The Rapid Fielding Initiative Business Case Analysis

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Table of Contents

1 EXECUTIVE SUMMARY

The Army's Rapid Fielding Initiative (RFI) is the process by which new equipment is distributed to Soldiers either at home station or in a theater of operations. Currently, equipment is shipped from over 50 suppliers around the United States to a single central warehouse on the east coast where it is packaged into sets. The sets are then shipped to the end user stationed at one of over 40 locations around the world. It is a process that costs the Army time, money and a great deal of effort to execute.

The continually changing fielding requirements and priorities have stressed the system in many ways. On some occasions the warehouse has been pushed to its storage capacity. With the scheduled increase from 54 to 83 RFI items during this fiscal year, the likelihood that the warehouse will run out of storage space increases. While some of the increased storage space requirement stems from the increase in RFI items, it is also attributable to a dynamic fielding schedule where the number of items sent to the various fielding sites changes greatly from week to week. However, this is not the only cause. Communication gaps that exist between the three program managers (PM) under the Program Executive Office – Soldier (PEO-Soldier), the RFI suppliers and the warehouse have caused inventory levels to increase for some items and fall short during fielding for others. There may also be an issue with the location of the warehouse and packaging facility. The warehouse was originally placed in Middle River, MD to take advantage of an Air Force base located across the street. The Air Force aircraft would be used to ship the RFI items to units already in the theater of operations either in Afghanistan or Iraq. Unfortunately, the air base

was not used and neither was Baltimore Washington International Airport (BWI) located just 30 miles away. Instead, fielding packages were transported via commercial trucking to John F. Kennedy International Airport (JFK) in New York City. Now that RFI has matured significantly since it was originally put into place, 98% of fieldings occur at home station and the need for the warehouse to cater to units already deployed has diminished. A warehouse more centrally located in the United States may be more economical for both time and money.

This case study examines the RFI supply chain and makes recommendations to improve the current inventory management system (IMS) by removing the communication gaps between the PM, warehouse and suppliers; a location analysis is performed to select the most efficient and economic location for the warehouse and packaging facility; and, a new tariff is proposed that will reduce the number of items shipped to and returned from each fielding location that better meets the needs of the Soldier. The recommendations are the result of applying a combination of Lean Six Sigma tools and the Systems Decision Process to determine the most efficient and economic solutions and provide the greatest value to the stakeholders.

2 INTRODUCTION

2.1 Background

The Army Rapid Fielding Initiative (RFI) was developed in response to equipment shortages for Soldiers and military units supporting the Global War on Terror in Afghanistan in 2002. Support development teams that were sent to visit units and Soldiers both during operations in Afghanistan and after redeployment made three key findings: (1) units were insufficiently funded to purchase needed equipment that was available either commercially or through normal supply channels; (2) current fielding plans were not meeting the needs of the Army; and (3) Soldiers were subsidizing the Army's underfunding of Organizational Clothing and Individual Equipment (OCIE) by individually purchasing commercial-off-the-shelf equipment. In response to the findings, the Chief of Staff of the Army tasked the program executive office for Soldier systems (PEO-Soldier) with equipping all deploying forces with the Soldier as a System (SaaS) Integrated Concept Team (ICT) equipment list to support Operations Iraqi Freedom (OIF) and Enduring Freedom (OEF). By December of 2003, a 500,000 square foot Government-owned/Contractor-operated (GOCO) warehouse facility was established in Middle River, MD and the PEO-Soldier Rapid Fielding Initiative was ready to begin fielding deploying units. The original fielding plan, which went into effect in 2004, consisted of 49 items for each of 119,000 Soldiers supporting OIF2 and OEF5. However, operational needs mandated changes to the original fielding plan and by year's end 20 Brigade Combat Teams (BCT) made up of over 187,000 combat troops and 113,000 support Soldiers received their initial issue. The Chief of Staff soon revised his initial tasking and gave PEO-Soldier the mission of procuring and distributing Soldier and small unit equipment in accordance with the SaaS ICT Approved Capabilities List for the entire Operating Army (nearly 1.2 million Soldiers) by the end of 2007. Since that revision, PEO-Soldier has been notified that RFI operations will continue indefinitely as Soldiers and units are fielded with new equipment and replace unserviceable equipment. Current RFI operations support the fielding of an average of 6000 Soldiers per week.

2.2 The RFI Process

Initial OIF and OEF fieldings of SaaS ICT equipment went directly into the theater of operations where they were distributed to Soldiers. The RFI warehouse and packaging facility was used to receive equipment from over 50 suppliers located across the United States, package it based on the operational needs of the receiving unit, and ship it into theater via commercial air carriers. Now that fielding operations have matured, nearly all (98%) of the Soldier and unit equipment included in the Rapid Fielding Initiative is issued at home station or one of the combat training centers prior to a unit's deployment into theater.

RFI is driven by the Army Campaign Plan [1]. Campaign planning determines the order of deployment and length of stay for various Army forces into the theater of operations. From the campaign plan, a master fielding schedule is developed. The master fielding schedule determines when each unit receives its OCIE. Product managers (PM), who work at PEO-Soldier, are responsible for ordering the equipment on the list of items to be fielded from suppliers located throughout the United States. These items are sent to the RFI warehouse facility in Middle River, MD where they are kept in inventory until they are needed. In accordance with the master fielding schedule, the equipment is packaged into sets and shipped to various fielding sites throughout the United States where it is then distributed to the units and their Soldiers.

Fielding sets are packaged with overages built in to account for both the uncertainty in demand (sometimes more Soldiers show up needing equipment than was originally planned for) and the uncertainty of sized items. For example, 140% of the required number of pairs of boots is sent to each fielding site in a distribution of sizes because Soldier boot sizes are unknown prior to the actual issue. Additionally, boots are manufactured by three different vendors and sizing varies between the vendors, further complicating the matter. Those items that are not issued are sent back to the Middle River warehouse and packaging facility where they are checked for quality and re-shelved to support future fielding exercises. In the case of shortages, Fielding Teams will notify the warehouse and packaging facility immediately and as long as the shortage items are on hand in the warehouse, the items will be packaged and shipped to the fielding site in an effort to make up any deficiencies before the fielding event is completed. Shortages that cannot be immediately rectified by the warehouse are shipped to the unit at a later date. In some cases, a shortage item may not make it to the unit and Soldier until after they have deployed into theater.

Many business practices, especially those in manufacturing, now support the use of a *pull system* where items are generally not produced by an upstream activity until there is an order in hand from the downstream activity. This results in lower inventory levels being held at all stages of a production and distribution system. Additionally, in many cases manufacturers ship directly to the customer eliminating the need for large warehouses, distribution centers and retail sites. Management retains visibility of items ordered, shipped and received by customers in this “vendor-direct” system, and may choose to maintain only a small inventory of safety stock as a buffer against unforeseen events. Obvious benefits include reduced transportation costs, faster delivery times and lower overhead. Additional benefits include a reduced inventory, lower labor costs, reduced stock holding period, more accurate order fulfillment and improved inventory accuracy.

The current RFI process cannot support direct vendor to customer fieldings. This is primarily due to a lack of integration in the supply chain operations. For example, each supplier uses a unique package labeling system different from the one used at the Middle River packaging facility. As shipments come in from various suppliers, new labels that conform to the military supply system need to be placed on each box. Additionally, the location and quantity of each item is not tracked until it reaches the Middle River facility further hindering supply chain management. Another consideration is fielding site operations. Prior to each unit fielding, usually 30 days in advance, an RFI coordination team visits the fielding location and coordinates the requirements for the delivery, storage and distribution of equipment. A 10-15 person RFI Fielding Team arrives at the unit fielding site one day prior to arrival of the packaged sets of items from the Middle River warehouse and packaging facility. During a given fielding, the Fielding Team with the assistance of local labor (generally Soldiers from a local unit) unloads the trucks as they arrive with the equipment, accounts for the items they receive, arranges the site to facilitate efficient equipment issue, and ultimately issues the equipment to units and individual Soldiers. For sized items (e.g. boots), members of the Fielding Team will ensure that Soldiers are properly fitted with the right sized gear. In addition to issuing individual items to the Soldiers and unit equipment to the units, the Fielding Teams are responsible for maintaining strict accountability of the equipment ensuring that the issued items are signed for by individual Soldiers and the unit representatives. The timeline is often tight during the course of a fielding event. Standardized packaging of equipment that occurs at the warehouse relieves the Fielding Team of conducting single item inventories and reduces site setup time as the equipment arrives on site. Over time, the Fielding Teams have gained invaluable experience and are quite efficient at laying out the site and issuing equipment.

2.3 Purpose of the Business Case

The purpose of this business case is to investigate the current RFI process and suggest improvements to make it more efficient and economical. The warehouse location, fielding tariff and inventory management system were analyzed to solve the issue of rising inventory levels for some RFI items and continual shortage of others and to make room for the increase in fielded items from 54 to 83. The location of the current warehouse was also considered. The change in fielding location from theater to home station requires a facility that is more centrally located to both the suppliers and the Soldiers. Since the improvements in RFI are process oriented and not product oriented, the entire process is considered with the focus given to the capabilities and use of the CORE inventory management system (CORE IMS).

The ultimate objective of RFI operations is to field 100% of Soldiers deploying to theater with 100% of their RFI items 30 days prior to conducting their mission readiness exercise (MRE). The overall success of the recommendations from this case study will be measured by their improvement on the current process' ability to accomplish this goal while simultaneously reducing the overall cost.

3 METHODS AND ASSUMPTIONS

The investigation team was asked to take a Lean Six Sigma (LSS) approach to improve RFI operations. While none of the investigators are certified in using Lean Six Sigma, we familiarized ourselves with the Lean Six Sigma methodology. Additionally, we are all very familiar with the use of the Systems Decision Process (SDP) which compares favorably with the Lean Six Sigma methodology. The Department of Systems Engineering at the United States Military Academy developed and uses the Systems Decision Process as the basis for its research. In this case, the investigators were able to incorporate a number of the tools associated with LSS into its use of the Systems Decision Process. Both Lean Six Sigma and the Systems Decision Process are described in the following sections. Additionally, a comparison is made of the two methodologies.

3.1 Lean Six Sigma

Lean Six Sigma is a combination of two methodologies, Lean and Six Sigma that focus on continuous process improvement. The Lean approach derives from the Toyota Production System (TPS) which became prominent in the 1980's as Toyota began its rise to power in the US car market by producing less expensive cars with higher quality than their US counterparts [2]. The Lean approach is designed to improve the speed and efficiency of an organization by eliminating waste. Six Sigma, on the other hand, is a continuous improvement plan that is intended to reduce variability. Six Sigma was developed in the 1980s by Motorola in an effort to improve their quality by reducing variability in their manufacturing operations as they competed in the semiconductor industry [3]. Six Sigma derives from Total Quality Management (TQM). Like its predecessor, Six Sigma relies on the use of statistical analysis and other quality tools to identify and eliminate defects but provides a framework for using them and extends its focus beyond quality to other strategic areas of the organization. Separately, Lean and Six Sigma methodologies often fail to lead to results that achieve the dramatic improvements that organizations desire. Though Six Sigma is adept at identifying and eliminating defects, it does not address how to optimize the system by improving process flow. Lean methodologies, on the other hand, lack the statistical analysis required to achieve a truly “lean” system. By combining the Lean and Six Sigma methodologies, LSS aims to achieve total customer satisfaction and improved operational effectiveness and efficiency by removing waste and non-value added activities, decreasing defects, decreasing cycle time and increasing first pass yields [4], all resulting in a significant cost savings. This is achieved by focusing on the Lean Six Sigma principles and implementing the DMAIC methodology. DMAIC stands for Define, Measure, Analyze, Improve and Control [5, 11].

