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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

September 30, 1985

B-220514

General Richard H. Thompson
Commander, U.S. Army Materiel Command
5001 Eisenhower Avenue
Alexandria, Virginia 22333

Dear General Thompson:

Subject: The Army's Safety Level Requirements for Secondary Items May Be Inaccurate and Excessive (GAO/NSIAD-85-160)

We have concluded a limited survey of the Army's safety level requirements in the wholesale supply system. The purpose of safety level stocks is to have a quantity of materiel on hand to meet Army needs should there be a minor interruption in the manufacturer's ability to provide items or should the Army's demand for items increase for some unpredictable reason. This work was initiated because we had observed instances where safety level requirements, as stated in number of months, exceeded the items' procurement lead time requirements.[1] In these circumstances, we believe, the safety level requirements may be overstated and may not meet the DOD objective of minimum stocks needed to efficiently meet the Army's supply support mission.

Our survey of the Army Materiel Command's (AMC) 6 major subordinate commands showed that safety level requirements for 48,399 secondary items (spares and repair parts) exceeded procurement lead time requirements by a number of items valued at about $76 million. The Department of Defense (DOD) requires that safety levels be at least equal to the procurement lead time requirements. We have observed that the economic order quantity/variable safety level (EOQ/VSL) formula used to compute requirements for stock produces quantities that are erratic, may be excessive, and do not materially improve supply support.

Though our work was limited in scope, we believe there may be potential for reducing some safety level requirements. Army

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[1]The quantity of materiel needed to meet requirements during the time elapsing between the initiation of procurement action and receipt of the materiel purchased.

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supply officials also have questioned the validity of some safety levels and have requested a technical review of the variable safety level formula. We are concerned that this technical review, which was requested in September 1984, has not yet begun. However, because the need for a review has been identified by the Army, we do not plan to expand our survey.

BACKGROUND

Safety level stocks are those required to be on hand to permit continued operation in the event of minor interruption of normal replenishment or unpredictable fluctuation in demands. To determine its needs for secondary items, the Army uses an EOQ/VSL model. The total peacetime requirements for secondary items include, in addition to safety level requirements, procurement lead time and reorder cycle requirements.

The EOQ/VSL model is a complex formula that considers probability of fluctuating demands and lead times in determining the quantity needed. The formula takes item price into consideration and provides larger quantities of shelf stock for low-cost erratic-demand-type items and smaller safety level quantities of more stable high-demand high-dollar parts. The formula includes such factors as the cost to hold items in the Army's inventory and the cost to buy the items. Also included are probability tables and variable elements, such as procurement lead times, unit prices, and demand rates.

DOD instructions for determining variable safety levels provide that the services (1) constrain safety level requirements to equal no more than average procurement lead time demand or (2) allow up to three standard deviations of procurement lead time demand, whichever is less. Procurement lead time demand is computed by multiplying the average monthly demand for an item by procurement lead time in months for the same items.

The Army, in 1981, obtained a waiver from DOD's constraint that safety levels equal the lesser of the two because it felt the constraint was too restrictive and did not allow the model to function adequately. The waiver allowed the Army to use three standard deviations of procurement lead time demand for all items. The Army increased the safety level computation to three standard deviations of the procurement lead time demand in December 1981. Using three standard deviations of procurement lead time demand provides very high assurance that requisitions can be satisfied in the event there are fluctuations in demand and/or replenishment. Since December 1981, one subordinate command has complained to AMC that the EOQ/VSL formula was

causing unwarranted fluctuation in safety level requirements and another command has taken action to constrain safety level requirements. AMC officials have agreed that using three standard deviations of procurement lead time is liberal and may not be completely necessary.

SCOPE AND METHODOLOGY

Our survey involved (1) interviewing officials at Headquarters, AMC; the Army Inventory Research Office; and the Automated Logistics Management Systems Activity and (2) examining requirements data for the items managed by the six major AMC subordinate commands. Through use of a computer data extraction program, we examined the December 31, 1984, requirements data for about 1.2 million secondary items managed by the 6 major AMC subordinate commands. We identified 221,000 items with safety levels which represented a requirements value of $679 million. Over 48,000 of these items had safety levels which exceeded their procurement lead time requirements.

