EXPLORING THE HEART OF LOGISTICS

Improving Equipment Management Using Lessons Learned from the Air Force Spares Management Process

Douglas J. Blazer, PhD, LMI
Lori C. Jones, LMI
Wayne B. Faulkner, LMI
Paige G. Meeks, 542d MSUG/GBMM
Cathy McIntosh, 542d MSUG/GBMM
John D. Yelverton, 542d MSUG/GBMM

Introduction

For the last two years, and under the direction of the Warner Robins Equipment Management Office (542d MSUG/GBMM), the Air Force has improved its equipment management process, developing automated tools that have improved the equipment requirement methods and execution of logistics decisions, such as buy, repair, distribute, redistribute and allocate funds. The underlying reason was to apply successful spares management technology and business practices to equipment.

In the late 1980s, the Air Force developed a way to link mission capability, that is, aircraft availability, to spares funding. The Air Force could identify the change in the number of available aircraft that would result from a change in spares funding, and aircraft availability became the prioritization logic for spares execution decisions. The spares community also employed automated systems like the Execution and Prioritization of Repair Support System (EXPRESS), to prioritize the repair, distribution, and redistribution of assets that exceeded a base's requisition objective.

Article Acronyms

AFEMS - Air Force Equipment Management System
BP - Budget Program
ERS - Equipment Requirements System
EXPRESS - Execution and Prioritization of Repair Support System
FAD - Force Activity Designator
FY - Fiscal Year
MAJCOM - Major Command
O&M - Operations and Maintenance
SET - Support Equipment Transformation
SORTS - Status of Operational Readiness and Training System
UMMIPS - Uniform Material Movement and Issue Priority System

Current equipment systems do an adequate job of computing the spares requirement, but nothing ensures the effective fulfillment of that requirement. The equipment community cannot link mission needs to equipment requirements, nor does it have the automated tools to make equipment execution decisions. There is no systemic redistribution of malpositioned equipment. In addition there is no way to prioritize repairs or identify repair backlogs.

Until recently, no equipment system could ensure serviceable assets were released promptly. Further, there was no way to prioritize what to buy or how to allocate funds to maximize Air Force mission capability. These execution decisions depended on item managers continuously reviewing their inventories. There were no tools available to let those managers know that action was required. More importantly, no tools considered the entire Air Force enterprise in execution decisions.

When funds are limited, what is the next item that should be inducted into repair? Nothing provided the necessary oversight and enterprise prioritization to ensure the right decisions were made.

In the last two years, the Air Force has found a way to link equipment support to Air Force readiness. This association is the key to determining the most effective way to execute equipment decisions that result in the largest number of organizations reporting as mission ready. Aside from supporting funding decisions, the linkage provides a basis from which to prioritize equipment requirements and decide how best to spend limited resources.

Using the prioritization logic of the Status of Operational Readiness and Training System (SORTS), LMI developed automated processes to perform the following.

- Prioritize equipment buys
- Distribute equipment

- Redistribute improperly positioned equipment
- Induct items into repair

LMI also developed an automated process that will improve the accuracy of the Air Force's forecasting and computation of replacement needs.

Equipment Prioritization

The Air Force now uses prioritization logic to link readiness to support equipment purchases. The prioritization logic uses SORTS-driven fill rate targets to make asset and resource allocation decisions (see Table 1). This approach uses marginal analysis to maximize the number of organizations that are fully mission ready by force activity designator (FAD) and use code (A for mobility, D for war readiness materiel, and B for support equipment).

Figure 1 illustrates how the prioritization logic ranks equipment. In a waterfall effect, it allocates assets to FAD I, II, and III, use code A units until those organizations achieve a 90 percent (S-1) fill rate. It then allocates assets to FAD IV and V, use code A organizations until they reach an 80 percent (S-2) fill rate, and so on.

Table 2 presents the fill-rate targets for each prioritization tier. Once all organizations meet their Tier 1 fill-rate target, the prioritization process starts over for the next tier, with higher fill rate targets.

LMI applied this prioritization logic to the fiscal year (FY04) support equipment buy list by organization for each stock record account number, and compared the resulting Air Force's SORTS-driven fill rates to the current Uniform Material Movement and Issue Priority System (UMMIPS) method of prioritizing requirements. Table 3 presents those results.

The Air Force funding in FY04 for budget program (BP) 12, common support equipment, was $217M. Applying the SORTS-driven fill-rate targets, the Air Force would have prioritized the purchase of 18,000 units of equipment. This is a marked increase from the 7,400 units of equipment the Air Force would have purchased with UMMIPS. The SORTS-driven prioritization approach would have also resulted in 2,943 S-1 rated organizations, whereas only 1,339 organizations would have been S-1 rated had the UMMIPS method been employed.

