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# Assessment of the USCENTCOM Medical Distribution Structure

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## Summary

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In July 2008, the Director of Logistics of the Joint Staff (JSJ4) and the U.S. Army Deputy Chief of Staff, G-4 (Army G-4) visited the U.S. Central Command (USCENTCOM) area of responsibility (AOR) to review logistics operations. One of their questions was whether efficiencies could be gained by combining medical and nonmedical warehouse distribution with stocks consolidated at one location. RAND Arroyo Center and U.S. Army Medical Research and Materiel Command (USAM-RMC) expanded this question and explored whether there might be less costly medical distribution structures for USCENTCOM that would maintain the quality of health care delivery. In this report we describe the current distribution structure for medical (Class VIII) materiel for USCENTCOM customers, a set of alternatives, and the likely performance, cost, and other effects of changing the current system to that of one of the alternatives.

### **Background: The Current Distribution Structure and Its Origins**

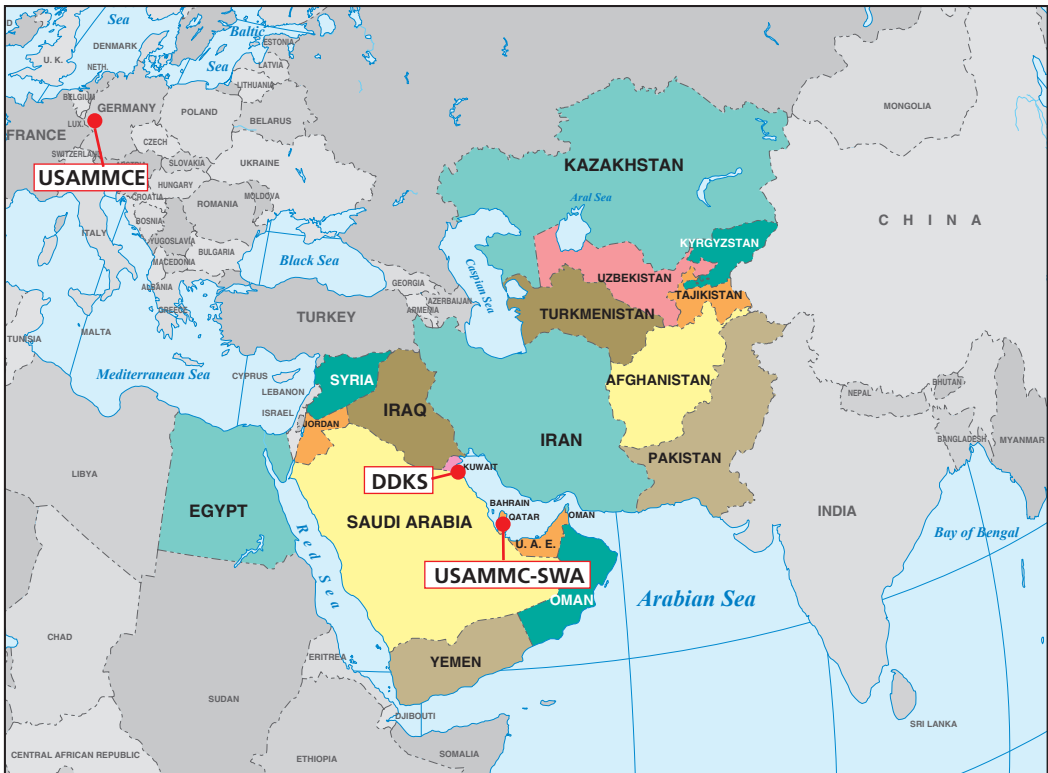
Class VIII materiel is supplied to USCENTCOM AOR customers from two distribution centers: U.S. Army Medical Materiel Center, Southwest Asia (USAMMC-SWA), located at Camp As Sayliyah, Qatar; and U.S. Army Medical Materiel Center, Europe (USAMMCE), located in Pirmasens, Germany. Approximately 60 percent of the medical materiel sent to USCENTCOM AOR customers comes from USAMMC-SWA, which stocks 3,000 lines of the fastest-moving items and is replenished by USAMMCE. The other 40 percent of the requisitions that cannot be filled by USAMMC-SWA are passed back to and filled directly by USAMMCE, which carries approximately 13,000 lines of stock and is replenished by commercial prime vendors.

Non-Class VIII materiel for USCENTCOM customers is shipped primarily from the Defense Distribution Depot Kuwait, Southwest Asia (DDKS), from continental U.S. (CONUS) distribution centers—most often Defense Distribution Depot Susquehanna, PA (DDSP)—and directly from vendors for certain classes of items such as food. Managed by the Defense Logistics Agency (DLA), DDKS is a contractor-owned and -operated distribution center that stores and distributes supply Classes II (such as

textiles, uniforms, tents), IIIp (packaged petroleum products), IV (barrier and construction materials), and IX (repair parts). Figure S.1 shows the locations for DDKS, USAMMCE, and USAMMC-SWA.

