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# INVENTORY MANAGEMENT

## Adopting Best Practices Could Enhance Navy Efforts to Achieve Efficiencies and Savings







United States  
General Accounting Office  
Washington, D.C. 20548

National Security and  
International Affairs Division

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The Honorable Carl Levin  
Ranking Minority Member  
Subcommittee on Oversight of  
Government Management and the  
District of Columbia  
Committee on Governmental Affairs  
United States Senate

Dear Senator Levin:

This report is the ninth in a series of reports comparing the Department of Defense's (DOD) logistics practices with those of the private sector.<sup>1</sup> As you requested, we are continuously examining DOD's inventory management practices to identify areas where costs can be reduced and problems can be avoided by adopting leading commercial practices. While DOD has implemented some innovative practices, many opportunities exist for improving the logistics system. This report focuses on the Navy's logistics system for aircraft parts. The objectives of this review were to (1) examine the current performance of the Navy's logistics system, (2) review the Navy's efforts to improve its logistics system and reduce costs, and (3) examine leading best practices used by the airline industry to identify potential opportunities to improve the efficiency and effectiveness of the Navy's logistics operations.

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## Background

The private sector, driven by today's globally competitive business environment, is faced with the challenge of improving its service while lowering costs. As a result, many companies have adopted innovative business practices to meet customer needs and retain profitability. Since DOD is facing a similar challenge of providing better service at a lower cost, it has begun to reexamine its business practices. With the end of the Cold War, the DOD logistics system must support a smaller, highly mobile, high technology force with fewer resources. Also, due to the pressures of budgetary limits and base closures, DOD must seek new and innovative ways to make logistics processes as efficient and effective as possible.

To supply reparable parts for its approximately 4,900 aircraft, the Navy uses an extensive logistics system based on management concepts largely

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<sup>1</sup>See Related GAO Products.

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developed decades ago.<sup>2</sup> The Navy's system, commonly called a "pipeline," consists of many activities that play a key role in providing aircraft parts to end-users when and where needed. This pipeline encompasses several functions, including the purchase, storage, distribution, and repair of parts. Another important function of this pipeline is to provide consumable parts (e.g., nuts, bearings, and fuses) that are used extensively to fix reparable parts and aircraft. The Defense Logistics Agency (DLA) provides most of the consumable parts that Navy repair activities need and handles a large part of the warehousing and distribution of reparable parts.

Although not as large as the Navy, commercial airlines have similar operating characteristics to the Navy. They maintain fleets of aircraft that use reparable parts and operate logistics pipelines whose activities are similar. For both the Navy and commercial airlines, time plays a crucial role in the responsiveness of logistics operations and the amount of inventory needed. Pipeline complexity also adds to logistics costs by increasing overhead and adding to pipeline times. Condensing and simplifying pipeline operations, therefore, simultaneously improves responsiveness and decreases costs by reducing inventory requirements and eliminating infrastructure (warehouses, people, etc.) needed to manage unnecessary material.

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## Results in Brief

The Navy is working to improve its logistics system. Our work shows that the best practices we identified in the airline industry have the potential for use in the Navy's system. These practices, if applied where feasible, could improve the responsiveness of the Navy's logistics system and potentially save hundreds of millions of dollars. The Navy's system, characterized by a \$10-billion inventory of reparable parts, is slow and complex and often does not respond quickly to customer needs. For example, customers wait, on average, 16 days at operating bases and 32 days on aircraft carriers to receive parts from the wholesale system. If the wholesale system does not have the item in stock, customers wait over 2.5 months. Many factors contribute to this situation, but among the most prominent is a slow and complex repair pipeline. Within this pipeline, broken parts can pass through as many as 16 steps, which can take as long as 4 months, before they are repaired at a repair depot and available again for use. Specific problems that prevent parts from flowing quickly through the pipeline include a lack of consumable parts needed to complete

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<sup>2</sup>Reparables are parts that, if damaged or worn, can be fixed or overhauled for less than the cost of new items. These items include landing gear, hydraulic pumps, and "black boxes" essential to an aircraft's operations.

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repairs, slow distribution, and inefficient repair practices. For example, the Navy's practice of routing parts through several workshops at repair depots increases the time needed to complete repairs. One item we examined had a repair time of 232 hours, only 20 hours of which was spent actually repairing the item. The remaining 212 hours involved time to handle and move the part to different locations.

The Navy recognizes it must improve its logistics system to make it more responsive and less costly. To achieve these goals, the Navy has established programs that focus on centralizing supply management and repair activities and outsourcing certain material management functions. It has also established a logistics response team to analyze the Navy's pipeline and identify opportunities to reduce its length and complexity. The Navy is in the early stages of developing these programs and has not yet identified many of the specific business practices that it will use to achieve its goals. However, the initiatives provide a framework for improvements by focusing on pipeline time and complexity.

Best practices used by the private sector provide opportunities to build on the Navy's improvement efforts. These best practices appear feasible for inclusion in the Navy's efforts and could potentially save hundreds of millions of dollars while improving customer service. The commercial airline industry has adopted leading-edge practices that have resulted in significant improvements and reduced logistics costs. Leading firms in the airline industry hold minimum levels of inventory that can turn over four times as often as the Navy's. Parts are more readily available and delivered to the customer within hours. The repair process is faster, taking an average of 11 days for certain items at one airline we examined, compared to the Navy's 37-day process. Specific practices that have enabled companies to achieve these results include (1) repairing items promptly after they break, (2) employing a "repair cell" concept to speed the repair of component parts, (3) using local distribution centers and integrated supplier programs to improve consumable item support and reduce "just-in-case" inventory, and (4) using third-party logistics providers to manage logistics functions.

Although we cannot say with certainty that these best practices can be integrated into the Navy's logistics system, we believe they are compatible with many aspects of the Navy's operations. Because of the significant benefits realized by private firms, we further believe that the potential benefits to the Navy in adopting these practices are enough to justify a

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demonstration project. Such an approach can determine with certainty the feasibility or cost-effectiveness of the practices.