The key to nearly every successful LSS project is properly defining the voice-of-the-customer (VOC). “VOC is a set of tools, methods and techniques that allow the Lean Six Sigma improvement team to methodically collect and analyze customer needs and how customers value those needs [5].” From the customers’ needs come the major drivers of customer satisfaction, called critical-to-quality (CTQ) requirements. This is the **Define** phase of the methodology. When the CTQ requirements are represented by internal operational metrics they are reclassified as key process output variables (KPOV) and represent the “Ys” in the equation Y=f(X), where f(X) represents the functional relationship between the KPOV and the key process input variables (KPIV). Once the relationship is established between the KPOV and KPIV through data collection (**Measure**) and analysis (**Analyze**), sources for process improvement can be identified. Improving the process comes from prioritizing the root causes, developing innovative solutions and implementing them into the current process. Some of the common tools used in the **Improve** phase include design of experiments (DOE), brainstorming, implementing pull systems, process flow diagrams and hypothesis testing [6]. The purpose of the final phase of LSS, the **Control** phase, is to insure improvements are maintained. This often includes training employees on new processes and integrating tools not previously used in the operation. The following 9-step process was developed by James Martin [5] as an LSS approach to supply chain improvement utilizing the DMAIC methodology:

1. Develop a list of questions related to the project's problem statement that must be answered to complete the project's objective.
2. Ensure required data is available to complete the desired analysis.
3. Build a simple supply chain/ work stream/ inventory model.
4. Analyze the model relative to the project's objectives.
5. Identify the root causes for the problem using LSS methods.
6. Ensure the counter-measures are fact-based and tied to the root cause analysis.
7. Eliminate the underlying root causes adversely impacting the key metrics.
8. Complete the "target" and "baseline" portions of the metric scorecard.
9. Develop long-range plans to sustain improvements over time.

3.2 Systems Decision Process

The Department of Systems Engineering at the United States Military Academy (USMA) has adopted its description of systems engineering from the definition provided by the International Council on Systems Engineering (INCOSE). "Systems engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, and then proceeding with design synthesis and system validation while considering the complete problem [7].” The Systems Decision Process was developed by the Department of Systems Engineering at USMA as a general procedure for employing “systems thinking” while making major systems decisions and was designed for use at any stage of the systems lifecycle. Systems thinking is defined as “a holistic mental framework and worldview that recognizes a system as a entity first, with its fit and relationship to its environment being primary concerns [8].” The USMA Department of Systems Engineering recently completed a book titled, Systems Decision Making in Systems Engineering and Management [8]. Much of the information about the Systems Decision Process in this section comes directly from that publication.

The SDP is a four phase process that includes Problem Definition, Solution Design, Decision Making and Solution Implementation. Each of the phases has three steps that support the decision gates (represented by the spokes between the phases) as depicted in figure 1. Note that the entire process occurs while giving explicit consideration to the operational environment of the system. The SDP is a value-focused thinking (VFT) approach where “values are the driving force behind decision-making [9].” In VFT, the focus is on value creation not just evaluation.

The Problem Definition phase is the first and arguably the most important of the SDP phases. As it was once said, “a great solution to the wrong problem is…*wrong.*” – Anonymous. Since the initial problem given by the client is rarely the real problem, an important outcome of the Problem Definition phase is a revised problem statement (RPS) that captures the stakeholders’ needs, wants and desires. The **Problem Definition** phase begins by developing a description of the existing system being studied. This is the baseline for assessing system needs and evaluating the changes necessary to meet those needs.

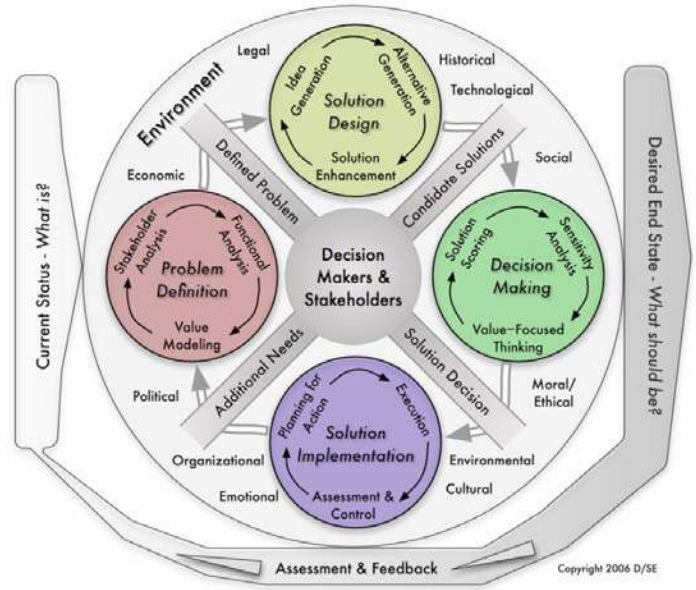

Figure 1. The Systems Decision Process

Next, system needs are determined by a group of stakeholders and decision makers that includes consumers and end users of the products and services of the system. Value modeling is used to help capture the most important functions and objectives of the system and later as a means for comparing alternative solutions. It includes both the qualitative and quantitative values articulated by the stakeholders.

The **Solution Design** phase serves the purpose of developing a set of feasible alternatives for the decision maker to consider. First, a set of candidate solutions are developed using one or more alternative generation techniques like brainstorming, affinity diagramming or exercising a Delphi method. Candidate solutions are screened for feasibility by comparing each with the requirements and constraints defined in the problem definition phase. Candidates that do not meet stakeholder criteria are refined, combined with other solution ideas or eliminated. Remaining alternatives are enhanced through qualitative and quantitative measures and only the best alternatives are presented to decision makers.

There are three tasks involved in the **Decision Making** phase: scoring candidate solutions, conducting sensitivity analysis, and using value focused thinking to improve solutions. The role here for the systems engineer is not to make a decision, but rather to provide the necessary information to allow for an informed, logical, and defensible decision to be made by the decision maker. While preparing to score the candidate set of alternatives, it is important for the engineer to revisit the revised problem statement to make sure it is still valid and represents the needs of the stakeholders. The alternatives are scored for each of the value measures using any number of scoring methods including testing, modeling, simulation and expert opinion. These “raw scores” are then converted to a dimensionless value score that allows direct comparison between alternatives across the value measures. Sensitivity analysis is used to identify critical assumptions and identify the key drivers for each alternative and its total value score. Since it is rare for an alternative to dominate all others by scoring the highest for all measures, value-focused thinking is once again applied to improve solutions. By looking at how a given solution faired against each of the value measures, it is easy to see areas where we might improve that alternative solution. We might also look at the alternatives that scored particularly well for a given value measure and see how we might incorporate some of its design into other solutions. The use of value focused thinking to improve solutions is viewed as an improvement on alternative focused thinking (AFT) where engineers run the risk of locking into the candidate list of alternatives and they see only the criteria that fit those alternatives and ignore all others. Ultimately, in preparing a recommendation for the decision maker the alternative solutions are compared using a cost-benefit analysis (CBA) that plots system cost against system value. The purpose here is to clearly show the decision maker the tradeoffs between higher cost and higher value.

Once a decision is made, if we treat the decision as "an irrevocable allocation of resources [10]," as it is in the SDP, great care must be given to how those resources are used. The **Solution Implementation** phase of the SDP provides a means for ensuring the successful implementation of the chosen system solution. It calls for detailed planning, careful execution of the implementation plan, and vigorous assessment and control of the system as it operates. Implementing the solution may be the most difficult and time consuming phase of the SDP. In military operations, even the best course of action will be a complete failure if it is not planned, executed and controlled down to the lowest level. Engineers should do their best to apply the concept of *Napoleon's Corporal*. Prior to issuing orders to his army, Napoleon would brief them to his corporal then ask him to explain what he had heard. Napoleon would not issue the order until the corporal could completely understand it. Successful implementation will only occur if everyone involved in the process is moving in the same direction. As continual assessments of the new system are performed and data is collected, new and unique problems may surface. The SDP is an iterative methodology that revisits each phase of the process as a means of continual improvement throughout the system life-cycle.

It is not too difficult to see that there is a great deal of overlap between Lean Six Sigma's DMAIC methodology and the Systems Decision Process. The primary differences between them are: (1) the SDP's explicit consideration of the environment, to include social, moral, ethical, political, organization, emotional, economic, historical and cultural issues, (2) SDP's re-visitation of the original problem statement to insure stakeholder values are met, as well as the underlying needs and requirements, in a system solution and (3) LSS's focus on critical-to-quality issues and the desire to not make major changes in the process that would require large capital outlays or significant resource commitments by the organization [5].

3.3 Benefits

By integrating LSS tools and techniques into the SDP, specific recommendations can be made for process improvements that apply directly to supply chain management. Specific to this investigation, value stream modeling is used to determine the value added, non value added and non value added but essential activities in the RFI process. Treating portions of the process as non value adding allows for the investigation of new candidate processes that incorporate only value adding and non value adding but essential activities and their overall effect of the system. Value modeling will determine the best candidate alternative.

Determining the relationship of key output variables to key input variables, Y=f(X), is used to improve the supply tariff for each fielding. The tariff includes the number of items and distribution of sizes sent to each unit fielding.

A load-distance analysis is performed to improve the speed and efficiency of operations associated with warehousing by moving the warehouse and packaging facility to the geographical center of gravity for RFI operations occurring in the continental United States (CONUS). *Fast* and *efficient* are two essential elements of a lean operation.

3.4 Costs

The recommended alternatives in the following chapter for movement of the warehouse to a central location for CONUS RFI operations and improvements to the CORE IMS require an initial investment of time, money and personnel resources. Additional costs may be incurred if a third party supply chain manager is selected to run the inventory management system. The improved tariff alternative requires the lowest investment of resources requiring only an update to the fielding book shell that is used to determine the number of each item to package.

4 BUSINESS IMPACTS

4.1 Overall Results

The alternatives and recommendations presented in the following sections are a culmination of Lean Six Sigma tools applied within the Systems Decision Process. Several alternatives were considered in this analysis but only a subset of feasible solutions is presented. The result is three recommendations that address the reduction of resources required to execute RFI operations across the Army. The first recommendation pertains to the location of the warehouse. We have shown that there are cost benefits to moving the facility from its current location in Middle River, MD to Louisville, KY. We have also shown that improvements to the current inventory management system will bridge communication gaps that exist between the program managers, suppliers and the warehouse. Employing a third party to manage the supply chain may provide additional benefits that include expertise in supply chain management, a commercial-off-the-shelf solution to improving the IMS and a trucking system for transporting RFI items to and from the warehouse. Finally, several recommendations are made that address the size distribution and tariff for each RFI item. The recommended changes will reduce inventory levels at the warehouse, reduce shipping costs to the fielding sites, reduce the cost of shipping overages back to the warehouse and may even have an effect on ordering costs from the suppliers.

4.2 Benefits

The specific benefits of employing the following recommendations are primarily a reduction in current operating costs. Though there may also be a reduction in personnel resources by “leaning” out the RFI process, no analysis has been completed to support this hypothesis. Additionally, many costs were not considered that have a direct effect on the economic feasibility of employing the first two recommendations of moving the warehouse and improving the IMS. For example, though we show a decrease in the cost of running day to day operations in Louisville rather than Middle River, no attention was given to the cost of potentially training new employees, moving the warehoused items from one location to another, or the cost of operating two facilities at the same time. It is not known how long it will take to recoup the costs of moving the facility through a savings in the cost of day to day operations.