Initially, USCENTCOM nonmedical theater-level sustainment stocks were stored in Army general support (GS) supply support activities (SSAs), which were stood up in early 2003. When DDKS became active in 2004, the Army phased out the inventory levels in the Class II, IIIp, and IV and Class IX common GS SSAs so that they would not be replenished. However, a GS SSA remained in place to accept and process serviceable returns. In 2007, shipments from the GS SSA and DDKS were combined on pallets to improve distribution performance and improve transportation efficiency through larger pallets built more quickly. In 2008, process and information system changes were made so that DDKS could take over the mission of receiving and processing serviceable returns for increased warehousing and distribution efficiency. The new question was whether further efficiencies could be gained by also consolidating distribution of non-Class VIII and Class VIII medical supplies.

**Figure S.1**  
**Locations of USAMMCE, USAMMC-SWA, and DDKS**



## Study Methodology and Evaluation of Options

The initial options were to consider supporting the USCENTCOM AOR with medical materiel shipped via prime vendor support from CONUS through DDSP, stocking medical supplies at DDKS and closing the distribution center at USAMMC-SWA, and the status quo structure (see Table S.1). Two additional options were considered based upon preliminary data analysis and as a result of interviews with medical logisticians: providing all direct support of medical materiel to USCENTCOM from USAMMCE, and replicating more of the USAMMCE inventory at USAMMC-SWA so that it could directly provide most items to customers.

The first criterion that each option had to satisfy was that of performance: Does the option maintain or improve performance with regard to how long it takes to fill orders? The medical supply chain is focused on clinical outcomes, and timely response to needs is considered critical, with current performance considered acceptable. Thus, the medical community expected that the performance for any new distribution option would be equal to or better than current performance.<sup>1</sup> Second, is the option less costly than the status quo? If an option meets these two criteria of performance and cost, then it is considered a possible distribution option for medical materiel to the USCENTCOM AOR (see Figure S.2).

### The CONUS Option

The best representation of the time associated with this option is the time for direct vendor delivery (DVD) shipments from CONUS, since there is no CONUS stockage of medical supplies—only prime vendor support. We compared average end-to-end distribution times for Class VIII and DVD shipments of Class IX materiel through the DDSP CCP to customers in USCENTCOM (see Figure S.3).<sup>2</sup> Beginning at a vendor

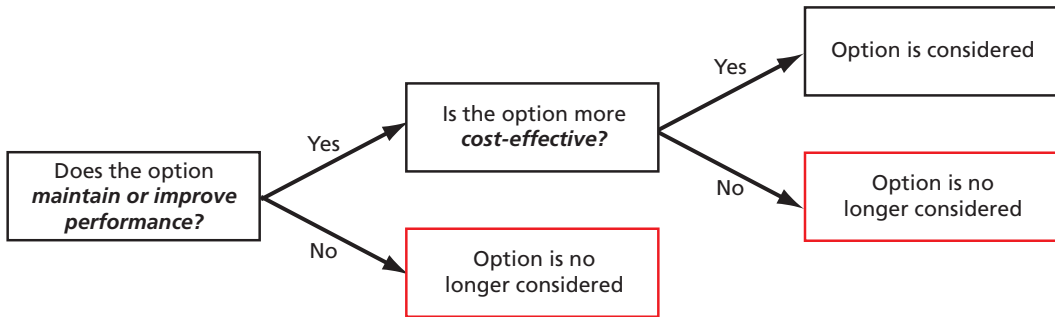
**Table S.1**  
**Medical Distribution Options Considered**

Option	Performance	Cost	Other
Status quo			
Prime vendor from CONUS through DDSP CCP			
Stock medical supplies at DDKS			
Consolidate at USAMMCE (no USAMMC-SWA)			
Replicate USAMMCE stocks at USAMMC-SWA			

<sup>1</sup> Performance is measured in terms of distribution time.

<sup>2</sup> The DVD model is the closest analogue to the current medical model that relies upon prime vendor support.

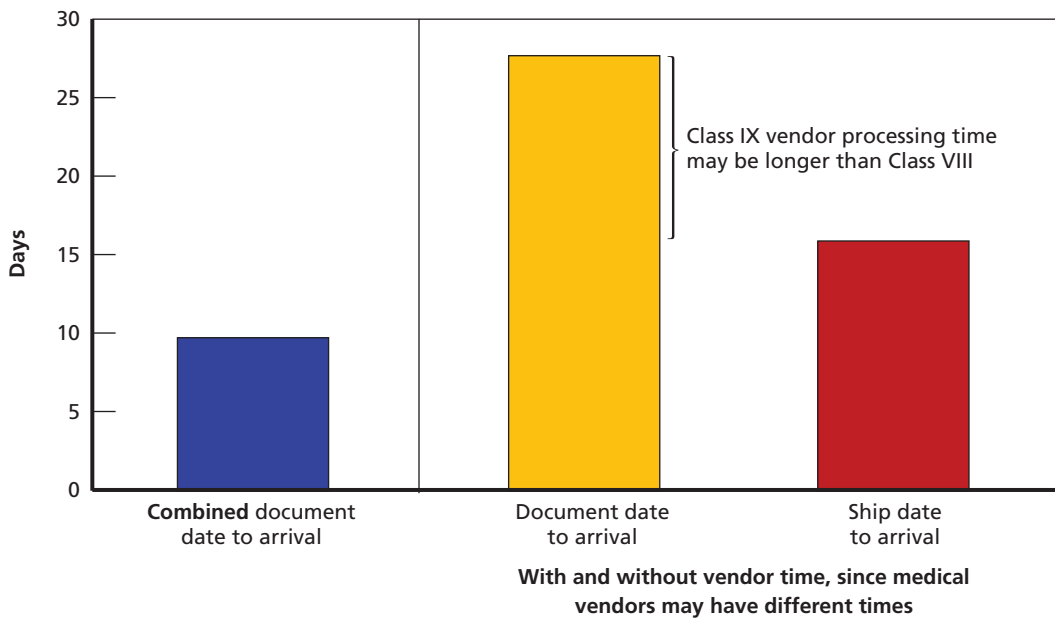
**Figure S.2**  
**Decision Framework for Evaluating Distribution Options**



