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United States Government Accountability Office
Washington, DC 20548

November 21, 2008

The Honorable Robert Gates
The Secretary of Defense

Dear Mr. Secretary:

Attached is a copy of our proposed report entitled *Defense Inventory: Army Needs to Evaluate Impact of Recent Actions to Improve Demand Forecasts for Spare Parts* (GAO-09-199). We are providing this draft for your review and comment before the report is issued.

We would like to obtain the department's written or oral comments from you or your designated representative by December 16, 2008. These comments will be reflected in the final report. We prefer written comments and request that the written comments be provided electronically. However, we will accept comments provided in hard copy, orally, or in an unsigned e-mail message. Please direct all comments and any questions you may have concerning this draft to Mr. Thomas Gosling, Assistant Director, (202) 512-8919 or goslingt@gao.gov.

As the cover indicates, this draft has not been fully reviewed within GAO, is subject to change, and must be safeguarded to prevent its improper disclosure. Please do not show or release its contents for any purpose. All drafts remain the property of GAO. Upon request, all electronic copies of drafts must be destroyed and any hard copies of drafts must be returned. We appreciate your cooperation in this matter.

Sincerely yours,

William M. Solis
Director/Defense Capabilities
and Management

Enclosure

United States Government Accountability Office

GAO

Report to Congressional Requesters

January 2009

DRAFT

DEFENSE INVENTORY

Army Needs to Evaluate Impact of Recent Actions to Improve Demand Forecasts for Spare Parts

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GAO-09-199

January 2009

DEFENSE INVENTORY

Army Needs to Evaluate Impact of Recent Actions to Improve Demand Forecasts for Spare Parts

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Highlights

Highlights of GAO-09-199, a report to Congressional Requesters

Why GAO Did This Study

Since 1990, GAO has designated the Department of Defense's (DOD) inventory management as a high-risk area. It is critical that the military services and the Defense Logistics Agency effectively and efficiently manage DOD's secondary inventory to ensure that the warfighter is supplied with the right items at the right time. It is also imperative that they maintain good stewardship over the billions of dollars invested in their inventory. GAO reviewed the Army's management of secondary inventory and determined (1) the extent to which on-hand and on-order secondary inventory reflected the amount needed to support current requirements and (2) causes for the Army's having secondary inventory that exceeded current requirements or, conversely, for having inventory deficits. To address these objectives, GAO analyzed Army secondary inventory data (spare parts such as aircraft and tank engines and their components and accessories) from fiscal years 2004 through 2007.

What GAO Recommends

GAO recommends that the Army strengthen inventory management by incorporating cost efficiency metrics and goals, evaluating and improving demand forecasting procedures, monitoring the effectiveness of providing operational information to item managers, and enhancing oversight of inventory management through the Army's chief management officer.

To view the full product, including the scope and methodology, click on GAO-09-199. For more information, contact William M. Solis at (202) 512-8365 or solisw@gao.gov.

What GAO Found

For the 4-year period GAO examined, the Army had significantly more inventory than was needed to support current requirements. At the same time, the Army had substantial inventory deficits. GAO's analysis of Army data reflected an annual average of about $16.3 billion of secondary inventory for fiscal years 2004 to 2007, of which about $3.6 billion (22 percent) exceeded current requirements. On average, approximately 97 percent of the inventory value exceeding requirements was on-hand and the remaining 3 percent was on-order. Based on Army demand forecasts, inventory that exceeded current requirements had enough parts on-hand for some items to satisfy several years, or even decades, of anticipated supply needs. Also, a large proportion of items that exceeded current requirements had no projected demand. The Army also had an annual average of about $3.5 billion of inventory deficits over this 4-year period.

Army inventory did not align with current requirements over this period because of (1) a lack of cost-efficiency metrics and goals and (2) inaccurate demand forecasting. DOD's supply chain management regulation requires the military services to take a number of steps to provide for effective and efficient end-to-end materiel support For example, the regulation directs the components to size secondary inventory to minimize DOD's investment while providing the inventory needed. Although the Army has supply support performance measures for meeting warfighter needs, it has not established metrics and goals that can measure the cost efficiency of its inventory management practices. Furthermore, the Army's demand forecasts have frequently been inaccurate. The Army uses a computer model to forecast its spare parts requirements, but when demand data are inaccurate or untimely, the result is a misalignment between inventory and current requirements. As a result, the Army has accumulated billions of dollars in excess inventory against current requirements for some items and substantial inventory deficits in other items. Without accurate and timely demand data, managers cannot ensure that their purchasing decisions will result in inventory levels that are sized to minimize DOD's investment needed to support requirements. The Army has acknowledged that challenges exist in its forecasting procedures and has begun to take steps to address shortcomings. In October 2008, the Army issued guidance directing managers to reduce the forecast period from 24 months to 12 months to better account for changes in the size of the force and the resulting changes in demands. The guidance also directs managers to update forecast models to match actual quantities of weapon systems being used in Southwest Asia; previous models were updated based on estimates that were not always timely or accurate. These two changes constitute steps toward improving the accuracy of demand forecasts, but we were unable to assess their effectiveness because this guidance was issued as we were completing our audit work. Also, the Army's recent designation of the Under Secretary of the Army as its chief management officer responsible for business transformation provides an opportunity for enhanced oversight of inventory management improvement efforts. Strengthening the Army's inventory management – while maintaining high levels of supply availability and meeting warfighter needs – could reduce support costs and free up funds for other needs.

The Honorable Solomon P. Ortiz
Chairman
The Honorable Randy Forbes
Ranking Minority Member
Subcommittee on Readiness
Committee on Armed Services
House of Representatives

The Honorable Bernard Sanders
United States Senate

The military services and the Defense Logistics Agency procure and manage large supplies of spare parts to keep military equipment operating. With U.S. military forces and their equipment in high demand, it is critical that the services and the Defense Logistics Agency effectively and efficiently manage the Department of Defense's (DOD) secondary inventory[1] to ensure that the warfighter is supplied with the right items at the right time. Because the military services and the Defense Logistics Agency are competing for available resources at a time when the nation faces an increasingly constrained fiscal environment, it is also imperative that they exercise good stewardship over the billions of dollars invested in their inventory. DOD reported that the total value of its secondary inventory as of September 30, 2007, was about $82.6 billion.[2] Since 1990, we have identified DOD inventory management as a high-risk area due to its ineffective and inefficient inventory management practices and procedures, and to its excessively high levels of inventory beyond what is needed to support current requirements. These high levels of inventory have included both on-hand and on-order inventory. Inventory that is in DOD's possession is considered to be on hand. Inventory that is not in DOD's possession but for which contracts have been awarded or funds have been obligated is considered to be on order.

[1]Secondary inventory items include reparable components, subsystems, and assemblies other than major end items (e.g., tanks and helicopters), consumable repair parts, bulk items and materiel, subsistence, and expendable end items, including clothing and other personal gear.

[2]This was the most recent data available at the time we began our review.

In response to your request that we review the DOD components' secondary inventory, this report addresses the management of the Army's secondary inventory. Our objectives were to (1) determine the extent to which the Army's on-hand and on-order secondary inventory reflects the amount needed to support current requirements and (2) identify causes, if applicable, for the Army's having secondary inventory that exceeded current requirements or, conversely, for having inventory deficits. We previously reported on the management of the Air Force's secondary inventory[3] and are reporting separately on the management of the Navy's secondary inventory.[4]

To determine the extent to which the Army's on-hand and on-order secondary inventory reflects the amount of inventory needed to support current requirements, we analyzed fiscal year 2004 to 2007 stratification data[5] for the Army's Aviation and Missile Command (AMCOM) and the Tank-automotive and Armaments Command (TACOM), including summary reports and item-specific data as of September 30 for each fiscal year. However, we did not include the Army's Communication and Electronics Command (CECOM) in our analysis because the information system used to manage secondary inventory was not able to provide item-specific data for the period of our review.[6] We determined the total number of items that had more or less than enough inventory to satisfy current requirements, and for each of these items we also determined the number and value of parts that were more or less than needed to satisfy current requirements.[7] In presenting the value of inventory in this report, we converted then-year dollars to

[3] GAO, *Defense Inventory: Opportunities Exist to Save Billions by Reducing Air Force's Unneeded Spare Parts Inventory*, GAO-07-232 (Washington, D.C.: Apr. 27, 2007).