4.3 Costs

Movement of the warehouse and improving or replacing the IMS both require initial investments of time and money. As stated in the previous section, it is not currently known when both of those alternatives will become profitable. The recommendations for improvements in the size distribution of fielded items and the current tariff require no investment of money. Adopting the new fielding plan will provide an immediate cost savings that will trickle down throughout the supply chain.

4.4 Analysis of Alternatives

Several process improvement alternatives were considered in the solution design phase of this analysis. In this section, three alternatives are recommended for implementation into RFI operations. The recommendations include:

1. Move the warehouse and packaging facility from its current location in Middle River, MD to a location near Louisville, KY.
2. Integrate a new inventory management system that bridges the current communication gaps between PMs, the warehouse and RFI suppliers and consider management of the inventory system through a third party.
3. Adopt a new tariff and size distribution for packaging fielding sets based on historical data from past fielding events that better reflects the random variation in the distribution of sizes in the fielded population.

Implementing one or all of the recommendations will improve RFI operations by reducing costs and decreasing the commitment of valuable resources. The following subsections describe how each alternative was formulated.

4.4.1 Location Analysis

Location analysis considers moving the warehouse from its current location in Middle River, MD to a location that is geographically centered between the suppliers and fielding sites based on a load-distance analysis. The analysis method finds a geographic location for the warehouse that minimizes the total distance that the loads (truckloads of equipment) will travel from the suppliers to the warehouse and then from the warehouse to the fielding sites. The distances used in the analysis are the straight line distances to the warehouse from each supplier and from the warehouse to each fielding site[1].The loads used are the number of trucks sent to and from the warehouse in fiscal year 2006. Excel's Solver was used to determine a new warehouse location that minimizes the sum product for each load and distance traveled. Using the number of trucks received in FY06 from 51 suppliers and sent to 29 fielding sites, a weighted center of gravity location was determined at 38.14 degrees north latitude and 85.43 degrees west longitude, 20 miles east of Louisville, KY (figure 2). Had the warehouse been in this location during FY06, the total mileage traveled by loaded trucks would have been reduced by almost 160,000 miles which equates to a 15% reduction.

Along with the mileage savings, there is a significant rental rate savings when comparing Louisville to Middle River. A survey of industrial warehouses for rent with space in excess of 100,000 square feet averaged $5.71/ft^2 in and around Middle River, MD, but the average rate for the same type of space was only $3.93/ft^2 in Louisville, KY.[2] RFI

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[1] The distances used are actually Euclidian distances between Lat-Long coordinates for each location. Use of this distance, while shorter than road distances, is consistent and lends itself to a tractable search of the solution space.

[2] Rental rates for Middle River, MD and Louisville, KY were determined using LoopNet.com, an online commercial real estate broker, accessed March 12, 2007.

currently uses over 500,000 ft^2 to store equipment. Moving the warehouse to a location near Louisville could result in an annual cost savings of approximately $900,000 in leasing costs. There are a number of other cost and operational concerns that must still be considered. The availability and cost of labor is an obvious concern although there is the potential that labor cost would in fact be reduced at the new location. The availability of contract shipping from the new location is another significant concern. RFI currently uses a single transportation company to handle all of its outbound shipments from the warehouse to the fielding sites (as well as return shipments from fielding sites to the warehouse) including shipments it makes overseas and into the theater of operations. Additional analysis is required to determine if the potential cost savings over a number of years outweighs the costs incurred by moving the facility to include hiring and training new employees, running two facilities simultaneously for a period of time and any additional start-up costs.

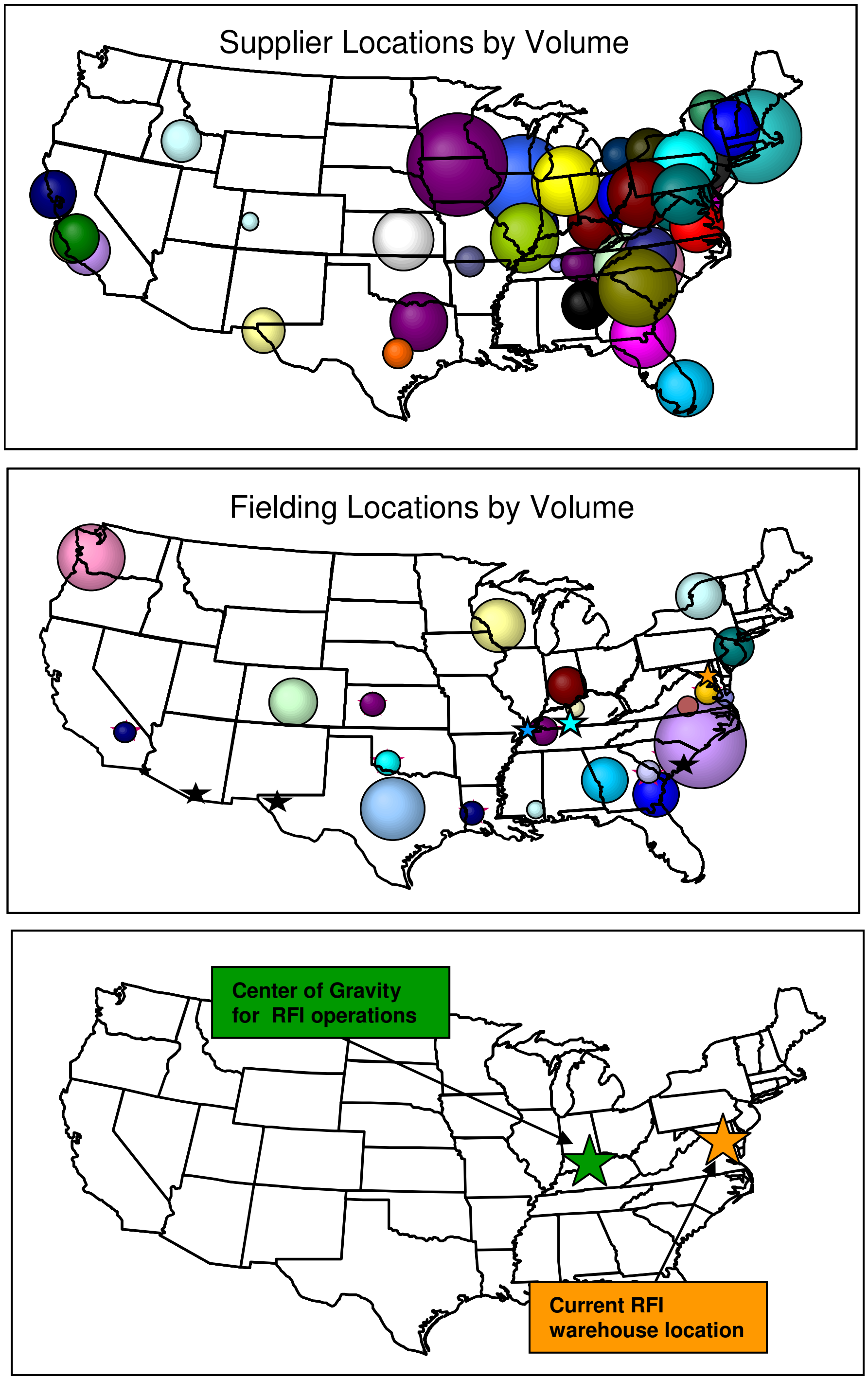

Figure 2. RFI Center of Gravity[3]

4.4.2 Improved Inventory Management System

A value stream map of the current process, shown in figure 3, was used to determine value added, non value added and non value added but essential activities. The value of each activity is not always obvious, especially between the non value added and non value added but essential activities. The difference is, non value added but essential parts of the process add no intrinsic value to the end product but are required to achieve the desired end state. An example is packaging. Though packaging adds no value to a product, it is necessary for the product to reach the consumer in a working condition.

Initially, the entire warehouse was treated as non value adding. This was done in an attempt to formulate a pull system where the suppliers shipped directly to the fielding sites. Overages would be shipped to a warehouse, possibly the one in Middle River, and the shortages would be made up from that warehouse where the safety stock for each item was stored. Although this was a feasible solution, it was not practical or beneficial in terms of cost. Rather than six trucks arriving at a fielding site for each thousand Soldiers with RFI items packaged for quick layout, there would be 50 trucks, or more, coming from the separate suppliers.

In the current RFI process PM's place orders to their suppliers with enough lead time to meet upcoming fielding dates, usually 6-9 months. After the suppliers receive the order, it is manufactured and prepared for shipment. The suppliers are capable of (and supposed to) then access the CORE inventory management system (CORE IMS) to input the shipment date and an estimated date of arrival to the warehouse. Based on our discussions with the RFI team, this rarely happens. Though the warehouse is aware they will receive shipments of items in a particular month, they do not know when during the month they will receive the

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[3] The circles depict unit (top) and supplier (middle) locations with the size representing the relative number of shipments from FY 2006 data.

items unless the vendor accesses CORE and inputs an expected arrival date with enough lead time for the warehouse. In those cases where the vendor inputs shipment data, often times it occurs after the fact. Once the warehouse receives a vendor's shipment, bar code labels are placed on each box and inventory is then entered and tracked in CORE IMS from the warehouse to the fielding site. If a particular item is out of stock at the warehouse, the fielding package is still shipped to meet the fielding date and shortages are made up when the item is in stock. Sometimes it is not until the Soldier is deployed into the theater of operations. At the fielding site, Fielding Teams arrive one day prior to unit fielding to conduct a 100% inventory of goods received from the packaging facility. Shipments arrive in bulk from Middle River from a contracted commercial transporter. Figure 3 depicts each element of the RFI process and its value. Green is a value added activity (VA), yellow is a non value added but essential (NVAE), and red is non value added (NVA) activity. Figure 4 depicts the information flow for the current RFI operation in greater detail. In figure 4, dotted lines represent non automated processes and solid lines represent automated processes.

The investigation team determined that each of the steps in the process is either VA or NVAE. However, there is a problem with the structure of the information flow in that there are links in the information chain that do not currently exist but would improve the flow of information in the process if they did. These information links are depicted in red in both figure 3 and figure 4. A communication gap exists between the PM, warehouse and suppliers leading to uncertainty in shipment information. This is primarily a process issue that deals with the purchase contracts and ship orders between the suppliers and the PM. The result is little insight at the warehouse for when to expect each shipment and the exact breakdown of what each shipment contains which can be vital information when packaging items for fielding, especially for items that have experienced shortages in previous fieldings.