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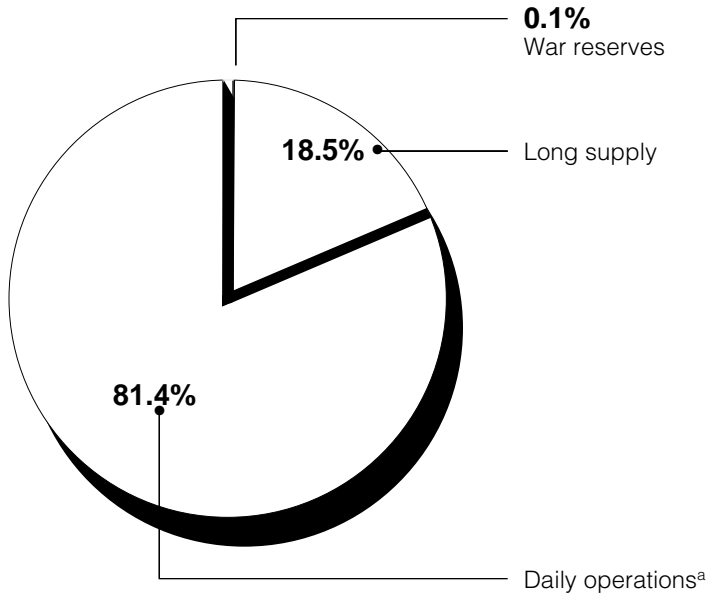
## The Navy's System Results in Large Costs and Untimely Service

The Navy's overall inventory management philosophy is one of maintaining large inventory levels at many different locations to ensure parts are readily available to meet customers' needs. As of September 1995, the Navy had repairable inventory valued at \$10.4 billion. However, a portion of this inventory is not needed to support daily operations and war reserves. Of the \$10.4 billion inventory, the Navy classifies \$1.9 billion (18 percent) as long supply—a term denoting that more stock is on hand than is needed to meet daily operations and war reserve requirements.<sup>3</sup> The \$10.4-billion and the \$1.9-billion inventories were valued using DOD's standard valuation methodology—reparables requiring repair were reduced by the estimated cost of repair and excess inventory was valued at salvage prices (2.5 percent of latest acquisition cost). Figure 1 details the Navy's allocation of its inventory to daily operations, war reserves, and long supply.

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<sup>3</sup>In our report entitled, *Defense Inventory: Opportunities to Reduce Warehouse Space* (GAO/NSIAD-95-64, May 24, 1995), we recommended that DOD systematically review and dispose of items most likely to have no future need.

Figure 1: Navy Inventory Allocation



<sup>a</sup>Includes parts in transit between locations.

Source: DOD's Supply System Inventory Report as of September 30, 1995.

The inventory turnover rate is a measure of how efficiently a business uses its inventory investment and can be expressed as the ratio of the dollar value of repairs to the average inventory value. One commercial airline we visited calculated that, using this ratio, it would turn its reparable inventory over once every 5 months. In comparison, we calculate that, based on fiscal year 1995 repairs, the Navy's wholesale-level inventory of reparable parts would turn over once every 2 years.<sup>4</sup> The Navy incurs significant costs to manage this large inventory investment. At the wholesale level alone, the Navy estimates it spent almost \$1.8 billion to repair, buy, and manage reparable parts during fiscal year 1995 (see table 1). This amount does not include the costs to store and maintain parts at operating locations, such as bases and aircraft carriers.

<sup>4</sup>Wholesale-level stocks are generally held in large quantities at DLA storage depots. This stock is used to resupply end-user locations.

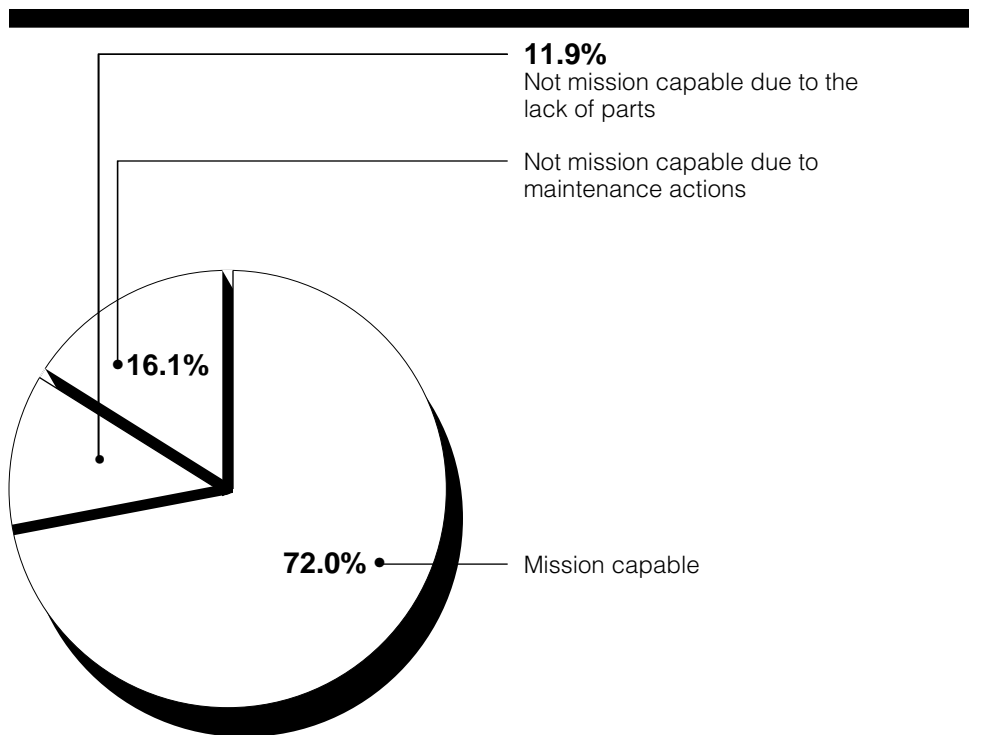
**Table 1: Navy Wholesale Costs for Repairable Parts—Fiscal Year 1995**

Dollars in millions	
Category	Costs
Component repairs	\$957.4
Purchases	250.4
Material management	584.8
<b>Total</b>	<b>\$1,792.6</b>

Source: Naval Inventory Control Point.