[4] GAO, *Defense Inventory: Management Actions Needed to Improve the Cost Efficiency of the Navy's Spare Parts Inventory*, GAO-09-103 (Washington, D.C.: Nov. 2008).

[5] DOD requires each service and the Defense Logistics Agency to prepare inventory stratification reports semi-annually to match assets to requirements.

[6] For the period of our review, CECOM used the Logistics Modernization Program to manage its secondary inventory, while the other Army commands used the Commodity Command Standard System. CECOM officials stated that item-specific data will be available beginning with the fiscal year 2008 stratification report.

[7] The Army secondary inventory data are identified by unique stock numbers for each spare part, such as a component for an engine, which we refer to as unique items. The Army may have in its inventory multiple quantities of each unique item, which we refer to as individual parts.

constant fiscal year 2007 dollars using DOD Operations and Maintenance price deflators.[8] To determine the primary causes for the Army's having inventory that exceeded current requirements or having inventory deficits, we selected a random probability sample of inventory items that met these conditions and sent questionnaires to Army inventory personnel who are responsible for item management. Because we used a random probability sample, the results of our analysis can be projected to all Army items that met our selection criteria. To gain additional understanding about the management of secondary inventory, we interviewed Army inventory personnel to discuss some items in more detail. Appendix I provides further information on our scope and methodology. We conducted this performance audit from February 2008 through January 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

In this report, we characterize inventory as exceeding current requirements when existing inventory levels are greater than what DOD calls its "requirements objective," defined as:

> For wholesale stock replenishment, the maximum authorized quantity of stock for an item. It consists of the sum of stock represented by the economic order quantity, the safety level, the repair-cycle level, and the authorized additive levels.[9]

We used the requirements objective as our baseline because, as the definition states, it reflects the maximum authorized quantity of stock for an item. In other words, if the Army had enough parts to meet the requirements objective, it would not purchase new

[8] DOD Comptroller, *National Defense Budget Estimates for FY 2009*, March 2008, p. 47.

[9] Department of Defense Supply Chain Materiel Management Regulation 4140.1-R, p. 207 (May 2003).

parts. We use the term "inventory deficit" to describe items that have an amount of on-hand and on-order inventory that falls below the baseline established in the requirements objective. The categories DOD and the Army use to characterize and manage inventory are discussed further in the background section of this report.

Results in Brief

For the 4-year period we examined, the Army had significantly more secondary inventory than was needed to support current requirements. At the same time, the Army had substantial inventory deficits. Our analysis of stratification data identified an annual average of about $16.3 billion of Army secondary inventory for fiscal years 2004 to 2007, of which about $3.6 billion (22 percent) exceeded current requirements. On average, approximately 97 percent of the inventory value exceeding requirements was on-hand, and the remaining 3 percent was on-order. For on-hand inventory, the value of inventory that exceeded current requirements increased by 59 percent from $2.7 billion in fiscal year 2004 to $4.3 billion in fiscal year 2007. Based on Army demand forecasts, inventory that exceeded current requirements had enough parts on hand for some items to satisfy several years, or even decades, of anticipated supply needs. Also, a large proportion of items that exceeded current requirements had no projected demand. For on-order inventory, the proportion of this inventory that exceeded current requirements stayed relatively constant, although the value decreased from approximately $150 million in fiscal year 2004 to $110 million in fiscal year 2007. In fiscal year 2007, the Army identified approximately $55 million of that $110 million of on-order inventory as potential excess for disposal or reutilization. The Army also had substantial inventory deficits—an average value of $3.5 billion over the 4-year period. However, the value of inventory deficits decreased 17 percent from $4.1 billion in fiscal year 2004 to approximately $3.4 billion in fiscal year 2007.

On the basis of our analysis, we found that Army secondary inventory did not align with current requirements due in part to two factors—(1) a lack of cost efficiency metrics and goals and (2) inaccurate demand forecasting. DOD's supply chain management

regulation requires the military services to take a number of steps to provide effective and efficient end-to-end materiel support. For example, the regulation directs the components to size secondary item inventory to minimize DOD's investment while providing the inventory needed to support both peacetime and wartime requirements. Although the Army has supply support performance measures for meeting warfighter needs and other methods for managing its inventory, it has not established metrics and goals that can measure the cost efficiency of its inventory management practices. In the absence of such metrics and goals, Army officials lack an effective means for assessing whether inventory is being managed as efficiently as possible and for tracking trends and the impact of any corrective actions. Furthermore, the Army's demand forecasts have frequently been inaccurate. The Army uses a computer model to forecast its spare parts requirements, but when demand data are inaccurate or untimely, the result is a misalignment between inventory and current requirements. As discussed above, the Army has accumulated billions of dollars in excess inventory against current requirements for some items and substantial inventory deficits for other items. Army item managers responding to our survey most frequently cited changes in demand as the reason why inventory did not align with current requirements.[10] Without accurate and timely demand data, managers cannot ensure that their purchasing decisions will result in inventory levels that are sized to minimize DOD's investment needed to support requirements. The Army has acknowledged that challenges exist in its forecasting procedures and has begun to take steps to address shortcomings. In October 2008, the Army issued guidance directing managers to reduce the forecast period from the previous 24 months to the previous 12 months to better account for changes in the size of the force and the resulting changes to demands.[11] The guidance also directs managers to update forecast models to match actual quantities of weapon systems being used in Southwest Asia; previous models were updated based on estimates that were not always timely or accurate. These two changes constitute steps toward improving the accuracy of demand forecasts, but we are unable to assess their effectiveness because this guidance

[10] For more detailed results, see table 9, "Estimated Frequency of Reasons for Army Having Inventory That Exceeded Current Requirements."

[11] The Army G-4 issued a memorandum to assist the Army Materiel Command in forecasting spare parts requirements. This memorandum adjusts planning assumptions for the fiscal year 2009 Army Working Capital Fund budget preparation "in light of a potentially changing operational and resource environment."

was issued as we were completing our audit work. Further, we noted during our review that the Army has designated the Under Secretary of the Army as its chief management officer responsible for business transformation. This new designation provides an opportunity to enhance oversight of inventory management improvement efforts.

To improve the management of Army secondary inventory, we are recommending that the Army develop cost efficiency metrics and goals for inventory management, evaluate the effectiveness of changes to demand forecasting procedures to identify and correct systemic weaknesses, improve the flow of information to item managers, and enhance oversight of inventory management.

BACKGROUND

Under DOD's supply chain materiel management policy, the secondary item inventory is to be sized to minimize DOD's investment while providing the inventory needed to support both peacetime and wartime requirements.[12] Management and oversight of Army inventory is a responsibility shared between the Offices of the Secretary of Defense and the Secretary of the Army. The Under Secretary of Defense for Acquisition, Technology, and Logistics is responsible for the uniform implementation of DOD inventory management policies throughout the department, while the Secretary of the Army is responsible for implementing DOD inventory policies and procedures. Army inventory management is primarily the responsibility of the Army Materiel Command, and inventory management functions are performed at subordinate commands, namely TACOM, AMCOM, and CECOM. The Army prescribes guidance and procedural instructions for computing requirements for its secondary inventory. Army managers are responsible for developing inventory management plans for their assigned items, to include coordinating all purchase and repair decisions.