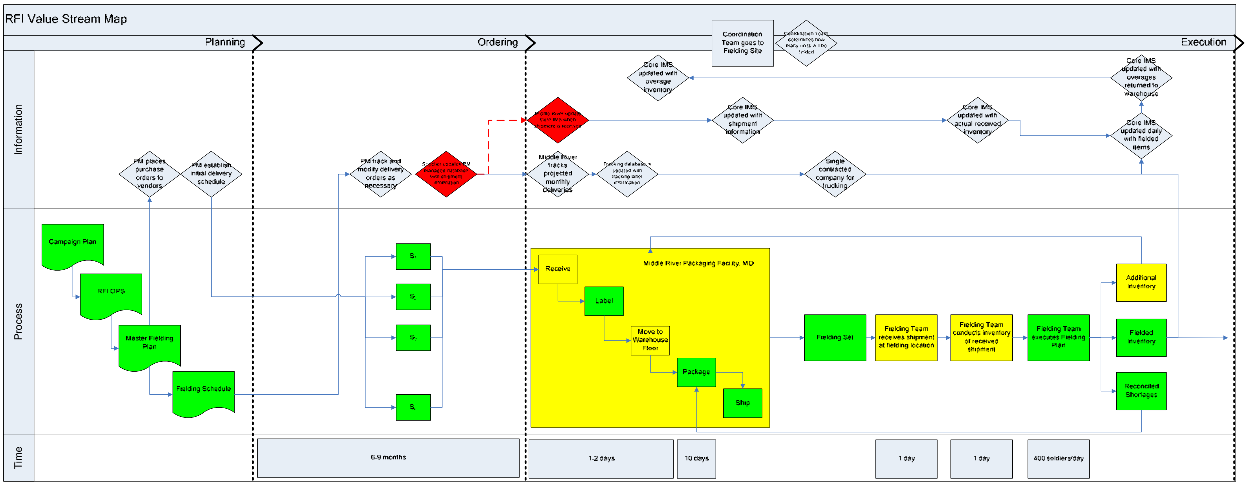

Figure 3. Current Value Stream Map

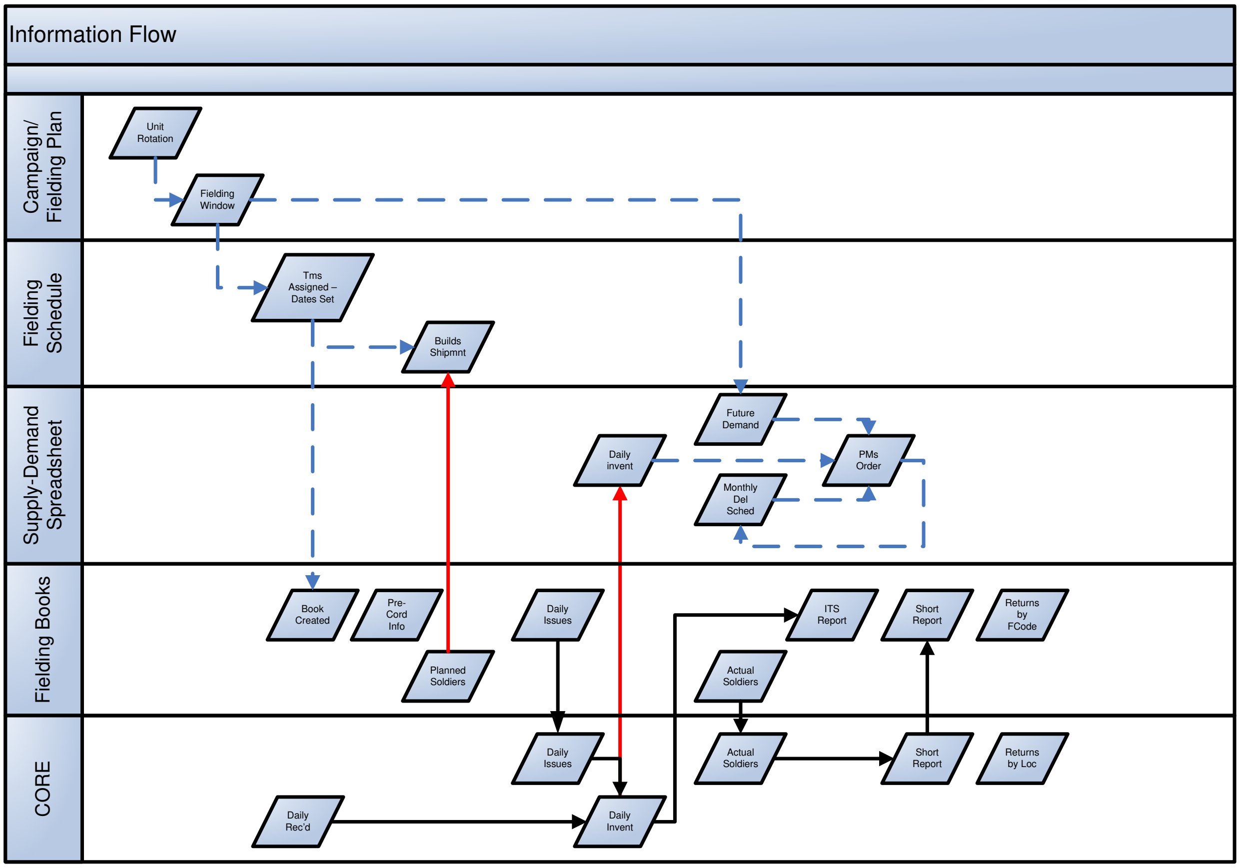

Figure 4. Current RFI Process Information Flow

An improved inventory managements system is recommended that bridges the communication gaps and is the focal point for all RFI operations. Figure 5 depicts the future value stream map. The future process is built around an improved inventory management system. The improved IMS may be a revision of the current system or a commercial-off-the-shelf database run by a third party supply chain manager that specializes in this area (i.e. UPS, FedEx, Maersk, SAP, etc). The primary features of the improved IMS should include:

1. Delivery order schedule established by the PM with input from the warehouse based on the master fielding plan.
2. Real time inventory levels provided from the warehouse with updates received daily from the Fielding Teams.

3. Shipment information from the suppliers that depicts the number and size of each item in the shipment and the arrival date.
4. Limited visibility of the database for the suppliers so that they can proactively manage inventory levels, particularly for shortage items.

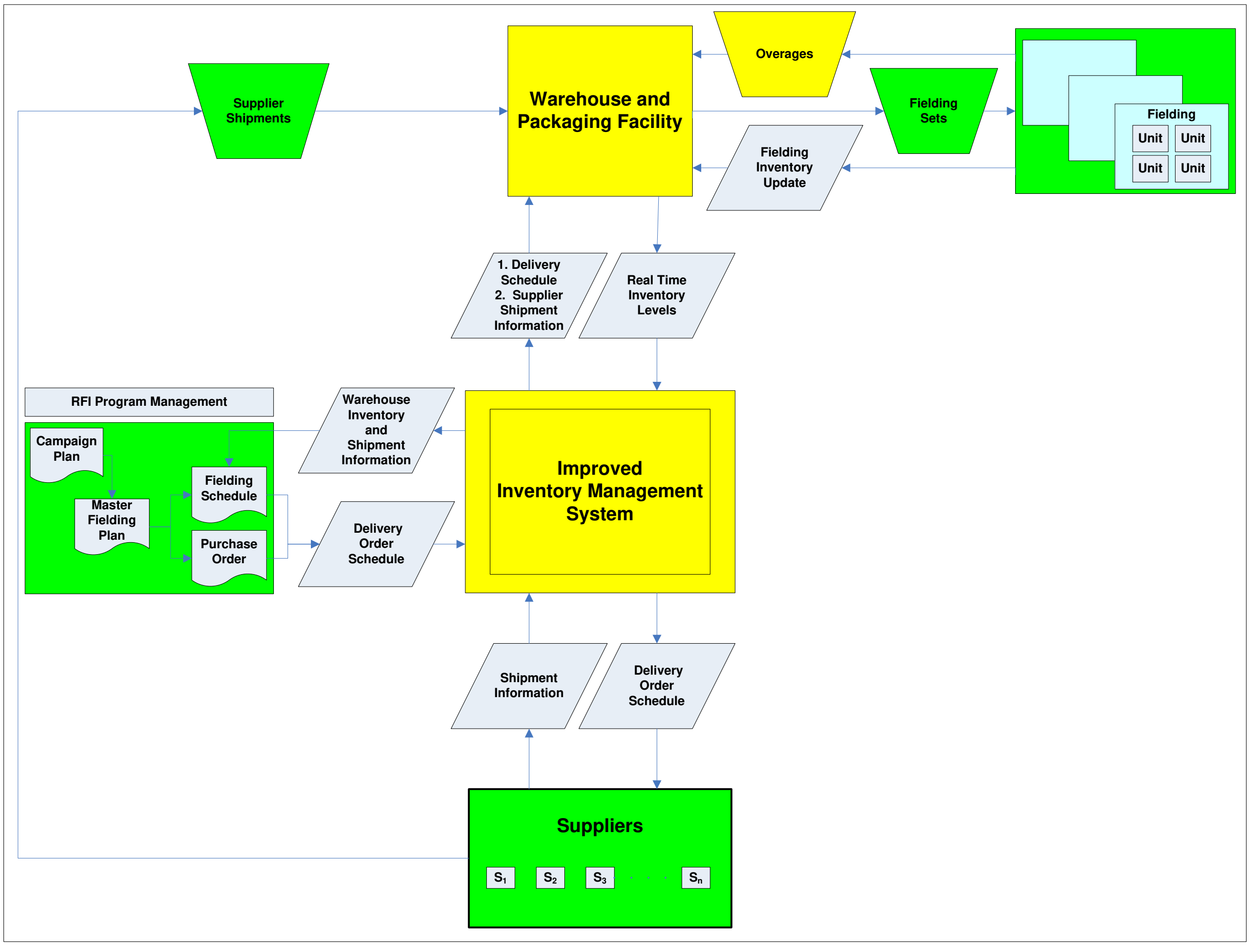

Figure 5. Future Value Stream Map

The main improvements of the proposed system over the current system are: warehouse visibility of orders and expected shipment arrivals; daily updates to inventory levels; and proactive supplier involvement in managing the inventory levels for stocked out items. There may also be an added benefit to having a third party supply chain manager that runs the inventory management system database and potentially be used for shipment of items to and from the warehouse. In the previous section, the location analysis showed an RFI center of gravity around Louisville, KY which is home to the UPS cargo air headquarters.

4.4.3 Tariff Distribution Analysis

One of the aspects that we investigated for PEO Soldier was the distribution of sized items that they used to build their shipments from the Middle River (MR) facility. This distribution, the Tariff Factors applied to it and the estimate of the expected population to be served, drive the quantities of each size of each commodity that the Fielding Site receives. The closer this distribution represents the true population of soldiers and accounts for their random variation at each site, the fewer items will need to be shipped to the site to complete the issue and the fewer un-issued items will have to be returned to MR.

4.4.3.1 Current Process

Currently RFI uses a shipping order build sheet (Build Sheet SO) to determine the quantity of each size of each item to ship to a Fielding Site. On the Build Sheet SO, the user places the number of soldiers expected at the site. This number then has two different factors applied to it. First, is the Tfx (unknown meaning). This factor appears to indicate how much over 100% that RFI feels they need to send above and beyond the size distribution (Sfx) to account for the random variation of each population. For example, if they felt it was extremely important to ensure every soldier had that particular item at the fielding (boots, knee pads, elbow pads, etc) the Tfx would be set to 1.2, or 120% of the Sfx. If an item is not viewed as critical, then the Tfx would be set at 1.06 or 1.08, accepting more risk of a soldier not getting an item (socks, fleece, etc). RFI set the Tfx for all sizes of a commodity the same, except for the boots. Most of the Tfx factors appeared to follow that methodology for their level, but there were some deviations, helmets (Tfx = 1.06) being the most notable.

