United States General Accounting Office

GAO

Report to the Ranking Member, Committee on Armed Services, U.S. Senate

May 2001

DEFENSE INVENTORY

Approach for Deciding Whether to Retain or Dispose of Items Needs Improvement

GAO

Accountability * Integrity * Reliability

GAO-01-475

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Abbreviations

DLA	Defense Logistics Agency
DOD	Department of Defense

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Accountability * Integrity * Reliability

United States General Accounting Office
Washington, DC 20548

May 25, 2001

The Honorable Carl Levin
Ranking Member
Committee on Armed Services
United States Senate

Dear Senator Levin:

As of September 30, 1999, the Department of Defense reported[1] that it owned about $64 billion of secondary inventory[2] and that, of that amount, components have determined that about $9.4 billion is more economical to retain than to dispose of and possibly need to repurchase. We previously reported that $39.4 billion (about 60 percent) of the Department's $65.8 billion secondary inventory as of September 30, 1997, exceeded operating requirements and that the Department's cost of operations could be reduced by disposing of inventories if it was economical to do so.[3] Through disposal, the Department eliminates some storage costs and the government recoups a small fraction of an item's purchase price. However, if stock is disposed of before it is economical to do so, inadequate supplies of the item could reduce readiness and costly repurchases might be necessary.

The Department divides secondary inventory into two broad categories. Supplies that are expected to be used within 2 years or that meet war reserve requirements are categorized as active inventory;[4] amounts beyond that level are placed in inactive status. Components may retain inactive inventory if it is economical to do so; inventory retained for this reason is

[1] The analysis in this report is based on information provided from Department of Defense reporting systems, which have significant deficiencies. See our report *Major Management Challenges and Program Risks: Department of Defense* (GAO-01-244, Jan. 2001). However, this information is the best available on Department inventory levels and is therefore used in this report.

[2] Secondary inventory includes spare and repair parts and other items that support the Department's operating forces.

[3] *Defense Inventory: Status of Inventory and Purchases and Their Relationship to Current Needs* (GAO/NSIAD-99-60, Apr. 1999).

[4] Department of Defense Materiel Management Regulation 4140.1-R, appendix 16, Office of the Under Secretary of Defense for Acquisition and Technology, May 1998.

referred to as economic retention inventory. Department regulations state that the economic retention level for an item should be based on an analysis that balances the costs of retention and disposal.[5] In doing the analysis, the Department's regulations state that components[6] should consider factors such as storage costs, potential long-term demand, potential repurchase costs, and the expected life of the weapon system the item is to support.[7] As agreed with your office, we determined whether the Department components' approaches for making economic retention decisions are sound.

Results in Brief

The Department's components do not have sound analytical support for determining when it is economical to retain or dispose of the $9.4 billion in inventory the Department is holding for economic reasons. The components' decision-making approaches for retaining economic retention inventory have evolved from the use of economic models to the use of judgmentally determined levels. In the mid-1990s, to meet Department inventory reduction goals, each component lowered the maximum levels set for holding economic retention inventory. The factors that support these models and the current maximum levels being used by the components have various weaknesses. For example, there are variations in common model factors without explanation, and the assumptions used lack consistency with governmentwide and Department-wide guidance. In addition, the Department did not have sound analytical support for the maximum levels they selected. Also, although the Department requires annual reviews of the analyses supporting economic retention decisions, the components have generally not done such reviews. As a result of these weaknesses, the Department is vulnerable to retaining some items when it is uneconomical to do so and disposing of others when it is economical to retain them.

We are recommending that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics, in

[5]Department of Defense Materiel Management Regulation 4140.1-R, section C4.2.1.2.1, Office of the Under Secretary of Defense for Acquisition and Technology, May 1998.

[6]The Air Force, the Army, the Navy, and the Defense Logistics Agency manage almost all (over 99 percent) of the Department's secondary and economic retention inventories. Since the Marine Corps manages such a small portion of inventory, it was not included in this review.

[7]See footnote 5 above.

consultation with the Secretaries of the Army, Navy, and Air Force and the Director, Defense Logistics Agency, to develop and implement sound approaches for making economic retention decisions. We also recommend that the components annually review their approaches as required by Department regulations.

Background

The Army, Navy, and Defense Logistics Agency approach to complying with Department of Defense requirements was to develop economic models to determine the maximum amount of inactive inventory they could retain. The Air Force did not develop an economic retention model; rather it employed a model based on historical usage patterns. Most recently, all the components lowered their maximum levels (referred to as ceilings) for items in economic retention during the 1990s to help them meet inventory reduction targets.

The Department requires that an economic model calculating whether to retain an inventory item or dispose of it should compare the cost of retention with the cost of disposal and select the option with the least cost.[8] As the amount of inactive stock increases, the cost of retention increases (more items cost more to hold) and the cost of disposal decreases (with greater amounts of an item on hand, the likelihood of having to repurchase it becomes less). Equilibrium is reached when the additional cost of retention equals that of disposal. This equilibrium level of inventory is the economic retention level—the largest retention amount of an inactive item that can be justified by economic analysis. Any amount of inventory over this level would become eligible for retention on a contingency basis or disposal.

Management of the Department's secondary inventory is a complex process, and effectively implementing systemwide improved management approaches has been a long-standing challenge for the Department.[9] However, following the end of the Cold War, the Department recognized that it had unnecessarily high inventories as a result of major reductions in

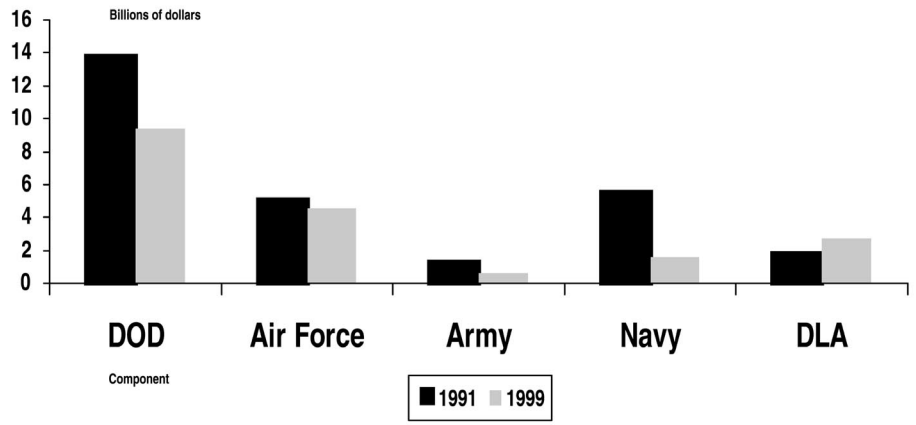
[8]See footnote 5 above.

