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DOCUMENTED BRIEFING

Using Field Data to Improve Authorized Stockage List Push Packages

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Summary

When new equipment comes into the Army, it is often fielded on a unit-by-unit basis over a period of many years. This is true whether the Army is fielding an entirely new weapon system, such as the M777 lightweight howitzer, or an upgrade of an existing weapon system, such as the CROWS (Common Remotely Operated Weapon Station), which allows the soldier to acquire targets and fire the weapon from within an armored vehicle. For new equipment, the program manager (PM) works with the vendor to develop an initial parts list for sustainment, which is known as a “push” package (PP). The push package becomes part of the supply support activity’s (SSA) authorized stockage list (ASL), along with other parts required to keep the unit’s equipment mission-capable.

Although new equipment fielding typically occurs in phases over time, empirical demand data from the earliest fieldings have not typically been used to update the ASL or the push package. As a result, even for systems that have been used for years, the push package may be based on the original engineering estimates of failure rates with few or no changes based on empirical demand data from field experience.

RAND Arroyo Center researchers believed that demand data from the field could be used to improve push packages, increasing equipment readiness and reducing the number of unused items. Arroyo initially tested this approach for MRAP (Mine Resistant Ambush Protected) vehicles, which the Army began rapidly fielding in 2008. Arroyo simulated the performance of the ASL push package being fielded with several variants of MRAPs against actual demands for MRAP-unique parts and found that overall the performance was poor. Hence, special runs were made monthly to analyze MRAP-unique parts demands; these parts were rapidly added to the ASL of SSAs supporting the appropriate MRAP variants. As a result, ASL performance began to improve quickly. Even after a single ASL update, the accommodation rate for the ASL

(i.e., the percentage of parts demanded that were on the ASL) for MRAP-unique parts increased from less than 20 percent to 31 percent.

This documented briefing demonstrates the feasibility of using demands from an earlier fielding to improve the push package as new equipment is fielded to successive units. We conducted case studies for the lightweight howitzer (M777) and the new armored security vehicle (ASV). We also provide suggestions for improving the process for developing push packages.

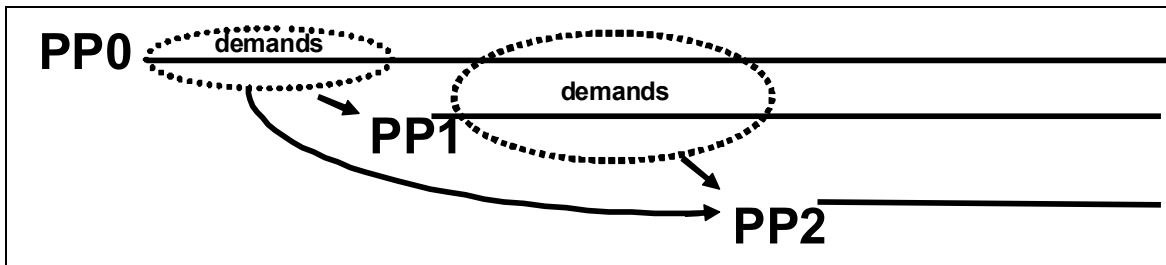
Process for Using Field Data to Update Push Packages

Figure S.1 illustrates the process of using demand data from earlier fieldings to improve push packages as new equipment is fielded to successive units. PP0 is the initial push package, which is based largely on engineering estimates, test data, experience with similar parts on similar equipment, and, in some cases, input from subject matter experts (SMEs). The new equipment and PP0 are given to the first unit in the fielding sequence. As the unit uses the new equipment, its demands for repair parts are recorded in the Army supply system. To develop an improved push package (PP1), the performance of PP0 is reviewed along with the newly available demand data from the first unit. The second fielding of new equipment is given an improved push package, PP1, which has been improved based on demand data. Now two Army units are generating demands for repair parts, and these data can be used to develop a further improved push package, PP2, for use with the next unit that receives the new equipment. And so on.