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**Figure S.3**  
**Average Distribution Time Performance from CONUS**

MRO to destination arrival for USAMMC-SWA and Class IX DVDs from CONUS to CENTCOM Customers



RAND MG929-S.3

location, DVD Class IX materiel is shipped to the CCP and then forwarded on to the final aerial port of debarkation (APOD). The average time from the moment a materiel release order (MRO) goes to the vendor for a DVD item until the materiel arrives at the customer’s APOD when originating from CONUS is 28 days, whereas Class VIII

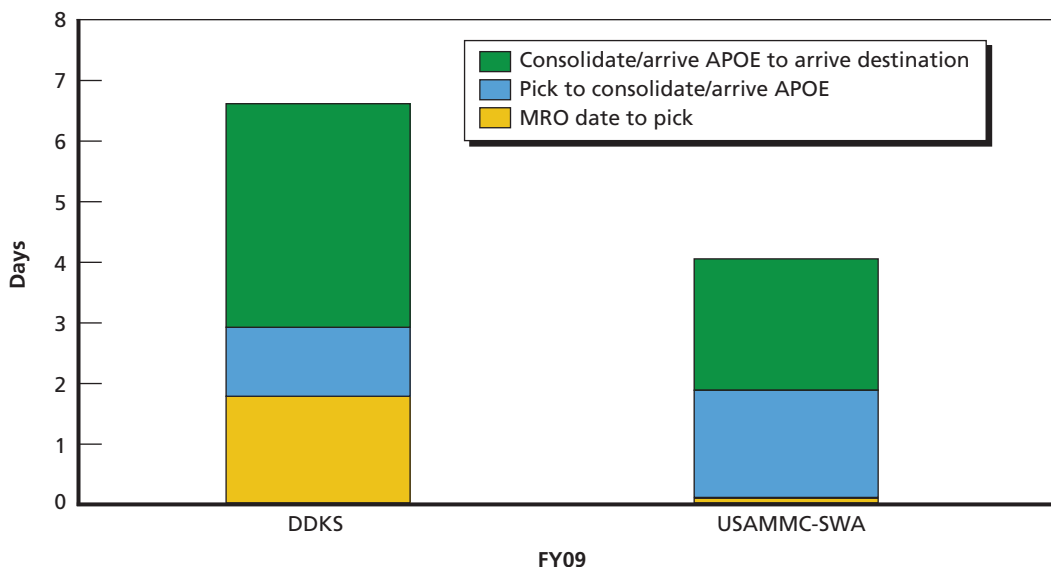
average performance is 10 days total time. If we take out the vendor processing time to account for the possibility that medical prime vendors have better processes than the non-Class VIII DVD suppliers, the average time from shipment to arrival for DVD shipments is still longer than the total Class VIII average distribution time. Because the performance associated with the CONUS option is significantly worse than that associated with the current medical materiel distribution structure, we did not consider this option further.

## The DDKS Option

The data in Figure S.4 show that USAMMC-SWA has a performance advantage over DDKS. Times from MRO to arrival at the APOD from DDKS have averaged about 6.5 days in fiscal year (FY) 2009, whereas USAMMC-SWA shipments averaged 4 days. The advantage for USAMMC-SWA lies primarily in the MRO-to-pick segment, with some advantage also in the transportation segment.

To compare costs between the two locations, we estimated how much it would cost to conduct the USAMMC-SWA distribution center mission at DDKS, the actual costs for performing this mission at USAMMC-SWA, and how transportation costs would change based upon the actual airlift rates from the two locations.

