

KIDA Brief

NO. 2021-12

KIDA Brief provides publicly available summaries of research projects and analysis conducted at KIDA.

Improving the Authorized Stockage List Selection Methodology for Future Logistics

KIM, Jae Dong, KIM, Kang Hyun
Center for Defense Resource Management

Background and Purpose

- We carried out this study to present an improved methodology for selecting the authorized stockage lists (ASLs) so that they can capture actual demand with greater accuracy. We also sought to contribute to developing the logistics policy for a future environment.
 - The Army needs to improve its methodology for selecting items on the ASL for the following reasons.
 - As the primary indicator of performance, the accommodation rate of ASL has been so low in recent years that it has fallen short of the Army's management standards.
 - Selecting the wrong items for an ASL can degrade the combat readiness and operational availability of military equipment and increase their cost of maintenance.
 - We sought to propose improvements to the methodology for selecting the ASL so that resources may be used more efficiently in a future logistics environment.

Research Results

- We proposed the following improvements to the methodology for ASL selection using predictive techniques and simulations.
 - The concept of an ASL should move away from the one currently understood in the Army and toward a new one that is centered on the formations that need the items that are on the list (an approach across the entire joint force).

- We also proposed an improved technique for selecting the ASL,
 - taking into consideration factors such as an effective combinatorial search, predictive technique, and costs (inventory, backorder, etc.).
- Adopting our proposal may also require certain institutional improvements.
 - The ASL selection timeline needs to be adjusted. An automated selection system needs to be introduced.
 - ASL selections need to take place using the most recent data. Proposed changes need to be implemented gradually through the use of pilot runs.



The authorized stockage list (ASL) refers to a list of items that are authorized for storage in inventories at logistical support formations. Its purpose is to ensure that there is always an adequate level of supply for items that are included in the list. It is therefore a very important part of logistics that are required to ensure efficient employment of weapon systems and proper expenditure of the budget. If an ASL fails to accurately capture which items will be in demand, it will lead to wasted expenses purchasing and managing dead inventory, while also taking up the space that could have been used to stock items for which there is actual demand. This can lead to degraded levels of combat readiness and operational availability of the weapon systems involved.

In this study, we sought to ① examine the issues related to the ASL in the status quo, ② propose improvements to the ASL selection methodology, referring to models used in the sister services and the US military, and ③ propose a reasonable way to manage the ASL selection process. By investigating the status quo, we discovered that there are currently three problems for selecting the ASL. One, the Army has consistently suffered from an ASL accommodation rate that fell below the required standard of 70~85%, except in 2015 when it was 71%. The average accommodation rate



was a mere 61%. The consistent failure to meet the standard must mean the Army has to either adjust the standard or improve the methodology for ASL selection. Two, there was a recurring need to readjust the ASL. Depending on the competence of individual staffers handling the selection, similar units ended up with significantly different products for the ASL. Given the high turnover rate in staff and a low level of familiarization with ASL-specific tasks, there is a general lack of expertise when it comes to selecting an ASL that can accurately anticipate future demand. Such accuracy, therefore, relies heavily on the competence of individual staffers, a pattern that will be further accentuated by the continued decrease in the logistics and therefore ASL-related workforce. Furthermore, shifting the list selection from F-1 to F-2 years in the timeline has introduced additional causes for later readjustment. Finally, the current ASL selection methodology is far too simplistic. When it comes to predicting demand for repair parts, the Army has already moved beyond the simple reliance on the arithmetic mean, employing instead a complex analysis that also takes into account the unique features of an item other factors that can lead to its demand. By contrast, the Army still selects the ASL merely to comprise some of all the items that are in high demand. We believe there needs to be a better and more varied approach to selection than this.

Our proposals for improving the efficiency of ASLs can be divided into those for improving the selection methodology and those for redefining the concept of ASL altogether. First, in terms of selection methodology, we compared the Army's method of ASL selection to two of those adapted from the sister services, evaluating each method along with the criteria of accommodation rate and inventory costs. The first of the adapted methods selected ASL based on the number of item requests, while the second selected it based on the predicted number of item requests. To be more specific, the former method selected an item for the ASL if each echelon

requested the item at least a certain number of times within a given time frame. For this study, we called this the combinatorial search method. We came up with a total of 20 different combinations between time frames, ranging from two to five years, and minimum requests required, ranging between one and five times. We then compared and analyzed all of the ASLs that resulted from applying each of these 20 standards. As for the selection method that is based on the predicted number of item requests, we used the time series, machine learning, and deep learning techniques to forecast the number of times the item will be requested, which we then used to determine whether the item belonged to an ASL. For each selection method, we also generated and compared the results that would occur if that method is applied at F-1 years as opposed to F-2 years.

