependent on contractual relationships with its suppliers rather than having direct authority.

DoD's core policy, as the services currently apply it, would allow DoD to avoid the costs and risks associated with shifting maintenance to the private sector. The core approach emphasizes the necessity of using public depots to maintain the frontline systems that the Joint Chiefs of Staff's scenario requires. Under that policy, the percentage of work done in public depots would increase in the Air Force and Army. Compared with an approach that would raise the share of maintenance allocated to the private sector, the DoD core approach lessens the need to close additional public depots. (Even so, additional public depots may have to be closed. After taking into account the base closures and realignments that the BRAC process identified in 1991 and 1993, the aviation depots in the public sector will still have significant levels of excess capacity.)

In the short run, changes in public and private roles are likely to entail costs and risks. Over the long run, however, greater reliance on the private sector where appropriate could offer the government the potential for significant savings--perhaps on the order of $1 billion annually. And the benefits could

go beyond the realm of costs. Competition in the private sector might encourage innovation and push suppliers to improve the quality of the maintenance they provided to DoD. Moreover, private industry has manufacturing and repair capabilities beyond those available in DoD's depots. The services already depend on the private sector to repair some specialized components of frontline weapon systems. The quality of the maintenance support that U.S. forces receive in wartime might actually improve if DoD's focus shifted from asking how it could maintain capabilities in its own depots to how it could gain rapid, reliable access to the capabilities of private industry, and particularly those of the private defense industry.

Finally, some of the people who support privatization throughout the government argue that industrial activities should, as a matter of principle, be left in the private sector to the maximum extent possible. That same principle underlies DoD's core philosophy, with its emphasis on maintaining only the minimum essential capabilities in the public sector. The difference in outcomes stems from different views of what the private sector can accomplish.