In other words, the use of the new prioritization logic would have resulted in a 120 percent increase ([2,943 - 1,339] ÷ 1339 = 1.2) in S-1 rated organizations for BP-12 purchases, and a 68 percent increase ([3,858 - 2,289] ÷ 2,289 = 0.68) in S-1 rated organizations for BP-84 purchases. Likewise, there would have

SORTS Code	Fill Requirement	Fill Target
S-1	Fully wartime mission ready	> 90%
S-2	Capable of most wartime missions	> 80%
S-3	Capable of many portions of its wartime missions	> 65%
S-4	Not mission ready without more resources	< 65%

Table 1. SORTS Ratings

Category	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6	Tier 7	Tier 8
Spares Priority Release Sequence									
All Use codes—100%									
Use code A (Mobility)									
FAD I, II, and III	–	90%	90%	90%	92%	94%	96%	98%	100%
FAD IV and V	–	80%	90%	90%	92%	94%	96%	98%	100%
Use Code C (Joint Use) and Use Code D (WRM)									
FAD I, II, and III	–	90%	90%	90%	92%	94%	96%	98%	100%
FAD IV and V	–	80%	90%	90%	92%	94%	96%	98%	100%
Use Code B (Support Equipment)									
FAD I, II, and III	–	80%	90%	90%	92%	94%	96%	98%	100%
FAD IV and V	–	65%	90%	90%	92%	94%	96%	98%	100%

Table 2. Prioritization Tiers

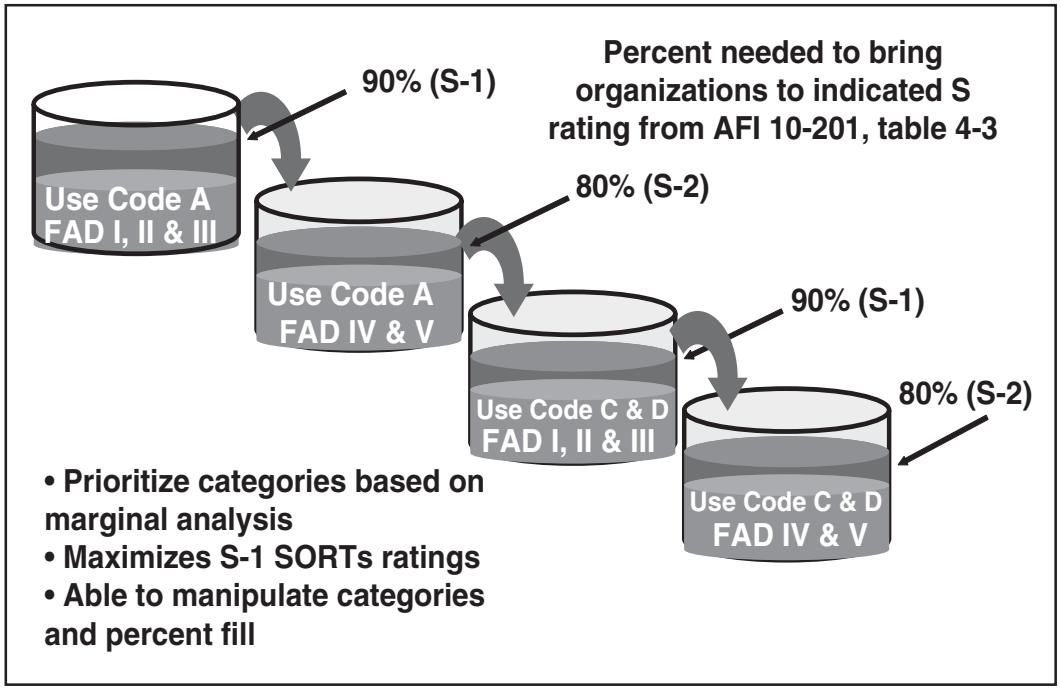

Figure 1. Prioritization Execution Waterfall

BP-12 ($217M)	Number of Units Purchased	Number of Organizations 90% Fill	Number of Organizations 80% Fill	Number of Organizations 65% Fill	Number of Organizations < 65% Fill
Start	–	694	734	837	1,000
Current System—UMMIPS	7,400	1,339	538	618	770
Proposed Marginal Analysis	18,000	2,943	109	213	0
BP-84 ($242.5M)	**Units purchased**	**Number of Organizations 90% Fill**	**Number of Organizations 80% Fill**	**Number of Organizations 65% Fill**	**Number of Organizations < 65% Fill**
Start	–	924	346	855	2310
Current System—UMMIPS	34,300	2,289	181	494	1,471
Proposed Marginal Analysis	42,200	3,858	486	91	0

Table 3. FY04 Funding Results

been no S-4 rated organizations, compared to 770 [BP12] and 1,471 [BP-84] with UMMIPS, for other base maintenance (BP-84) and support equipment (BP-12).