RFI uses a second factor, Sfx, to account for the actual distribution of sizes within a commodity. An analysis conducted on the earliest fieldings yielded the levels of these factors. Initially, this appeared to be a straight forward factor. However, upon closer inspection, the sum across a particular item did not always add up to 100%. In many cases the total added up to 120% (helmets, fleece, socks, etc.). This inflates the size distribution across the entire item and, in effect decreases the risk of soldiers leaving a fielding site without the prescribed equipment. Both of these factors were multiplied against the expected number of soldiers at the fielding to get the number of items, by size that should be shipped.

4.4.3.2 Sources of Error

An error in the number and sizes of the items shipped to a fielding site results in either too many items being shipped to the site which must then be returned to the warehouse (over-shipment) or, worse yet, too few items being shipped to a fielding site resulting in a soldier not getting fielded a required item (under-shipment). Of course, it is possible to ship too many of some items and not enough of other items as part of the same fielding event. Indeed, this often occurs in the case of sized items, for example when there may be enough total boots on hand for the number of soldiers being fielded but not in the appropriate sizes.

These errors, under-shipment of some items and sizes and over-shipment of others, come from two places. First, the percentage of the planned number of soldiers that a Fielding Team actually serves at a site varies greatly. Figure 6 shows a distribution of the percentage of soldiers actually served based on the planned number of soldiers for a given fielding. This percentage is calculated by dividing the planned soldier attendance by the actual soldier attendance for a given fielding.

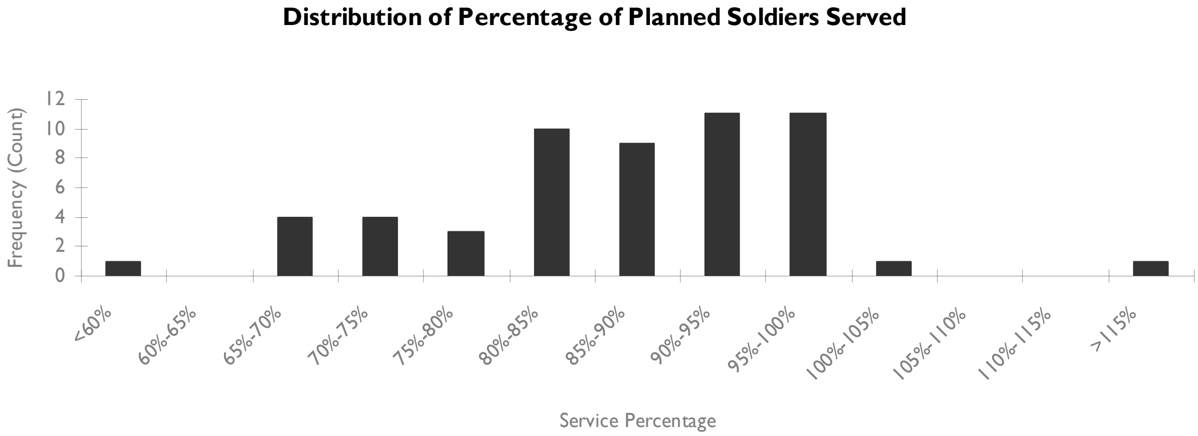

Figure 6. Distribution of Planned Soldiers Served

As is evident from the distribution, the actual soldier attendance at a fielding is far more likely to be less than the planned attendance than to exceed it. Indeed, out of 55 fieldings during 2006 in only two cases did a fielding site have more than 100% of the planned number of soldiers in attendance. On average, only 87.25% of the planned number of soldiers showed up at a given fielding. This skewed variation contributes largely to a higher than anticipated number of items being returned to the warehouse with minimal contribution to the occurrence of shortages. These results suggest that a decrease in the tariff factor (Tfx) might be appropriate to significantly decrease the number of returned items while only marginally increasing the likelihood of a shortage.

The second source of error comes from the distribution of sizes of a particular item in a given fielding population. Since we can affect the distribution of sized items that we ship to a given fielding site, better aligning the distribution of shipped sizes to the expected distribution within the population of soldiers at the fielding site will reduce both the number of excess items at a fielding site and the number of shortages.

While our analysis focuses on this second source of error (the size distribution problem), we considered both by adjusting the Tfx factor in conjunction with the Sfx factor for determining the proper number and distribution of sizes of shipped items for a given fielding.

4.4.3.3 Fielding Data

The best way to accurately model the distribution of the sizes of the population is to look at the historical demand from each fielding event that RFI has completed to date. The historical demand (broken down by fielding site, item and size) was made available to us in the form of Fielding Books which we believed to be accurate and complete when we initiated the analysis in January 2007. As described below, in conducting our analysis we found a number of issues with the Fielding Books that limited the amount of information we could include in our analysis. At a later date (April 2007), we got limited access to CORE for pre-defined queries. Given the latency of the connection and CORE not having planning data in the pre-defined queries, we decided to continue our use of the Fielding Books as the source for fielding data. Also, based on discussions with RFI personnel, we focused on the data from the previous calendar year's (2006) fielding events as they were believed to most closely resemble the current fielding operations and those expected in the foreseeable future.

In our analysis we found that using the Fielding Books is problematic in its own right. Each fielding event has its own book that is supposed to be standardized. However, while each Fielding Book has the same number of tabs the format of the contents of the tabs varies from book to book. Additionally, the many Fielding Books had varying levels of completeness. Each Fielding Book was captured in its own separate Microsoft Excel file. This made aggregation and analysis of the data across the different Fielding Books difficult. Using Microsoft Visual Basic for Applications (VBA) we were able to compile the necessary information from each book into a master file that we later used for the analysis. In the process of consolidating the data from the different Fielding Books, those books that were found to be significantly different from the bulk of the books (in terms of the formatting and level of completeness of the information contained in them) were set aside and not used in the analysis. This initial vetting of incomplete books resulted in a decrease from 84 Fielding Books to 55 that were useable for our purposes. Later in our analysis, additional Fielding Books were dropped on a commodity by commodity basis for discrepancies found. In the end, each commodity (end item) had from 10 to 25 books or data points from which this analysis was drawn. We have since re-visited the consolidation process to get more books through the initial pass and decrease the number of books that fall out during the commodity by commodity process. While we do not anticipate any significant change to our findings by including these additional data points, the analysis is on going the results of which will be presented during the briefing of this project to the client.

4.4.3.4 The Analysis

As described, we consolidated in a single file the information needed to analyze the demands by site, by commodity and by size from the ITS Report, Due Outs, and UIC Data tabs of each Fielding Book. We used the UIC Data tab to calculate the planned number of soldiers for each site as well. Using this consolidated information we were able to calculate the average size distribution for each item experienced by the RFI Fielding Teams during last year's fielding events. These average distributions would represent the distribution of sizes for the "population" of soldiers being fielded and could theoretically be used to predict the size distributions needed for future fielding events. However, in many cases it might be true that the "population" may be made up of more than one sub-population which could dramatically effect the distribution of sizes for a given population. For example, a non-BCT unit may be comprised of more women than a BCT unit which might affect the distribution of sizes needed for a given item (e.g. women tend to have smaller feet than men and we'd expect a larger demand for small boots in the fielding of a unit that has a higher percentage of women assigned to it). In order to see if our data contained more than one population, we classified each fielding using a number of factors. These factors included the number of soldiers served, percentage of served population that were women, divisional versus non-divisional units, active versus non-active component and BCT versus non-BCT units. Upon initial exploration of the data, we could not identify any significantly distinct or separate populations so we continued our analysis treating the data as though it had come from a single population. We believe that with more data and a more extensive exploration of this area, we might find multiple populations that could help improve prediction accuracy at a later date.

Our analysis focused on two aspects of the Build Sheet SO. First, we compared the average size distributions calculated from last year's data, which we call our Proposed Size Distribution, with the Current Size Distributions currently being used to prepare shipments to fielding sites. Second, using the Proposed Size Distributions we adjusted the tariff factor (Tfx) that is applied to the size distribution to account for the random variation in the populations at each fielding in an attempt to minimize both the over- and under-shipments to each fielding site.

Checking the proposed size distribution against the current one verified that the distribution currently in use is fairly close to the distribution of the actual population in most cases. However, in some cases the size distributions were significantly different. Two comparisons of the Proposed versus Current size distributions are included below. The first graph (Figure 7) shows a case where the Current Size Distribution tracks fairly closely to the Proposed Size Distribution. The second graph (Figure 8) is an example where the distributions differ significantly.

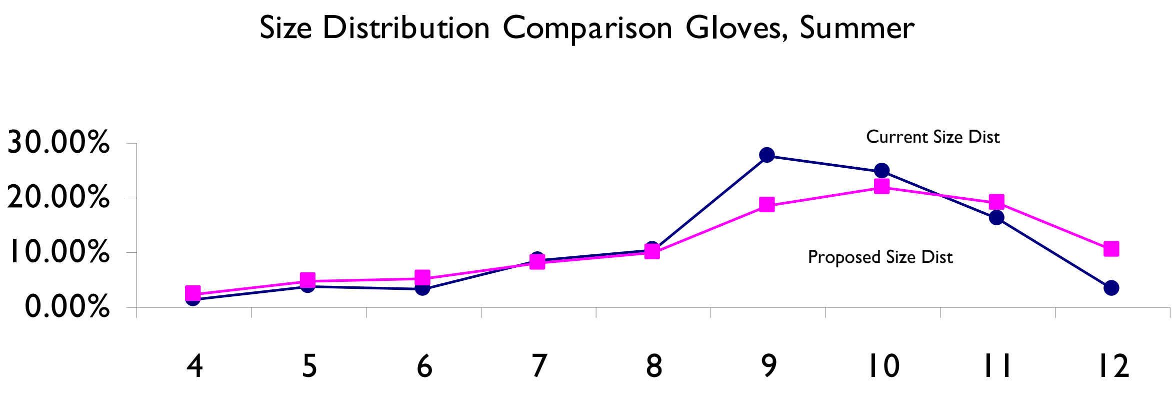

Figure 7. Size Distribution Comparison (Gloves, Summer)

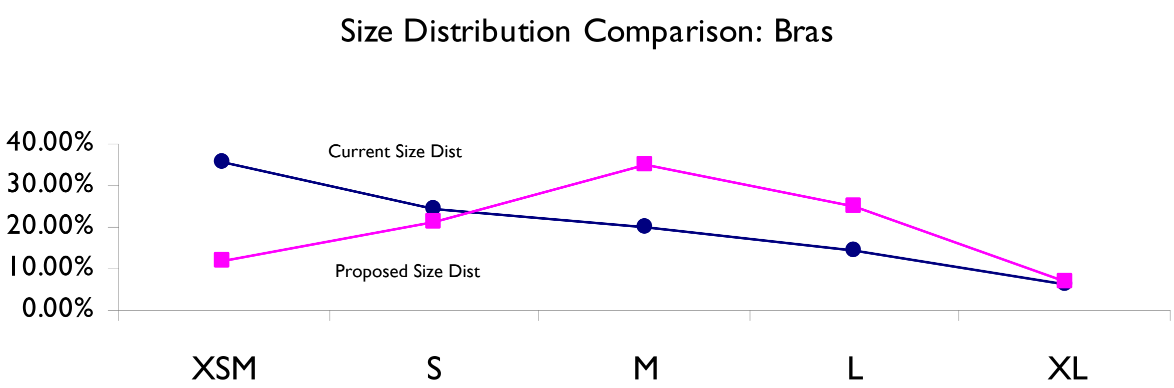

Figure 8. Size Distribution Comparison (Bras)

We compared the performance of shipments/fieldings based on the current tariff factor (Tfx) using the current sizing distribution factor (Sfx) with the performance based on using the current tariff factor and the proposed sizing distributions. The results of this comparison are shown in Table 2 below. In 15 of the 21 categories of sized items, the number of stock outs decreased. In 3 of the cases the number of stock outs remained the same however the number of returns was significantly reduced. In 3 out of the 20 categories, the proposed size distribution increased the number of stock outs. However, in 2 of the 3 cases where increased stock-outs occurred, the number of returns of those items was significantly decreased. In 8 of 20 categories both the number of stock-outs and the number of returns decreased using the proposed size distribution. Overall, if we had used the proposed size distribution for last year's fieldings there would have been a total of 634 fewer stock outs and 6690 fewer items returned over approximately 25 fieldings considered.