[9]In 1990, we identified the Department's management of secondary inventories as a high-risk area because inventory levels were too high and management systems and procedures were ineffective. Some improvements have been made, but these conditions still exist and this area remains on our high-risk list. See *Major Management Challenges and Program Risks, Department of Defense* (GAO-01-244, Jan. 2001).

its force structure, and it directed the components to take action to lower inventory levels, including economic retention inventory. In response to this directive, during 1994, the Army, Navy, and Defense Logistics Agency chose to lower economic retention inventory levels by placing a preset maximum retention level that generally fell below the levels calculated by the models. The Air Force lowered its maximum level in 1996.

The Department reported its economic retention inventory fell from about $13.8 billion to about $9.4 billion (about 32 percent) between fiscal year 1991 and 1999 (see fig. 1) and by 40 percent when adjusted for inflation. The latter part of this period covers the years when lower ceilings were put in place by the services and Defense Logistics Agency. Although all three services reported reductions in economic retention inventory levels during this time, the changes were uneven. The Air Force reported the smallest decrease in economic retention inventory—from about $5.1 billion to about $4.5 billion (about 12 percent). In contrast, the Army reported a decrease from about $1.3 billion to about $600 million (about 54 percent) and the Navy from about $5.6 billion to about $1.6 billion (over 71 percent). On the other hand, the Defense Logistics Agency reported an increase in economic retention inventory from about $1.8 billion to about $2.7 billion (about 50 percent) as a result of a decision to consolidate management responsibility for all consumable items within the Agency. According to Department data, if it had not required the services to transfer management of large quantities of inventory to the Defense Logistics Agency during the 1990s, the Defense Logistics Agency inventory would have decreased by over a billion dollars. (See app. I for more details on how the composition of secondary and retention inventory changed between fiscal year 1991 and 1999.)

Figure 1: Department of Defense and Components' Economic Retention Inventories, September 30, 1991, and September 30, 1999



Source: Our analysis of the Department of Defense Supply System Inventory Report's data for fiscal years 1991 and 1999.

It is also important to note that, in response to a congressional mandate, the Department is conducting an independent study of secondary inventory and parts shortages as required by section 362 of the National Defense Authorization Act for Fiscal Year 2000.[10] As described in the authorization act, the independent study is to include analyses of the appropriate levels and use of secondary inventories, alternative methods for disposing of excess inventory, and the application of private sector cost calculation models in determining the cost of secondary inventory storage. According to the Department, the study is scheduled for completion by the end of August 2001.

Economic Retention Inventory Decisions Lack Sound Analytical Support

The services and Defense Logistics Agency do not have sound analytic support for their approaches for determining whether they are holding the correct amount of items in economic retention inventory. While components (with the exception of the Air Force) developed individual economic models designed to place inactive inventory in economic retention status as early as 1969, they have not used them since 1994. Instead, components lowered maximum levels of inventory that could be held (referred to as ceilings) to make economic retention determinations that would help achieve agency inventory reduction goals. Agency

[10]Public Law 106-65.

information indicates that this approach has helped to reduce inventory levels. However, the components have not annually reviewed the analyses used to support their economic retention decisions, as required by the Department, and therefore have no assurance that the inventories held in economic retention status are appropriate.

Component Retention Model Cost Factors and Assumptions Are Different and Not Current

Although the components were not using their economic retention models to manage inventory levels, we did generally review the models. We noted that factors and assumptions within the models differed and were not current without explanation for the differences. Given the differences we found in these models, such as varied and outdated cost factors and assumptions and the lack of support for these factors and assumptions, it is uncertain whether they determine an accurate retention level.

A methodology for determining how many items are to be kept in economic retention status, which the Department of Defense requires, should compare the costs of retention to the costs of disposal of an inventory item.[11] The Army, Navy, and Defense Logistics Agency developed models designed for making economic decisions that consider the costs of retention and the costs of disposal. The Air Force does not compare retention and disposal costs in determining economic retention inventories. Instead, the Air Force employs historical usage levels to determine economic retention levels.

The components developed their models in different ways and use different factors and assumptions in their models without detailed documentation. The amount of inventory to hold in economic retention varies by model depending on the factors and assumptions in the models. The economic retention models of the three components generally meet the Department's requirements to compare retention costs to disposal costs, but the factors and assumptions in them vary across the components. For example, the Army and Navy use a factor of obsolescence and the Defense Logistics Agency does not. In addition, the values for similar factors used in economic retention models varied among components. For example, the Army's value for loss rates (loss through theft or decay) is 1 percent, the Navy's value is 4 percent, and the Defense Logistics Agency does not use a loss rate.

[11]See footnote 5 above.

Furthermore, the components have not appropriately updated their model assumptions. For example, prescribed discount rates, a key assumption in all economic retention models, vary across components' models. The Navy uses a 10-percent discount rate and the Army and the Defense Logistics Agency use a 7-percent rate for computing net present values.[12] Neither value matches discount rates recommended by the Office of Management and Budget for a cost-effectiveness analysis, which is the decision to retain or dispose of inventory.[13] The rates are also inconsistent with our guidance on discount rates.[14] For example, for the year 2000, the Office of Management and Budget discount rate for a cost-effectiveness analysis was 4.2 percent for a 30-year analysis; the rate was 2.9 percent in 1999.

Further information about component economic models can be found in appendix II of this report.

Components' Ceilings Are Different and Judgmentally Based

The use of a maximum level to manage economic retention stocks (commonly called ceilings by components) makes the Department vulnerable to retaining items when it is uneconomical to retain them or disposing of items that are economical to keep. The components judgmentally developed their ceilings for economic retention inventory, which differ and have yielded lower levels of economic retention inventory than the levels calculated by the economic retention models.