① **Effective Combinatorial Search**



② **Time-Series, Machine Learning, and Deep Learning Techniques**



Figure 1. Applying improvements to the ASL selection methodology

Apart from improving the selection methodology, we also proposed two ways to rethink the concept of an ASL altogether. First, an ASL can be seen as the product of an independent selection that takes place at each echelon (across the entire joint force). In the status quo, subordinate formations can only select items that have already been included in the ASL of their higher formations. In other words, field units might find themselves unable to add an item to the ASL despite the high demand they have for it because it was



not included in the ASL of a higher command. Second, the Army can track the accommodation rate and inventory cost as indicators of ASL performance across all formations (in an integrated approach) instead of at each echelon. We proposed this especially because we noticed that inventory costs tended to increase lower down on the chain of command. We saw that the inventory cost as calculated by the Army Logistics Command would drop below that of the status quo, no matter which technique we used during this study. However, it would increase to a level above that of the status quo depending on which technique was used at each echelon. We therefore proposed integrating the calculation of these figures across all echelons, an idea we backed up with an simulated performance evaluation. To do so, we ran a simulation using the ASL selection technique that we determined to be the best in the previous step of the study. We compared the resulting accommodation rate, customer waiting time (CWT), requisition waiting time (RWT), and fill rate in each instance. Ultimately, we discovered that using an integrated approach (across the entirety of the joint force), which is better suited to the future logistics environment, yielded better results than both the Army's current practice and the individualized (echelon-by-echelon) approach.

Based on these findings, we recommended the following ways to manage a reasonable process of ASL selection. First, each echelon should be allowed to independently select its own ASL. The selection of the list needs to be driven by the units that need the items rather than by the list created by a higher formation. Second, an ASL has to become more accurate in anticipating need by capturing item demand and other factors such as the effective combinatorial search (by year / number of requests), demand prediction (time series, machine learning, deep learning), budget (inventory cost, backorder cost), and timeline for ASL selection (F-1 year, F-2 years). Third, the timeline for ASL selection needs to be adjusted. Our study suggests that the budgeting timeline should allow the selection of ASLs at



F-1 year. There also needs to be a switch over to the use of automated systems in making selections so that the list can become more accurate and the process more efficient. These are currently determined largely by the individual competence of whoever happens to be handling the ASL in a given point in time. We believe the Army can save two months of time by switching to a process of having the Army Logistics Command make a single round of selection, followed by selections at the logistics support commands and the army divisions. Finally, the Army has to address the fact that their current method of calculating the ASL accommodation rate using the number of valid item requests at the end of each month cannot capture the many changes that occur to those requests following the end of the month. An adjustment will have to be made to make sure that the most up-to-date data is used when calculating the accommodation rate.

There are also a few points of caution that need to be remembered when implementing the recommendations of this study. Despite our efforts to capture accurate item demand and other relevant factors in testing our selection methodologies, there may be other variables that the study failed to account for when employing our techniques in actual ASL selections. As such, the Army should use both its current methodology and the one that we recommended for the next two to three years, comparing the ASL that would result in each method to the other before making the final decision on which methodology to use. We also recommend adopting our proposed change to the ASL selection concept only after observing the relevant indices such as the CWT and RWT in further performance simulations. Even then, we recommend applying that concept gradually at each of the logistics support commands.

We proposed what we believed to be an improved concept of ASL selection that could work within the future shape of logistics. We gave consideration to various factors as we sought to articulate a concept that



would work for the logistical environments of both the present and the future. We hope the study can contribute to the discussions and preparations that are now taking place to address the changes that are in progress in logistics and add to the groundwork and direction-setting for a new ASL selection methodology that is better suited to the logistical environment of the future.

** The views expressed in this paper are those of the participants (KIM, Jae-Dong, LEE, Hyuk-Soo, KIM, Kang-Hyun) of the research project “A Study for Improving the Authorized Stockage List Selection Methodology for Future Logistics” conducted at KIDA in 2020, and do not represent or reflect the official position of Korea Institute for Defense Analyses.*