Table 2 Comparison of the Current Tariff with the Current and Proposed Size Distribution

	Current			Old Tariff New Sizes		Change	
Item	Tariff	StockOuts	# Returns	StockOuts	# Returns	StockOuts	# Returns
Boots TW, N	120%	334	889	267	2098	-67	1209
Boots TW, R	144%	363	15531	428	12213	65	-3318
Boots TW, W	144%	386	15787	381	16657	-5	870
Boots TW, XW	120%	504	792	291	4021	-213	3229
Boots HW, N	120%	334	1044	265	2727	-69	1683
Boots HW, R	144%	471	23178	495	15790	24	-7388
Boots HW, W	144%	530	23123	490	18686	-40	-4437
Boots HW, XW	120%	532	638	314	4403	-218	3765
Helmets	127%	15	12107	4	14528	-11	2421
Overalls	118%	48	5762	53	5829	5	67
Shirt, Cold Weather	142%	7	12298	6	12150	-1	-148
Socks	552%	5	66209	3	65826	-2	-383
Knee Pad	118%	23	9651	9	9784	-14	133
Elbow Pad	142%	9	12884	3	12562	-6	-322
Undershirt, CW	283%	18	19721	6	19297	-12	-424
Drawers, CW	283%	18	19727	6	19300	-12	-427
Gloves, Winter	127%	50	12552	40	12262	-10	-290
Gloves, Summer	127%	90	11028	42	10790	-48	-238
Undershirt	552%	28	35492	28	34721	0	-771
Bras	460%	4	299676	5	299681	1	5
Helmet Covers	127%	3	11102	3	11098	0	-4
				Total Change		-633	-4768

In determining the optimal value of the tariff factor (Tfx) which is applied across all items after the sizing factor has already been applied to each commodity, we needed an objective function to measure performance at various tariff values. Based on our discussions with the relevant stakeholders and what we know about RFI Operations, we assessed your primary goal of fielding 100% of Soldiers deploying to theater with 100% of their RFI items 30 days prior to conducting their mission readiness exercise (MRE). For the purposes of creating an objective function, this goal translates into minimizing the number of items that stock out at a given fielding site. A secondary goal is to minimize the number of returned items to the warehouse. Capturing these two competing goals in a single objective function is best done assuming a linear relationship that decreases the emphasis on one goal while emphasis on the other is increased. This led us to create the following equation:

$$\text{MIN Tariff Score}_{\text{Commodity}} = \text{RASO} * \sum_{j=1}^{m}\sum_{i=1}^{n}\text{Stock Outs}_{ij} + (1-\text{RASO}) * \frac{\sum_{j=1}^{m}\sum_{i=1}^{n}\text{Items Returned}_{ij}}{\sum_{j=1}^{m}\sum_{i=1}^{n}\text{Items Shipped}_{ij}}$$

where: m = number of fieldings

n = number of sizes per commodity

$\text{RASO} = \text{Risk Aversion to Stock Out} \in [0,1]$

This equation's structure heavily weights the stock outs over the return percentage. This is a function of the ranges and averages of the two values. The number of stock outs (Stock Outs_{ij}) has a range of 0 to 393 which represents the total number of NSN's for sized commodities. The return percentage, by definition, can take on a value between 0 and 1. The variable RASO represents the risk aversion to stocking out and places weight on the summed number of stock outs per commodity across fieldings.

In implementing this equation, we analyzed each commodity separately. The optimal tariff factor as determined by minimizing the objective function above applies across an entire commodity. We varied the Risk Aversion to Stock Out factor from 0% to 100% in increments of 1% and the Tfx from 50% to 250% in increments of 5%. As we varied these factors, we recorded the number of stock outs caused by the Tfx and the percentage of items returned for each commodity. We used these data points to calculate the Tariff Score for each tariff level as outlined in the equation above. Each commodity and the performance of the various size distributions and tariffs are below.

Table 3. Comparison of the Current Tariff and Size Distribution with the Proposed Tariff and Size Distribution (RASO 50%)

	Current			Proposed (@ RASO 50%)			Change		
Item	Tariff	StockOuts	# Returns	Tariff	StockOuts	# Returns	Tariff	StockOuts	# Returns
Boots TW, N	120%	334	889	210%	195	2776	90%	-139	1887
Boots TW, R	144%	363	15531	130%	457	8889	-14%	94	-6642
Boots TW, W	144%	386	15787	120%	478	9773	-24%	92	-6014
Boots TW, XW	120%	504	792	145%	244	3709	25%	-260	2917
Boots HW, N	120%	334	1044	220%	190	3783	100%	-144	2739
Boots HW, R	144%	471	23178	105%	536	8193	-39%	65	-14985
Boots HW, W	144%	530	23123	110%	564	10424	-34%	34	-12699
Boots HW, XW	120%	532	638	135%	242	3951	15%	-290	3313
Helmets	127%	15	12107	80%	32	2532	-47%	17	-9575
Overalls	118%	48	5762	115%	54	5336	-3%	6	-426
Shirt, Cold Weather	142%	7	12298	100%	28	3244	-42%	21	-9054
Socks	552%	5	66209	340%	47	11235	-212%	42	-54974
Knee Pad	118%	23	9651	115%	11	8863	-3%	-12	-788
Elbow Pad	142%	9	12884	115%	8	6057	-27%	-1	-6827
Undershirt, CW	283%	18	19721	210%	36	5994	-73%	18	-13727
Drawers, CW	283%	18	19727	210%	36	5960	-73%	18	-13767
Gloves, Winter	127%	50	12552	120%	45	10442	-7%	-5	-2110
Gloves, Summer	127%	90	11028	125%	44	10281	-2%	-46	-747
Undershirt	552%	28	35492	280%	98	2809	-272%	70	-32683
Bras	460%	4	299676	55%	83	19879	-405%	79	-279797
Helmet Covers	127%	3	11102	110%	5	6495	-17%	2	-4607
					Total Change		-13.04	-339	-458566

Not knowing your exact aversion to stocking out, we determined the effect a slightly higher RASO would have on the performance of the tariff. With the RASO set at 65%, Table 4 shows a great decrease in the number of stock outs that occur while still providing fewer items returned to the warehouse.

Table 4 Comparison of the Current Tariff and Size Distribution with the Proposed Tariff and Size Distribution (RASO 65%)

	Current			Proposed (@ RASO 65%)			Change		
Item	Tariff	StockOuts	# Returns	Tariff	StockOuts	# Returns	Tariff	StockOuts	# Returns
Boots TW, N	120%	334	889	245%	188	3254	125%	-146	2365
Boots TW, R	144%	363	15531	165%	327	15894	21%	-36	363
Boots TW, W	144%	386	15787	155%	322	19264	11%	-64	3477
Boots TW, XW	120%	504	792	225%	193	6283	105%	-311	5491
Boots HW, N	120%	334	1044	245%	181	4212	125%	-153	3168
Boots HW, R	144%	471	23178	140%	418	14981	-4%	-53	-8197
Boots HW, W	144%	530	23123	140%	450	17854	-4%	-80	-5269
Boots HW, XW	120%	532	638	215%	199	6903	95%	-333	6265
Helmets	127%	15	12107	95%	17	5859	-32%	2	-6248
Overalls	118%	48	5762	105%	69	3836	-13%	21	-1926
Shirt, Cold Weather	142%	7	12298	105%	24	4161	-37%	17	-8137
Socks	552%	5	66209	420%	23	25609	-132%	18	-40600
Knee Pad	118%	23	9651	135%	2	15186	17%	-21	5535
Elbow Pad	142%	9	12884	115%	8	6057	-27%	-1	-6827
Undershirt, CW	283%	18	19721	210%	36	5994	-73%	18	-13727
Drawers, CW	283%	18	19727	210%	36	5960	-73%	18	-13767
Gloves, Winter	127%	50	12552	145%	20	17360	18%	-30	4808
Gloves, Summer	127%	90	11028	150%	18	17132	23%	-72	6104
Undershirt	552%	28	35492	340%	77	6326	-212%	49	-29166
Bras	460%	4	299676	55%	83	19879	-405%	79	-279797
Helmet Covers	127%	3	11102	110%	5	6495	-17%	2	-4607
					Total Change		-7.29	-1076	-380692

The performance of the new size distribution and tariff is based on a hand picked optimization of Risk Aversion to Stock Out Factor. In order to get these results the RASO ranged from 1% to 100%, but most of the values between 2%-10%.

Based on this analysis, we first recommend that you clearly separate and define your size distribution factor from your tariff factor. The size distribution can and should be used to reflect the distribution of required sizes in the population of Soldiers being fielded. The tariff factor should be used to account for the variability in the size distribution as well as the uncertainty in the number of Soldiers attending a fielding event. We recommend immediately adopting the Proposed Size Distribution. This will reduce the number of stock outs as well as reduce the number of items returned to the warehouse. Lastly, we recommend applying a tariff factor (Tfx) based on your level of risk aversion to stock outs using the tables and analysis provided.

5 RECOMMENDATIONS AND CONCLUSIONS

Based on the recommendations made in the previous chapter and the costs and benefits associated with each recommendation, we offer the following prioritized order of implementation. First, the new size distribution and tariff recommendation should be put into effect. This alternative is an immediate cost effective improvement to the current distribution plan. It requires only an investment of time and can be put into execution almost immediately.

Second, we suggest improving the inventory management system. Greater communication between all parties involved in RFI operations allows for the employment of Economic Order Quantities and Economic Production Quantities which are both integral to an effective and economically efficient supply chain. Failure to integrate the ordering of RFI items from suppliers with warehouse operations will dilute the effectiveness of improved distribution plan discussed above. At a minimum, policy changes must be put into effect where the warehouse is informed of orders from suppliers and shipping dates. It is preferable, however, to employ a third party supply chain manager that has expertise in the areas of supply chain management and shipping. An expert in SCM may provide additional insight in cost savings through additional improvements to the existing system.

The final recommendation is the lowest in priority. Due to the high investment of resources associated with moving the warehouse and packaging facility from Middle, River, MD to Louisville, KY, it may take several years to recapture the costs of moving such a large warehouse. It should be kept in mind however that moving the warehouse to Louisville or another location that is more central to the RFI suppliers and fielding sites, may be advantageous when employing a third party supply chain manager. Several shipping companies that also have expertise in supply chain management are headquartered in regions that reduce the total number of trucking miles traveled. The cost benefit of integrating one of these companies requires further analysis but should be considered prior to dismissing this recommendation due to cost.

Implementing one or more of the recommendations will improve the RFI process and reduce the overall cost of operations. They will also assist in attaining the ultimate goal of fielding 100% of RFI items to 100% of Soldiers 30 days prior to MRE. Failure to integrate these findings will result in increased inventory levels at the warehouse and continued economically inefficient distribution of the RFI items to Soldiers deploying into the theater of operations.