[12] Department of Defense Directive 4140.1, *Supply Chain Materiel Management Policy* (April 2004), establishes policy and responsibilities for materiel management. The Department of Defense Supply Chain Materiel Management Regulation 4140.1-R (May 23, 2003) implements this directive.

Value of Army's Secondary Inventory Increased Since 2004

DOD annual stratification reports show that for the 4 years covered in our review, the value of the Army's secondary inventory increased both in total dollars and as a percentage of DOD's overall secondary inventory (see table 1).

Table 1: Value of DOD's Inventory and the Value and Percentage Represented by the Army (Fiscal Years 2004-2007)

Dollars (in billions)

Fiscal year	Reported value of DOD's inventory	Value of Army's inventory	Percent of DOD's inventory held by the Army
2004	$84.5	$13.9	16%
2005	$83.7	$15.9	19%
2006	$87.6	$18.3	21%
2007	$82.6	$19.1	23%

Note: Values are expressed in constant fiscal year 2007 dollars. DOD values inventory at latest acquisition cost, with reductions for reparable inventory in need of repair and salvage prices for potential reutilization/disposal stock. Data reported by DOD include all Army inventory management centers (AMCOM, CECOM, and TACOM).

Source: GAO analysis of DOD data.

While the total reported value of DOD's secondary inventory decreased by almost $2 billion from fiscal year 2004 to fiscal year 2007, the reported value of the Army's inventory increased by more than $5 billion. Based on our analysis of AMCOM and TACOM inventories from fiscal year 2004 through fiscal year 2007,[13] the Army's on-hand inventory increased by about $4 billion, while the Army's on-order inventory decreased by $1 billion (see table 2). The number of unique items managed by AMCOM and TACOM also increased over that time period, from 59,443 unique items in fiscal year 2004 to 63,504 items in fiscal year 2007.

[13] As noted earlier, CECOM was excluded from the scope of our review because that command lacked item-specific inventory stratification data.

Table 2: Army's On Hand and On-Order Secondary Inventory (Fiscal Years 2004-2007)

Dollars (in billions)

Fiscal year	On-hand inventory		On-order inventory		Total inventory	
	Number of parts	Value	Number of parts	Value	Number of parts	Value
2004	18,029,065	$8.8	19,077,562	$5.3	37,106,627	$14.1
2005	21,379,282	$11.1	18,220,814	$5.9	39,600,096	$17.1
2006	25,981,192	$12.7	13,300,360	$4.8	39,281,552	$17.5
2007	28,361,721	$12.4	12,963,307	$4.2	41,325,028	$16.5
Average	23,437,815	$11.3	15,890,511	$5.0	39,328,326	$16.3

Note: Values are expressed in constant fiscal year 2007 dollars. Analysis includes AMCOM and TACOM managed items.

Source: GAO analysis of Army data.

Army's Process for Determining Needed Amount of Secondary Inventory

The Army uses a process called requirements determination to calculate the amount of inventory that is needed to be held in storage (on hand) and the amount that should be purchased (on order). This information is used to develop the Army's budget stratification report showing the amount of inventory allocated to meet specific requirements, including operating and acquisition lead time requirements.

Operating requirements include the war reserves authorized for purchase; customer-requisitioned materiel that has not yet been shipped (also known as due-outs); a safety level of reserve to be kept on hand in case of minor interruptions in the re-supply process or unpredictable fluctuations in demand; minimum quantities of essential items for which demand cannot normally be predicted (also referred to as numeric stockage objective or insurance items); and inventory reserve sufficient to satisfy demand while broken items are being repaired (also referred to as repair cycle stock).

Acquisition lead time requirements include administrative lead time requirements, which refer to inventory reserves sufficient to satisfy demand from the time that the need for

replenishment of an item is identified to the time when a contract is awarded for its purchase or an order is placed; and production lead time requirements, which refer to inventory reserves sufficient to satisfy demand from the time when a contract is let or an order is placed for inventory to the time when the item is received.

When the combined total of on-hand and on-order inventory for an item drops to a threshold level – called the reorder point – the item manager may place an order for additional inventory of that item, to avoid the risk of the item's going out of stock in the Army's inventory. The reorder point includes both operating requirements and acquisition lead time requirements. An economic order quantity – the amount of inventory that will result in the lowest total costs for ordering and holding inventory – is automatically calculated by a computer program and is added to the order. The reorder point factors in both the demand for inventory items during the reordering period, so that the Army managers can replace items before they go out of stock, and a safety level, to ensure a supply of stock during interruptions in production or repair. A purchase request can be terminated or modified if requirements change.

These requirements collectively constitute the requirements objective, which we refer to as the Army's current requirements in this report. An assessment of the Army's requirements or requirements determination process falls outside the scope of our review. In accounting for its inventory, the Army uses the stratification process to allocate, or apply, inventory to each requirement category. On-hand inventory in serviceable condition is applied first, followed by on-hand inventory in unserviceable condition. On-order inventory is applied when on-hand inventory is unavailable to be applied to requirements. We refer to situations in which on-hand and on-order inventory are insufficient to satisfy current requirements as inventory deficits.

ARMY SECONDARY INVENTORY EXCEEDED AMOUNT NEEDED TO SATISFY CURRENT REQUIREMENTS

Our analysis of Army secondary inventory data for the 4-year period we examined showed that about $3.6 billion (22 percent) of the average annual total inventory value of $16.3 billion was not needed to meet current requirements. During this time period, the value of on-hand inventory exceeding current requirements increased, whereas the value of on-order inventory that exceeded requirements decreased. During this same time period, the value of Army inventory deficits decreased but remained substantial– an average value of $3.5 billion over the 4-year period.

About $3.6 Billion, or 22 Percent, of the Army's On-Hand and On-Order Inventory Value Exceeded Current Requirements Each Year

Our analysis of Army secondary inventory data showed that, on average, about $12.7 billion (78 percent) of the total annual inventory value was needed to meet current requirements, whereas $3.6 billion (22 percent) exceeded current requirements. Measured by number of parts, these percentages were similar: 81 percent of the parts applied to current requirements on average each year, and the remaining 19 percent exceeded current requirements. The value of the inventory that exceeded current requirements increased over the period of our review, from $2.9 billion in fiscal year 2004 to $4.4 billion in fiscal year 2007, as did the number of parts that exceeded current requirements, from 5.2 million parts to 10.2 million parts (see table 3).

Table 3: Total Army Inventory Exceeding Current Requirements (Fiscal years 2004-2007)

Dollars (in billions)

Fiscal year	Total value of inventory	Inventory not needed to support current requirements		
		Number of parts	Value	Percent of inventory
2004	$14.1	5,200,755	$2.9	20%
2005	$17.1	5,705,048	$3.4	20%
2006	$17.5	8,384,379	$3.9	22%
2007	$16.5	10,223,980	$4.4	27%
Average	$16.3	7,378,541	$3.6	22%

