How Data Analytics Will Improve Logistics Planning

By Maj. Blake Schwartz, Brandon M. McConnell, and Greg H. Parlier

While the United States boasts the most powerful army in the world, one of its most critical military assets is the Army’s logistics infrastructure. Gen. Gustave Perna, commander of Army Materiel Command, writes in his 2018 Army Sustainment article, “Projecting Our Force: Our Strategic Advantage,” that one of our key strategic advantages is the ability to project power across the globe and overcome logistics challenges to sustain deployed forces.

As the Army shifts away from the force generation model of the last decade and a half of deployments, it must rely more heavily on the logistics base in the continental United States to sustain deployed forces. Globally positioned assets, such as Army pre-positioned stocks, will augment stateside sustainment capabilities, but the Central Command model of extremely robust sustainment centers in theater will no longer work.

The next conflict will likely require an expeditionary force gaining entry, with additional forces following. Sustainment of the force is likely to be a significant challenge. As the 2017 National Security Strategy notes, “The ability of the military to surge in response to an emergency depends on our Nation’s ability to produce needed parts and systems, healthy and secure supply chains, and a skilled U.S. workforce.”

We have not faced the need to rapidly execute expe-
ditionary logistics to sustain major forces since Operation Iraqi Freedom in 2003. Fortunately, the data and analytics aids are now becoming available for logistics planners to much more effectively predict the requirements of an expeditionary force and sustain it efficiently.

According to “Mastering the Deployment Basics: An Interview With Retired Lt. Gen. Patricia McQuiston,” published in the March–April 2018 issue of Army Sustainment, significant benefits can be derived from the ubiquitous data available through Global Combat Support System–Army and other systems by fully capitalizing on rapidly developing information technologies and data analysis techniques.

These techniques can be especially helpful in informing the requirements and expected performance of the sustainment network.

With better sustainment demand forecasts, the Army can avoid costly “iron mountains” of supplies in theater. Additionally, supply chain bottlenecks can be anticipated and avoided so that units receive supplies much faster.

In short, the total asset visibility and historical data provided by GCSS–Army should enable much more effective logistics. However, relevant data must be used to generate accurate forecasts for future operations and to inform models of our sustainment networks.

The tools to perform these functions are just emerging, and will soon revolutionize military sustainment planning. Several Army agencies use sustainment models that perform some of these functions. However, the models are not well-suited for operational units because of setup and run-time limitations and specialized software requirements.

Two of these models are the Logistics Battle Command (LBC) model and the Planning Logistics Analysis Network System (PLANS). LBC is a simulation used by the Training and Doctrine Command Analysis Center–Lee to conduct comparative assessments of the impacts of force designs, weapon systems, vehicles, and concepts of support on military logistics.

PLANS is a web-based tool developed by the Army Corps of Engineers’ Engineer Research and Development Center that can project multi-modal logistics performance at a high fidelity. Further, PLANS boasts a user-friendly web-based interface and excels in over-the-shore logistics and route planning. Although LBC and PLANS are both excellent tools, they were not designed to incorporate GCSS–Army data.

Operational Demand Forecasting Tools

While LBC and PLANS are very useful as applied, neither is optimal for operational units, which need tools to quickly generate demand forecasts. Logistics planners at the tactical and operational levels rely predominantly on two tools to help them generate a forecast of sustainment demand for a mission: the Operational Logistics (OPLOG) Planner and the Logistics Estimation Workbook (LEW).

During the planning process, logistics planners could use real-time analytics to evaluate and compare sustainment courses of action, create decision points, and generate recommendations for commanders.

From a broader national security perspective, effective sustainment will remain crucial to meeting future challenges. More intelligent planning and analytics tools will enable the Army to further extend logistics innovation and effectiveness.
OPLOG Planner

OPLOG Planner is the most widely used logistics planning tool in the operational force. The tool is maintained by the Combined Arms Support Command’s Planning Data Branch (PDB), which is responsible for developing logistics planning factors in accordance with Army regulations. OPLOG Planner generates a forecast by estimating the weight and pallets required over time for each class of supply. The PDB uses logistics data from across the Army and joint communities to assess planning factors (how much a force will require of what classes of supply under specified conditions) and disseminates these factors to the Army and the joint community for planning use.

OPLOG Planner is PDB’s primary means of publishing logistics planning factors. It is a user-friendly standalone program that produces estimates for the logistics needed to meet mission goals based on user inputs that describe the mission. Planners use OPLOG Planner to calculate transportation and other logistics assets required for the scheme of maneuver and to forecast demand over time.

OPLOG Planner is continuously updated through coordination between PDB and data owners including the Center for Army Lessons Learned, the Army G-1, and Training and Doctrine Command. Consumption for items is estimated using data from current and past operations, and a new version is released annually.

The LEW

The LEW is a Microsoft Excel spreadsheet-based tool that allows logistics planners to quickly estimate a forecast for supply, transportation, and maintenance requirements. The LEW uses doctrinal combat profiles and supply consumption rates and information in planning manuals, Army reference publications, and field manuals to derive planning factors and consumption rates for classes of supply. It is intended to be used during the planning process.

The LEW planning factors mirror those used by PDB and the Theater Sustainment Battle Book. Additionally, the LEW is updated by users in the Army logistics community to incorporate best practices and to keep it current.

The LEW is now part of the programs of instruction for the Combined Logistics Officers Advanced Course, the Logistics Captains Career Course, the Support Operations Course, and other Army logistics courses.

Current Gaps

OPLOG Planner and the LEW are effective tools for quickly determining a demand forecast. The continual updating of the tools and their underlying data provides units with the most relevant and up-to-date forecast factors available to generate the best sustainment demand forecast possible.