Despite the billions of dollars invested in inventory, the Navy’s logistics system is still often unable to provide spare parts when and where needed. During fiscal year 1995, Navy aircraft were not mission capable 11.9 percent of the time because spare parts were not available to repair the aircraft (see fig. 2).

**Figure 2: Navy Aircraft Readiness Rates—Fiscal Year 1995**



Source: Navy data.



One reason parts were not available was that the Navy's system often does not provide timely deliveries of parts. The Navy reported that, between October 1994 and June 1995, parts were not immediately available to mechanics at operating locations 25 percent of the time for reparable parts and 43 percent for consumable parts. When a part is not available, an end-user requisitions the part from the wholesale supply system. According to the Navy's data, the length of time from requisition to delivery of a part takes, on average, 16 days to operating bases and 32 days to aircraft carriers. If the Navy's wholesale system does not have the item in stock (32 percent of the time for reparable parts), the Navy places the item on backorder. According to the Navy's data, customers wait over 2.5 months, on average, to receive backordered items. The Navy reported that, as of June 1995, it had more than 31,000 backorders for reparable parts, worth about \$831 million.

The delay in receiving parts often forces mechanics to cannibalize parts (removing parts from one aircraft to make repairs on another). Between July 1994 and June 1995, the Navy reported that its mechanics at operating bases and on aircraft carriers cannibalized parts at least 70,500 times. This practice is inefficient because the mechanics have to remove a working part from one aircraft and then install the part on a different aircraft. According to Navy guidance, cannibalization is a symptom of a failure somewhere in the logistics system, but, in some instances, can be a viable management tool in keeping aircraft operational. Aircraft squadron officials at several locations we visited, however, told us that cannibalizing parts is a routine practice because the Navy's system does not consistently provide replacement parts on a dependable basis.

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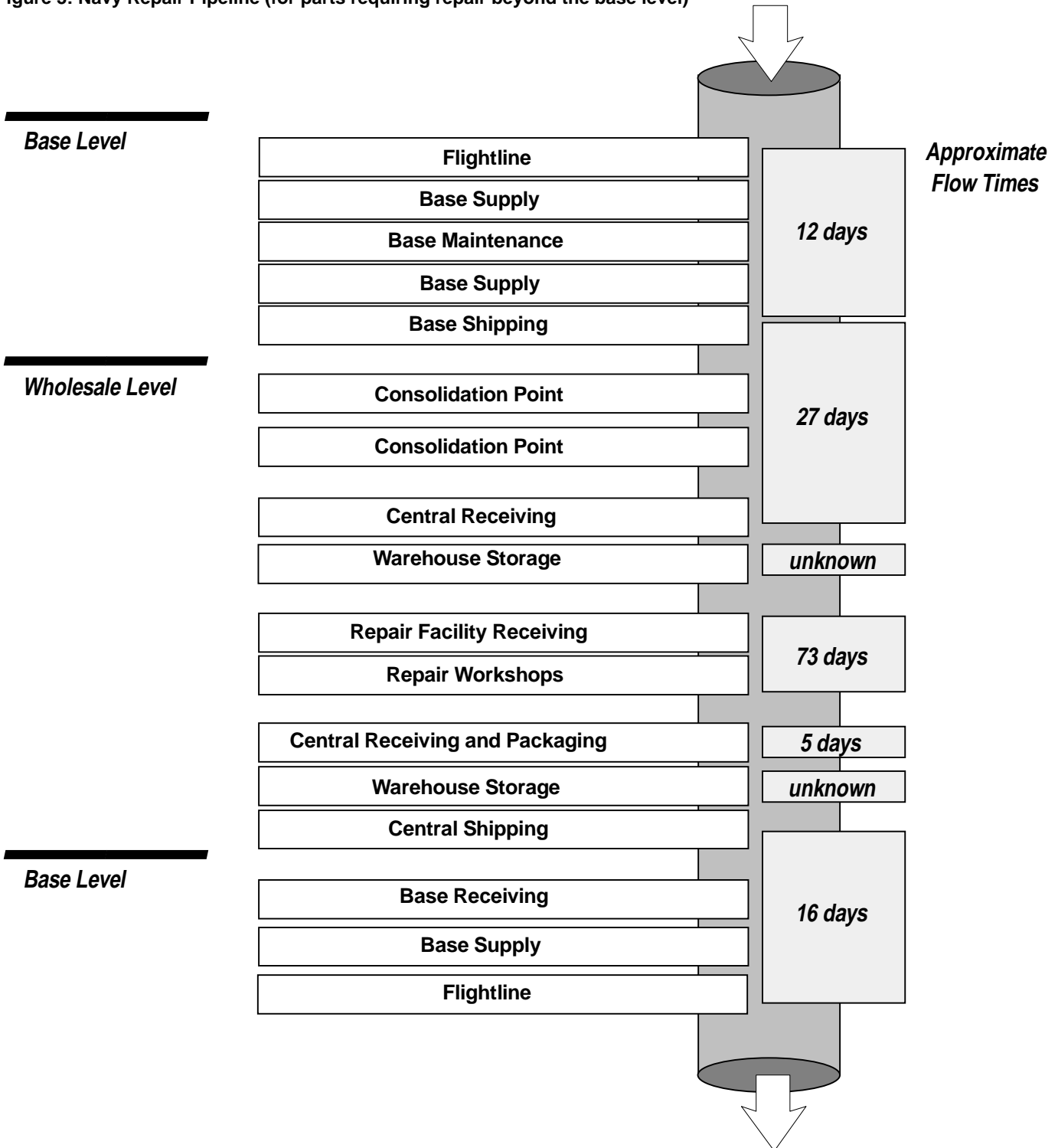
## Several Factors Contribute to Inefficient System

