

Distributed Operational Logistics

Operating in a contested environment

by Maj Jason H. Fincher

The realities of the near future anti-access/area-denial dilemma require an examination of conventional operational logistics support. The current support plan is designed around the peace time requirement of transportation efficiency, but the expansion and proliferation of adversarial long-range precision fires places the concentrated operational logistics chain at risk. Furthermore, evolving concepts of employment that disperse friendly forces across unprecedented distances highlight a need for operational logistics agility that the Joint Logistics Enterprise (JLENT) simply does not possess. Without the creditable logistics capacity to project and sustain expeditionary forces, those forces lose critical creditability as a strategic deterrent.

To address these challenges, the Marine Corps Warfighting Laboratory has explored an idea referred to as distributed operational logistics in a contested environment (DOLCE). DOLCE is designed to meet the needs of the 21st century force by guiding logistics modernization to adapt the civilian sector's supply-chain-management ideas to the military context.

The primary purpose of DOLCE is to minimize large stockpiles of logistics at fixed locations ashore to mitigate the risk posed by adversarial long-range fires and effects while increasing the ability and flexibility of logistics support. DOLCE seeks to exchange the concentrated physical mass of materiel for a combination of dispersed supplies, rapid transportation, and forecasting enabled by advanced information awareness. From the warfighter's perspective,

>Maj Fincher is assigned to the Analysis Integration Center, Operations Analysis Directorate, Combat Development & Integration.

DOLCE can be described as exchanging stockpiling inventory on-hand for knowledge on where the inventory is and how to get it at the right time and place.

Operational Logistics Agility

The buildup of stockpiles commonly referred to as "iron mountains" is no longer tenable within the effects radius of enemies' long-range weapons systems. We present large physical footprints which are detectable and targetable by any peer or near-peer adversary and even non-state actors. As future forces work to avoid targeting by reducing the signature, so too must the logistics units providing support.

Responsiveness is the yardstick by which effective logistics is measured.

—MCDP 4

DOLCE retains responsiveness as the primary measure of effectiveness and seeks to extend it through the operational level of logistics. Industrial practices that capitalize on modern technology and processes indicate that responsiveness provided by mass can be achieved through improved precision

and agility. Companies like Walmart, Amazon, Zara, and many others have challenged distribution models based on transportation efficiency with great success by shifting to information-enabled responsiveness. DOLCE seeks to achieve similar agility by replacing mass with awareness and speed.

Logistics agility combines the tested logistics principles of responsiveness, flexibility, and accuracy but adds the ability to rapidly shift tasking and resources to ensure that the needs of units are precisely met without overloading them or their tactical support units with excessive materiel. If supporting and supported units' locations, stocks, and transportation modes are accurately reported or predicted, an agile support force can deliver precise and timely support to point targets without overloading the forward unit or creating a vulnerable physical signature.

Avoid the Iron Mountain

With the end of the Cold War and entrance of the new global order, military planners are reconsidering how to fight war with a peer adversary, a situation that demands a similar reconsideration of logistics to meet the needs of service members in theater. Iron mountains have become a staple of logistics for several reasons. Some of these are intentional based on legitimate military requirements; others are unintentional and resulting from inefficient management practices. These reasons include:

- A tendency to husband resources for future operations.
- A mismatch between the arriving bulk and distribution capacity at the intermediate level.

- A buildup of safety stock to account for variations in demand.
- A buildup because of errors in forecasting requirements.

The DOLCE concept seeks to address these underlying causes with better-informed planning and by dispersing remaining inventory while keeping it accessible. Dispersed inventory paired with coordinated transportation becomes a virtual warehouse that can perform as well as, or better than, traditional methods. It relies on the accurate information of inventory locations and available distribution methods to hit point targets with tailored supply packages from distances that extend outside the enemy threat radius. Based on known or predictable demand and arrival times, DOLCE accounts for inventory in transit to minimize stocks held on hand at any forward location. For supplies that are difficult to predict, DOLCE relies on rapid, responsive transportation enabled by advanced forecasting techniques.