The Air Force implemented LMI's prioritization logic into the Equipment Requirements System (ERS), and that logic was used as the basis for the FY06 buy requirement provided to the major commands (MAJCOMs) for their review and adjustment.

Buy Execution

The Air Force needed a way to determine what to buy with limited funding. Historically, equipment receives 40 to 60 percent funding, without any way to systemically determine what purchases will maximize mission effectiveness. Under the support equipment transformation (SET) effort, the Air Force needed a way to prioritize and identify the items it wanted to fund and have the equipment item managers buy.

The Air Force ERS uses the prioritization logic and links the user's requisitions to the computed requirement to provide a suggested buy list for the MAJCOM review. The MAJCOMs can modify the priority list and apply their operations and maintenance (O&M) funding. ERS then consolidates the MAJCOM lists for Air Force Materiel Command buy execution. For items that cost more than $250,000, ERS also prioritizes centralized support (that is, non-O&M funded) equipment for MAJCOM review.

Organization	Use Code	FAD	Target Fill Rate	Fill Rate	Marginal Gain	Priority
123	B	3	80%	85%	7%	3
789	A	2	90%	88%	5%	1
456	A	2	90%	86%	2%	2

Table 4. Sample Asset Distribution Prioritization

Total Unserviceable		Unserviceable Aligned in Computation		Not on Work Order		Back Order	
Units	Repair Cost	Units	Repair Cost	Units	Repair Cost	Units	Repair Cost
126,000	$465M	112,000	$49M	8,200	$44M	4,100	$25M

Table 5. October 2005 Equipment Repair Position

More work is needed in ERS to better reconcile the MAJCOM requisitions to the computed requirement and to track MAJCOM funds. To do so, the Air Force developed use cases for ERS as a way to track how the air logistics centers purchase the items that the MAJCOM funds.

Asset Distribution

Before SET, the Air Force needed a way to determine where to distribute an asset when it became available. LMI developed an automated program that incorporates the marginal analysis prioritization logic to suggest where to distribute available assets. This asset distribution list is based on the individual fill rate of each organization. It prioritizes the asset's release to ensure the greatest improvement in fill rate as targeted by the use code and FAD. The resulting list is developed every 2 weeks and posted on a Web site.

Many SET items are available for distribution because they are purchased. These items should be released to the MAJCOM, and specific requisition, that funded the buy. For assets that are available because of nonpurchase actions, the item manager can use the new distribution list to release the asset to the organization with the greatest need.

As an example, Table 4 lists three organizations that require an available asset. The first asset goes to organization 789, because that organization is below its targeted fill rate and has the highest marginal fill-rate gain (5 percent). Although organization 123 has a higher marginal gain (7 percent), it already exceeded its target fill rate.

The capability to provide an asset distribution priority list should eventually be part of the ERS. The ERS asset distribution should include MAJCOM prioritization and track funding to identify what requisitions have been funded and by whom, thus ensuring the MAJCOM that funded the buy or repair, receives the item it needs.

Redistribution

The Air Force did not systemically redistribute malpositioned equipment that is either in a warehouse or identified by a special allowance standard (for example, 000, nonauthorized; 048, temporary loan; and H000-WRM, no longer authorized) as no longer needed by the organization in possession of the equipment.

The Air Force equipment computation system (D200C) applies malpositioned equipment to fill a valid need. If the asset is not redistributed to fill that need, the need will go unfilled indefinitely. The computation will not allow a buy when there is an asset available to meet the need. Because the Air Force does not redistribute its malpositioned equipment, needs go unfulfilled.

Malpositioned assets can also be the result of *dirty* data. Some assets listed as *in warehouse* or *000, nonauthorized,* do not exist, or are no longer *000*. Failure to either redistribute the equipment or clean up the data means users' needs are never satisfied.