The Navy's large inventory costs and slow customer service are the result of several factors, but the largest contributor is a slow and complex repair pipeline. According to Navy officials, about 75 percent of component repairs are relatively minor in nature and can be done by maintenance personnel at the operating bases. They also stated that, when a part requires more complex and extensive repair (about 25 percent of the time), the process can create as many as 16 time-consuming steps as parts move through the repair pipeline (see fig. 3). Component parts can accumulate at each step in the process, which increases the total number of parts that are needed to meet customer demands and to ensure a continuous flow of parts. Tracking parts through each of the 16 steps listed in figure 3, we estimate, using the Navy's flow time data, that it can

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take about 4 months, on average, from the time a broken part is removed from an aircraft until the time it is ready for reissue.

Figure 3: Navy Repair Pipeline (for parts requiring repair beyond the base level)



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As figure 3 illustrates, a broken part can pass through a number of base- and wholesale-level steps. At the base level, after a mechanic removes a broken part from an aircraft, the item is routed through base maintenance. If the part cannot be repaired at the base, it is then sent to a wholesale storage location, where it sits until scheduled for repair. Once scheduled, it is inducted into repair workshops and fixed, then sent to storage or used to fill a customer's order. The Navy reported that over 190,000 parts were fixed through this process during fiscal year 1995 at a cost of about \$957 million.

While the repair pipeline time can take as long as 4 months, on average, it could be significantly longer because it does not include the time parts sit in wholesale storage awaiting repair. The Navy does not measure this step in the process; however, this time could be substantial. For example, the Navy does not promptly forward items to repair workshops after they break. Also, because the Navy schedules most repairs quarterly, many broken items could sit in storage for several months before being repaired. Parts may also sit in storage because many broken items in the Navy's system are not needed to support daily operations or war reserves.

Of the portions of the pipeline that are measured, the time spent receiving and repairing items at repair facilities accounts for the largest amount of pipeline time. Shown in figure 3 as "repair facility receiving" and "repair workshops," these activities take an average of 73 days to complete.<sup>5</sup> In examining the repair process at two repair facilities, we found that parts can be routed through several different workshops, thereby increasing the time to complete repairs. Functions such as testing, cleaning, machining, and final assembly are sometimes done at different locations at the repair facility. As a result, parts could be handled, packaged, and transported several times throughout the repair process. According to Navy officials, this is a common practice at the Navy's repair facilities.

At one repair facility, we examined 10 frequently repaired pneumatic and hydraulic components and found that about 85 percent of the repair time needed for these parts involved activities such as unpacking, handling, and routing the part to different workshops. The remaining 15 percent of the time was spent on the actual repair of the items. One item we examined had a repair time of 232 hours. However, only 20 hours was needed to actually repair the item; the remaining 212 hours involved time to handle and move the part to different locations.

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<sup>5</sup>Based on an August 1995 Naval Inventory Control Point analysis.

In addition to delays caused by routing parts to different locations, mechanics often do not have the necessary consumable parts (nuts, bolts, bearings, fuses, etc.) that are used in large quantities to repair parts. According to Navy officials, having the necessary consumable parts is another important factor affecting the timely repair of components. The Navy calculates that the lack of parts adds as much as 4 weeks to the average repair time. As of February 1996, the Navy had 11,753 reparable aircraft parts, valued at \$486 million, in storage because parts were not available during the repair process to complete repairs. These items, which had been packaged and moved to a warehouse next to the repair facility, had been in storage for an average of 9 months. Figure 4 shows aircraft components awaiting parts in a warehouse at the Navy's repair depot at Cherry Point, North Carolina.

**Figure 4: Components Awaiting Parts at a Navy Repair Depot**



The Navy's data indicates that DOD's distribution and transportation system is slow in moving material among storage, repair, and end-user facilities and is another factor adding to the length of the repair pipeline. For example, with the current system, it takes an average of 16 days for a

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customer to receive a part at an operating base after a requisition is placed. As of June 1995, the Navy estimated that over one-half of this time involved DLA's retrieval of the part from the warehouse and shipment of the part to the customer.

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## The Navy Recognizes the Need to Improve Logistics Operations

In recognition of a changing global threat, increasing budgetary pressures, and the need for improvements to logistics system responsiveness, the Navy has recently undertaken three primary initiatives aimed at streamlining logistics operations. These initiatives are the regionalization of supply management and maintenance functions, privatization and outsourcing, and logistics response time reductions. The Navy is in the early stages of developing these initiatives and has not yet identified many of the specific business practices that it will use to achieve its goals. We have not reviewed the feasibility of these initiatives. However, we believe the initiatives provide a framework for improvements by focusing on the speed and complexity of the logistics pipeline.

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## Regionalizing Supply Management and Maintenance Functions

Under its regional supply initiative, the Navy is consolidating certain supply operations that are managed by a number of organizations under regionally managed supply centers. For example, naval bases, aviation repair depots, and shipyards each have supply organizations to manage their parts needs. These activities often use different information systems and business practices and their own personnel and facilities. Under the new process, one supply center in each of seven geographic regions will centrally manage the spare parts for these individual operations, with the objective of improving parts' visibility and reducing the overhead expenses associated with separate management functions. The Navy also hopes this approach will lead to better sharing of inventory between locations, thus allowing it to reduce inventories. The Navy is not consolidating inventories into fewer storage locations; however, it is transferring data and management functions to the centers.