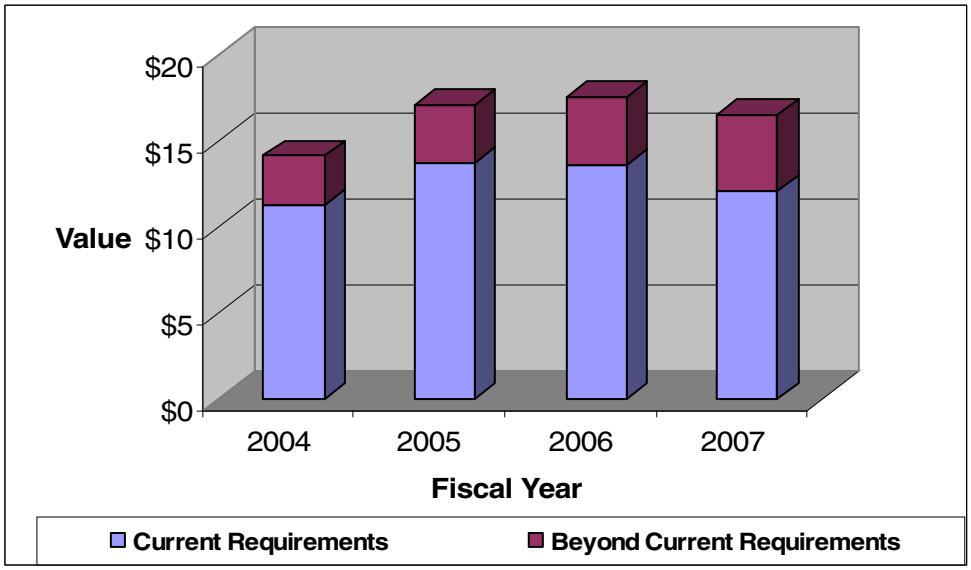
Note: Values are expressed in constant fiscal year 2007 dollars. Analysis includes AMCOM and TACOM managed items.

Source: GAO analysis of Army data.

The Army's total inventory levels increased from fiscal year 2004 to fiscal year 2007, with the greatest increase occurring from fiscal year 2004 to fiscal year 2005. Additionally, the overall proportion of inventory exceeding requirements increased when compared with inventory meeting current requirements (see fig. 1).

Figure 1: Army Secondary Inventory Meeting and Exceeding Current Requirements (Fiscal Years 2004-2007)

Dollars (in billions)



Note: Values are expressed in constant fiscal year 2007 dollars. Analysis includes AMCOM and TACOM managed items.

Source: GAO analysis of Army data.

Army On-Hand Inventory Exceeding Current Requirements Increased

Both the total value of the Army's on-hand inventory and the total value of on-hand inventory exceeding current requirements increased. Over the 4-year period, the value of the Army's on-hand inventory exceeding current requirements averaged $3.5 billion, or 31 percent of total on-hand inventory (see table 4).

Table 4: Army On-Hand Secondary Inventory Exceeding Current Requirements (Fiscal Years 2004-2007)

Dollars (in billions)

Fiscal year	Total value of on-hand inventory	Inventory not needed to support current requirements		
		Number of parts	Value	Percent of on-hand Inventory
2004	$8.8	4,332,900	$2.7	31%
2005	$11.1	5,058,714	$3.3	30%
2006	$12.7	6,843,315	$3.7	29%
2007	$12.4	9,207,931	$4.3	35%
Average	$11.3	6,360,715	$3.5	31%

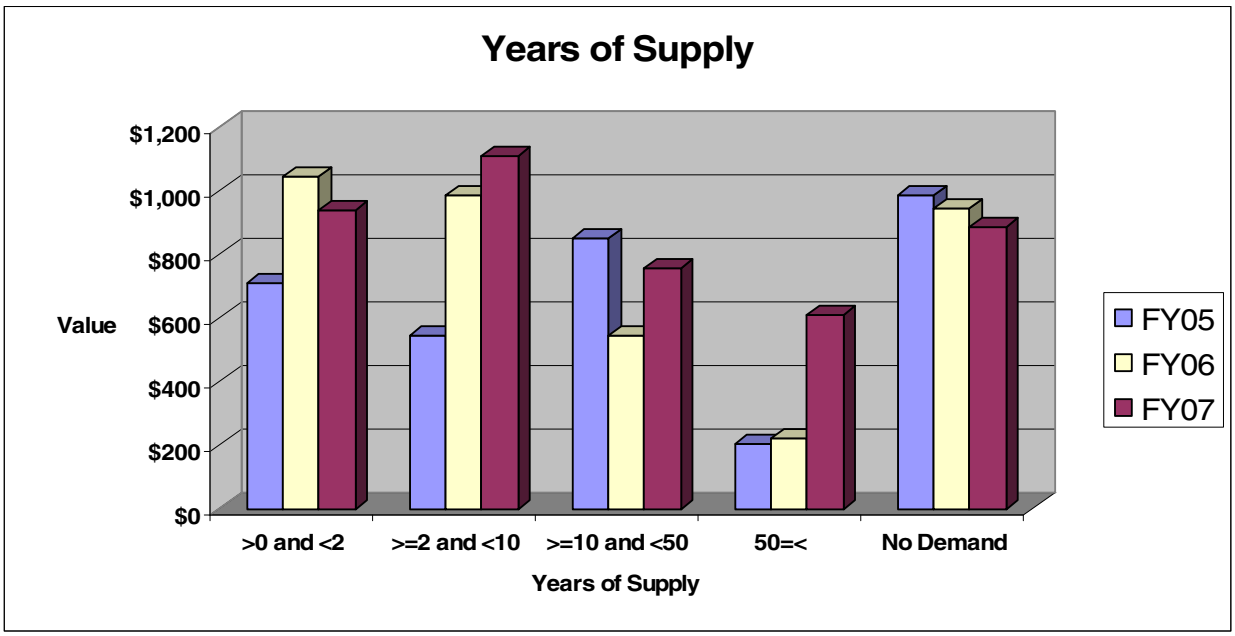
Note: Values are expressed in constant fiscal year 2007 dollars. Analysis includes AMCOM and TACOM managed items.

Source: GAO analysis of Army data

The Army's forecasts for items with a recurring demand in fiscal years 2005 through 2007 showed that supplies for some of the on-hand inventory that exceeded current requirements were sufficient to meet many years and sometimes decades of demand. In addition, a substantial amount of the Army's on-hand inventory showed no projected demand. The results of this analysis are shown in figure 2.

Figure 2: Value of Army Inventory Exceeding Current Requirements, by Years of Supply (Fiscal Years 2005-2007)

Dollars (in millions)



Notes: We identified the annual demand forecast for individual items in the fiscal year 2005, 2006, and 2007 September stratification reports. We removed non-recurring demands from the excess inventory, and then divided the remainder by the annual demand forecast to obtain the number of years of supply the inventory levels would satisfy. Data for fiscal year 2004 was not available. Analysis includes AMCOM and TACOM managed items.

Values are expressed in constant fiscal year 2007 dollars.

Source: GAO analysis of Army data.

As shown in figure 2, about $900 million (22 percent) of the on-hand inventory exceeding current requirements in fiscal year 2007 would be sufficient to satisfy 2 years of demand, $1.1 billion (26 percent) would be sufficient to meet demands for 2 to 10 years, $750 million (18 percent) would be sufficient to meet demands for 10 to 50 years, and $600 million (14 percent) would be sufficient to meet demands for 50 years or more. In addition, the Army in fiscal year 2007 had nearly $900 million (21 percent) of on-hand inventory exceeding current requirements for which there were no forecasted demands.

Army On-Order Inventory Exceeding Current Requirements Decreased

For the 4-year period we reviewed, the value of the Army's on-order inventory exceeding current requirements decreased from $150 million in fiscal year 2004 to $110 million in fiscal year 2007. However, because the value of the Army's on-order inventory also decreased from $5.3 billion in fiscal year 2004 to $4.2 billion in fiscal year 2007, the proportion of Army on-order inventory exceeding current requirements remained relatively constant (see table 5).