Logistics systems tend to mirror the forces they support. While the Marine Corps is envisioning future operations through the *Concept for Expeditionary Advance Base Operations*¹ (EABO), DOLCE aims to do the same for the logistical side; both seek to attain the benefits of mass without the physical risks of concentration.²

Smaller, dispersed units will drive a shift to smaller, more dispersed logistics methods in forward areas. In the past, U.S. forces achieved responsiveness in the last tactical mile by relying on massive build ups of supplies at a location in the “rear area.” Yet, in a future conflict against peer adversaries, the rear area will be under threat in multiple domains and cannot be assumed to provide a safe-haven. As the logistics area of concern expands in width and depth, the single efficient supply chain will need to adapt toward a more resilient and networked design.

Demand Categories

Logisticians are familiar with the traditional dichotomy of push-and-pull logistics. In general, things that lend themselves to forecasting can be pushed, and things that evade forecasting are

pulled via request. Expanding on this observation, DOLCE identifies five demand profiles based on how much the demand varies over time.

Stable demand varies little, is predicted with simple methods, and equates to purely push logistics. Predictable demand varies in accordance with a known influence and can be forecasted with informed planning methods. For these two categories, matching arrival rates closely to demand minimizes on-hand inventory as the supplies flow to the intended recipients.

... the rear area will be under threat in multiple domains ...

The next two categories demonstrate more variable demand but are stratified into “combat critical variable” supplies and “non-critical variable” supplies. These categories require more advanced predictive analytics for forecasting. To account for inevitable error, these items rely more on rapid transportation for delivery from dispersed or more distant stocks to avoid vulnerable stockpiles. For combat critical supplies, support forces will have to accept risk by locating them on dispersed or mobile platforms within the adversary’s weapons range to minimize transportation time. Non-critical supplies can be positioned well outside the threat, acknowledging the resulting increased delivery time.

The final category is intermittent demand, which is the hardest to forecast and equates to purely pull logistics. The profile for intermittent demand exhibits a large number of zeros in the demand profile, punctuated by spikes at random times. Many consumable repair parts exhibit intermittent demand. Intermittent demand items should remain outside the enemy weapons engagement zone but require a rapid transportation such as air delivery.

These categories provide logistics planners with a greater degree of calibration for inventory positioning measured against risk. Using the demand profile of an item to determine its relative location in the battlespace allows for the minimization of physical footprint.

There will be cases where an item or supply should be managed in more than one category simultaneously. A supply item that has stable demand up to a point, but then varies above that point, may have a calculated proportion of its requirement managed in transit and a complementary safety stock managed as an on-hand inventory in the appropriate network. The same is true for combat critical variable items where only a small percentage of the total demand may be for the time-sensitive requirement. By managing inventory positioning intelligently, the support enterprise can minimize inventory at risk without adversely affecting responsiveness.

The Distribution Network

In private industry, the 21st century supply chain is no longer strictly linear. Instead of supply chains, the support-

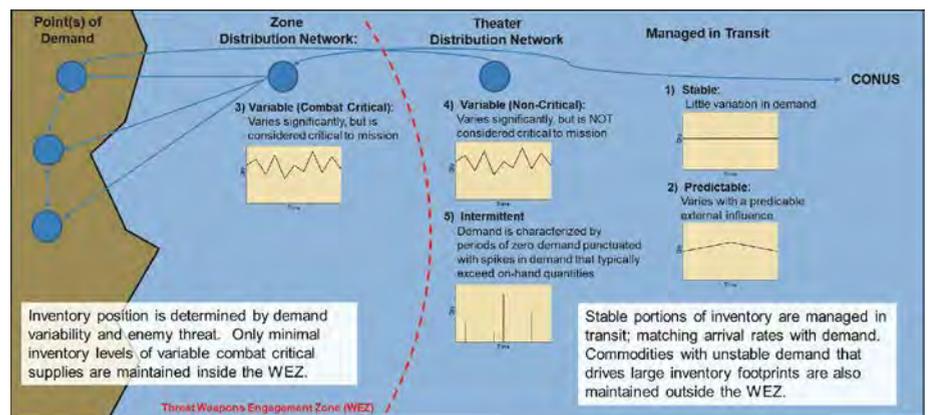


Figure 1. The distribution network. (Figure provided by author.)