During 1994-96, the components established different ceilings for items in economic retention. A ceiling imposes an upper constraint of years of demand—the quantity needed on an annual basis to meet requirements—on how much inactive inventory can be retained. Prior to the 1990s, the components had set ceilings on retention inventory that varied but that generally exceeded higher levels determined by their economic retention

[12] A discount rate of 10 percent implies that 91 cents would grow at a 10-percent interest rate to $1 in a year ($0.91 times 1.1 = $1). Thus, the value today (the present value of $1 received one year from now) is 91 cents. The calculation of the present value of $1 received 2 years from now would be 1 divided by 1.1 squared, or 1 divided by 1.21, which equals 82.6 cents.

[13] Office Of Management and Budget Circular A-94, *2000 Discount Rates for the Office of Management and Budget Circular No. A-94*, appendix C, February 9, 2000.

[14] *Discount Rate Policy* (GAO/OCE-17.1.1, May 1991, pp. 25-26). Comparing the estimated costs of retention to the costs of disposal in deciding whether to keep or dispose inventory is a cost-effectiveness analysis. The discount rates that are to be used in such analyses are updated every year and are published in appendix C of the Office of Management and Budget Circular A-94.

models. While component ceilings varied in the span of years of demand, they also varied in the total years of inventory covered. The Army ceiling is applied to inventories above active inventory requirements.[15] The Air Force, Navy, and Defense Logistics Agency ceilings apply to their entire inventory requirements, including active inventory. Table 1 summarizes the maximum levels used by each component during the 1990s.

Table 1: Component Ceilings on Economic Retention Inventories

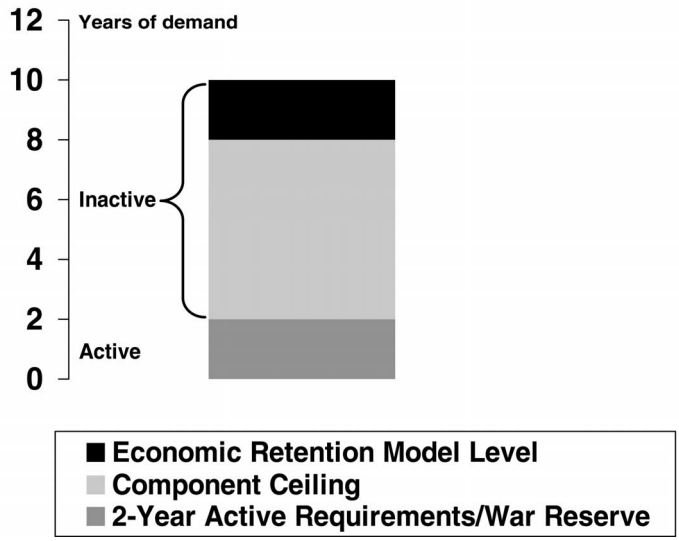
Component	Ceilings for inventory to be held
Air Force	13 years of total maximum demand for all items
Army	7 years of demand above requirements for serviceable reparables, 6 years for unserviceable reparables 5 years of demand above requirements for all other items (as of Dec. 1999, levels left up to management)
Navy	12 years of total demand for new weapons systems 8 years of total demand for "steady" weapon systems 4 years of total demand for weapons systems approaching obsolescence
Defense Logistics Agency	6 years of total demand

Source: Our analysis of component information.

According to component officials the components now hold fewer items in economic retention status because the ceilings established in the 1990s replaced the levels calculated by economic retention models. The components' more stringent ceilings result in smaller inventory level determinations than would be calculated with economic retention models. Figure 2 illustrates the level a model might calculate and how a more constrained ceiling would override it. For example, a component's ceiling for economic retention stock is 6 years of demand above requirements. If the model computed an economic retention limit (e.g., 8 years of demand of 25 items a year—200 items) that exceeded the maximum level (e.g., 6 years of demand—150 items), the ceiling (150 items) would be selected as the retention level. The additional stock (50 items) would be moved to other inactive categories (contingency or reutilization status) or be disposed of.

[15]As defined in the Supply System Inventory Report (September 30, 1999, p. 25), active inventory requirements are materiel expected to be used within the budget year and materiel that has been purchased to meet specific war reserve requirements.

Figure 2: How Ceilings Reduce an Economic Retention Level



Source: Our analysis.

Limited Reviews of Approaches for Making Economic Retention Decisions

Components have not reviewed their economic retention models or the judgmentally established ceilings annually, although required to do so by the Department. [16] The lack of the components' reviews of their retention analyses, either their models or ceilings, raises further questions about the cost-effectiveness of either approach.

The Department's required annual reviews are to focus on

- improving analyses supporting retention decisions by accounting for potential upward or downward trends in demand and/or the uncertainties of predicting future long-term demand based on historical data and
- improved estimates of costs used in retention decision-making. [17]

All components have conducted studies of their economic retention analyses, and initiatives were undertaken to meet inventory reduction goals during the 1990s, such as constraining economic retention model

[16]Department of Defense Materiel Management Regulation 4140.1-R, section C4.2.1.1.4, Office of the Under Secretary of Defense for Acquisition and Technology, May 1998.

[17]Department of Defense Materiel Management Regulation 4140.1-R, section C4.2.1.2.3., Office of the Under Secretary of Defense for Acquisition and Technology, May 1998.

determinations with ceilings. However, no studies had been conducted to determine if economic retention models could be used to establish appropriate Department inventory levels on an economic basis, rather than through the use of ceilings. There was little documentation available supporting the selection of the factors and assumptions used in economic retention models, such as obsolescence rates and discount rates. The various factors and assumptions might be appropriate, but in most cases the components lacked documentation describing why they were selected for use.

Furthermore, the limited information that is available about the impact of ceilings indicates that they could be causing uneconomical disposals. For example, the Army Audit Agency produced a March 2000 study that suggested that, while the Agency found no instances in which an item was disposed of when it was more economical to retain it, it concluded, based on the statements of inventory managers, that maximum levels resulted in the disposal of items that were still economical to retain.[18] Inventory managers also told us that maximum levels also caused disposal of items that were still economical to retain, but components were unable to provide data about repurchases of disposed items because of limitations in component databases.