**Figure S.4**  
**Average Distribution Segment Times: DDKS and USAMMC-SWA**

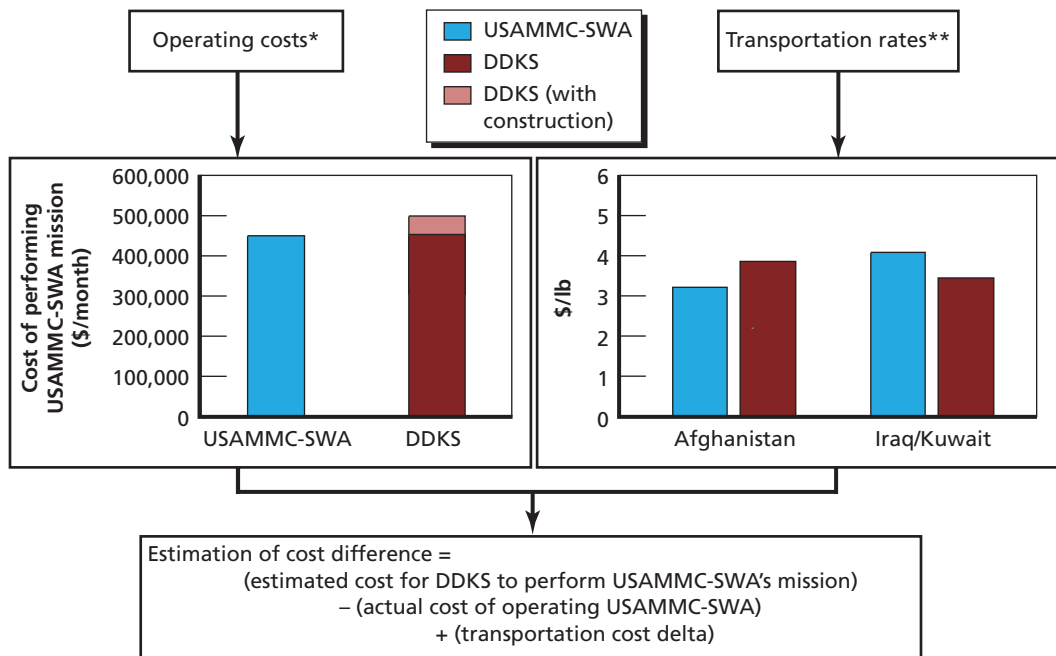


We combined the DDKS cost and volume data to develop cost factors (or rates) to estimate the DDKS operating costs of performing the USAMMC-SWA mission. We also estimated what construction would cost at DDKS if it were determined that additional space would be needed for the medical mission, and we provided cost estimates with and without the construction costs due to uncertainty with regard to this requirement.

To calculate the transportation difference, we decomposed the weight moved by USAMMC-SWA country (Iraq and Afghanistan) and by month, and then we applied the appropriate airlift rates by destination country from the two depots. Figure S.5 shows the cost estimates.

A cost-sensitivity analysis was conducted by increasing the number of pounds of Class VIII materiel shipped to Afghanistan and decreasing the Class VIII pounds shipped to Iraq, in accordance with FY2009 trends and Department of Defense (DoD) planning (see Figure S.6). For each set of conditions there are two bars, blue and red. The lower, blue bars correspond to the operating cost estimates that assume no con-

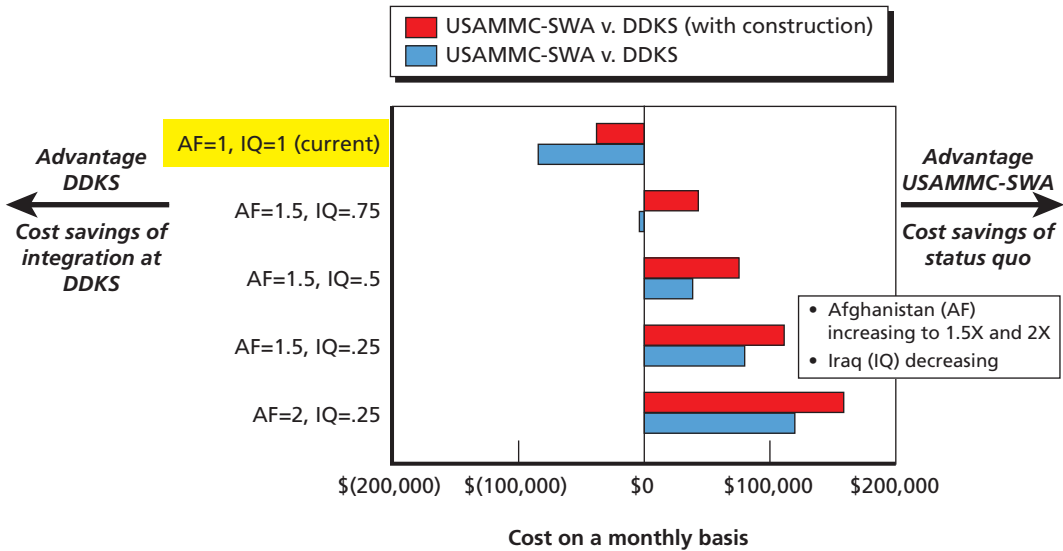
**Figure S.5**  
**Cost Estimates for USAMMC-SWA and DDKS**



\*Monthly operating costs determined using FY08 annual data, based upon transaction costs at each location.

\*\*Transportation rates using October–December 2008 data; rates are not at steady state as USAMMC-SWA ratio of tender to total continues to increase.

**Figure S.6**  
**Cost Sensitivity Analysis for USAMMC-SWA and DDKS**



RAND MG929-S.6

struction costs are necessary at DDKS for Class VIII mission absorption. The top, red bars represent the cases where the cost of new construction is included in the estimate of DDKS operating rates. A bar displaying value to the right of the center vertical axis indicates that there is a cost advantage to continuing to supply USCENTCOM Class VIII materiel from USAMMC-SWA. Conversely, a bar pointing to the left indicates that performing the USCENTCOM Class VIII mission from DDKS would generate a cost savings over continuing the mission from USAMMC-SWA.

Under “current” conditions, DDKS is estimated to have a slight cost advantage over USAMMC-SWA.<sup>3</sup> However, as troop levels in Afghanistan increase and Iraq levels decrease, the cost difference shifts to favor USAMMC-SWA. When the Afghanistan weight is doubled and Iraq is at one-quarter, we estimate that the cost advantage for USAMMC-SWA would reach up to \$160,000 per month.