We also visited the Army Aviation Systems Command, which manages items for which there is a high instance of safety levels exceeding the procurement lead time requirements, and the Army Troop Support Command, which is colocated with the Aviation Systems Command in St. Louis, Missouri. We also visited the Army Missile Command, which has been taking actions to reduce and/or limit the size of the safety level inventories. At these three major subordinate commands, we reviewed requirements and asset information shown in the master data record and in supply control studies/item management plans. We interviewed item managers and policy personnel at the commands and reviewed DOD and Army policy and procedures relative to supply support operations. Our survey was made in accordance with generally accepted government auditing standards. It was conducted from July 1984 to July 1985.

SAFETY LEVEL REQUIREMENTS ARE ERRATIC AND MAY BE EXCESSIVE

Safety level requirements for a total of 48,399 items at the 6 major subordinate commands exceeded the requirements for procurement lead time by about $76 million. The safety level requirements varied significantly from one monthly study period to another and, in some cases, provided for up to 99 months of supply for repair parts. The items' requirements may be overstated in these cases.

Officials at the Army Armament, Munitions and Chemical Command requested that AMC review the EOQ/VSL computational

process because they believed it was extremely sensitive to changes in price and demand. They pointed out 1 instance where safety level requirements had decreased from 62.4 months to 9.9 months based solely on a change in the average monthly demand from 1.7 to 1.83, a drastic reduction in stockage months for a very minor change in average monthly demand. AMC supply officials could not explain the reason for the extreme sensitivity but said that they planned to review the EOQ/VSL model to determine the validity of the computations.

At the Army Aviation Systems Command, safety level requirements for a beam clip for the UH-1 helicopter decreased from 508 in April 1984 to 185 in January 1985. Part of the reduction was due to a decline in demand from 11 per month to 7 per month. The EOQ/VSL formula reduced safety level requirements from 46 to 27 months. The item manager could not explain the reason for the reduction but suggested that an increase in unit price from 69 cents to $2.95 may have been the reason.

A review of a limited number of items at three major subordinate commands showed that limiting the safety level requirements to something less than three standard deviations of procurement lead time demand would not significantly impact the commands' ability to fill customer requisitions. For example, safety level requirements for a reactor plate managed by the Army Troop Support Command were about 11 times greater than procurement lead time requirements. Safety level requirements were for 45 units, or about 57 months of supply, compared with procurement lead time requirements of 4 units, or 6 months supply. The average monthly demand was less than 1, and there were more than 800 plates in stock. Our review of supply records covering the past 2 years showed that reducing the safety level requirements to equal procurement lead time requirements would have reduced the safety level requirements by 41 units and would have had no impact on the Army's ability to satisfy customer requisitions for this item.

Supply officials at the Army Missile Command have reduced their safety level requirements to equal estimated procurement lead time requirements. Safety level requirements computed for the low-dollar-value items are restricted to no more than 20 months of supply, while requirements computed for the high-dollar-value items are restricted to no more than 27 months of supply. Missile Command officials told us that they believed the EOQ/VSL formula caused excessive inventories and erratic requirements. However, they could not provide us an estimate of the amount of excessive inventories involved.

In 1984, AMC asked its Inventory Research Office to investigate the extent of the inconsistencies observed by various supply personnel with regard to safety levels. The Research Office reported in September 1984 that its perusal of the EOQ/VSL model in the wholesale level automated logistics system indicated several errors in the computational methods being used. The Research Office submitted a systems change request to initiate corrective action for the known errors in the model and to conduct a complete review of the model to make sure it was working as intended. At the time of our survey, no action had been taken to implement corrective actions on known problems or to initiate the review recommended by the Research Office.

CONCLUSIONS

Since you are already aware of the need for a technical review of the EOQ/VSL model, we do not plan to expand our survey. However, the fact that safety level stocks exceed procurement lead time requirements by $76 million indicates a need to conduct the EOQ/VSL model validation review as soon as possible.

One command has already chosen not to use the three standard deviations of procurement lead time demand as a basis for safety level requirements. Therefore, the technical review of EOQ/VSL should include an evaluation of the Army's decision to use three standard deviations of procurement lead time demand as its basis for safety levels since its use may be resulting in excessive safety level requirements.

We are available to discuss these concerns in more detail with you or your staff and would like to be informed of any actions you decide to take. Copies of this report are also being sent to the Secretaries of Defense and the Army.

Sincerely yours,

Henry W. Connor
Senior Associate Director