Conclusions

Components (other than the Air Force) have developed models designed to make economic retention decisions. However, none of the components currently use their economic retention models. Instead, they and the Air Force use ceilings to limit the amount of economic retention inventory they hold. Components have not properly documented their approaches to economic retention decisions. For example, there are variations in common model factors and assumptions lack consistency and are not current. In addition, the Department did not have sound analytical support for the maximum levels they currently use. As a result, the components cannot currently depend on their models or ceilings to determine retention inventory levels without review and improvement. They also have not annually reviewed their approaches. However, the Department is currently conducting a mandated study of secondary inventory and spare parts shortages. Because the ceilings lack analytical support, and the model factors and assumptions vary without explanation and are out of date, the

[18] Audit of Repair Parts Disposal Policy and Procedures, U.S. Army Audit Agency (AA 00-203, Mar. 13, 2000).

Department cannot provide reasonable assurance that inventories held in economic retention are the right amount.

Recommendations for Executive Action

We recommend that the Secretary of Defense direct the Secretaries of the Army, Navy, and Air Force and the Director of the Defense Logistics Agency, in consultation with the Under Secretary of Defense for Acquisition, Technology, and Logistics, to take the following actions:

- Taking into consideration the results of the congressionally mandated study, establish milestones for reviewing current and recently used approaches for making decisions on whether to hold or dispose of economic retention inventory to identify actions needed to develop and implement appropriate approaches to economic retention decisions.
- Annually review their approaches to meet Department regulations to ensure that they have sound support for determining economic retention inventory levels.

Agency Comments and Our Evaluation

In written comments on a draft of this report, the Department of Defense partially concurred with our recommendations. The Department agreed with our recommendation that its components needed to annually review the appropriateness of their economic retention inventory levels.

Regarding our draft recommendation that the components review their approaches to determining economic retention levels, the Department stated that the need for components' further review of retention decisions would be determined after the completion of an independent study in August 2001 of secondary inventory and parts shortages required by section 362 of the National Defense Authorization Act for Fiscal Year 2000. The results of the study could affect component approaches to making economic retention decisions. The study is to report on such issues as the appropriate levels of secondary inventories, alternative methods for disposing of excess inventory, and the application of private sector cost calculation models in determining the cost of secondary inventory storage. Our recommendation focuses on reviewing the approaches for setting economic retention levels to minimize the possibility of inappropriate retention or disposal decisions. How the study results will affect how the Department should address our recommendation remains to be seen. Therefore, we modified our draft recommendation. We are now recommending that the Department establish milestones for taking action on the study's recommendations as they relate to the economic retention issues that we raised in this report. The Department's comments are reprinted in appendix IV.

Appendix III describes our objectives, scope, and methodology for this report.

We are sending copies of this report to the appropriate congressional committees; to the Honorable Donald H. Rumsfeld, Secretary of Defense; the Honorable Joseph W. Westphal, Acting Secretary of the Army; the Honorable Robert B. Pirie, Jr., Acting Secretary of the Navy; the Honorable Lawrence J. Delaney, Acting Secretary of the Air Force; Lieutenant General Henry T. Glisson, Director, Defense Logistics Agency; and the Honorable Mitchell E. Daniels, Jr., Director, Office of Management and Budget.

Please contact me at (202) 512-8412 if you have any questions. Key contributors to this report were Charles Patton, Donald Snyder, Scott Pettis, and Charles Perdue.

Sincerely yours,

David R. Warren, Director
Defense Capabilities and Management

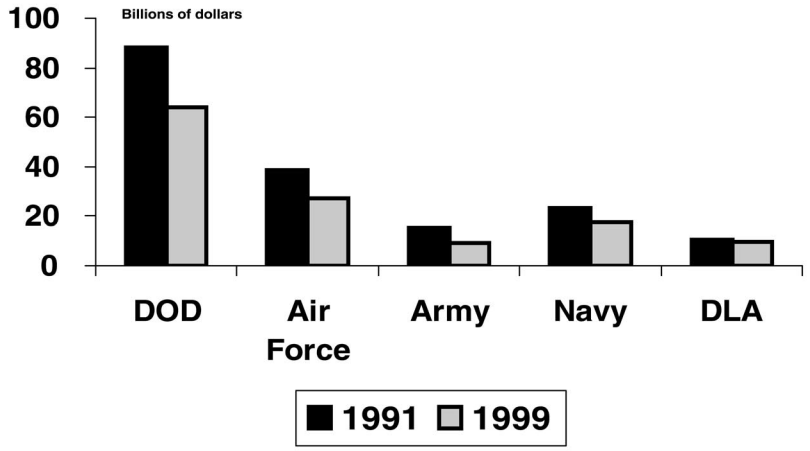
Appendix I: Changes in Secondary and Economic Retention Inventory Levels

After the end of the Cold War and a subsequent reduction in force structure, the Department of Defense recognized that it had high inventory levels and took action to reduce them. Department secondary inventory levels were reduced by about a third between 1991 and 1999 when adjusted for inflation. All four components reviewed reduced their secondary inventory levels during this time, although the level of reduction varied by component. The percentage of secondary inventory held in economic retention status also was reduced during this time, although there were fluctuations in inventory levels among components. There were also sizable shifts in the amount of consumable and reparable inventories managed by each component. The following sections provide details of Department and component secondary and economic retention inventory trends.

Secondary Inventory Levels Have Decreased

The Department reported reductions in its secondary inventory during the 1990s. The amount of secondary inventory fell from $88 billion in 1991 to $64 billion in 1999 (a decline of 27 percent and a 36-percent reduction when adjusted for inflation). As shown in figure 3, component performance in reducing inventory levels was uneven but generally reflected the Department-wide performance.