Similarly, maintenance activities, such as base-level repair operations and depot-level repair operations, are managed by different organizations. As a result, maintenance capabilities, personnel, and facilities may be unnecessarily duplicated. Under the regional maintenance initiative, the Navy is identifying these redundant maintenance capabilities and consolidating these operations into regionally based repair facilities. For example, in one region, the Navy is consolidating 32 locations used to calibrate maintenance test equipment into 4 locations.

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The Navy believes that, by eliminating the fragmented management approach to supply management and maintenance, it can decrease infrastructure costs by reducing redundancies and eliminating excess capacity. The Navy also believes that by moving away from highly decentralized operations, it will be better positioned to improve and streamline operations Navy-wide. Both initiatives are in the early phases, however, so broad-based improvements have not yet occurred.

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### Privatizing and Outsourcing Functions

The Navy also has an initiative to outsource and privatize functions. This initiative encompasses a broad spectrum of Navy activities, and possible outsourcing of functions within the reparable parts pipeline is only one aspect of this effort. Within the pipeline, the Navy has identified several material management functions, such as cataloging of items and overseas warehousing operations, as potential candidates for outsourcing. In January 1996, the Navy began developing cost analyses to determine whether contracting these functions out would be beneficial. Navy officials told us that they did not know when analyses on all candidates would be completed. One official said, however, that some candidates may be outsourced in 1997 at the earliest.

The Navy expects other activities to be targeted for outsourcing in the future. According to Navy officials, those candidates will be identified as the Navy's initiatives to streamline and improve operations progress.

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### Improving Logistics System Responsiveness

The objective of this initiative is to reduce the amount of time it takes a customer, such as a mechanic, to receive a part after placing an order. This initiative takes into account the series of processes that contribute to ensuring customers get the parts they need. These processes include placing and processing orders; storing, transporting, and distributing inventory; and repairing broken items. The Office of the Secretary of Defense (OSD) has established responsiveness goals that the Navy and other services are encouraged to meet. OSD wants to reduce the time it takes to fill a customer's order from wholesale stock to 5 days by September 1996 and to 3 days by September 1998. OSD also wants to reduce the average backorder age to 30 days by October 2001. The Navy hopes to achieve these goals by looking at the pipeline as a whole and improving processes where needed.

To identify and carry out improvements, the Navy has established a Logistics Response Time team, consisting of representatives from across

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the Navy and from DLA. Thus far, the team has focused primarily on collecting the data needed to accurately measure pipeline performance. In the spring of 1996, the team expects to begin identifying areas where process improvements should be applied to achieve the biggest gains in performance. This work will then be used to identify specific practices for carrying out these improvements.

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## Industry Best Practices Can Be Used to Build on Navy Initiatives

The airline industry has developed leading-edge practices that focus on reducing the time and complexity associated with logistics operations. We identified four best practices in the airline industry that have the potential for use in the Navy's system. These practices have resulted in significant improvements and reduced logistics costs, especially for British Airways. These practices include the prompt repair of items, the reorganization of the repair process, the establishment of partnerships with key suppliers, and the use of third-party logistics services. When used together, they can help maximize a company's inventory investment, decrease inventory levels, and provide a more flexible repair capability. In our opinion, they address many of the same problems the Navy faces and represent practices that could be applied to Navy operations. These practices appear particularly suited to Navy facilities that repair aircraft and components, such as repair depots and operating bases.

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## Repairing Items Promptly

Certain airlines begin repairing items as quickly as possible, which prevents the broken items from sitting idle for extended periods. Minimizing idle time helps reduce inventories because it lessens the need for extra "cushions" of inventory to cover operations while parts are out of service. In addition, repairing items promptly promotes flexible scheduling and production practices, enabling maintenance operations to respond more quickly as repair needs arise.

Prompt repair involves inducting parts into maintenance shops soon after broken items arrive at repair facilities. Prompt repair does not mean that all parts are fixed, however. The goal is to quickly fix only those parts that are needed. One airline that uses this approach routes broken items directly to holding areas next to repair shops, rather than to stand-alone warehouses, so that mechanics can quickly access broken parts when it comes time for repair. These holding areas also give mechanics better visibility of any backlog.



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It is difficult to specifically quantify the benefits of repairing items promptly because it is often used with other practices to speed up pipeline processes. One airline official said, however, that his airline has kept inventory investment down partly because it does not allow broken parts to sit idle. In addition, the Air Force found through a series of demonstration projects that prompt repair, when used with other practices, could enable operations to be sustained with significantly fewer parts. For example, the Air Force reported in February 1995 that after the new practices were put in place at one location, 52 percent (\$56.3 million) of the items involved in the test were potentially excess. The Air Force tested the new practices as part of its Lean Logistics program, which aims to improve Air Force logistics operations.

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## Reorganizing the Repair Process

One approach to simplify the repair process is the “cellular” concept. This concept brings all the resources, such as tooling and support equipment, personnel, and inventory, that are needed to repair a broken part into one location, or one “cell.” This approach simplifies the flow of parts by eliminating the time-consuming exercise of routing parts to workshops in different locations. It also ensures that mechanics have the technical support so that operations run smoothly. In addition, because inventory is placed near workshops, mechanics have quick access to the parts they need to complete repairs more quickly. British Airways adopted the cellular approach after determining that parts could be repaired as much as 10 times faster using this concept. Another airline that adopted this approach in its engine-blade repair shop was able to reduce repair time by 50 to 60 percent and decrease work-in-process inventory by 60 percent. Figure 5 shows a repair cell used in British Airways maintenance center at Heathrow Airport.