Case Studies of M777 and ASV

We used simulation to evaluate the performance of alternative push package designs, including some developed without demand-based data (i.e., instances of PP0 in Figure S.1) and some developed with demand-based data (instances of PP1 in the figure) to support the M777 and the ASV.

Figure S.1
Demands Are Used to Update Push Packages as Equipment Is Fielded



The simulation was used to evaluate both Army-developed and Arroyo-developed push packages. For the M777, we evaluated push packages generated using four different methods, shown in Table S.1. For each package, the table shows the method and model used, and the number and value of parts. The push package developed by SMEs and fielded to the 10th Mountain Division contained 293 parts and was valued at \$920,000. The Visual SESAME Readiness Based Sparing (RBS) model produced a push package with 662 parts at a value of \$111,000. This model is designed to produce a least-cost part list to obtain 80 percent weapon system availability. CCSS produced an ASL push package using the Support List Allowance Card (SLAC) that contained 39 parts valued at \$79,000.

Table S.1
M777 Push Packages Were Generated Using Four Different Methods

Method	Model	Push Package	# NIINs	Value
SME	PP fielded to 10th MTN	PP0 actual	293	\$920K
RBS	Visual SESAME	PP0 budget	662	\$111K
CCSS	SLAC	SLAC	39	\$79K
Use field demands	Extended Dollar Cost Banding	PP1 nondeployed	21	\$104K
		PP1 deployed	28	\$104K

RBS = Readiness Based Sparing; Visual SESAME = Selective Stockage for Availability, Multi-Echelon; CCSS = Command Commodity Standard System; SLAC = Support List Allowance Card; NIIN = National Item Identification Number.

Arroyo developed two push packages using FY09 field demands. The first push package (PP1 nondeployed) used the demands from a nondeployed fires battalion, W0S in CONUS. In FY09, the unit had 166 demands for M777 parts. PP1 nondeployed contained 21 parts valued at \$104,294. The second push package (PP1 deployed) used the demands from a deployed fires battalion, W0P in Afghanistan. In FY09, W0P had 215 demands for M777 parts. PP1 deployed contained 28 parts valued at \$103,619.

To evaluate the alternative push packages, we simulated the performance of each in meeting the same streams of demands for repair parts: FY10 demands for repair parts from deployed units in Afghanistan (W0F) and nondeployed units in Germany (WA3) and a brigade combat team in Hawaii (WHJ). There were 631 demands for M777 parts from the W0F's ASL in Afghanistan, 179 M777 demands from WA3 in Germany, and 175 demands for M777 from WHJ in CONUS.

The Push Package for the M777 Improved Greatly Using Field Data from Afghanistan

As shown in Figure S.2, we were able to develop a much improved push package (PP1) using field data from Afghanistan (W0P). These graphs show the simulation results for demands from W0F—an SSA supporting a unit in Afghanistan with 20 howitzers.

The graph on the left shows performance of the push packages meeting demands for all Class IX (repair) parts; during the time period of the simulation (August 2009 to July 2010), 97 Class IX NIINs had demands.