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7 ANNEX A

Table of Current and Proposed Size Distributions by Commodity

NSN	Size / Model	Nomenclature	UI	Current Sz Dist	New Sz Dist
8470-01-529-6302	S6	HELMET,ADVANCED COMBAT	EA		0.00%
8470-01-506-6373	M8	HELMET,ADVANCED COMBAT	EA		0.00%
8470-01-506-6377	L8	HELMET,ADVANCED COMBAT	EA		0.13%
8470-01-513-6414	XL8	HELMET,ADVANCED COMBAT	EA		0.00%
8470-01-506-6369	M6	HELMET,ADVANCED COMBAT	EA	47.00%	51.00%
8470-01-506-6375	L6	HELMET,ADVANCED COMBAT	EA	49.30%	48.88%
8470-01-513-6411	XL6	HELMET,ADVANCED COMBAT	EA	3.70%	7.60%
8415-01-472-6867	XS-S/R	OVERALLS,COLD WEATHER	EA	0.54%	0.27%
8415-01-472-6908	XS-L	OVERALLS,COLD WEATHER	EA	0.15%	0.05%
8415-01-472-6909	S-S/R	OVERALLS,COLD WEATHER	EA	7.93%	8.38%
8415-01-472-6911	S-L	OVERALLS,COLD WEATHER	EA	1.94%	1.22%
8415-01-472-6912	M-S/R	OVERALLS,COLD WEATHER	EA	36.82%	35.96%
8415-01-472-6914	M-L	OVERALLS,COLD WEATHER	EA	16.80%	10.55%
8415-01-472-6915	L-S/R	OVERALLS,COLD WEATHER	EA	15.29%	22.53%
8415-01-472-6916	L-L	OVERALLS,COLD WEATHER	EA	12.49%	11.00%
8415-01-472-6917	XL-S/R	OVERALLS,COLD WEATHER	EA	2.75%	4.40%
8415-01-472-6918	XL-L	OVERALLS,COLD WEATHER	EA	5.29%	5.65%
8415-01-F00-0436	XXL-S/R	OVERALLS,COLD WEATHER	EA	0.00%	0.00%
8415-01-F00-0437	XXL-L	OVERALLS,COLD WEATHER	EA	0.00%	0.00%
8415-01-F00-0440	XXXL-SR	OVERALLS,COLD WEATHER	EA	0.00%	0.00%
8415-01-F00-0441	XXXL-L	OVERALLS,COLD WEATHER	EA	0.00%	0.00%
8415-01-472-3526	XS	SHIRT,COLD WEATHER	EA	0.80%	0.62%
8415-01-461-8336	S	SHIRT,COLD WEATHER	EA	13.20%	9.72%
8415-01-461-8337	M	SHIRT,COLD WEATHER	EA	36.08%	34.05%
8415-01-461-8341	L	SHIRT,COLD WEATHER	EA	37.61%	37.36%
8415-01-461-8356	XL	SHIRT,COLD WEATHER	EA	12.31%	18.20%
8415-01-F00-0281	XXL	SHIRT,COLD WEATHER	EA		0.05%
8415-01-F00-0282	XXXL	SHIRT,COLD WEATHER	EA		0.00%
8440-01-508-3357	XS	SOCKS - GREEN	PR		0.00%
8440-01-508-3359	S	SOCKS - GREEN	PR		0.00%

8440-01-508-3360	M	SOCKS - GREEN	PR		0.00%
8440-01-508-3362	L	SOCKS - GREEN	PR		0.00%
8440-01-508-3364	XL	SOCKS - GREEN	PR		0.00%
8440-00-543-7777	S	SOCKS	PR	21.59%	14.55%
8440-00-543-7778	M	SOCKS	PR	46.67%	49.85%
8440-00-543-7779	L	SOCKS	PR	31.74%	35.60%
8415-01-530-2347	S	PAD,KNEE	PR	10.34%	13.98%
8415-01-530-2350	M	PAD,KNEE	PR	63.89%	57.97%
8415-01-530-2351	L	PAD,KNEE	PR	25.77%	28.04%
8415-01-530-2148	S	ELBOW,PAD	PR	11.48%	14.64%
8415-01-530-2157	M	ELBOW,PAD	PR	66.19%	57.63%
8415-01-530-2161	L	ELBOW,PAD	PR	22.34%	27.73%
8430-01-F00-0369	1.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-F00-0370	1.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-F00-0371	1.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-F00-0374	1.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-F00-0420	1.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1506	2N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.08%
8430-01-516-1513	2R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.09%
8430-01-516-1514	2W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.06%
8430-01-516-1517	2XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.09%
8430-01-526-5875	2XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1520	2.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.09%
8430-01-516-1521	2.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.03%	0.10%
8430-01-516-1522	2.5W	BOOTS,COMBAT - TW -	PR	0.02%	0.11%

		B13584/DA3033*			
8430-01-516-1527	2.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.10%
8430-01-526-5876	2.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1528	3N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.03%
8430-01-516-1526	3R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.12%
8430-01-516-1530	3W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.13%
8430-01-516-1532	3XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.06%	0.23%
8430-01-526-5877	3XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1543	3.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.06%
8430-01-516-1544	3.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.24%
8430-01-516-1545	3.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.06%	0.23%
8430-01-516-1546	3.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.14%
8430-01-526-5878	3.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1547	4N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1548	4R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.04%	0.18%
8430-01-516-1557	4W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.27%	0.35%
8430-01-516-1564	4XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.03%	0.23%
8430-01-526-5879	4XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1565	4.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.08%
8430-01-516-1567	4.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.36%	0.26%

8430-01-516-1568	4.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.82%	0.62%
8430-01-516-1569	4.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.05%	0.27%
8430-01-526-5888	4.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1574	5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.10%
8430-01-516-1575	5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.37%	0.27%
8430-01-516-1576	5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.74%	0.79%
8430-01-516-1577	5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.05%	0.22%
8430-01-526-5889	5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1578	5.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1580	5.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.44%	0.43%
8430-01-516-1589	5.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.47%	1.15%
8430-01-516-1590	5.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.05%	0.24%
8430-01-526-5892	5.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1591	6N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1599	6R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.59%	0.63%
8430-01-516-1598	6W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.46%	1.19%
8430-01-516-1597	6XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.05%	0.22%
8430-01-526-5895	6XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1602	6.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.16%
8430-01-516-1603	6.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.87%	0.64%

8430-01-516-1605	6.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.20%	1.19%
8430-01-516-1606	6.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.07%	0.22%
8430-01-526-5894	6.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1607	7N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.13%
8430-01-516-1608	7R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.16%	0.80%
8430-01-516-1610	7W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.94%	1.76%
8430-01-516-1611	7XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.07%	0.19%
8430-01-526-5896	7XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1615	7.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.08%
8430-01-516-1614	7.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.18%	1.01%
8430-01-516-1613	7.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.44%	1.73%
8430-01-516-1612	7.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.12%	0.24%
8430-01-526-5898	7.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1621	8N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.08%
8430-01-516-1628	8R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.80%	1.41%
8430-01-516-1630	8W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	2.66%	2.68%
8430-01-516-1644	8XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.04%	0.25%
8430-01-526-5899	8XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1632	8.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1633	8.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.90%	1.86%

8430-01-516-1634	8.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	3.70%	3.56%
8430-01-516-1635	8.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.06%	0.35%
8430-01-539-9329	8.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1645	9N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.07%
8430-01-516-1646	9R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	3.24%	3.25%
8430-01-516-1649	9W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	4.97%	5.90%
8430-01-516-1650	9XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.08%	0.34%
8430-01-539-4717	9XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1651	9.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.09%
8430-01-516-1652	9.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	4.54%	4.29%
8430-01-516-1653	9.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	6.73%	6.34%
8430-01-516-1647	9.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.07%	0.21%
8430-01-539-4722	9.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1657	10N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.06%
8430-01-516-1659	10R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	5.72%	5.07%
8430-01-516-1678	10W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	6.54%	7.03%
8430-01-516-1679	10XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.06%	0.38%
8430-01-539-4723	10XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1681	10.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.11%
8430-01-516-1682	10.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	5.95%	5.80%

8430-01-516-1685	10.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	4.80%	5.29%
8430-01-516-1686	10.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.05%	0.25%
8430-01-539-4725	10.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1689	11N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.12%
8430-01-516-1691	11R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	6.07%	4.51%
8430-01-516-1693	11W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	5.68%	4.38%
8430-01-516-1694	11XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.14%
8430-01-539-4727	11XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1696	11.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.12%
8430-01-516-1701	11.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	4.43%	3.55%
8430-01-516-1699	11.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	2.93%	2.99%
8430-01-516-1704	11.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.03%	0.13%
8430-01-539-4728	11.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1705	12N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.13%
8430-01-516-1708	12R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	3.99%	2.98%
8430-01-516-1703	12W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	2.42%	2.19%
8430-01-516-1700	12XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.14%
8430-01-539-4729	12XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1715	12.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.10%
8430-01-516-1716	12.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.74%	1.61%

8430-01-516-1719	12.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	1.05%	0.87%
8430-01-516-1720	12.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.11%
8430-01-539-4730	12.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1723	13N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.10%
8430-01-516-1727	13R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.75%	0.73%
8430-01-516-1725	13W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.41%	0.52%
8430-01-516-1750	13XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.10%
8430-01-539-4731	13XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1751	13.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.09%
8430-01-516-1728	13.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.94%	0.52%
8430-01-516-1726	13.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.47%	0.43%
8430-01-516-1722	13.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.12%
8430-01-539-4732	13.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1730	14N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.02%
8430-01-516-1732	14R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.31%	0.18%
8430-01-516-1733	14W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.12%	0.14%
8430-01-516-1734	14XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-539-4733	14XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1735	14.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.08%
8430-01-516-1738	14.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.15%	0.14%

8430-01-516-1887	14.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.10%	0.11%
8430-01-516-1888	14.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-539-4734	14.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1936	15N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.09%
8430-01-516-1811	15R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.04%	0.10%
8430-01-516-1934	15W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.04%	0.13%
8430-01-516-1938	15XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-539-9332	15XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1890	15.5N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1944	15.5R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.10%
8430-01-516-1947	15.5W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.08%
8430-01-516-1946	15.5XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-539-9334	15.5XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1945	16N	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-516-1948	16R	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.01%	0.09%
8430-01-516-1949	16W	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.02%	0.11%
8430-01-516-1950	16XW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-539-9336	16XXW	BOOTS,COMBAT - TW - B13584/DA3033*	PR	0.00%	0.00%
8430-01-539-9398	1.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-9401	1.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%

8430-01-526-5603	1.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-9403	1.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-9404	1.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-4935	2N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.04%
8430-01-514-4939	2R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.09%
8430-01-514-4941	2W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.10%
8430-01-514-4943	2XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.15%
8430-01-526-5606	2XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-4946	2.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.11%
8430-01-514-4950	2.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.11%
8430-01-514-4955	2.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.45%
8430-01-514-4965	2.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.21%
8430-01-526-5611	2.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-4966	3N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.02%	0.05%
8430-01-514-4968	3R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.10%	0.14%
8430-01-514-4970	3W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.24%	0.22%
8430-01-514-4975	3XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.10%	0.20%
8430-01-526-5613	3XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-4984	3.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.02%	0.02%
8430-01-514-4985	3.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.14%	0.15%