Ideally, the demand estimate should be a mission-based forecast (MBF) that incorporates mission type, task organization, climate, geography, and other statistically relevant factors. A Logistics Management Institute study has documented the benefits of MBFs for Army aviation units. In Transforming U.S. Army Supply Chains: Strategies for Management Innovation, Greg Parlier notes that although the Department of Defense continues to research the potential of MBFs, the Army currently lacks the analytical capabilities to systematically generate them.

As the MBF and other improved demand forecasting methods emerge, the LEW and OPLOG Planner are designed to accommodate these updates quickly; however, gaps endure. For example, data is almost completely lacking on how varying climates affect supplies (other than water). To what degree will a combat vehicle’s maintenance requirements differ in a jungle versus a desert? A planner’s intuition says they will, but the data for such a forecast is lacking. Consequently, OPLOG Planner and the LEW cannot yet account for these factors.

Ammunition forecasting is another gap. OPLOG Planner calculates basic loads for systems but not ammunition consumption or requirements over time. The LEW provides even less forecasting capability for ammunition, providing only a means for units to track their ammunition consumption and levels in stock. Ammunition consumption forecasts are particularly complicated, because they depend on many factors including ammunition availability, interdependencies between weapon systems, and even the personnel involved. For this reason, ammunition forecasts will have a large variance, but future tools that provide a consolidated sustainment forecast should nevertheless include class V (ammunition).

More fundamental than the current demand forecast deficiencies is the lack of a tool to provide sufficient wargaming capability for sustainment planning. Neither the LEW nor OPLOG Planner provide logisticians with the ability to analyze the logistics network for a given course of action (COA). While the tools can be used to forecast sustainment requirements, they cannot be used to assess the supply chain to meet those requirements. They cannot predict bottlenecks or capacity shortfalls for a logistics network or assess risk.

Operational commanders and their staffs assess the scheme of maneuver for an operational COA for risks, suspect assumptions, agility, flexibility, mass, protection, and any criterion that the commander desires. But the sustainment plan often does not benefit from the same rigor of analysis.

Where is the supply chain most vulnerable? How would losing a logistics node due to weather or enemy action affect the plan? If the demand does not match the forecast (it never does because perfect forecasting is impossible), how long will it take to receive the needed items? And how do maneuver COAs compare in the logistics realm; is one more risky or harder to sustain? Logistics planners do not currently have tools to help them answer these questions in a rigorous way, especially in the time-constrained environment of expeditionary planning.
While OPLOG Planner and the LEW allow logistics planners to forecast the sustainment required for a mission, they do not enable operational or tactical planners to evaluate logistics COAs for feasibility, risk, robustness, or efficiency or to methodically compare alternate COAs. With the recent advent of total asset visibility through the GCSS–Army system, there is an opportunity to enable planners to conduct end-to-end analysis of a logistics COA for a mission and leverage GCSS–Army data to determine how best to sustain the scheme of maneuver. This would dramatically improve the ability of sustainment planners to prepare for and support operations. One new approach to provide this capability is the Military Logistics Network Planning System (MLNPS).

**The MLNPS**

The MLNPS was developed at North Carolina State University (NCSU) by a research team including active and former military officers. It is currently being further enhanced by the authors of this article and other researchers.

The MLNPS can generate a forecast for sustainment requirements based on mission information provided by a user. The forecast includes the needed quantity of supplies by location and time. The MLNPS creators have consulted with PDB in order to mirror OPLOG Planner estimating techniques where appropriate and improve on them where possible.

With the MLNPS, however, the demand forecast is only the first step. Using the forecast, a logistics planner can use the MLNPS to analyze from end to end the sustainment network intended for a COA. The tool can identify bottlenecks in the sustainment flow, expected delays, and logistics capacity or resources needed to improve the sustainment network’s performance.

For example, the MLNPS might indicate that after arriving in theater, supplies are predicted to face mounting delays at the theater distribution point before going to tactical units. The MLNPS could be used to determine whether increasing warehouse capacity (by adding workers or space) or adding transportation assets for the distribution effort would mitigate or solve the problem. A planner could determine when added capacity was required and plan accordingly.

In addition, the MLNPS enables risk analysis, where the planner can identify what the effects of potential disruptions to the system are likely to be. For example, a planner could accurately estimate the delays downstream from a logistics node that closes or has reduced capacity. This allows the logistics planner to create decision points for the commander and recommend appropriate alternatives to prevent sustainment disruption. All of this is accomplished in near-real time (within minutes or hours, depending on the size of the model), keeping the tool relevant for operational mission planning.

Another critical advantage of MLNPS is that it is designed to incorporate data from GCSS–Army. While this capability is currently being developed, the intent is for MLNPS to draw upon GCSS–Army’s asset visibility to identify the best sourcing for supplies to further streamline expeditionary logistics.

After discussions with the Combined Arms Support Command, the research team is encouraged about the prospect of future integration of MLNPS as a GCSS–Army application. This would provide MLNPS capability to the force, make it accessible through GCSS–Army, and integrate a modeling capability with real-time sourcing data for supplies.

GCSS–Army provides opportunities to develop tremendously improved decision-support tools for logistics planners and decision-makers. During the planning process, logistics planners could use real-time analytics to evaluate and compare sustainment courses of action, create decision points, and generate recommendations for commanders. While units are currently using GCSS–Army to improve their requisition processes and supply operations, MLNPS provides the opportunity to dramatically improve sustainment planning as well.

From a broader national security perspective, effective sustainment will remain crucial to meeting future challenges. More intelligent planning and analytics tools will enable the Army to further extend logistics innovation and effectiveness.

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