Table 5: Army On-Order Secondary Inventory Exceeding Current Requirements

Dollars (in billions)

Fiscal year	Total value of on-order inventory	Inventory not needed to support current requirements		
		Number of parts	Value	Percent of on-order inventory
2004	$5.3	867,855	$0.15	3%
2005	$5.9	646,334	$0.12	2%
2006	$4.8	1,541,064	$0.11	2%
2007	$4.2	1,016,049	$0.11	3%
Average	$5.0	1,017,826	$0.12	2%

Note: Values are expressed in constant fiscal year 2007 dollars. Analysis includes AMCOM and TACOM managed items.

Source: GAO analysis of Army data.

For all 4 years, the Army also had some on-order inventory that was designated as potential excess for disposal or reutilization. For example, according to the Army's fiscal year 2007 stratification report, about $55 million of on-order inventory items were designated as potential excess, meaning that they could be disposed of or reutilized as soon as they were delivered (see table 6).

Table 6: Army On-Order Inventory Identified as Potential Excess (Fiscal Years 2004-2007)

Dollars (in millions)

	Fiscal year			
	2004	2005	2006	2007
Total	$64.8	$18.6	$42.7	$55.7

Note: Values are expressed in constant fiscal year 2007 dollars.

Source: GAO analysis of Army data.

Army Inventory Deficits Decreased, but Remained Substantial

The Army had substantial inventory deficits for some items – that is, an insufficient level of inventory on hand or on order to meet the current requirements. For the 4-year period we reviewed, the Army's inventory deficits had an average value of $3.5 billion. However, the value of the deficits decreased by 17 percent from $4.1 billion in fiscal year 2004 to approximately $3.4 billion in fiscal year 2007 (see table 7).

Table 7: Army Inventory Deficits (Fiscal Years 2004-2007)

Dollars (in billions)

Fiscal year	Total value of Army's stated requirements	Total inventory deficits		
		Number of parts	Value	Percent of value
2004	$15.4	10,366,808	$4.1	27%
2005	$17.3	7,054,927	$3.7	21%
2006	$16.5	6,286,566	$2.9	17%
2007	$15.5	6,520,067	$3.4	22%
Average	$16.2	7,557,092	$3.5	22%

Note: Values are expressed in constant fiscal year 2007 dollars. Analysis includes AMCOM and TACOM managed items.

Source: GAO analysis of Army data.

While inventory deficits exist, they do not always translate directly into an operational impact. Army officials told us that, in the past, inventories have fallen below current requirements because of unforeseen demands. In those cases, managers were able to use parts that were designated for safety level requirements in order to minimize the operational impact of the inventory deficit. However, we could not determine the

criticality of the Army's inventory deficits because this information is not available in stratification reporting.

FACTORS CONTRIBUTING TO THE CONSISTENT MISALIGNMENT BETWEEN ARMY INVENTORY LEVELS AND CURRENT REQUIREMENTS

Our review of the Army's secondary inventory identified two factors contributing to the consistent misalignment between inventory levels and current requirements. First, while the Army strives to provide effective supply support to the warfighter and uses metrics such as supply availability to measure performance, it lacks corresponding metrics and goals for assessing and tracking the cost efficiency of its inventory management practices. Inaccurate demand forecasting for spare parts also contributed to the Army's having inventory that was excess to current requirements as well as having inventory deficits. After evaluating its demand forecasting procedures, the Army has issued guidance that the Army expects to improve the accuracy of its forecasts. Because the guidance was issued as we were completing our audit work, we were unable to assess whether the changes to forecasting procedures would be sufficient to address deficiencies. However, these actions are consistent with some of our past recommendations related to inventory management.

In addition, we noted during our review that the Army has an opportunity to enhance oversight of inventory management as it develops the roles and responsibilities for the newly designated chief management officer.

Army Lacks Metrics and Goals to Assess and Track the Cost Efficiency of Inventory Management

Although the Army uses a number of methods to manage its secondary inventory, it lacks metrics and goals for assessing and tracking cost efficiency of its inventory management practices. DOD's supply chain management regulation requires the military services to take a number of steps to provide for effective and efficient end-to-end materiel support. The regulation also sets out a number of management goals, including sizing secondary item inventories to minimize the DOD investment while providing the inventory needed; considering all costs associated with materiel management in making best-value logistics decisions; balancing the use of all available logistics resources to accomplish timely and quality delivery at the lowest cost; and measuring total supply chain performance based on timely and cost-effective delivery. To ensure efficient and effective supply chain management, the regulation also calls for the use of metrics to evaluate the performance and cost of supply chain operations. These metrics should, among other things, monitor the efficient use of DOD resources and provide a means to assess costs versus benefits of supply chain operations.[14] However, the regulation does not prescribe specific cost metrics and goals that the services should or must use to track and assess the efficiency of their inventory management practices.

According to Army officials, the Army has processes and controls for efficiently managing secondary inventory and fulfilling the DOD regulation. First, Army officials stated that they use a number of metrics to determine whether the Army provides the inventory needed, including customer wait time, back orders, stock availability, and the not- mission-capable supply rate, which counts the number of vehicles or aircraft that cannot perform the Army's mission due to a lack of parts. Second, the Army uses a cost differential model to determine the appropriate level of inventory to maintain in order to achieve a desired performance goal. The model is based on a number of variables, including procurement costs, holding costs, frequency of demand, implied stockage cost, and the probability of future demand. Army officials also stated that cost minimization is

[14] Department of Defense Supply Chain Materiel Regulation 4140.1-R, C1.5.1 (May 23, 2003).

integral in the formulae used to compute requirements. Third, the Army assesses the effectiveness of inventory by evaluating the Army Working Capital Fund. Specifically, if sales from the fund to customers match the values of inventory purchased, then inventory purchases have been cost effective.

While these methods may be effective management tools, we found that the Army has not established metrics and goals for measuring the cost efficiency of its inventory management. In the absence of such metrics and goals, Army officials lack an effective means for assessing whether inventory is being managed as efficiently as possible and for tracking trends and the impact of any corrective actions. As discussed in this report, we determined that the Army has substantial amounts of inventory that exceeded requirements for all 4 years of our review. However, the consistent misalignment between inventory levels and current requirements are not readily revealed by the Army's current methods for measuring inventory management. The overall secondary inventory data we analyzed show that the Army carried about $1.29 in inventory for every $1 in requirements to meet its goals during the 4-year period of fiscal years 2004 through 2007. Such a metric, in combination with other cost metrics and established goals, could provide the Army with a capability to track trends and assess progress toward achieving greater cost efficiency.

Demand Forecasting Has Been Inaccurate

Our review showed that demand forecasting for spare parts has been inaccurate. According to the Army regulation on centralized management of the Army supply system,[15] the Army uses a computer model to forecast its spare parts requirements. The model uses the average monthly demand over the previous 24 months as a baseline, and it allows the demand forecast to be modified to account for expected future usage. Army officials stated that when demand data does not accurately reflect usage or forecasts for future usage are incorrect, the result is a misalignment between inventory and current requirements. For example, Army officials stated that at the beginning of the global war

[15] Army Regulation 710-1, *Centralized Management of the Army Supply System* (Sept. 20. 2007).

on terrorism, the average monthly demand was based on a peacetime operations tempo, which did not accurately reflect a wartime usage of items. They also stated that they did not always have complete or accurate information on the amounts or types of weapon systems in the global war on terror, so they modified the demand forecast to account for expected future usage based on speculation. As a result, inventory did not always align with requirements.

Army managers who responded to our survey most frequently cited changes in demand as the reason why inventory did not align with current requirements. Demand may decrease, fluctuate, or not materialize at all, resulting in inventory exceeding current requirements; conversely, it may increase, resulting in inventory deficits. Table 9 shows the results of our representative survey of items with inventory excesses (160 items), and table 10 shows the results of our survey for items with inventory deficits (56 items).