Figure 5: A British Airways Repair Center Cell



## Establishing Partnerships With Key Suppliers

Several airlines and manufacturers have worked with suppliers to improve parts support while reducing overall inventory. Two approaches—the use of local distribution centers and integrated supplier programs—specifically seek to improve the management and distribution of consumable items. These approaches help ensure that the consumable parts for repair and manufacturing operations are readily available, which prevents items from stalling in the repair process and is crucial in speeding up repair time. In addition, by improving management and distribution methods, such as using streamlined ordering and fast deliveries, these approaches enable firms to delay the purchase of inventory until a point that is closer to the time it is needed. Firms, therefore, can reduce their stocks of “just-in-case” inventory.

Local distribution centers are supplier-operated facilities that are established near a customer’s operations and provide deliveries of parts within 24 hours. One airline that used this approach has worked with key suppliers to establish more than 30 centers near its major repair operations. These centers receive orders electronically and, in some cases, handle up to eight deliveries a day. Airline officials said that the ability to get parts quickly has contributed to repair time reductions. In addition, the

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officials said that the centers have helped the airline cut its on-hand supply of consumable items nearly in half.

Integrated supplier programs involve shifting inventory management functions to suppliers. Under this arrangement, a supplier is responsible for monitoring parts usage and determining how much inventory is needed to maintain a sufficient supply. The supplier's services are tailored to the customer's requirements and can include placing a supplier representative in customer facilities to monitor supply bins at end-user locations, place orders, manage receipts, and restock bins. Other services can include 24-hour order-to-delivery times, quality inspection, parts kits, establishment of data interchange links and inventory bar coding, and vendor selection management. One manufacturer that used this approach received parts from its supplier within 24 hours of placing an order 98 percent of the time, which enabled it to reduce inventories for these items by \$7.4 million—an 84-percent reduction.

We have issued a series of reports on similar private sector practices that could be applied to DOD's consumable inventories.<sup>6</sup> These reports recommended new techniques that would minimize DOD's role in storing and distributing consumable inventories. Companies, such as PPG Industries and Bethlehem Steel, have reduced consumable inventories by as much as 80 percent and saved millions in associated costs by using "supplier parks" and other techniques that give established commercial distribution networks the responsibility to manage, store, and distribute inventory on a frequent and regular basis to end-users.

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## Using Third-Party Logistics Providers

The airlines we contacted provided examples of how third-party logistics providers can be used to reduce costs and improve performance. Third-party firms take on responsibility for managing and carrying out certain logistics functions, such as storage and distribution. Outsourcing these tasks enables companies to reduce overhead costs because it eliminates the need to maintain personnel, facilities, and other resources that are required to do these functions in-house. It also helps companies improve various aspects of their operations because third-party providers can offer expertise that companies often do not have the time or the resources to develop.

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<sup>6</sup>Inventory Management: DOD Could Build on Progress in using Best Practices to Achieve Substantial Savings (GAO/NSIAD-95-142, Aug. 4, 1995); Commercial Practices: DOD Could Reduce Electronics Inventories by Using Private Sector Techniques (GAO/NSIAD-94-110, June 29, 1994); and Commercial Practices: DOD Could Save Millions by Reducing Maintenance and Repair Inventories (GAO/NSIAD-93-155, June 7, 1993).

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For example, one airline contracts with a third-party logistics provider to handle deliveries and pickups from suppliers and repair vendors, which has improved the reliability and speed of deliveries and reduced overall administrative costs. The airline receives most items within 5 days, which includes time-consuming customs delays, and is able to deliver most items to repair vendors in 3 days. In the past, deliveries took as long as 3 weeks.

Third-party providers can also assume other functions. One third-party firm that we visited, for example, can assume warehousing and shipping responsibilities and provide rapid transportation to speed parts to end-users. The company can also pick up any broken parts from a customer and deliver them to the source of repair within 48 hours. In addition, this company maintains the data associated with warehousing and in-transit activities, offering real-time visibility of assets.

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### British Airways Illustrates Benefits of Using Best Practices

The best practices that we observed in the airline industry can prove particularly beneficial when used in an integrated fashion. One airline, British Airways, used all of these practices as part of an overall reengineering effort, and it illustrates the benefits of using such an integrated approach. These efforts have helped transform British Airways from a financially troubled, state-owned airline into a successful private sector enterprise. British Airways today is considered among the most profitable airlines in the world and has posted profits every year since 1983. Table 2 shows several key logistics performance measures of British Airways and the Navy.

**Table 2: British Airways and Navy Logistics Performance Measures**

Key performance measure	British Airways (1994)	Navy (1995)
<b>Consumer-level supply availability rates</b>		
Reparable parts	86%	75%
Consumable parts	97%	57% <sup>a</sup>
<b>Average order-ship time</b>	1 to 5 days	16 to 32 days <sup>b</sup>
<b>Inventory turnover</b>		
Reparable parts	1 time every 5 months	1 time every 2 years <sup>c</sup>
Consumable parts	1 time every 8 months	1 time every 2 years <sup>c</sup>
<b>Repair times</b>		
Avionics	11 days	37 days <sup>d</sup>

<sup>a</sup>DLA-managed items only.

<sup>b</sup>Represents the time it takes to obtain an item through the wholesale system when it is unavailable at the consumer level (includes requisition submission, inventory control point processing, stock point processing, transportation hold, and transportation times).

<sup>c</sup>The Navy's turnover rate includes retention stocks that are kept for future peacetime needs.

<sup>d</sup>Does not include time awaiting parts.

In addition to implementing the four practices discussed earlier, British Airways took a number of other steps to successfully reengineer its logistics operations. One of the first steps was to undertake a fundamental shift in corporate philosophy, where British Airways placed top priority on customer service and cost containment. This philosophy directed all improvement efforts, and specific practices were assessed on how well they furthered these overall goals. Also, British Airways approached the process of change as a long-term effort that requires a steady vision and a focus on continual improvement. Although the airline has reaped significant gains to date, it continues to reexamine and improve its operations.

