RAND Research Brief

In Support of the Warfighter

Reinventing Marine Corps Inventory Management

Marine Corps logistics has one overarching goal: to provide effective and efficient support to the Marine warfighter. To further this goal, beginning in 1996, the Marine Corps' Precision Logistics program targeted for improvement each of the critical links in the chain connecting the warfighter to requisite supplies. Working with analysts in RAND's National Defense Research Institute, initial efforts focused on improving the performance of supply and repair processes, thereby increasing overall warfighter readiness.[1] More recently, the Marine Corps has initiated the Integrated Logistics Capability (ILC) Initiative to plan the next generation of core logistics processes and the supporting information technology infrastructure.[2]

In support of these efforts, RAND analysts have developed new ways to define repair parts inventories and to measure their performance. *Retooling for the Logistics Revolution: Designing Marine Corps Inventories to Support the Warfighter* shows how the use of two innovative inventory management techniques can save money and increase customer satisfaction. The findings have direct application to any organization, military or civilian, that seeks to improve the performance of its supply inventory.

RAND DEVELOPS CUSTOMER-FOCUSED METRIC OF INVENTORY EFFECTIVENESS

Traditionally, Marine Corps inventory practices have been measured in terms of "fill rate"—the percentage of retail demands satisfied from local stock. However, this metric fails to capture how well Marine inventory actually meets customer needs. Since the majority of repairs require a number of parts to complete, even with fill rates of 60 or 70 percent for some parts, most jobs are delayed waiting for parts from nonlocal sources. Some 75 percent of major subassembly repairs, for example, require parts not locally stocked. Most significantly, repairs that require a part from the wholesale supply system *take 30 percent longer, on average, to complete.* And often the critical wholesale part is inexpensive. The lack of a $1 part can hold down a deadlined weapon system even as other parts—worth thousands of dollars—are immediately available.

To quantify supply's impact on repairs, RAND analysts developed a new metric—the Equipment Repair Order (ERO) fill rate. The ERO fill rate measures inventory effectiveness from the perspective of the mechanic. It tallies the percentage of critical repairs for which all high-priority parts are immediately available from local supply.

RAND INVENTORY MANAGEMENT TECHNIQUES OFFER SIGNIFICANT PERFORMANCE BENEFITS

Motivated by the idea that inventory performance could be measured in terms of real warfighter satisfaction, the Marines sought further ways to improve their inventory management techniques.

Inventory managers must be able to answer three important questions: what to stock, how much to stock, and when to reorder stock. The determination of what to stock is based on a variety of considerations, such as past demand history and the importance of the item. How much to stock and when to reorder is based on an assessment of risk. In particular, what risk of running out of stock is the inventory manager willing to assume when it is time to submit a replenishment order? The higher the reorder point (the ROP, or the level of items on the shelf that triggers a replenishment order) is set, the lower the

[1] Marc L. Robbins, Patricia M. Boren, Rick Eden, and Daniel A. Relles, *Measurement of USMC Logistics Processes: Creating a Baseline to Support Precision Logistics Implementation*, RAND, DB-235-USMC, 1998.

[2] United States Marine Corps Materiel Command Integrated Logistics Capability, Case Study & Appendices A-C, dated 4 March 1999.

risk of running out of stock during the replenishment time, but the more capital is tied up in safety stock.

To help local managers answer these questions, RAND analysts have developed two techniques: the "bootstrap ROP" and "dollar banding." The *bootstrap ROP* allows the inventory manager to set stock levels by risk of running out. This approach automatically sizes the inventory to account for variations in demand—variation inherent in the supply system and not accounted for in the current Marine Corps methodology. *Dollar banding* incorporates cost into the stock decision. It is based on the idea that many more inexpensive items can be stocked for the cost of very few expensive items. Bootstrapping the ROP and dollar banding combine synergistically to produce significant improvements in inventory performance.

Applying these techniques to existing Marine inventories through advanced simulation, and using data from a Marine Expeditionary Force, RAND researchers have demonstrated the potentially large performance benefits that could result from using the bootstrap ROP and dollar-banding techniques. As the table highlights, both the fill rate and the ERO fill rate are much higher, while the investment in inventory is noticeably reduced, using the new techniques. In addition, the variety of stock held almost triples, with the number of lines (specific types of items) increasing from 13,159 to 32,537.

	Projected Inventory Performance Under:	
	Actual Marine Corps Guidelines	New Techniques
ERO fill rate	54%	75%
Fill rate	72%	87%
Inventory value at RO	$24M	$17M
Number of lines stocked	13,159	32,537

Comparison of the projected inventory performance for a Marine Expeditionary Force using actual and new techniques

TOWARD FURTHER IMPROVEMENTS IN INVENTORY PERFORMANCE

Importantly, RAND simulations further suggest that dramatic improvement in inventory performance will also require marked reductions in Marine Corps Order and Ship Times (OSTs). Reduced OST frees up capital previously required for safety stock. This capital can then be applied to stocking many more cheap, low-demand items. In this way, the depth of stocks is "rightsized" to fit demand history and avoid backorders while at the same time reducing inventory costs.

While more recent Marine Corps initiatives, such as the ILC plan, use information technology to reduce the logistics "iron mountain," some part of that mountain will always remain. Thus, cutting-edge inventory techniques, such as the bootstrap ROP and dollar banding, will be required to effectively manage even an "iron molehill." Indeed, from a warfighter's perspective, the smaller the mountain becomes, the more critical effectively managing it will be.

RAND research briefs summarize research that has been more fully documented elsewhere. This research brief describes work done for the National Defense Research Institute; it is documented in Retooling for the Logistics Revolution: Designing Marine Corps Inventories to Support the Warfighter, *by Ronald D. Fricker, Jr., and Marc Robbins, MR-1096-USMC, 2000, 112 pp., $15.00, ISBN: 0-8330-2855-3, available from RAND Distribution Services (Telephone: toll free 877-584-8642; FAX: 310-451-6915; or Internet: order@rand.org). Abstracts of all RAND documents may be viewed on the World Wide Web (http://www.rand.org). Publications are distributed to the trade by NBN. RAND® is a registered trademark. RAND is a nonprofit institution that helps improve policy and decisionmaking through research and analysis; its publications do not necessarily reflect the opinions or policies of its research sponsors.*

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