ing forces will need to manage supply networks that extend from the point of need in all directions. These networks are an interconnected web of suppliers, intermediaries, and consumers operating in various domains. Supplies transiting the supply chain take the most expeditious path available to minimize wait time. Inventories maintained in the network are dispersed throughout multiple nodes but are accessible and managed as if they were a single inventory. Any variation of path, to include direct delivery from the source, is a feasible and acceptable option. By relying on networks instead of concentrated nodes, the supply system is more resilient. If any single node or path is interdicted, then DOLCE selects the next fastest options for delivery. DOLCE considers the network in layers, radiating from the highest to lowest risk based on the adversary's capabilities.

Point of demand. This is the location of the requesting unit, and it is closest to the adversary. In a distributed lay-down, this may be a squad- or platoon-sized element. The point of demand is the target point for the entire supply chain. To unify efforts, DOLCE measures wait time from the time of request to the time of delivery at the point of demand.

Zone distribution network. This network operates within the enemy's threat radius and maintains combat critical supplies accessible to the point of demand. Supply stores are managed to minimize their targetable footprint while maximizing accessibility to combat forces. These supplies can be mobile aboard transportation assets or stored in accessible, distributed sites.

Theater distribution network. This network operates outside the enemy's threat radius but within range of responsive transportation methods. The types of supplies stored in this network exhibit variable (non-critical) or intermittent demand profiles. Since forecasting demand for these supplies is difficult, access to rapid tactical delivery is a key enabler of any node within the theater distribution network layer to ensure responsiveness.

In-transit network. This network contains predictable or stable inventory in



The iron mountain will be a thing of the past. (Photo by Cpl Ricardo Hurtado.)

transit, with the bulk of the inventory held in transportation vessels rather than occupying a large amount of space on the ground. It represents a flow of materiel from the source into any of the distribution networks or directly to the point of demand. In-transit visibility allows for this inventory to be a virtual warehouse that synchronizes deliveries with demand signals.

Source. This is the point at which the DOD accesses the commercial market or strategic level of logistics. This may be based in CONUS or a partner nation. The Defense Logistics Agency is the primary responsible agent, but direct purchase from other parties is also possible.

These layered distribution networks replace the traditional logistics pipeline. The logistics pipeline was necessary because of the sheer volume of logistics needs; mass was required to meet all demands in theaters with the available transportation and information capabilities. Modern capabilities, however, enable the JLENT to replace the pipeline with a series of networks that simultaneously reduces the physical concentration of supplies and increases responsiveness and flexibility, achieving the mass of the effect of logistics without the liability of physical concentration.

Key Enablers

Unified inventory and distribution management as well as integrated logistics planning are the key enablers. World-class supply chain management focuses on the flow of information and funds at least as much as the flow of material. This requires information system integration between suppliers and consumers that spans the entire length and width of the supply chain. With supplies arriving through various modes from multiple sources, the visibility of the distribution system and inventory in transit become critical enablers.

Commanders at the receiving end must have confidence in the new approach. This confidence is provided by visibility and must be earned through performance. DOLCE seeks to provide visibility and improves responsiveness through the use of modernized information management and in-transit visibility. This includes visibility of adjacent units and non-traditional sourcing options. Commanders will know exactly when and where their next resupply is because they will have access to the information. The supporting units will know exactly what is needed as well as when and where it is needed because they also will have access to the information.

In a Marine Corps context, this integration and visibility must span from

the requesting unit to adjacent Services, commercial suppliers, strategic partners, and supporting Defense agencies. Resource exchange should be streamlined (or seamless) but must retain accountability of performance and quality. This will require the information systems to communicate the date and the expertise to manage complex operations.