### The Option of Consolidating Operations at USAMMCE

While distribution times from USAMMCE appear to be longer than those from USAMMC-SWA, these differences are driven by their respective roles in the USCENT-

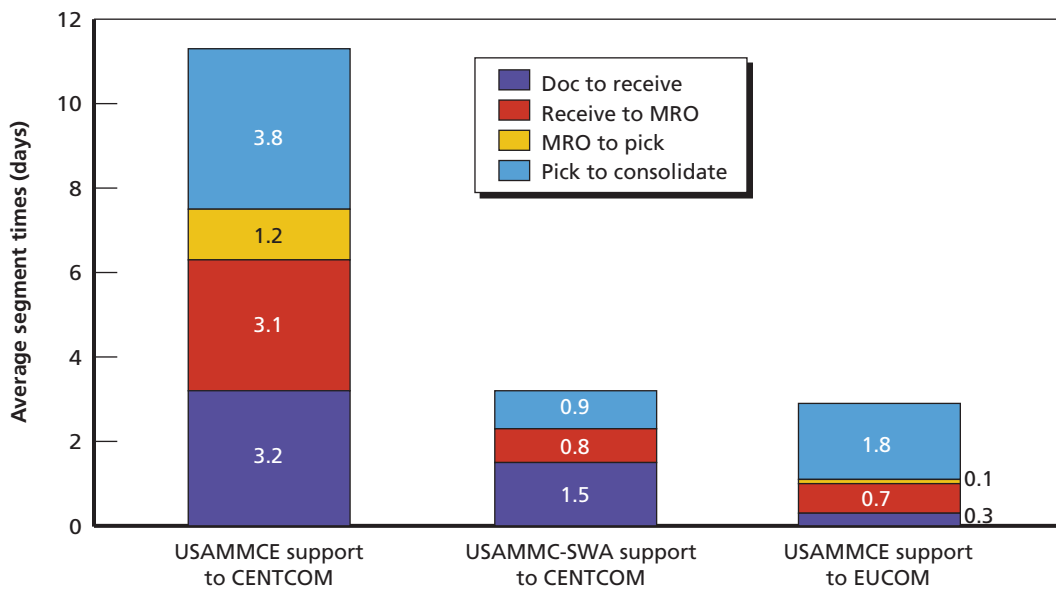
<sup>3</sup> “Current” conditions are defined by taking the average of the Class VIII weights shipped during October–December 2008.

COM supply chain and not by process performance differences (see Figure S.7).<sup>4</sup> We found that if USAMMCE had USAMMC-SWA’s direct customer support mission for USCENTCOM, the times would most likely be similar.

The two main factors driving the performance differences between the two locations are that USAMMCE is on a five-day work week instead of seven, and the fact that USAMMCE is the second source of supply. Being the second source creates requisition pass-back delays, exacerbated by batching, and lower volume, which leads to longer time to collect materiel for consolidated shipments. There are also some backorders miscoded as immediate issue shipments in the USAMMCE data (USAMMC-SWA has no backorders, because they are all passed to USAMMCE).

When USAMMCE is the primary source of support for customers, performance looks similar to that of USAMMC-SWA for CENTCOM customers. The column on the far right of the chart shows FY2008 performance for USAMMCE in support of

**Figure S.7**  
Average Distribution Segment Times: USAMMCE and USAMMC-SWA



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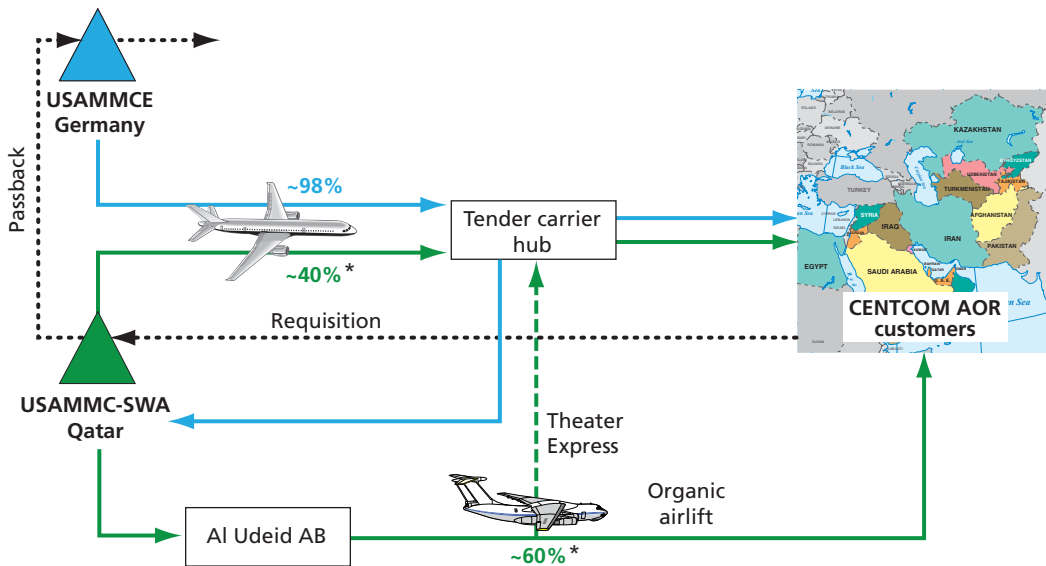
<sup>4</sup> The first segment (*doc to receive*) covers the time from the initial request for materiel, or document date (*doc*), to the time that the request is received electronically at the depot (*receive*). The next segment (*receive to MRO*) is the time that it takes for the *received* request to be prioritized and printed as an MRO for the depot to *issue*. The third segment (*MRO to pick*) is the time that it takes for the warehouse staff to identify and collect the materiel requested. The fourth segment is the amount of time necessary to consolidate all materiel to be shipped to a particular customer(s) or location(s).