Table 9: Estimated Frequency of Reasons for Army Having Inventory That Exceeded Current Requirements

Reasons	Sample Item Count	Percentage of estimated frequency	95 percent, 2-sided confidence interval
Demands decreased, fluctuated, or did not materialize	57	63	(52% to 73%)
Changes in wearout or survival rate/ washout	7	9	(3% to 18%)
Non-recurring demands did not materialize	17	24	(14% to 36%)
Higher assembly or weapon system being phased out or reduced	13	17	(9% to 28%)
Item was/ is being replaced or became obsolete	23	30	(20% to 42%)
Changes in fielding schedule of the weapon system or higher assembly	4	6	(2% to 15%)
Potential support of new weapon system by current item	2	2	(0.1% to 7%)
Minimum purchase quantity or value	14	11	(5% to 20%)
Projected repair changed or was canceled	4	4	(0.9% to 10%)
Procurement contracts for on-order were not changed or terminated	12	10	(5% to 18%)
Inaccurate data used	5	6	(2% to 13%)
Other	34[a]	46	(34% to 57%)

Notes: Percentage estimates are based on a limited sample size and have a margin of error of at most plus or minus 10 percent at the 95 percent confidence level. Reasons are not mutually exclusive, therefore, percentages do not total to 100.

These estimates are based on a stratified sample and while item counts may be the same, percentage estimates may vary due to weighting.

Source: GAO survey of Army inventory managers.

Table 10: Estimated Frequency of Reasons for Army Having Inventory Deficits

Reason	Sample Item Count	Percentage of estimated frequency	95 percent, 2-sided confidence interval
Demands increased	22	46	(30% to 64%)
Changes in wearout or survival rate/ washout	4	8	(2% to 20%)
Nonrecurring demands increased	17	32	(19% to 48%)
Next higher assembly/ weapon systems are upgraded or new ones are added	7	14	(4% to 30%)
Item was/ is being replaced, and can no longer be procured	6	16	(6% to 33%)
Items are purchased on an annual basis	6	14	(5% to 30%)
Lost or delayed repair capability	3	7	(1% to 19%)
Qualified supplier not available	3	9	(2% to 25%)
Inaccurate data used	4	6	(0.8% to 20%)
Other	20	51	(33% to 69%)

Notes: Percentage estimates are based on a limited sample size and have a margin of error of at most plus or minus 10 percent at the 95 percent confidence level. Reasons are not mutually exclusive, therefore, percentages do not total to 100.

These estimates are based on a stratified sample and while item counts may be the same, percentage estimates may vary due to weighting.

Source: GAO survey of Army inventory managers.

Responses categorized as "other" varied but included issues related to lack of data, obsolescence, or other explanations of demand changes. For example, Army managers stated that the 2005 Base Realignment and Closure (BRAC) recommended a supply transfer of consumable items from the Army to the Defense Logistics Agency that was underway during the time of our review. Army managers who participated in the survey could not provide information on some of the items because prior data was not retained.

Our discussions with Army managers provided examples that illustrate the challenges they face in predicting demands for items due to changes in plans, policy, or repair schedules:

- In anticipation of higher usage, the Army purchased an additional 95 parts of a calibration tool that supports the UH-60 Black Hawk Helicopter. However, because the increased usage did not occur, in fiscal year 2007 the Army had 130 parts that exceeded current requirements, valued at $7.4 million.

- Conversely, an unanticipated increase in operational demand led to an inventory deficit of an item that supports the OH-58D Kiowa Warrior helicopter. This helicopter had higher than expected usage, which increased the need for repairs and replacements through procurement. In fiscal year 2007, the Army had an inventory deficit of 128 parts, valued at $1.2 million.
- A change in an overhaul repair program for a shipping and storage container used to store and transport the drive shaft for the M1 Abrams Tank resulted in excess inventory. As stated by an Army manager with whom we spoke and according to Army records, in fiscal year 2007 the Army had 272 on-hand units, valued at over $0.4 million, that exceeded current requirements because the Army's delay of the overhaul repair program for Abrams Tank caused demands not to materialize.
- Having identified a defect in some of the batteries used on the Patriot Missile System, the Army procured 350 new batteries. While awaiting production, however, the Army developed a repair for the defective batteries. The Army could not cancel the procurement order, resulting in an on-hand excess of 619 items, valued at about $0.6 million.
- Another example of multiple supply sources resulting in excess inventory concerns the corner actuator used to support the hydraulic suspension and steering for the M9 Armored Combat Earthmover (ACE) vehicle. The Army made an emergency purchase from a sole source contractor to ensure that sufficient parts would be available while it concurrently developed a repair program. The purchases and repaired assets increased on-hand inventory beyond current requirements, resulting in an excess quantity of 836 parts, valued at $7.7 million.

Army officials stated that forecasts rely heavily on accurate demand rates and relatively stable demand data. They stated in June that, since demand rates had achieved some stability, forecasts had improved. In the future, however--particularly as operations in Southwest Asia decrease--they indicated that they expect to see more difficulties in accurately forecasting future demands for parts.

Army Is Taking Steps to Improve Forecasting

The Army has taken steps designed to improve its inventory management. In January 2008, the Army began an evaluation of its secondary inventory management processes. Army officials stated that the impetus for the review was the need to manage the effects of the Army's increased operations tempo, which had resulted in a higher usage of secondary inventory. However, because the duration of the heightened operations tempo was unknown, the Army wanted to improve its forecasting processes to better account for a changing operational environment.

As part of its supply planning assumptions for fiscal year 2009, the Army shortened the forecast period used by managers to determine procurement decisions. The Army issued guidance[16] in October 2008 directing inventory managers to set a forecast period using the previous 6 months for missiles and the previous 12 months for all other secondary items. Army officials stated that, based on their evaluation, shortening the forecast period from the previous 24 months would provide managers the ability to better capture changing demand patterns, allowing them to adjust their purchase decisions to accommodate new force patterns. Army officials believe that shortening the forecast period should help capture changes to demand in a more real-time fashion.

The Army's guidance also directs managers to update forecast models based on the readiness portion of the Army Operations Update[17] to match actual quantities of weapon systems being used in Southwest Asia. According to Army officials, previous models were updated based on estimates that were not always timely or accurate. Army officials stated that the readiness portion of the Army Operations Update reflects the actual quantities of weapons systems as reported by commanders in Southwest Asia. Army officials believe that these changes should provide more accurate and timely information to item managers, allowing for better purchase decisions.

[16] Department of the Army, Office of the Deputy Chief of Staff, G-4 Memorandum, *Army Working Capital Fund Planning Assumptions for FY 2009* (Oct. 6, 2008).

[17] The Army Operations Update is a daily briefing delivered by the Army staff to the Army's leadership that includes information on personnel, operations, and equipment readiness.

The Army guidance was issued as we were completing our audit work. Accordingly, we were unable to assess whether these changes to the forecasting model will be sufficient to address this long-standing problem. Since early 1990, when we began reporting on this issue, inaccurate demand forecasts have consistently been identified as a key cause for DOD's inventory not aligning with requirements. The actions directed by the Army could address some of these challenges, and they have been consistent with recommendations we made in our prior work. In our report on the Air Force's management of spare parts, [18] we recommended that the Air Force evaluate reasons for decreases in demand and determine actions needed to address these decreases. The Army's evaluation of decreases in demand has identified the 24-month forecast period as a contributing factor, and its new guidance constitutes a step toward addressing the issue. We also recommended in a previous report on critical parts shortages that the Army should provide item managers with operational information in a timely manner so they can adjust their requirements forecasting. [19] The Army's guidance directing managers to use actual quantities of weapon systems as reported in the readiness portion of the Army Operations Update constitutes another step toward addressing this issue. Army officials also stated that the primary purpose of the guidance was to improve the performance of inventory rather than to reduce the amount of inventory that exceeds requirements. While Army officials expect that improved forecasting could result in reductions in excess inventory, the Army has yet to develop processes to measure the effectiveness of these actions on reducing excess inventory.