Figure 3: Changes in Department of Defense and Components' Secondary Inventory, September 30, 1991, and September 30, 1999



Legend
DLA = Defense Logistics Agency
DOD = Department of Defense

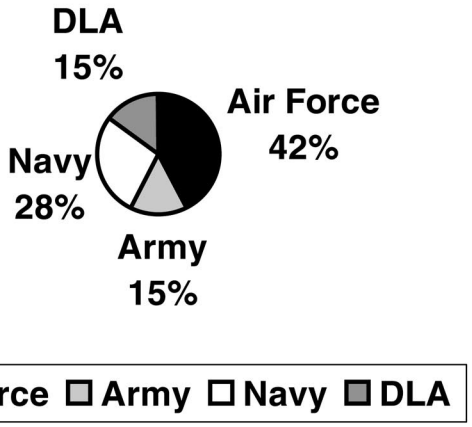
Source: Our analysis of the Department Supply System Inventory Report's data for fiscal years 1991 and 1999.

All four components reduced their secondary inventory levels during this time, but component performance in reducing inventory levels varied. The three services reported reductions in their levels of secondary inventories by amounts ranging from 24 to 38 percent. The Defense Logistics Agency realized a slightly smaller decrease of about 10 percent, primarily because the Department transferred management of many consumable inventories from the services to the Defense Logistics Agency during this time.[1] This transfer helped the services meet their inventory reduction goals.

In 1999, the portions of secondary inventory managed by components varied, with the Air Force managing the largest share of the Department's secondary inventory, as figure 4 shows.

[1] In November 1989, the Deputy Secretary of Defense directed a review of management practices in the Department. The result was a number of decisions called Defense Management Report Decisions. Decision 926, Nov. 9, 1989, "Consolidation of Inventory Control Points," recommended the transfer of the management of nearly all consumable items from the services to the Defense Logistics Agency. Phase 1 of the Consumable Item Transfer program involved the transfer of 760,000 consumable supplies and spare parts, began in August 1991, and concluded in November 1995. Items affected by phase 2 were unique end items that had critical applications or required intensive management. Under phase 2, which began in January 1996, 142,706 items were transferred to the Defense Logistics Agency. When the transfer ended in 1998, the Defense Logistics Agency was responsible for managing about 85 percent of the Department consumable item inventory.

Figure 4: Components' Shares of Department of Defense Secondary Inventory, September 30, 1999



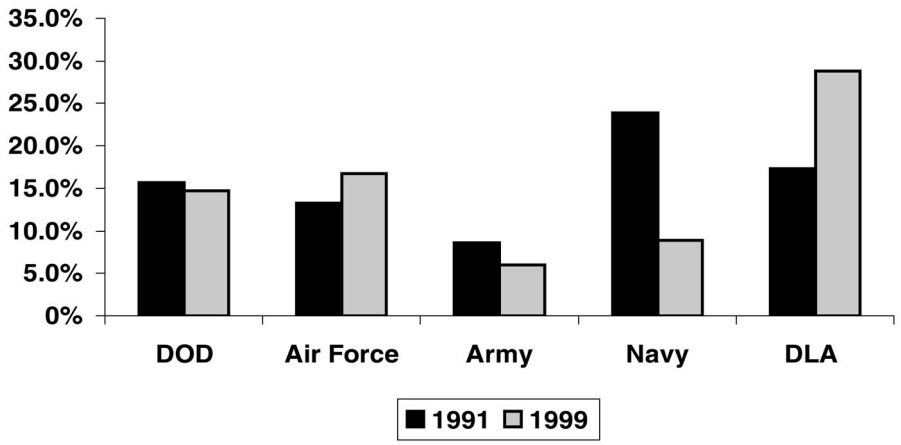
Legend
DLA = Defense Logistics Agency

Source: Our analysis of the Department Supply System Inventory Report's data for fiscal year 1999.

Economic Retention Shares of Secondary Inventory Have Decreased Overall

The percent of component secondary inventories held in economic retention status Department-wide fell slightly, from 15.7 percent to 14.7 percent between fiscal year 1991 and 1999. However, there were sizeable shifts in the percent of secondary inventory held in economic retention status by each component. For example, shares of secondary inventory held in economic retention status by the Army and Navy fell while the Air Force and Defense Logistics Agency portions increased (see fig. 5).

Figure 5: Share of Secondary Inventory Held in Economic Retention Status, by Component and Department-wide, September 30, 1991, and September 30, 1999

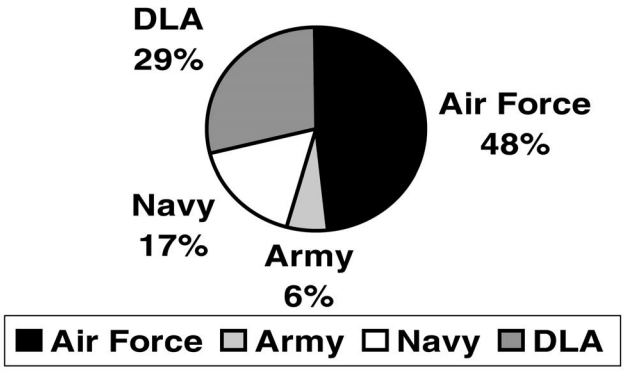


Legend
DLA = Defense Logistics Agency
DOD = Department of Defense

Source: Our analysis of Department Supply System Inventory Report data for fiscal years 1991 and 1999.

There was variance in the share of the Department's economic retention inventories managed by Defense components, with the Air Force holding almost half, as figure 6 shows.

Figure 6: Components' Shares of Department of Defense Economic Retention Inventory, September 30, 1999 (percent)



Legend
DLA = Defense Logistics Agency

Source: Our analysis of Department of Defense Supply System Inventory Report data for fiscal year 1999.

Trends in Consumable and Reparable Inventories in Economic Retention Status

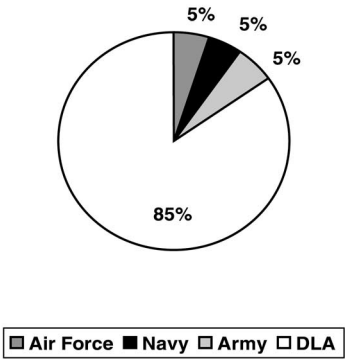
Currently, the services manage mostly reparable items because management responsibilities for nearly all consumable items have been transferred to the Defense Logistics Agency.[2] On September 30, 1999, over 34 percent ($3.2 billion) of the Department's consumable inventory was in economic retention status. The Defense Logistics Agency managed $2.7 billion (85 percent) of the Department's consumable economic retention inventory. The percentage of total Department consumable and reparable stock in economic retention status as of September 30, 1999, varied widely by component.