major U.S. European Command (USEUCOM) customers. Overall times excluding transportation are roughly the same as for USAMMC-SWA for its USCENTCOM customers.<sup>5</sup>

Figure S.8 depicts the transportation structure for USAMMCE and USAMMC-SWA as of FY2009. USAMMCE uses a Class VIII commercial tender to move a high percentage (greater than 98 percent) of the total weight it ships to customers in USCENTCOM. USAMMC-SWA uses the Class VIII tender for roughly 40 percent of its shipments, in terms of weight. Note that the Class VIII tender shipments for both distribution centers are shipped through the same carrier hub for final shipment to the destination airfield, and replenishments from USAMMCE to USAMMC-SWA are shipped through this same hub as well. The transportation structure drives most of the difference in the distribution costs between the two locations.

On the left-hand side of Figure S.9, we show USAMMC-SWA's operating costs per month. In the same graph, we show the estimated monthly operating cost increase at USAMMCE were it to perform USAMMC-SWA's mission. The total weight shipped would not change, because replenishment shipments would merely shift to customer issues. However, there would be an increase in transactions due to smaller

**Figure S.8**  
FY2009 Transportation Structure for USAMMCE and USAMMC-SWA

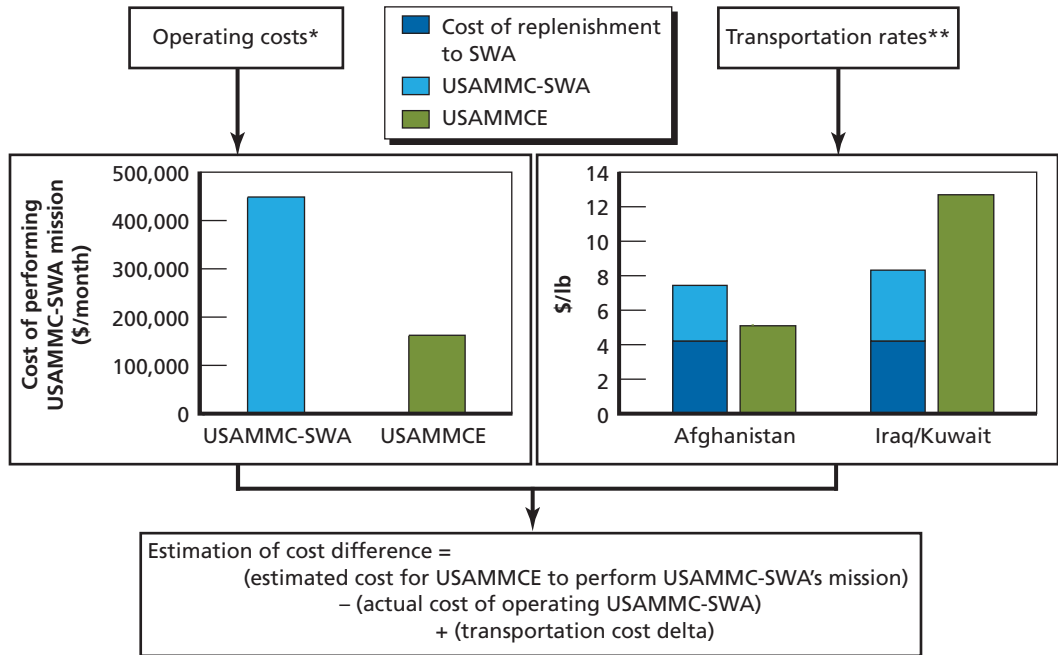


\*USAMMC-SWA ratio of tender to total rose in January–February 2009 to ~55%.

RAND MG929-S.8

<sup>5</sup> We have no means of measuring transportation times from USAMMCE to its USEUCOM customers, so we exclude showing the transportation segment in all three cases in Figure S.7.

**Figure S.9**  
**USAMMCE and USAMMC-SWA Operating and Transportation Costs**



\*Monthly operating costs determined using FY08 annual data and transaction costs at each location with replenishments to SWA replaced by USAMMCE issues.

\*\*Transportation rates using October–December 2008 data; rates are not at steady state as USAMMC-SWA ratio of tender to total continues to increase.