[18] GAO-07-232. p.25.

[19] GAO-05-275. p. 52.

Army Has Opportunity to Increase Its Oversight of Inventory Management

The Army has an opportunity to increase its ability to provide oversight of inventory management. Recently, the Army established a chief management officer for business transformation. However, it has not defined whether and how the chief management officer will have a role overseeing inventory management improvement. The costs of DOD's business operations have been of continuing concern. In April 2008, for example, the Defense Business Board noted that DOD had not aggressively reduced the overhead costs related to supporting the warfighter, which accounted for about 42 percent of DOD's total spending each year. The Defense Business Board recommended that DOD align strategies to focus on reducing overhead while supporting the warfighter.[20]

In May 2007, DOD established a chief management officer position with responsibility for ensuring that business transformation policies and programs are designed and managed to improve performance standards, economy and efficiency. In 2008, the Army designated the Under Secretary of the Army as its chief management officer responsible for business transformation. Although the role of the Army's chief management officer is still being developed, according to existing Army guidance[21], one of the Under Secretary of the Army's roles was to provide oversight of policy, planning, coordination, and execution of matters related to logistics. However, it is unclear whether inventory management was included as part of this existing oversight. The substantial value of the Army's inventory and the systemic challenges that we have identified since the early 1990s suggest that inventory management can be improved. Accordingly, the new designation of the chief management officer provides the Army an opportunity to enhance oversight of inventory management, as well as gauge the effectiveness of inventory management improvement efforts.

[20] Defense Business Board, *Task Group Report on Tooth-to-Tail Analysis*, FY08-2 (April 2008). The Deputy Secretary of Defense tasked the Board to assess and make recommendations regarding the relationship between the force structure executing the Department's major combat and irregular warfare missions ("tooth") and the infrastructure used to manage and support those forces ("tail").

[21] Army General Orders No. 03, Assignment of Functions and Responsibilities within Headquarters, Department of the Army, (Washington, D.C.: July 9, 2002). The Army is currently developing an update to this order. See Army General Orders No. 00, Managing the Headquarters, Department of the Army, (Washington, D.C.: March 9, 2007).

CONCLUSIONS

The Army accumulates high levels of secondary inventory each year that exceed current requirements without justifying that these inventory levels are sized to minimize DOD's investment. When the Army invests in the purchase of inventory items that become excess to its requirements, these funds are not available to meet other military needs. Taking steps to reduce the high levels of inventory exceeding requirements could help to ensure that DOD is meeting supply performance goals at least cost. Among other things, cost-efficiency metrics and goals that reveal the existence of inventory excesses and deficits could provide a basis for effective management and oversight of inventory reduction efforts. Much of the inventory that exceeded current requirements or had inventory deficits resulted from inaccurate demand forecasts. To its credit, the Army has evaluated the unpredictability of demand and taken steps that it believes will enhance flexibility in adapting to fluctuations in demand. Implementation of the plan, evaluation of the results, and continued monitoring could also assist in addressing this long-standing problem. Finally, since inventory management is part of the Army's broader business operations and transformation, it is reasonable to expect the newly established chief management officer to exercise some level of oversight of inventory management improvement efforts taken by the Army. Strengthening the Army's inventory management – while maintaining high levels of supply availability and meeting warfighter needs – could reduce support costs and free up funds for other needs.

RECOMMENDATIONS FOR EXECUTIVE ACTION

To improve the management of the Army's secondary inventory, we recommend that the Secretary of Defense direct the Secretary of the Army to take the following three actions:

- Establish metrics and goals for tracking and assessing the cost efficiency of inventory management and incorporate these into existing management and oversight processes.

- Evaluate the effectiveness of changes to demand forecasting procedures that were set forth in the Army's October 2008 guidance, including measuring the impact on reducing inventory that exceeds requirements, and based on that evaluation, take additional actions as appropriate to identify and correct systemic weaknesses in forecasting procedures.
- Monitor the effectiveness of providing item managers with operational information in a timely manner so they can adjust modeled requirements as necessary.

We also recommend that the Secretary of the Army direct the Army's Chief Management Officer to exercise oversight of Army inventory management improvements to align improvement efforts with overall business transformation and to reduce support costs.

AGENCY COMMENTS

To be obtained.

APPENDIX I: SCOPE AND METHODOLOGY

To determine the extent to which the Army's on-hand and on-order secondary inventory reflects the amount of inventory needed to support current requirements, we obtained the Central Secondary Item Stratification Budget Summary and item-specific reports for the Army's Aviation and Missile Command (AMCOM) and the Tank-automotive and Armaments Command (TACOM), including summary reports and item-specific data as of September 30 for fiscal years 2004 through 2007. Our analysis did not include the Army's Communication and Electronics Command (CECOM) because the information system used to manage secondary inventory was not able to provide item-specific data for the period of our review. Stratification reports serve as a budget request preparation tool and a mechanism for matching assets to requirements. Our analysis was based on analyzing the Army's item stratifications within the opening position table of the Central Secondary Item Stratification Reports.[22] To validate the data in the budget stratification reports, we generated summary reports using electronic data and verified our totals against the summary stratification reports obtained from the Army. The Army secondary inventory data are identified by unique stock numbers for each spare part, such as an engine for a particular vehicle, which we refer to as unique items. The Army may have in its inventory multiple quantities of each unique item, which we refer to as individual parts. We calculated the value of each unique item by multiplying the quantity of the item's individual parts by the item's unit price, which is the latest acquisition cost for the item.

After discussing the results with Army officials, we determined that the data were sufficiently reliable for the purposes of our analysis and findings. Upon completion of the data validation process, we revalued the Army's secondary inventory items identified in its budget stratification summary reports because these reports value useable items and items in need of repair at the same rate, and do not take into account the repair cost of repairing broken items. We computed the new value for items in need of repair by subtracting repair costs from the unit price for each item. We also removed overhead charges from the value of each item. In presenting the value of inventory in this report,

[22] The Opening Position table of the Army's Central Secondary Item Stratification Report shows current requirements as of a certain cutoff date and does not include any forecasted requirements or simulations.

we converted then-year dollars to constant fiscal year 2007 dollars using DOD Operations and Maintenance price deflators.[23]

We consider the Army to have inventory exceeding current requirements if it has more inventory than is needed to satisfy its requirements based on the opening position table of the Army's budget stratification report. Collectively, these requirements are referred to by DOD as the "requirements objective," defined as the maximum authorized quantity of stock for an item.[24] However, if the Army has more inventory on hand or on order than is needed to satisfy its requirements, it does not consider the inventory beyond the requirements to be unneeded. Instead, the Army uses the inventory that is beyond its requirements to satisfy future demands over a 2-year period, economic retention requirements,[25] and contingency retention requirements.[26] Only after applying inventory to satisfy these additional requirements would the Army consider that it has more inventory than is needed and would consider this inventory for potential reutilization or disposal.[27] In commenting on our past reports, DOD and the other Services have disagreed with our definition of inventory that was not needed to satisfy current operating requirements because it differed from the definition that is used for the inventory budget process. We do not agree with the Army's practice of not identifying inventory used to satisfy these additional requirements as excess because it overstates the amount of inventory needed to be on hand or on order by billions of dollars. The Army's requirements determination process does not consider these additional requirements when it calculates the amount of inventory needed to be on hand or on order, which means that if the Army did not have enough inventory on hand or on order to satisfy these additional requirements, the requirements determination process would

[23] DOD Comptroller, *National Defense Budget Estimates for FY2009*, March 2008, p.47

[24] Department of Defense Supply Chain Materiel Management Regulation 4140.1-R, AP1.1.126 (May 2003).