Department consumable inventory in economic retention status fell by about 42 percent between September 30, 1993, and September 30, 1999. Each service reduced its consumable inventory in economic retention by an average of 73 percent between 1993 and 1999. However, the Defense

[2]As defined in Department Regulation 4140.1-R, appendix 16, consumable items are items of supply (except explosive ordnance and major end items of equipment) that are normally expended or used up beyond recovery in the use for which the item is designed or intended. The Department defines reparable items as being items of supply subject to economical repair and for which the repair is considered in satisfying computed requirements at any inventory level. The majority dollar value of Department inactive inventory is reparable inventory.

Logistics Agency's consumable economic retention inventories were reduced by only 26 percent during this time. By 1993, the Defense Logistics Agency consumable retention inventory had more than doubled to $3.7 billion from its 1991 amount of $1.8 billion due to the Consumable Item Transfer program. The 1993 amount subsequently fell to $2.7 billion in 1999. After the transfer of most of the services' consumable items, the Defense Logistics Agency held about 85 percent of the Department's consumable inventory (see fig. 7).

Figure 7: Components' Shares of Department of Defense Consumable Economic Retention Inventory, September 30, 1999



Legend
DLA = Defense Logistics Agency

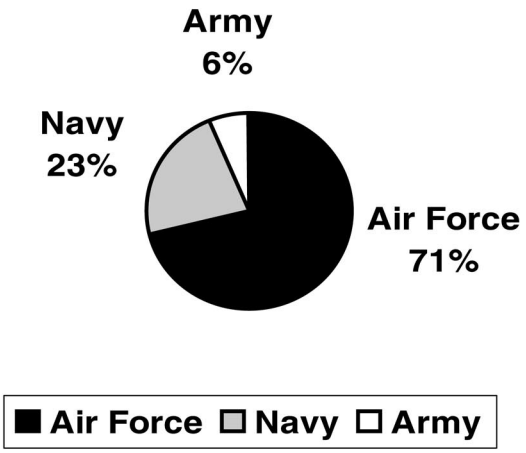
Source: Our analysis of the Supply System Inventory Report's data for fiscal year 1999.

The Air Force's share of Department of Defense reparable items in economic retention status increased between 1993 and 1999. The Air Force reparable inventory in economic retention status increased by $526 million (about 14 percent) during this time. In contrast, the Navy reduced reparable inventory in economic retention status by 55 percent[3] and the Army reduced its inventory in economic retention status by 63 percent between 1993 and 1999. By 1999 the Air Force managed over 70 percent of

[3]The Navy redefined the status of its reparables in economic retention status in September 1994; according to Navy officials this approach resulted in more stock being put into disposal or contingency status and reduced inventories by $1 billion.

total Department reparable inventories in economic retention—up from 48 percent in 1993 (see fig. 8).[4]

Figure 8: Components' Shares of Department of Defense Reparable Economic Retention Inventory, September 30, 1999



Note: The Defense Logistics Agency does not hold any inventory described as reparable in its accounting systems.

Source: Our analysis of Supply System Inventory Report data for fiscal year 1999.

[4]The Department's Supply System Inventory Report included consumable and reparable inventory data separately for the first time in 1993.

Appendix II: Information on Component Economic Retention Models

The following sections provide more detail on the general factors and specific models the components use to determine economic retention limits and the ceilings the components use.

General Factors in an Economic Retention Model

An economic retention methodology for determining how many items are to be kept in economic retention status, which the Department of Defense requires, should compare the costs of retention to the costs of disposal of an inventory item.[1] In practice, the components configure their models in different ways and often use distinct values for the factors and assumptions in their models. The solution the models seek, the economic retention limit, depends on how the models are set up and factors used in the models when calculating retention and disposal costs.

Retention Cost Factors

The principal factors in calculating the cost of retention include the estimated costs of operating storage facilities based on the estimated value of the item in storage and the probability of damage, theft, or loss. The component responsible for managing the item estimates the cost factors by taking a percentage of the value, or price, of the item. Components typically determine that the appropriate price to use in this calculation is the last price paid for an item. If an item needs repair, this cost is also added. The percentages for all the cost factors are then multiplied by an item's price and totaled to obtain the estimated cost of retention. The end result of these calculations is that the model's estimate of retention cost rises for each additional unit of an item held.

Another consideration for determining retention cost is the possibility that an item may become obsolete. An item could be replaced by a new item or the weapon system the item supports could be discontinued. To address this possibility, the value of the item is reduced based on estimates by the managing component of the likelihood it would not be used. For example, if an item is valued at $100 and there is a 0.9 probability that the item would be needed in a future period, then the $100 value of the item would be multiplied by 0.9 to yield a future value of $90, based on the 10-percent possibility of obsolescence.

Almost two-thirds of the Department's economic retention stock consists of reparable items. Some reparable items in inactive status are in disrepair

[1]Department of Defense Materiel Management Regulation 4140.1-R, section C4.2.1.2.1., Office of the Under Secretary of Defense for Acquisition and Technology, May 1998.

or need to be upgraded. In these cases, a repair cost is factored into the calculation, which is typically based on the item's estimated value in its unrepaired condition. Components also subtract an item's repair cost from the price of a new item. Additionally, delivery costs (based on a percentage of the item's price) for moving the item to a repair facility are estimated and added to the computation of retention costs.

Disposal Cost Factors

A key factor in determining the disposal cost of an item is the chance of having to repurchase the item later. To calculate the disposal cost, a component estimates the probability of repurchase and typically multiplies it by the item's estimated price, which is the estimated purchase price in the future. Some components include estimates of administrative costs associated with procuring an item (such as contract costs) and the cost of starting up a production line to manufacture the item. Estimated future prices can be higher than original purchase prices because additional costs could be incurred, such as the administrative costs involved in contracting with a manufacturer, and setup costs. However, items may become obsolete in the future. This estimated reduction in demand caused by obsolescence is also factored into the retention cost. Since the probability of repurchase declines as the amount held increases, the estimated disposal cost of the item declines as more items are held.