The concentration of support can be mitigated through effective information management; however, Marine Corps logistics information and data management currently struggles with ensuring precision, preventing excess, or protecting information. Logistics units must have covered and protected communications systems and reliable information technology platforms to execute complex logistics operations. Logistics processes that are refined to minimize the amount of data required are paramount to minimizing the electromagnetic signature and demand on limited operational bandwidth.

The point where supplies and forces enter the theater has traditionally involved a great deal of infrastructure and, consequently, a large concentration of troops and materiel. It is here where the tactical distribution system receives shipments, breaks them into manageable sizes, and transports those supplies to their own depots for issue to customers. Recent examples include

a diverse set of long-range transportation methods that can reach the operational-tactical hand-off in enough volume to meet the demand of the forward force.

The long-range, responsive delivery of Marine Corps items will likely remain a requirement of DOLCE inventory positioning. The Marine Corps is committed to leveraging unmanned and semi-autonomous systems to provide the conceptual goals of DOLCE with tangible distribution platforms. Modern logistics can no longer rely solely on large capacity logistics platforms but must augment them with small, easily distributable, and rapidly deployable platforms to ensure the necessary flexibility to logistics operations.

Conclusion

DOLCE neither provides a solution today nor is marketed as a perfect way-ahead. It simply offers a different approach to operational sustainment and provides a direction toward which to begin adapting our current logistics systems and processes.

The combination of layered distribution networks, improved forecasting, responsiveness, and in-transit visibility creates logistics operations that achieve mass without concentration, mitigating the vulnerabilities of traditional logistics systems; however, DOLCE is a large

formation technology and modernized processes.

It appears that the echoes of DOLCE were included in a broader scope in recent Installations and Logistics Department draft guidance, as it is easy to draw a line between the DOLCE and the four lines of effort identified in *Sustaining the Force in the 21st Century*: optimize installation support to the warfighter, establish global logistics awareness, improve sustainment, and diversify distribution.³

If implemented to full potential, the DOLCE concept will achieve multiple goals simultaneously. It will increase the flexibility and responsiveness of logistics operations across the spectrum of conflict. It will meet the goals of the *Marine Corps Operating Concept*⁴ and enable combat forces to operate in the highly distributed, fast-paced future operating environment.

By leveraging modern logistics design and capabilities, DOLCE will eliminate vulnerable iron mountains and lakes of fuel by shifting risk to the information domain where the joint force has an opportunity to mitigate it. DOLCE serves as an aiming point to address the logistical needs of the future Marine Corps by providing operational agility that can keep up with the speed of battle.

DOLCE's emphasis on integration steers it toward a Joint solution. How much of this solution is a Marine Corps responsibility is up for debate.

Bagram Air Base in Afghanistan and Balad Air Base in Iraq. Whenever possible, this buildup should be avoided by connecting logistics support directly to the customer as much as possible.

Under DOLCE, the remaining operational-tactical hand-off points may be at a great distance from the point of demand. Last tactical mile distribution may now extend to the last thousand tactical miles to avoid creating lucrative targets within the adversary's weapons engagement zone. The JLENT requires

departure from current processes. It will require a deep look and the potential re-engineering of supply and distribution processes.

DOLCE's emphasis on integration steers it toward a Joint solution. How much of this solution is a Marine Corps responsibility is up for debate. Marine Corps integration into DOLCE will enhance the LCE's ability to provide support to the widely distributed GCE by distributing both supplies and platforms while tying them together through in-

Notes

1. Headquarters Marine Corps, *Concept for Expeditionary Advance Base Operations*, (Washington, DC: 2019).
2. Arthur Corbett, Concepts and Plans Branch, Marine Corps Warfighting Laboratory, (Quantico, VA: 2018).
3. Headquarters Marine Corps, *Sustaining the Force in the 21st Century*, (Washington, DC: 2019).
4. Headquarters Marine Corps, *The Marine Corps Operating Concept: How an Expeditionary Force Operates in the 21st Century*, (Washington, DC: 2016).

