

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

**R**ather 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.

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## 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.<sup>1</sup> 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.<sup>2</sup> 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.

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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.<sup>3</sup> 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.<sup>4</sup> 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.<sup>5</sup> 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.<sup>6</sup>

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.<sup>7</sup> 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."<sup>8</sup> 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."<sup>9</sup>

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.

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## **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.

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## **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).<sup>10</sup> 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.<sup>11</sup>

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	<u>222</u>	<u>6</u>
<b>Total</b>	<b>3,756</b>	<b>100</b>

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 compet-

itors 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.

<b>Absence of Competition</b>		<b>Industry Concentration</b>		<b>Use of Cost-Type Contracts<sup>a</sup></b>	
Commodity	Percentage Not Awarded Competitively	Commodity	Percentage Awarded to Top Four Firms	Commodity	Percentage Awarded
<b>Highest Cost Risk</b>					
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
<b>Medium Cost Risk</b>					
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
<b>Lowest Cost Risk</b>					
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."<sup>12</sup> 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.<sup>13</sup>

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.<sup>14</sup> 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.<sup>15</sup> 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

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sumes that Electric Boat and Newport News could compete, as they have in the past, for routine overhauls of submarines.

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 as-

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.<sup>16</sup>

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.<sup>17</sup>

### 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.

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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.

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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.<sup>18</sup> 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.<sup>19</sup> 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

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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."<sup>20</sup> 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.<sup>21</sup> 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.<sup>22</sup>

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.<sup>23</sup>

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.)<sup>24</sup> 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.<sup>25</sup> 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.<sup>26</sup>

## 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.

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## 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

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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.