Additional adjustments to the disposal cost include estimated expenses associated with disposal (such as transportation to a disposal facility and conversion of sensitive items for sale) and administrative costs incurred in selling an item. These costs are estimated as a percentage of the price of an item and added to the disposal cost. Finally, an item's estimated salvage value would be deducted from the estimated disposal cost to obtain the net disposal cost for each unit.

Other Factors

The time value of money is also considered in determining whether to retain an item because the costs associated with storing or disposing of an item are incurred in the future. The costs and benefits of retaining or disposing of an item are computed on a present value basis (their value today) to equalize all of the costs and benefits. To make the present value calculation, a discount (interest) rate is used to factor in the time value of money. For example, if the model computes a benefit in one year that equals one dollar, discounting by 10 percent would make that present discounted value today equal to 91 cents.

Economic retention models use additional factors to determine whether to accept items offered for return from depots or other activities. If a return is accepted, then the estimated cost associated with that action would

have to be included. For example, estimated transportation costs to return an item would be added to estimated storage costs and compared to estimated disposal costs to decide whether to accept the return of an item.

Component Economic Retention Models

The Army, the Navy, and the Defense Logistics Agency use economic models to calculate the economic retention limit for each item they analyze; the components then apply the ceiling limits described in this report. The Air Force model does not compare the costs of retention to the costs of disposal. Instead, the Air Force employs an item's usage history and its retention ceiling to determine whether to dispose of an item. The specific factors and assumptions the three components' models use and the Air Force computation are described in the following sections.

Army

The Army model compares retention and disposal values to determine the economic retention limit. In calculating disposal costs, the Army model includes any potential disposal value. In calculating retention costs, the model includes the benefits of retention, i.e., not having to reorder an item. The model also includes the probability of obsolescence. The Army model allows for the possibility of obsolescence to vary depending on the age of the item. The Army uses a 7-percent discount rate to calculate the present value of disposal and retention values.

Navy

The Navy model compares what it calls holding costs to buy back costs to determine the economic retention requirement. Holding costs include a disposal value minus disposal transportation costs. The model also factors in an inventory loss rate and an obsolescence rate in computing storage costs. The major factors of buy back costs are those costs that would be incurred if the item had to be reordered and include item replacement price, the administrative costs of procurement, and manufacturer's set-up costs to manufacture unique items (if needed). The model computes buy back and retention costs on a present value basis (using a 10-percent discount rate) because reorder costs would be incurred in the future. If the item is reparable, repair costs (if appropriate) are included in the computation to account for the costs that would be incurred for making the item ready for issue.

The Defense Logistics Agency

The Defense Logistics Agency's holding costs are determined by computing storage costs times the probability of needing the material. Holding costs are compared to expected disposal costs. If holding costs are less than disposal costs (expected possible costs of reprocurement minus disposal proceeds), the item should be retained. The model can also evaluate whether an item manager should accept a return and pay the associated costs to bring an item back from retail operations or deny the

return and take the chance of reprocurement in the future. The costs of accepting a return are added to the expected holding costs, and the sum is compared to the expected cost to dispose and repurchase. The analysis is done on a present value basis using a discount rate of 7 percent because both costs involve potential outlays in the future.

Air Force

The Air Force model does not compute the costs of disposal or storage as required by the Department. The Air Force computation of economic retention limits is based on an item's usage history. The current Air Force model distinguishes between inactive items that have experienced zero demand over a 5-year span, and have no foreseeable demand, and demand items—those with a demand history over the past 5 years.

If an item has been categorized as inactive, the retention limit is based on a non-demand amount—called either an insurance or numeric stock objective limit. A maximum of five items is held for numeric stock objective items and a maximum of two items is held for insurance items. According to component officials and other experts, most Air Force items are in these categories.

For items that are categorized as demand items, the economic retention limit is determined through several steps. The system computes gross retention levels first by adding 9 years of demand to peak requirements (the highest quarterly demand level for the item from the prior 25 quarters). Second, the minimum retention level for stock needing repairs (unserviceable items) is computed by adding (1) condemned stock for the past 9 years, (2) stock held at supply facilities and (3) peak requirements identical to the factors computed for the gross retention level. Third, these two levels are then adjusted to establish maximum (gross) and minimum inventory levels, which are compared to the number of assets in inventory. Unserviceable items are retained only when the number of serviceable assets falls below the minimum retention level.

Table 2 summarizes the factors and assumptions used in component economic retention models.

Table 2: Retention and Disposal Cost Factors in Components' Economic Retention Models

Component	Retention factors	Disposal factors
Air Force	None	None
Army	Retention values: unit price obsolescence rate storage cost	Disposal values: unit price disposal value
Navy	Holding cost: item replacement price storage cost rate obsolescence rate loss rate	Buy back cost: item replacement price manufacturer's setup cost procurement order cost (administrative) obsolescence rate
Defense Logistics Agency	Hold option: item unit price storage cost rate probability of needing the material	Disposal benefit and possible repurchase cost: item unit price repurchase price rate (percent of item unit price) cost to reorder (administrative) net disposal rate (salvage value) Defense Logistics Agency disposal cost (administrative) probability of needing the material

Source: Our analysis of component information.

Many Inventory Items with Limited Demand Not Subject to Economic Retention Model Determinations

Economic retention models and ceilings are to be applied only to items with predictable and steady annual demand. Limited-demand items—those with no or infrequent demand in a year—are also held in economic retention status. They are retained even though the probability of demand is low because the lack of the items would seriously hamper the operational readiness of a weapon system. None of these inventory items would be considered for disposal unless they exceeded Department inventory requirements for limited-demand items.

The majority of items held in economic retention status fell into limited-demand status. Table 3 details the number and dollar value of items that the retention models and ceilings would analyze and the items that would not be analyzed due to low or no demand.

Table 3: Application of Economic Retention by Type of Item, by Component, as of September 30, 1999 (number and dollar value)

Component	Economic retention formula applies (number/dollar value)	Economic retention formula does not apply (number/dollar value)
Air Force	10,874 items $2.0 billion	56,370 items $2.4 billion
Army	23,721 items $0.8 billion	1,259 items $0.014 billion
Navy	37,035 items $0.6 billion	270,156 items $1.6 billion
Defense Logistics Agency	2.8 million items $2.7 billion	

Source: Component officials.