Additional steps taken by British Airways to reengineer its operations include (1) reorienting the workforce toward the new philosophy; (2) providing managers and employees with adequate information systems to control, track, and assess operations; and (3) refurbishing existing facilities and constructing new ones to accommodate the new practices.<sup>7</sup>

<sup>7</sup>Our recent report, *Best Management Practices: Reengineering the Air Force's Logistics System Can Yield Substantial Savings* (GAO/NSIAD-96-5, Feb. 21, 1996), provides additional detail on how British Airways carried out improvements in each of these areas.

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## Recommendations

As part of the Navy's current efforts to improve the logistics system's responsiveness and reduce its complexity, we recommend that the Secretary of Defense direct the Secretary of the Navy, working with DLA, to develop a demonstration project to determine the extent to which the Navy can apply best practices to its logistics operations. We recommend that the Secretary of the Navy identify several naval facilities to participate in the project and test specific practices highlighted in this report. The practices should be tested in an integrated manner, where feasible, to maximize the interrelationship many of these practices have with one another. The specific practices that should be tested are

- inducting parts at repair depots soon after they break, consistent with repair requirements, to prevent parts from sitting idle;
- reorganizing repair workshops using the cellular concept to reduce the time it takes to repair parts;
- using integrated supplier programs to shift the management responsibilities for consumable inventories to suppliers;
- using local supplier distribution centers near repair facilities for quick shipments of parts to mechanics; and
- expanding the use of third-party logistics services to store and distribute spare parts between the depots and end-users to improve delivery times.

We recommend that this demonstration project be used to quantify the costs and benefits of these practices and to serve as a means to identify and alleviate barriers or obstacles (such as overcoming a strong internal resistance to change and any unique operational requirements) that may inhibit the expansion of these practices. After these practices have been tested, the Navy should consider expanding and tailoring the use of these practices, where feasible, so they can be applied to other locations.

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## Agency Comments

In its comments on a draft of this report, DOD agreed with the findings and recommendations. DOD stated that by September 30, 1996, the Deputy Under Secretary of Defense (Logistics) will issue a memorandum to the Secretary of the Navy and the Director of DLA, requesting that a demonstration project be initiated. According to DOD, this project should be started by the first quarter of fiscal year 1997. The Navy will conduct a business case analysis and assess the leading-edge practices highlighted in this report for their applicability in a Navy setting and, where appropriate, will tailor and adopt a version of these practices for use in its repair process. DOD also stated that it will ask the Navy to submit an in-process review not later than 6 months after the inception of the business case

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analysis. Finally, DOD agreed that after the practices have been tested, the Navy should consider expanding and tailoring the use of these practices so they can be applied to other locations. DOD's comments are included in appendix I.

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## Scope and Methodology

We reviewed detailed documents and interviewed officials about the Navy's inventory policies, practices, and efforts to improve its logistics operations. We contacted officials at the Office of the Chief of Naval Operations, Washington, D.C.; U.S. Naval Supply Systems Command, Arlington, Virginia; U.S. Naval Air Systems Command, Arlington, Virginia; U.S. Atlantic Fleet Command, Norfolk, Virginia; and the Naval Inventory Control Point, Philadelphia, Pennsylvania. Also at these locations, we discussed the potential applications of private sector logistics practices to the Navy's operations.

To examine Navy logistics operations and improvement efforts, we visited the following locations:

- Naval Aviation Depot, Cherry Point, North Carolina;
- Naval Aviation Depot, Jacksonville, Florida;
- Oceana Naval Air Station, Virginia Beach, Virginia;
- Jacksonville Naval Air Station, Jacksonville, Florida;
- Norfolk Naval Air Station, Norfolk, Virginia;
- Fleet and Industrial Supply Center, Norfolk, Virginia;
- Fleet and Industrial Supply Center, Jacksonville, Florida;
- Defense Distribution Depot, Cherry Point, North Carolina;
- Defense Distribution Depot, Jacksonville, Florida; and
- U.S.S. Enterprise.

At these locations we discussed with supply, maintenance, and aircraft squadron personnel, the operations of the current logistics system, customer satisfaction, and the potential application of private sector logistics practices to their operations. Also, we reviewed and analyzed detailed information on inventory levels and usage; repair times; supply effectiveness and response times; and other related logistics performance measures. Except where noted, our data reflects inventory valued by the Navy at latest acquisition costs. We did not test or otherwise validate the Navy's data.

To identify leading commercial practices, we used information from our February 1996 report that compared Air Force logistics practices to those

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of commercial airlines. This information included an extensive literature search to identify leading inventory management concepts and detailed examinations and discussions of logistics practices used by British Airways, United Airlines, Southwest Airlines, American Airlines, Federal Express, Boeing, and Tri-Star Aerospace. We also participated in roundtables and symposiums with recognized leaders in the logistics field to obtain information on how companies are applying integrated approaches to their logistics operations and establishing supplier partnerships to eliminate unnecessary functions and reduce costs. Finally, to gain a better understanding on how companies are making breakthroughs in logistics operations, we attended and participated in the Council of Logistics Management's Annual Conference in San Diego, California. We did not independently verify the accuracy of logistics costs and performance measures provided by private sector organizations.

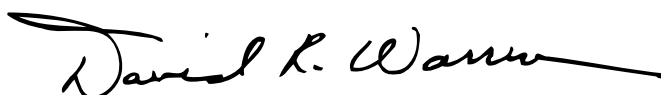
We conducted our review from June 1995 to April 1996 in accordance with generally accepted government auditing standards.

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We are sending copies of this report to the appropriate congressional committees; the Secretaries of Defense and the Navy; the Directors of DLA and the Office of Management and Budget; and other interested parties. We will make copies available to others upon request.

Please contact me on (202) 512-8412 if you or your staff have any questions concerning this report. The major contributors to this report are listed in appendix II.

Sincerely yours,

A handwritten signature in black ink that reads "David R. Warren". The signature is written in a cursive style with a long horizontal flourish at the end.