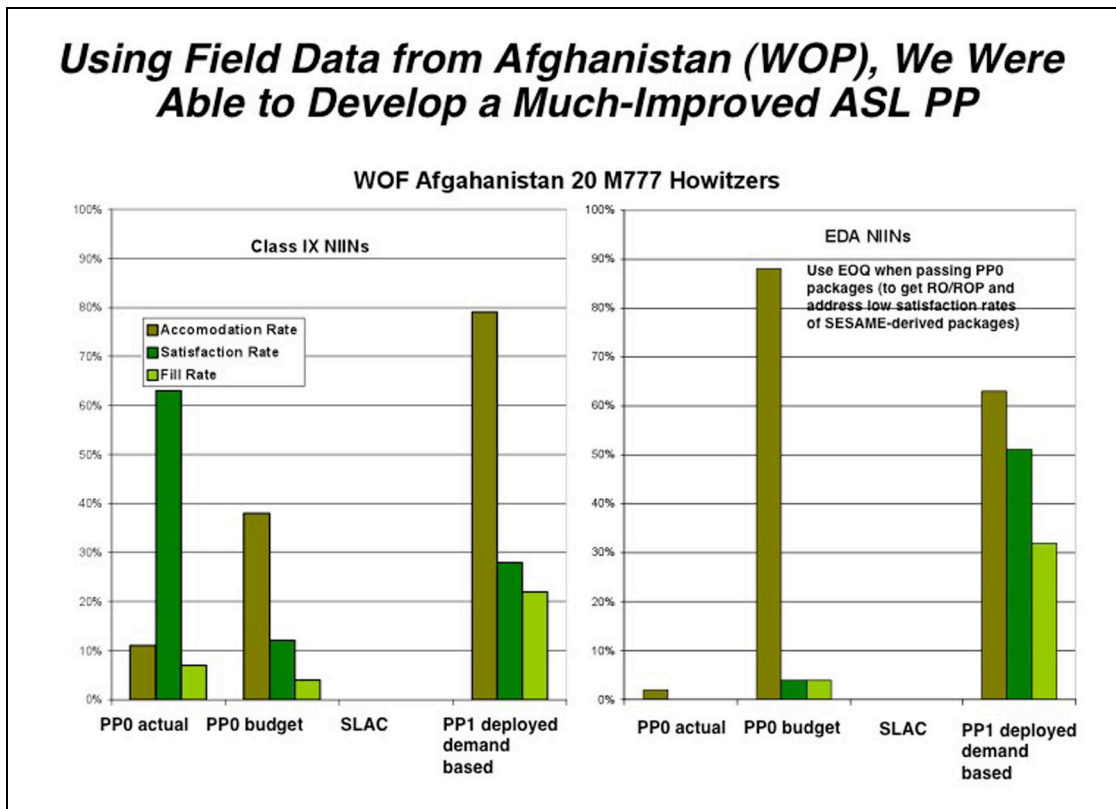
- PP0 actual (10th Mountain PP) had a poor accommodation rate (11 percent) and poor fill rate¹ (7 percent), but it had sufficient stock of

¹“Fill rate” refers to the percentage of requests that are immediately filled from the supporting ASL.

those parts that were accommodated so that the satisfaction rate² was good (63 percent).

- PP0 budget (the SESAME PP), with 662 parts, had a good simulated accommodation rate (38 percent), but the satisfaction rate was poor because the quantity for most of the parts in PP0 budget was one.
- PP1 deployed, a demand-based push package, had the best performance, with an accommodation rate³ of almost 80 percent as well as fair satisfaction (28 percent) and fill (22 percent) rates.

Figure S.2
Field Data from Afghanistan Were Used to Update Push Packages



²“Satisfaction rate” refers to the percentage of accommodated requests for which there is stock available at the time of the request.

³“Accommodation rate” is the percentage of demands for parts on the ASL, whether or not the needed part is available.

The graph on the right of Figure S.2 displays the simulation results for 24 critical howitzer parts: in this usage, “critical” means that according to EDA (equipment downtime analyzer) data, these parts were required to return the howitzer to mission-ready status.⁴

- Neither the PP0 actual push package nor the SLAC push package contained these critical parts.
- The PP0 budget push package had an accommodation rate of 88 percent, meaning that it contained almost all the critical parts, but the low satisfaction rate of 4 percent indicated that the depth of the stockage for these parts was insufficient to meet demands. The PP0 budget push package had low satisfaction rates because the authorized quantity recommended on most parts was one. Using an economic order quantity (EOQ, if greater than one) to increase the requisition objective (RO) for some items and using the authorized quantity as the reorder point (ROP) would improve the satisfaction rate for the PP0 budget-recommended push package.
- As with all Class IX repair parts, the PP1 deployed demand-based push package performed well for the EDA critical parts; accommodation and satisfaction rates were 63 and 51 percent, respectively.