The Structure of Component Ceilings

As discussed in the body of this report, components used a variety of maximum levels of demand (commonly called ceilings by components) to further reduce inventory levels (low-demand items noted in table 3 above were not affected by ceiling limits). Three of the four components reviewed imposed ceilings on the number of years of demand for all items, and most inventory control points in the fourth component (the Army) also used ceilings.

Through most of the 1990s, the Army set a different ceiling on how many years of demand can make up the retention limit, depending on the characteristics of the item. According to Army officials, in 1992 the Army adjusted its factors to a ceiling of 7 years of demand above requirements for essential items (items that directly support critical parts of a weapon system). The Army used a ceiling of 4 years of demand above requirements for nonessential items (items that do not directly support the critical parts of a weapon system). In December 1999 the Army revised the ceiling limits to 7 years of demand above requirements for serviceable reparables, 6 years of demand above requirements for unserviceable reparables, and 5 years of demand above requirements for all other items. At the same time the Army decided to let each inventory control point set its own ceilings. An Army official at one of its five inventory control points stated that his inventory control point is using the determinations of the economic retention model for setting retention inventory limits without the ceilings. Army officials at the other four inventory control points stated that they have not changed their ceilings.

In 1994, the Navy chose to implement ceilings of years of demand depending on the expected future growth of the weapon system. The Navy computation system for inventory calculates a single inventory limit that includes active requirements and inactive inventory. As a result, the demand ceiling (4, 8, or 12 years of total demand) applies to the entire computed demand limit—not just economic retention limits. The ceiling is 12 years of total demand for items supporting new weapon systems. A ceiling of 8 years of total demand is applied to items supporting weapons systems in common use and 4 years of total demand is applied to items supporting weapons systems approaching obsolescence.

The Defense Logistics Agency ceiling for items in economic retention, implemented in 1994, is 6 years of total demand. The prior ceiling on years of demand for inactive inventory was 10 years of total demand.

The Air Force ceiling for inventory in economic retention status was reduced from 20 years of total maximum demand to 13 years of total maximum demand in 1996, according to Air Force officials.

Appendix III: Scope and Methodology

To determine component approaches to making economic retention decisions, we interviewed Department and component officials who managed economic retention models and ceilings in the Defense Logistics Agency, the Army, the Navy, and the Air Force and reviewed documents they provided. Because the Marine Corps had less than 1 percent of the Department's total economic retention inventory, we did not include the Marine Corps in our analysis. We did not independently test or validate the component models or inventory systems.

We interviewed officials and gathered relevant documentation for our review at the following locations:

- The Office of the Deputy Under Secretary of Defense (Logistics), Washington, D.C.
- The Defense Logistics Agency, Ft. Belvoir, Virginia.
- The Army Material Systems Analysis Activity, Aberdeen, Maryland.
- The Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio.
- The Navy Inventory Control Point, Mechanicsburg, Pennsylvania.

To support our analysis of trends in component inventory levels, we analyzed information in the Department of Defense Supply System Inventory Report for September 30 of fiscal years 1991 through 1999. Our analysis included data for fiscal year 1991 through 1999 for trends in economic retention. We reviewed data from these time periods because the Department changed the way dollar estimates of inventory were calculated in 1990; inventory data was reported consistently in the Supply System Inventory Report from 1991 through 1999. Component officials stated that there were differences in the categories of inventory components reported in the Supply System Inventory Report. We did not adjust the Supply System Inventory Report data for this analysis. We analyzed data for reparable and consumable items for fiscal years 1993 through 1999 because the Department first separately reported data on reparable and consumable items in its 1993 Supply System Inventory Report. Our review focused on the models and items with predictable demand. We did not analyze items with limited demand (see app. II). We did not independently test or validate the accuracy of the data reported in these inventory systems. We adjusted Department data to account for inflation as part of our analysis of component performance in realizing inventory reductions over time.

We conducted our work between May 1999 and January 2001 in accordance with generally accepted government auditing standards.

Appendix IV: Comments From the Department of Defense

DEPUTY UNDER SECRETARY OF DEFENSE FOR
LOGISTICS AND MATERIEL READINESS
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

APR 27 2001

Mr. David R. Warren
Director, Defense Capabilities and Management
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Warren:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "DEFENSE INVENTORY: Approach for Deciding Whether to Retain or Dispose of Items Needs Improvement, " dated March 29, 2001 (GAO Code 709423/OSD Case 3067). The DoD generally concurs with the report.

Detailed comments on the draft report recommendations are included in the enclosure. The DoD appreciates the opportunity to comment on the draft report.

Sincerely,

Allen W. Beckett
Acting

Enclosure

GAO DRAFT REPORT DATED MARCH 29, 2001
(GAO CODE 709423) OSD CASE 3067

"DEFENSE INVENTORY: APPROACH FOR DECIDING WHETHER TO RETAIN OR DISPOSE OF ITEMS NEEDS IMPROVEMENT"

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATIONS

RECOMMENDATION: The GAO recommended that the Secretary of Defense direct the Secretaries of the Army, Navy, and Air Force and the Director of the Defense Logistics Agency, in consultation with the Under Secretary of Defense for Acquisition, Technology, and Logistics, to review current and recently used approaches for making decisions on whether to hold or dispose of economic retention inventory and establish milestones on an expedited basis for developing and implementing appropriate approaches to economic retention decisions, and annually review their approaches to meet Department regulations to ensure that they have a sound basis to determine economic retention inventory levels.

DOD RESPONSE: Partially concur. We agree with the need for DoD Components to continue their review of appropriate economic retention inventory levels. An independent study is currently being conducted as required by Section 362 of the National Defense Authorization Act for Fiscal Year 2000 (Public Law 106-65). This study includes an evaluation of secondary inventory retained by the Department and how much inventory, currently held by the Department, could be declared to be excess. The determination of a need for further review of retention decisions by the DoD Components will be made upon completion of this independent study which is scheduled for the end of August 2001.

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