David R. Warren, Director  
Defense Management Issues



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## Abbreviations

DLA	Defense Logistics Agency
DOD	Department of Defense
OSD	Office of the Secretary of Defense

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# Comments From the Department of Defense



ACQUISITION AND  
TECHNOLOGY

(L/MDM)

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3000



14 JUN 1996

Mr. David R. Warren  
Director, Defense Management Issues  
National Security and International  
Affairs Division  
U.S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Warren:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "INVENTORY MANAGEMENT: Adopting Best Practices Could Enhance Navy Efforts to Achieve Efficiencies and Savings," dated April 29, 1996 (GAO Code 709140), OSD Case 1142. The Department generally concurs with the recommendations contained in the draft report.

Specific comments on the recommendations contained in the GAO draft report are provided in the enclosure. The Department appreciates the opportunity to comment on the draft report.

Sincerely,

John F. Phillips  
Deputy Under Secretary  
of Defense (Logistics)

Enclosure



Appendix I  
Comments From the Department of Defense

GAO DRAFT REPORT DATED APRIL 29, 1996  
(GAO CODE 709140) OSD CASE 1142

"INVENTORY MANAGEMENT: ADOPTING BEST PRACTICES COULD ENHANCE  
NAVY EFFORTS TO ACHIEVE EFFICIENCIES AND SAVINGS"

DEPARTMENT OF DEFENSE COMMENTS

\* \* \* \* \*

**RECOMMENDATION 1:** The GAO recommended that the Secretary of Defense direct the Secretary of the Navy, working with the Defense Logistics Agency (DLA), to develop a demonstration project to determine the extent to which Navy can apply best practices to its logistics operations. (p. 19/GAO Draft Report)

**DoD RESPONSE:** Concur. By the end of Fiscal Year 1996, the Deputy Under Secretary of Defense (Logistics) will issue a memorandum to the Secretary of the Navy and the Director, Defense Logistics Agency, requesting that a demonstration project be initiated by the first quarter of Fiscal Year 1997.

**RECOMMENDATION 2:** The GAO recommended that the Secretary of the Navy identify several Naval facilities to participate in the project and test specific practices, highlighted in the report. According to the GAO, the practices should be tested in an integrated manner, where feasible, to maximize the interrelationship many of these practices have with one another. The specific practices that the GAO indicated should be tested are, as follows:

- inducting parts at repair depots soon after they break, consistent with repair requirements, to prevent parts from sitting idle;
- reorganizing repair workshops using the cellular concept to reduce the time it takes to repair parts;
- using integrated supplier programs to shift the management responsibilities for consumer inventories to suppliers;
- establishing local supplier distribution centers near repair facilities for quick shipments of parts to mechanics; and
- expanding the use of third party logistics services to store and distribute spare parts between the depots and end users to improve delivery times. (p. 19/GAO Draft Report)

ENCLOSURE

Now on p. 20.

Now on p. 20.

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**Appendix I**  
**Comments From the Department of Defense**

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**DoD RESPONSE:** Concur. The Department agrees with the objective of adopting best practices initiatives in order to reduce costs and improve customer support. The Department of the Navy will conduct business case analyses and assess the proposed practices for their applicability in a Navy setting. Where appropriate, the Department of the Navy will tailor and adopt a version of these practices for use in its repair process. The Office of the Secretary of Defense will request the Department of the Navy to submit an in-process review not later than six months after the inception of the Navy's business case analysis.

The Naval Supply Systems Command, the Naval Air Systems Command, and the Defense Logistics Agency are currently in partnership to implement initiatives to reduce depot repair turn around times. Additionally, the Fleet Industrial Support Center, San Diego and the Naval Aviation Depot, North Island are currently engaged in various initiatives to improve inventory availability and supply system responsiveness to the artisans on the repair lines. These initiatives will not only reduce the cost of repair and logistics pipelines, but will also be ideal candidates to test specific practices highlighted in the report.

**RECOMMENDATION 3:** The GAO recommended that the Secretary of Defense direct the demonstration project be used to quantify the costs and benefits of those practices and to serve as a means to identify and alleviate barriers or obstacles (such as overcoming a strong internal resistance to change and any unique operational requirements) that may inhibit the expansion of those practices. The GAO also suggested that, after those practices have been tested, the Secretary of the Navy should consider expanding and tailoring the use of those practices, where feasible, so they can be applied to other locations. (pp. 19-20/GAO Draft Report)

**DoD RESPONSE:** Concur.

Now on p. 20.

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**Appendix II**  
**Major Contributors to This Report**

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**Appendix II**  
**Major Contributors to This Report**

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# Related GAO Products

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Best Management Practices: Reengineering the Air Force's Logistics System Can Yield Substantial Savings (GAO/NSIAD-96-5, Feb. 21, 1996).

Inventory Management: DOD Can Build on Progress in Using Best Practices to Achieve Substantial Savings (GAO/NSIAD-95-142, Aug. 4, 1995).

Commercial Practices: DOD Could Reduce Electronics Inventories by Using Private Sector Techniques (GAO/NSIAD-94-110, June 29, 1994).

Commercial Practices: Leading-Edge Practices Can Help DOD Better Manage Clothing and Textile Stocks (GAO/NSIAD-94-64, Apr. 13, 1994).

Commercial Practices: DOD Could Save Millions by Reducing Maintenance and Repair Inventories (GAO/NSIAD-93-155, June 7, 1993).

DOD Food Inventory: Using Private Sector Practices Can Reduce Costs and Eliminate Problems (GAO/NSIAD-93-110, June 4, 1993).

DOD Medical Inventory: Reductions Can Be Made Through the Use of Commercial Practices (GAO/NSIAD-92-58, Dec. 5, 1991).

Commercial Practices: Opportunities Exist to Reduce Aircraft Engine Support Costs (GAO/NSIAD-91-240, June 28, 1991).

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