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TECHNICAL REPORT

A Funding Allocation Methodology for War Reserve Secondary Items

Kenneth J. Girardini, Carol E. Fan, Candice Miller

Prepared for the United States Army

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1200 South Hayes Street, Arlington, VA 22202-5050
4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665
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Summary

Army units must be ready to deploy rapidly in the event of a contingency, which creates challenges for the initial sustainment of deployed units, especially during the first 45 to 60 days or so it takes the first ships to arrive from CONUS. Additionally, when a contingency occurs, the increase in operating tempo leads to higher demands for some items. Because many items have lengthy procurement lead times, the baseline level of inventory will sometimes run out in the face of the higher demand before increased deliveries begin. Moreover, even if the contingency demands for certain items do not increase, these items must be transported to the site of the contingency, which places stress on the defense supply chain and on airlift capacity.

Stocks of war reserve secondary items (WRSI) within Army Prepositioned Stock (APS) are designed to address the two issues of production surge response time and competition for airlift early in a contingency. However, given the breadth of Army budget priorities, funding for WRSI stocks often falls short of the total calculated requirement, and the Army has lacked a formal method for prioritizing which items to stock.

Therefore, as part of an ongoing, formal process for determining WRSI stocks around the world, the Army asked the RAND Arroyo Center to develop techniques to prioritize the use of a $467 million FY 2007 budget for WRSI materiel for a Northeast Asia contingency scenario. RAND provided a quick-turn, 60-day product that (1) used empirical demand data to derive forecasts of the potential contingency demands, (2) determined which items should be forward positioned versus stored in CONUS and delivered via airlift, and (3) allocated the budgeted funding to maximize the WRSI inventory investment value with respect to readiness and reduced strategic airlift early in the contingency.

Empirical Demand Data Were Used to Forecast Contingency Demands

First, the Army needs a reliable method for estimating demands during a contingency. Second, it needs to know which items likely to be demanded are expected to have large demand increases over baseline levels, thus resulting in a shortfall or production gap. These items are important to be in WRSI inventory to bridge the gap until production surge deliveries commence to maintain readiness. Third, it needs to know which items would demand substantial early airlift if not stocked forward.

To determine which items fit the criteria above, RAND analyzed pre–Operation Iraqi Freedom (OIF) and OIF empirical data to identify items with large demand increases or with high backorders or stock availability problems early in OIF. Data from calendar year (CY) 2002 versus CY 2003 were used to identify the relative increase in demands at the beginning of OIF, as well as items with high backorders early in OIF. Items that experienced these problems reflect situations in which wartime demand stressed the production capacity. This process identified about 18,000 candidate items for possible war reserve funding.

RAND then used empirical data from ongoing contingency operations to develop two demand forecasts for a Northeast Asia scenario. We used demand data for units in OIF in CYs 2003 and 2006. CY 2006 data were used to ensure that parts for newly fielded and upgraded end items were included and that only items with ongoing demands were targeted as war reserve candidates. Demand data from both 2003 and 2006 were time-phased by unit to model the force buildup at the beginning of a contingency. Also, because the Army stocks materiel to support training and to maintain readiness for contingency operations, unless the item needs to be forward positioned, war reserve need be based only on the marginal increase in demands incurred as a result of contingency operations. So RAND determined the increases in global demands for these items, not just the contingency demands.

Forward Positioning Should Focus on Fast-Moving Items with Relatively Low Cost-to-Weight Ratios

Even if the supply system has sufficient inventory to handle increases in demand, decisions about which items should be forward positioned are key to ensuring that sustainment airlift is not overtaxed or supplies fall short during the initial days of a contingency. A forward-positioned item should be in high—and regular—demand, and the item should have a relatively low unit cost per pound or cubic foot. This enables most of the potential airlift need for sustainment, which is driven by item weight and size, to be avoided for relatively little inventory investment, which is driven by item price. For example, batteries are relatively heavy compared to their unit price. If they are needed in large numbers, it is much more cost-effective to forward position them than to use valuable airlift capacity to transport them from CONUS.

Only a small number of WRSI items need to be forward positioned to achieve a significant reduction in the airlift burden. Analysis using empirical demand data from OIF as a proxy for contingency demands identified about 1,800 candidate items for forward positioning. As shown in Table S.1, these items accounted for 70–80 percent of the volume (cubic feet) and about 80 percent of the weight of demands but less than 10 percent of the total demand value in the critical first 60 days of the demand forecasts, which were modeled from the March–April 2003 and time-phased January–February 2006 OIF demand streams. Thus, this policy requires relatively small investments in inventory to achieve very large airlift avoidance.

Table S.1
Forward-Positioned Items as a Percentage of All Items with Demands

Contingency Demand Data	Percentage of Items	Percentage of Demands	Percentage of Total Value of Demands	Percentage of Total Volume of Demands	Percentage of Total Weight of Demands
OIF, March–September, 2003	2	16	9	70	80
OIF, January–June 2006 (time-phased)	2	13	10	80	82

Items that are not forward positioned (referred to as *swing stocks*) can be used in any contingency, not just Northeast Asia. If the forward-positioned items are selected well, minimal airlift will be required to meet contingency demands using the remaining swing stocks (very expensive, low-demand, or small total shipment-weight items) stored in CONUS—e.g., one or two strategic lift aircraft per day early in a contingency.

Resource Allocation Method Trades Off Time and Readiness Benefits

RAND also developed a method to determine the best set of items (breadth) and inventory levels (depth) for a given funding level. This method takes into account the item's contribution to readiness and whether the item would be required early or late in the contingency—that is, how important it would be to potentially avoiding early airlift needs.

For this quick-turn analysis, RAND used the two demand forecasts developed from the OIF demand data (time-phased to reflect the deployment schedule assumed for the Northeast Asia scenario). However, demand forecasts from any source or model, including existing Army models, can be used as an input to the resource allocation tool. Using multiple forecasts reflecting different conditions allows the resource allocation to better deal with the real-world uncertainties associated with forecasting demands in a future contingency.

Another major advantage of this methodology is that the user may vary two levers—the weighting of the time periods (i.e., airlift avoidance) and the readiness weighting factor—to compute and compare different resource allocations that reflect different priorities. RAND used different weighting factors to develop two potential allocation schemes for the Army and then compared the benefits of stocking different items in terms of readiness and airlift avoidance. One of the solutions was chosen by the Army (after being reviewed and updated) as the basis for FY 2008 spending on WRSI materiel for a Northeast Asia scenario.[1]

Conclusion

Moving forward, the Army should ensure that the process for allocating war reserve budgets is flexible and agile so that it can be updated quickly as equipment, operational forecasts, and

[1] Due to changing priorities, the FY 2007 budget for WRSI materiel was shifted to other needs.

empirical demand data change. War reserve resources should be focused (1) on those items that should be forward positioned to avoid the excessive early sustainment burden and (2) on those items for which additional inventory minimizes the risk to operational readiness.