In coordination with the Air Force Logistics Management Agency, LMI developed a semiannual process to identify and create transactions to redistribute malpositioned equipment. We again used the marginal analysis prioritization logic to determine which of the competing requirements to fill with the malpositioned assets. The program creates turn-in and shipment transactions that the bases and regional supply squadrons process. The LMI program includes equipment in a base or depot warehouse and in-use with allowance source codes of 000, 048, and H000. The program also identifies—for MAJCOM review and action—equipment with other allowance source codes the computation applies to valid needs. This new program identified $163M of malpositioned equipment for redistribution in December 2004, $208M in March 2005, and $220M in September 2005.

LMI's semiannual program is a good start, but the Air Force needs a near-real-time method to redistribute equipment. The Air Force redistribution program should identify a malpositioned asset when it becomes available or when a requirement is identified that a malpositioned asset can satisfy. The Air Force also needs a tenable transaction process to redistribute a malpositioned asset where it is needed. The Air Force redistribution program should use the business rules we developed, but it should process the transactions immediately.

Repair

The spares community uses EXPRESS to determine what to repair every day. The Air Force equipment community does not have a product that identifies if there are unserviceable equipment assets with a valid need that are not yet inducted for repair. No central repair office determines what equipment needs to be repaired and what is keeping items from induction. Again, the computation applies unserviceable items to valid needs, and failure to repair, or a delay, means a valid need goes unfilled.

We developed an automated program that identifies unserviceable equipment with a valid need (a current requisition). Table 5 summarizes the results as of October 2005.

The Air Force Equipment Management System (AFEMS) shows unserviceable equipment accounts for $465M in repair costs, $49M of which equates to a current need which is applied in the Air Force equipment computation. A total of $44M of assets applied to a need are not on work order or not inducted, and $25M of those assets have an outstanding requisition.

The Warner-Robins program prioritizes a list of items that need repair, known as the repair backlog. The air logistics centers should use this list to induct equipment into repair or correct source data systems if items are in repair and the data is incorrect. If the data is accurate and the item cannot be inducted, the central repair office should manage the item and take steps to remove any constraints to induction. The repair backlog listing will be run monthly—more often if necessary early in the fiscal year—and provided to the ALCs.

The Air Force needs to find a multiple-user computer system to host the repair program, so the item managers and production specialists can provide feedback on the actions they take to induct equipment items in need of repair. LMI will continue to look for a system for the repair backlog list and develop procedures to manage equipment repair. Our program provides the business rules that should eventually be incorporated into the equipment requirements and execution system, whether it is ERS, AFEMS, or the Expeditionary Combat Support System.

Replacement Forecasting

LMI analyzed how the Air Force forecasts replacement requirements and found it has no way to forecast replacement requirements effectively. The current Air Force system does not collect the data needed to provide an accurate forecast. Even with more complete data, we doubt any system could forecast equipment replacement needs accurately enough at the national stock number level to risk buying in anticipation of a need.

In March 2003 the current system forecasted $350M worth of items that did not fail, and did not forecast $260M of items that did fail. There was a total of $568M of items with a replacement requisition that were not included in the computation. For some items, equipment users requisition items to replace, but retain the current equipment until the replacement is received. These replacement requisitions are not included in the computation unless the item manager forecasts a replacement factor or includes an additive requirement in the computation. We developed a program to identify the replacement requisitions that are not included in the computation and create transactions to load them as additives. This will ensure the computation includes all valid replacement requirements.

Summary

By using lessons learned from the spares community, LMI developed interim tools the Air Force can use to ensure the assumptions in the computation are effectively followed. The Air Force equipment computation applies assets to meet valid needs, but the Air Force does not ensure items are repaired or redistributed to meet those needs. The Air Force needs tools to execute (buy, repair, distribute, redistribute, and allocate funds) the computation.

LMI's interim tools provide the logic necessary to execute a requirement, and we have achieved significant results. The tools have nearly doubled the number of organizations with a 90 percent fill rate (S-1 fill rate goal). Using these tools, the Air Force identified more than $220M of improperly positioned equipment, and took action to either correct the data or ship the equipment to where it was needed.

The LMI-developed tools have also identified items awaiting distribution and repair, thereby reducing the customer wait time. However effective these tools are, they are only a provisional measure. The Air Force needs to incorporate LMI's business logic into near-real-time systems that will make accurate and effective decisions daily instead of periodically.

Douglas J. Blazer, Lori C. Jones, and Wayne B. Faulkner, all work for LMI, a government consulting firm under contract to support Air Force supply-chain management. Paige G. Meeks, Cathy McIntosh, and John D. Yelverton are all government civilians with the equipment management office (542d MSUG), Warner Robins Air Logistics Center, Robins Air Force Base, Georgia.