[25] Economic retention inventory includes items that have been determined to be more economical to keep than to dispose of because they are likely to be needed in the future. Economic retention inventory is not applied to on-order inventory not needed to satisfy requirements.

[26] Contingency retention inventory exceeds economic retention inventory (items that are more economical to keep than to dispose of) and would normally be processed for disposal but is retained for specific contingencies.

[27] Potential reutilization and/or disposal materiel exceeds contingency retention and has been identified for possible disposal but with potential for reutilization.

not result in additional inventory being purchased to satisfy these requirements. We consider the Army to have inventory deficits if levels of on-hand and on-order inventory are insufficient to meet the requirements objective.

To determine the extent to which the Army's on-order and on-hand secondary inventory reflects the amount of inventory needed to support requirements, we reviewed DOD and Army inventory management guidance, past GAO products on DOD and Army inventory management practices for secondary inventory items, and other related documentation. We also created a database which compared the Army's current inventory to its current requirements and computed the amount and value of secondary inventory exceeding or not meeting current requirements. Additionally, to understand whether the inventory not needed to support requirements had improved in relation to its years of supply, we calculated the number of supply years a given item would have based on its quantity and demand at the time of stratification in September 2005, September 2006, and September 2007.

We developed a survey to estimate the frequency of reasons why the Army maintained items in inventory that were not needed to support requirements or that did not meet requirements. The survey asked general questions about the higher assembly (component parts) and/or weapon systems that the items support, and the date of the last purchase. In addition, we asked survey respondents to identify the reason(s) for having inventory that exceeded current requirements or had an inventory deficit. We provided potential reasons as responses from which they could select based on reasons identified in some of our prior work. Since the list was not exhaustive, we provided an open-ended response option to allow other reasons to be provided. In addition to expert technical review of the questionnaire by an independent methodologist, we conducted pretests with Army managers with the Tank-automotive and Armaments Command (TACOM) and the Aviation and Missile Command (AMCOM) prior to sending out the final survey instrument. We revised the survey instrument accordingly based on findings from the pretests.

We sent this questionnaire electronically to specific Army managers in charge of sampled unique items at two of the Army's inventory control point locations in Huntsville, Alabama and Warren, Michigan. To estimate the frequency of reasons for inventory not needed to meet requirements and inventory deficits, we drew a stratified random probability sample of 220 unique items— 153 unique secondary inventory items not needed to support requirements and 67 with inventory deficits—from a study population of 45,007 items—30,222 with inventory not needed to meet requirements and 14,785 with inventory deficits. Based on our analysis of the Army stratification data, for fiscal year 2007, there were 26,535 unique items with on hand inventory not needed to meet requirements, and 3,687 unique items with on order inventory not needed to meet requirements. These categories identified a combined value of $4.4 billion of inventory not needed to meet requirements. All of these items met our criteria to be included in our study population of items not needed to meet requirements. Additionally, based on our analysis of stratification data, all the 14,785 unique items with inventory deficits, valued at $3.4 billion, met our criteria to be included in our deficit study population.

We sent 216 electronic questionnaires—one questionnaire for each item in the sample—to the 131 Army managers identified as being responsible for these items. Four of the items in our sample were determined to be out of scope, because three items did not have item managers and had low quantities and values associated, and one item was randomly selected at two commands, so the item was removed from one command and left for the other command with a higher quantity to answer.

Table 11, provides TACOM and AMCOM's on-hand excess, on-order excess and deficit inventory into 3 substratum each by the amount of supply for Fiscal Year 2007. The divisions of the population, sample, and respondents across the strata are also shown in Table 11. We received 187 responses for the questionnaire. Each sampled item was subsequently weighted in the final analysis to represent all the members of the target in-scope population.

Table 11: Sample Disposition for Fiscal Year 2007 Items

Stratum	Total population	Total sample size	Out of Scope Cases	Number of Responses
AMCOM – On Hand Excess – 0 to 2 Years of Supply	4,255	29	2	21
AMCOM – On Hand Excess – More than 2 Years of Supply	1,926	14	0	13
AMCOM – On Hand Excess – No Demand or Nonrecurring Only	3,355	23	0	19
AMCOM – On Order Excess – 0 to 2 Years of Supply	351	5	0	3
AMCOM – On Order Excess – More than 2 Years of Supply	17	5	0	4
AMCOM – On Order Excess – No Demand or Nonrecurring Only	53	5	0	5
AMCOM – Deficits	4,738	33	2	28
TACOM – On Hand Excess – 0 to 2 Years of Supply	1,957	7	0	6
TACOM – On Hand Excess –More than 2 Years of Supply	2,997	10	0	10
TACOM – On Hand Excess – No Demand or Nonrecurring Only	12,045	40	0	30
TACOM – On Order Excess – 0 to 2 Years of Supply	1,367	5	0	5
TACOM – On Order Excess – More than 2 Years of Supply	490	5	0	5
TACOM – On Order Excess – No Demand or Nonrecurring Only	1,409	5	0	5
TACOM – Deficits	10,047	34	0	33
Total	**45,007**	**220**	**4**	**187**

At the time of this review, the Army was undergoing secondary inventory supply transfer actions as a part of a larger 2005 Base Realignment and Closure (BRAC) recommendation.[28] In our survey of 216 items, we identified 38 items that were a part of this supply transfer to DLA. Most item managers overseeing these previously Army managed items stated that they no longer retained the data to complete our survey, therefore, these DLA transferred items are reflected in the "other" category of our sample results in Tables 9 and 10.

[28] GAO, *Military Base Realignments and Closures: Transfer of Supply, Storage, and Distribution Functions from Military Services to Defense Logistics Agency,* GAO-08-121R (Washington, D.C.: Oct. 26, 2007)

Because we followed a probability procedure based on random selections, our sample of unique items is only one of a large number of samples that we might have drawn. Because each sample could have provided different estimates, we express our confidence in the precision of our particular sample's results in 95 percent confidence intervals. These are intervals that would contain the actual population values for 95 percent of the samples we could have drawn. As a result, we are 95 percent confident that each of the confidence intervals in this report will include the true values in the study population.

In addition to sampling errors, the practical difficulties of conducting any questionnaire may introduce errors, commonly referred to as nonsampling errors. For example, difficulties in how a particular question is interpreted, in the sources of information that are available to respondents, or in how the data re entered into a database or were analyzed can introduce unwanted variability into the questionnaire results. We took steps in the development of the questionnaire, the data collection, and the data analysis to minimize these nonsampling errors. We reviewed each questionnaire to identify unusual, incomplete, or inconsistent responses and followed up with Army item managers by telephone and email to clarify those responses. In addition, we performed computer analyses to identify inconsistencies and other indicators of errors and had a second independent reviewer for the data analysis to further minimize such error.

To determine reasons for the types of answers given in the questionnaires, we held 30 face-to-face discussions with Army inventory managers, of which 14 were in our sample. We judgmentally selected some TACOM and AMCOM items that had unusual or high on-hand, on-order, and deficit inventory. During these discussions we obtained additional detailed comments and documentation related to demand, demand forecasting, acquisitions, retention and disposal actions.

We conducted this performance audit from February 2008 to January 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We

believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. On the basis of information obtained from the Army on the reliability of its inventory management systems' data, and the survey results and our follow-up analysis, we believe that the data used in this report were sufficient reliable for reporting purposes.

APPENDIX II: COMMENTS FROM THE DEPARTMENT OF DEFENSE

APPENDIX III: GAO CONTACT AND STAFF ACKNOWLEDGEMENTS

GAO Contact

William M. Solis, (202) 512-8365

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