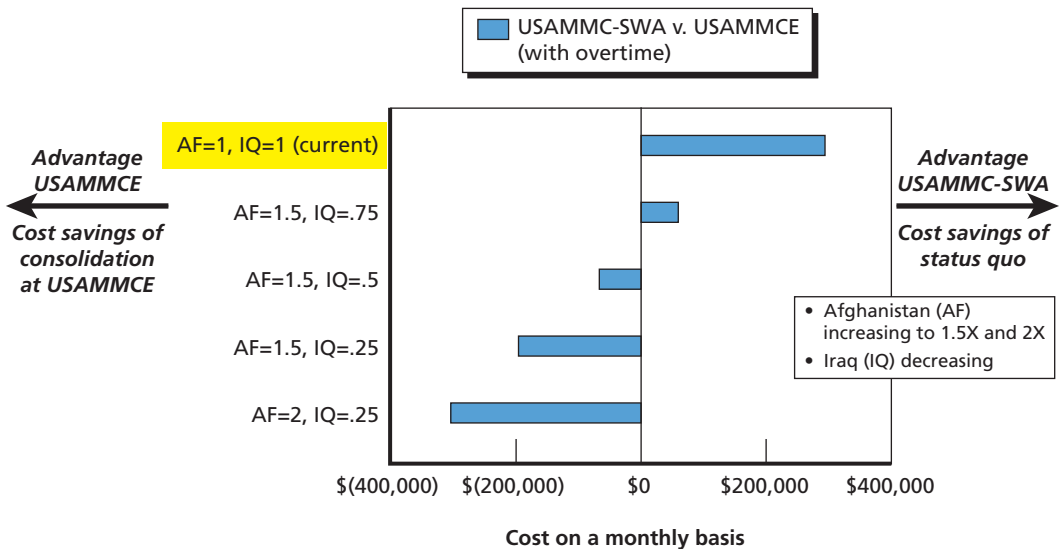
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quantities per transaction. Additionally and more importantly, USAMMCE would need to move to a seven-day work week to achieve USAMMC-SWA-like performance. We take these changes into account.

On the right-hand side of Figure S.9 is a graph comparing the aggregate transportation rates from the two distribution depots. The dark blue lower portions of the left columns indicate the cost of replenishments to USAMMC-SWA, and the light blue upper portions show the cost of actually going from USAMMC-SWA to the customer. For airlift to Afghanistan, it is less expensive to ship from USAMMCE. However, under the current structure and the commercial carrier selections for Iraq, it is less expensive to replenish USAMMC-SWA from USAMMCE and then ship to the customer than it is to simply ship directly from USAMMCE to the customer.

Figure S.10 shows the effect of increasing shipments to Afghanistan and decreasing them to Iraq. With an increase in troop levels in Afghanistan to 1.5 times early

**Figure S.10**  
**Cost Sensitivity Analysis for USAMMCE and USAMMC-SWA**



NOTE: Cost of replenishment is included for SWA for all cases.

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FY2009 levels and Iraq levels decreasing in 25-percent steps from the early FY2009 levels, the cost comparison shifts from favoring the status quo to favoring consolidation at USAMMCE. If the troop strength in Afghanistan were to double from early FY2009 levels and troop levels in Iraq were to fall to one-quarter of early FY2009 levels, there would be an estimated savings of roughly \$300,000 per month associated with consolidating distribution support for USCENTCOM at USAMMCE.

As shown in Table S.2, there are several other capabilities at USAMMC-SWA other than materiel warehousing and distribution, namely: medical equipment maintenance/repair, forward repair activity mission (FRA-M) support, patient movement item (PMI) cell support, optical fabrication, and customer technical support. However, medical maintenance actions conducted at USAMMC-SWA could probably be absorbed into the existing USAMMCE maintenance operations. Additionally, centralizing repair parts inventory at one location could reduce the overall cost of this inventory. Centralizing repair technicians could also facilitate cross-training among the workforce and provide more time on equipment for repair experience. We did not find any data that would indicate performance degradation or an increase in costs if the FRA-M teams, PMI cell support, optical fabrication, or customer support were not located at USAMMC-SWA.

**Table S.2**  
**Capabilities at USAMMC-SWA**

SWA Capability	Option	Implications		
		Performance	Cost	Intangibles
Medical equipment maintenance and repair	Move to USAMMCE	No known impact	May reduce cost of repair part inventory	May increase cross-training; will have access to ISO 9000 facilities
FRA-M mission support	Move to USAMMCE or Balad	No known impact	No known impact	The FRA-M team only needs a bed-down location
Patient movement item (PMI) cell support	Move to point of sortie origin or destination (i.e., Ramstein)	No known impact	No known impact	
Optical fabrication	Move to USAMMCE	No known impact	No known impact	
Customer and contingency operations support	Move to USAMMCE	No known impact	No known impact	May not have support that is fully “attuned” to theater environment

### The Option of Replicating USAMMCE Inventory at USAMMC-SWA

Just as consolidating support at USAMMCE, replication of USAMMCE capabilities at USAMMC-SWA so that most customer shipments would come from there would improve performance by eliminating distribution network fragmentation, but there would be some cost penalty. Inventory investments would have to be made at USAMMC-SWA. Currently, USAMMCE stocks approximately 13,000 lines of materiel, while USAMMC-SWA stocks approximately 3,000 of the fastest-moving lines. Based upon a rough estimate, an 85 percent customer demand fill rate target would require approximately 5,600 additional lines (for a total of 8,600 lines to be stocked at USAMMC-SWA) at a total “buildup” cost that would likely be less than \$1 million.<sup>6</sup> One potential complication is that if additional inventory were added to USAMMC-SWA and a customer service fill rate target of 85 percent were achieved, 15 percent of orders would still have to be satisfied by USAMMCE. This low volume of materiel might be a problem for the Class VIII tender usage by USAMMCE—as it might not be enough for the service or to get the prices that are in effect at this time, and alternatives such as the general USTRANSCOM World Wide Express contract might have to be explored.