8430-01-514-5003	3.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.13%	0.36%
8430-01-514-5012	3.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.05%	0.21%
8430-01-526-5615	3.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5007	4N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.03%	0.07%
8430-01-514-5006	4R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.16%	0.33%
8430-01-514-5016	4W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.65%	2.45%
8430-01-514-5014	4XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.04%	0.34%
5430-01-526-5617	4XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5021	4.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.10%
8430-01-514-5019	4.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.76%	0.66%
8430-01-514-5023	4.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.28%	1.06%
8430-01-514-5026	4.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.04%	0.24%
8430-01-526-5616	4.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5027	5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.15%
8430-01-514-5029	5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.95%	0.47%
8430-01-514-5032	5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.34%	1.08%
8430-01-514-5033	5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.07%	0.33%
8430-01-526-5618	5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5034	5.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.10%
8430-01-514-5036	5.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.07%	0.66%

8430-01-514-5037	5.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.45%	1.19%
8430-01-514-5039	5.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.05%	0.22%
8430-01-526-5619	5.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5040	6N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.02%	0.12%
8430-01-514-5041	6R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.29%	0.77%
8430-01-514-5043	6W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	2.05%	1.50%
8430-01-514-5045	6XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.05%	0.23%
8430-01-526-5622	6XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5046	6.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.11%
8430-01-514-5047	6.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.38%	0.93%
8430-01-514-5049	6.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.91%	1.62%
8430-01-514-5050	6.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.05%	0.22%
8430-01-526-5620	6.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5052	7N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.11%
8430-01-514-5065	7R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	2.21%	1.47%
8430-01-514-5064	7W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	3.57%	2.48%
8430-01-514-5066	7XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.04%	0.31%
8430-01-526-5623	7XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5067	7.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.12%
8430-01-514-5069	7.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	2.66%	1.84%

8430-01-514-5068	7.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	4.50%	3.01%
8430-01-514-5077	7.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.07%	0.39%
8430-01-526-5625	7.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5081	8N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.12%
8430-01-514-5083	8R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	4.28%	3.02%
8430-01-514-5084	8W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	5.82%	4.28%
8430-01-514-5086	8XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.05%	0.53%
8430-01-526-5628	8XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5088	8.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.12%
8430-01-514-5134	8.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	5.01%	3.75%
8430-01-514-5136	8.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	6.69%	5.25%
8430-01-514-5135	8.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.05%	0.35%
8430-01-539-9408	8.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5139	9N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.13%
8430-01-514-5137	9R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	6.11%	5.05%
8430-01-514-5138	9W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	6.35%	6.89%
8430-01-514-5142	9XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.04%	0.24%
8430-01-539-4738	9XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5141	9.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.02%	0.17%
8430-01-514-5143	9.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	5.98%	5.53%

8430-01-514-5144	9.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	5.39%	5.55%
8430-01-514-5147	9.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.03%	0.29%
8430-01-539-4739	9.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5146	10N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	-0.10%
8430-01-514-5148	10R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	4.67%	5.60%
8430-01-514-5149	10W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	3.58%	4.15%
8430-01-514-5150	10XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.02%	0.38%
8430-01-539-4740	10XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5151	10.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.13%
8430-01-514-5152	10.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	3.51%	3.36%
8430-01-514-5155	10.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	2.37%	2.85%
8430-01-514-5153	10.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.16%
8430-01-539-4741	10.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5156	11N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.14%
8430-01-514-5157	11R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	2.94%	2.87%
8430-01-514-5158	11W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.84%	2.08%
8430-01-514-5160	11XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.14%
8430-01-539-4742	11XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5161	11.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.11%
8430-01-514-5162	11.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	1.27%	2.02%

8430-01-514-5164	11.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.78%	1.68%
8430-01-514-5165	11.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.13%
8430-01-539-4744	11.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5166	12N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.13%
8430-01-514-5168	12R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.89%	1.31%
8430-01-514-5171	12W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.53%	0.77%
8430-01-514-5169	12XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.13%
8430-01-539-4745	12XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5172	12.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.10%
8430-01-514-5173	12.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.30%	0.60%
8430-01-514-5174	12.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.23%	0.54%
8430-01-514-5176	12.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.12%
8430-01-539-4746	12.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5175	13N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.09%
8430-01-514-5177	13R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.24%	0.37%
8430-01-514-5180	13W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.13%	0.29%
8430-01-514-5178	13XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.01%
8430-01-539-4748	13XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5182	13.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.09%
8430-01-514-5181	13.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.08%	0.15%

8430-01-514-5184	13.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.03%	0.13%
8430-01-514-5185	13.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-4749	13.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5186	14N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.10%
8430-01-514-5187	14R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.04%	0.14%
8430-01-514-5188	14W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.03%	0.18%
8430-01-514-5192	14XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-4750	14XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5238	14.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.02%
8430-01-514-5239	14.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.09%
8430-01-514-5240	14.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.12%
8430-01-514-5241	14.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-4751	14.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5242	15N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.01%
8430-01-514-5243	15R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.11%
8430-01-514-5244	15W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.01%	0.10%
8430-01-514-5246	15XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-9410	15XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5247	15.5N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5248	15.5R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.01%

8430-01-514-5249	15.5W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.01%
8430-01-514-5250	15.5XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-9420	15.5XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5252	16N	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-514-5253	16R	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.01%
8430-01-514-5254	16W	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.01%
8430-01-514-5255	16XW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8430-01-539-9417	16XXW	BOOTS,COMBAT - HW - B60315/DA3029*	PR	0.00%	0.00%
8415-01-501-7074	S-R	UNDERSHIRT, COLD WEATHER	EA	10.43%	10.50%
8415-01-501-7075	M-R	UNDERSHIRT, COLD WEATHER	EA	52.68%	45.79%
8415-01-501-7077	L-R	UNDERSHIRT, COLD WEATHER	EA	16.67%	24.22%
8415-01-501-7108	L-L	UNDERSHIRT, COLD WEATHER	EA	10.00%	10.45%
8415-01-501-7113	XL-R	UNDERSHIRT, COLD WEATHER	EA	7.59%	5.70%
8415-01-501-7114	XL-L	UNDERSHIRT, COLD WEATHER	EA	2.63%	3.33%
8415-01-F00-0922	XXL-R	UNDERSHIRT, COLD WEATHER	EA		0.00%
8415-01-501-6888	S-R	DRAWERS, COLD WEATHER	EA	10.43%	10.50%
8415-01-501-6891	M-R	DRAWERS, COLD WEATHER	EA	52.68%	45.77%
8415-01-501-6892	L-R	DRAWERS, COLD WEATHER	EA	16.67%	24.26%
8415-01-501-6894	L-L	DRAWERS, COLD WEATHER	EA	10.00%	10.44%
8415-01-501-6896	XL-R	DRAWERS, COLD WEATHER	EA	7.59%	5.69%
8415-01-501-6897	XL-L	DRAWERS, COLD WEATHER	EA	2.63%	3.34%
8415-01-F00-0923	XXL-R	DRAWERS, COLD WEATHER	EA		0.00%
8415-01-446-9247	5	GLOVES,FLYERS' - WINTER	PR	5.67%	6.81%

		G06171*			
8415-01-446-9248	6	GLOVES,FLYERS' - WINTER G06171*	PR	4.40%	5.60%
8415-01-446-9252	7	GLOVES,FLYERS' - WINTER G06171*	PR	8.99%	9.20%
8415-01-446-9253	8	GLOVES,FLYERS' - WINTER G06171*	PR	9.79%	12.09%
8415-01-446-9254	9	GLOVES,FLYERS' - WINTER G06171*	PR	30.20%	23.19%
8415-01-446-9256	10	GLOVES,FLYERS' - WINTER G06171*	PR	22.90%	22.37%
8415-01-446-9259	11	GLOVES,FLYERS' - WINTER G06171*	PR	18.06%	20.75%
8415-01-482-8417	4	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	1.63%	2.57%
8415-01-040-2012	5	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	3.84%	4.75%
8415-01-040-1453	6	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	3.39%	5.18%
8415-01-029-0109	7	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	8.45%	8.10%
8415-01-029-0111	8	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	10.63%	9.78%
8415-01-029-0112	9	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	27.67%	18.50%
8415-01-029-0113	10	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	24.88%	21.68%
8415-01-029-0116	11	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	16.21%	18.94%
8415-01-482-8420	12	GLOVES,FLYERS' - SUMMER J67052/DA1598/DA154H/*	PR	3.30%	10.49%
8415-01-519-8783	XS	UNDERSHIRT - TAN	EA	0.64%	4.87%
8415-01-519-8784	S	UNDERSHIRT - TAN	EA	10.80%	21.45%
8415-01-519-8785	M	UNDERSHIRT - TAN	EA	39.85%	48.55%
8415-01-519-8786	L	UNDERSHIRT - TAN	EA	36.82%	0.00%
8415-01-519-8788	XL	UNDERSHIRT - TAN	EA	11.08%	3.26%
8415-01-519-8789	XXL	UNDERSHIRT - TAN	EA	0.71%	21.31%
8415-01-519-8790	XXXL	UNDERSHIRT - TAN	EA	0.12%	0.56%

8415-01-504-8531	XS	UNDERSHIRT	EA	0.64%	0.51%
8415-01-504-8541	S	UNDERSHIRT	EA	10.80%	7.56%
8415-01-504-8542	M	UNDERSHIRT	EA	39.85%	33.60%
8415-01-504-8543	L	UNDERSHIRT	EA	36.82%	38.07%
8415-01-504-8544	XL	UNDERSHIRT	EA	11.08%	18.87%
8415-01-504-8545	XXL	UNDERSHIRT	EA	0.71%	1.29%
8415-01-504-8546	XXXL	UNDERSHIRT	EA	0.12%	0.10%
8425-01-515-9555	XSM	BRASSIERE	EA	35.35%	11.79%
8425-01-515-9556	S	BRASSIERE	EA	24.24%	21.17%
8425-01-515-9557	M	BRASSIERE	EA	20.20%	34.95%
8425-01-515-9559	L	BRASSIERE	EA	14.14%	25.15%
8425-01-515-9560	XL	BRASSIERE	EA	6.06%	6.94%
8415-01-521-8806	S/M	COVER,HELMET,CAMOUFLAGE	EA	47.00%	43.43%
8415-01-521-8808	L/XL	COVER,HELMET,CAMOUFLAGE	EA	53.00%	56.57%

Distribution List

NAME/AGENCY	ADDRESS	COPIES
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14. ABSTRACT
The Army's Rapid Fielding Initiative (RFI) is the process by which new equipment is distributed to Soldiers either at home station or in a theater of operations. Currently, equipment is shipped from over 50 suppliers around the United States to a single central warehouse on the east coast where it is packaged into sets. The sets are then shipped to the end user stationed at one of over 40 locations around the world. It is a process that costs the Army time, money and a great deal of effort to execute.

This case study examines the RFI supply chain and makes recommendations to improve the current inventory management system (IMS) by removing the communication gaps between the PM, warehouse and suppliers; a location analysis is performed to select the most efficient and economic location for the warehouse and packaging facility; and, a new tariff is proposed that will reduce the number of items shipped to and returned from each fielding location that better meets the needs of the Soldier. The recommendations are the result of applying a combination of Lean Six Sigma tools and the Systems Decision Process to determine the most efficient and economic solutions and provide the greatest value to the stakeholders.

15. SUBJECT TERMS
Supply chain management; Inventory Management System, Lean Six Sigma; Systems Decision Process; Rapid Fielding Initiative

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