Similar Results Were Achieved for Nondeployed Units

The results were similar when we simulated the performance of each push package in meeting the streams of demands for repair parts from nondeployed units in Germany (WA3) and a brigade combat team in Hawaii (WHJ). WA3, an SSA in Germany, supports 18 howitzers; WHJ supports a Hawaiian unit with 16 howitzers. The demand-based push packages had good accommodation and satisfaction rates. Because the PP0 budget push package had over 600 parts,

⁴The EDA tracks critical parts that caused equipment to be non-mission-capable. EDA data link part NIINs to a particular end-item.

the accommodation rate was very good (89 percent), but lack of depth made the satisfaction rate very low (12 percent). The other push package, PP0 actual, did not perform well. For WHJ, both demand-based push packages had high Class IX accommodation rates (89 percent and 97 percent), although the lack of depth again made the satisfaction rates very low.

Use of Field Data Also Led to Improved Push Packages for the ASV

For the ASV, we evaluated three push package designs developed without the benefit of empirical demand data: two push packages developed by SMEs—the initial Fort Carson Installation Supply Representative (ISR)-developed push package (in Table S.2, called PP0 actual1) and the Carson push package that was actually fielded (PP0 actual2), as well as a SESAME push package (PP0 budget). Using one year of demands from a military police (MP) battalion supported by W0F in Afghanistan, we developed one demand-based push package (PP1 demand based). Data on the composition of these alternative push package designs are summarized in Table S.2.

**Table S.2
Four ASV Push Packages Were Compared**

Method	Model	# NIINs	Value
SME	PP0 actual1	44	\$29K
SME	PP0 actual2	44	\$24K
RBS	PP0 budget	493	\$38K
Field demands July 2008 to June 2009	PP1 demand based	111	\$39K

An MP battalion has four MP companies with nine vehicles each. We simulated how well each of the push packages supported a CONUS-based MP battalion with 299 demands. Simulation results are shown in Table S.3. For both Class IX and EDA-critical parts, the demand-based push package had the highest accommodation, satisfaction, and fill rates. The PP0 budget push package had a low accommodation rate but a satisfaction rate between those of

Table S.3
Simulation Performance of ASV Push Package

Push Package	Class IX Parts			EDA Critical Parts		
	Accommodation Rate	Satisfaction Rate	Fill Rate	Accommodation Rate	Satisfaction Rate	Fill Rate
PP0 actual1	25%	39%	10%	9%	73%	7%
PP0 actual2	25%	80%	20%	9%	73%	7%
PP0 budget	8%	54%	4%	5%	50%	2%
PP1 demand based	38%	83%	32%	79%	83%	66%

the two Carson PPs. Clearly, the demand-based push package gave the best simulated performance for the ASV using these data.

Suggested Improvements

The Army should continuously update push packages during the roll-out of new equipment. We offer the following steps to guide the development of a systemic process for improving push packages prior to each new fielding:

- Starting with a list of NIINs that are applied to the newly fielded systems and the initial push package, determine which items are unique to the new system (i.e., new NIINs added to the catalogue). The items that are unique to the newly fielded system tend to drive the initial sustainment challenges.
- As new systems are fielded, the Army should analyze demands from the Army supply system at the supporting SSA/DODAACs and EDA data. The latter can potentially identify new items linked to the newly fielded system (this occurred in the case of MRAP), either because they simply were not listed or engineers did not anticipate a failure mode. Use the EDA data to determine item criticality and the supply data to estimate demand or failure rates (in conjunction with end-item density)

- As additional end-items are fielded, the demand data and EDA data can be integrated into the analysis.
- Focus initially on adds and increases to the push package (errors of omission). As more data are accumulated (e.g., 12–24 months of brigade-level data), decrease or delete items off the original push package if not supported by demands (errors of inclusion). Continue to update the push package even after fielding is completed to adjust ASLs when the equipment changes support relationships due to task force organization or other support missions in contingencies.