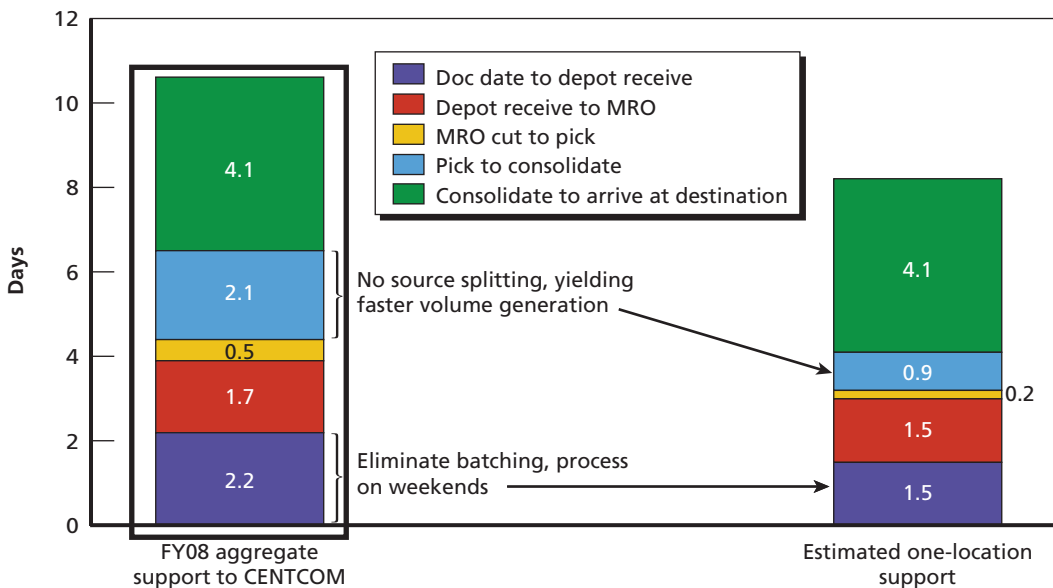
<sup>6</sup> Although there may not be adequate space to accommodate the additional stock levels at USAMMC-SWA at its current Camp As Sayliyah location, there is a request in to add an additional 30,000 square feet of space when the operations are moved to Al Udeid Air Base by the fourth quarter of 2012.

In addition to inventory, there would be a need for personnel to manage the medical air bridge supplying materiel coming out of CONUS, assuming direct replenishment as opposed to replenishment from USAMMCE stocks, as well as personnel to manage the new item requests (NIRs), which number in the hundreds per month at USAMMCE. An alternative to locating the vendor support and NIR processing forward could be to establish a capability within CONUS to remotely perform these activities.

### The Value of Consolidation at a Single Location

Supporting CENTCOM customers out of one location would likely yield better performance by eliminating the delays associated with split-sourcing. The potential benefits of doing so could be a 20 percent improvement in average end-to-end time, as shown in Figure S.11. If USAMMCE were the sole source, it would be necessary to move to a seven-day per week schedule to support ongoing war operations. Alternatively, USAMMC-SWA could be the predominant source. As noted, in this case, USAMMCE’s distribution strategy for direct support to USCENTCOM customers would most likely have to change.

**Figure S.11**  
**Estimated Average Distribution Time Associated with Single Location**



## Acceptable Medical Distribution Options

There are three options that would preserve or improve performance while maintaining or lowering costs (see Table S.3). Consolidation at one location would yield 20 percent better performance, and, if at USAMMCE, consolidation would likely provide for a relatively modest reduction in total costs, anywhere from \$1 million to \$3.5 million per year. Such consolidation could potentially further reduce costs and improve performance through renegotiation of the Class VIII tender contracts to provide all materiel distribution out of one airfield. Consolidation at USAMMC-SWA would improve performance, perhaps even more, but it would be more costly than consolidation at USAMMCE, as inventory would increase, economies of scale would not be leveraged, and transportation rates to Afghanistan would be higher from this location. The status quo would not change cost or performance.

Since distribution performance would be worse and costs would not be lower than USAMMC-SWA, the DDKS option does not meet the criteria for an option to be considered. Support from CONUS through a CCP would result in unacceptable performance and is therefore not an option that would meet the criteria for consideration.

**Table S.3**  
**Assessment of Distribution Options**

Option	Performance	Cost	Other Factors
Status quo	—	—	—
Consolidate at USAMMCE	Slightly better performance than status quo with elimination of pass-back delays and consolidation	Better cost efficiency	—
Replicate at USAMMC-SWA	Better performance than status quo	Potentially higher cost	Would need to establish and manage prime vendor support and new item request management <sup>a</sup>
DDKS	Worse performance to Afghanistan and Iraq	Likely similar cost; some risk of higher cost	Transition would create need for medical logistics, specific assets, and medical logistics information system
CONUS support: DDSP	Overall worse performance	—	Transition would create need for medical logistics, specific assets, and medical logistics system

NOTE: Shaded areas do not meet acceptability criteria.

<sup>a</sup> Establishing a CONUS capability to provide prime vendor and NIR support for deployed units might mitigate this personnel and management requirement.