

Letterkenny Army Depot: Finance Innovations Support Lean Six Sigma Success

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Note to the Reader

This research case builds upon our initial case, Harvey and Labeledz (2006), *Letterkenny Army Depot: The Army Teaches Business a Lesson in Lean Six Sigma*, a study of leading change and implementing Lean Six Sigma (L6 σ) at a U.S. Army depot. This case goes into more detail than our initial case by describing how depot leaders developed two financial reward programs that provided critical incentives for stakeholders in the depot's successful L6 σ transformation. In addition, the case describes reactions to these programs by stakeholders and value stream members.

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Lean Enterprise Change Research Case Study Series

This case study provides an example of managerial and organizational changes that have accumulated into significant performance improvements. It is one of a series of case studies undertaken by researchers at the Lean Aerospace Initiative (LAI) at the Massachusetts Institute of Technology. LAI focuses on developing, testing and studying the application of lean and other management principles in the aerospace industry. LAI's sponsors, and their improvement initiatives, have created a natural laboratory for studying lean enterprise efforts. The case studies in this series report on interesting and novel applications of lean methodologies at enterprise levels in LAI-sponsoring and other organizations.

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ABSTRACT

As a result of significant dollar savings to the Army and U.S. taxpayers, Letterkenny Army Depot received widespread public recognition in 2005. The depot received a public sector Shingo Prize for applying Lean principles and tools to its PATRIOT missile system recapitalization program. While Letterkenny was Leaning its production systems, the depot implemented two innovative and effective financial incentive systems: one to reward employees, the other to reward customers. The reward systems were innovative because they occurred in a not-for-profit organization and effective because they motivated customers, employees, and unions to embrace Lean.

First, the commander of Letterkenny Army Depot introduced a mechanism for immediately recognizing surplus Net Operating Results (“NOR”) funds generated by Lean savings. Rather than following prescribed budgeting procedures, Letterkenny made sixty percent of auditable surplus NOR available to customers within the current fiscal year. With Lean savings immediately put “back in customers’ hands”, the customers usually chose to repurchase Letterkenny services with their Lean savings checks. The additional services performed by the depot at essentially no cost to the customer provided combat-ready weapon systems to the Warfighter, over and above the quantities planned for the current fiscal year. The depot reinvested the balance of its NOR surpluses in improvements to its facilities and equipment, helping to promote Lean buy-in among civilian employees and their unions.

Second, Letterkenny negotiated a revised process for awarding NOR-related bonus checks to its employees. To further promote Lean buy-in, the depot established a “threshold” approach to determine the size of the employee payments. Letterkenny awarded payouts of \$200/employee for each \$1 million increase in NOR, up to a maximum of \$5 million. By reaching annual Lean-enabled NOR of at least \$5 million each year, Letterkenny employees could and did receive annual bonus checks of \$1,000 in three successive years.

The case describes the organizational conditions leading to these innovations and the responses to them among its customers, unions and headquarters.

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When Col. William Guinn arrived as commander of Letterkenny Army Depot in July 2002, he faced a major problem: his installation was an inefficient Army maintenance facility, and many believed it would be closed through the 2005 BRAC decisions. He had to act quickly if he was to turn Letterkenny around, so he promptly launched a Lean campaign against waste in the depot's largest contract – the RECAP of the PATRIOT missile system during FY 2003. (PATRIOT is an acronym for Phased Array Tracking Radar Intercept On Target.)

Three years later Letterkenny Army Depot gained significant national attention. The depot received the 2005 Public Sector Silver Shingo Prize for its success in applying Lean principles to its recapitalization efforts on the PATRIOT system. Letterkenny utilized several Lean and Lean-supporting practices with the PATRIOT RECAP program, and continues to do so for other Department of Defense projects.

THE ISSUES

By the spring of 2003, Col. Guinn saw that he faced new issues, albeit happier ones. Lean efforts on PATRIOT RECAP already suggested probable savings of \$1 million and a reduction of 2.5 months in delivery time. What should Letterkenny do with this additional profit and favorable schedule variance? How would the depot keep its work force employed once it delivered the contracted systems months ahead of time, and keep every employee on the depot focused on Lean savings?

The authors described the Lean practices and successes at the depot from 2002 through 2005 in their earlier case study entitled *Letterkenny Army Depot: The Army Teaches Business a Lesson in Lean Six Sigma [citation from authors]*. We excerpt from our previous case but still suggest reading the case for more extensive discussion of the depot's successes in assessing its value streams and Leaning its maintenance (i.e., production) and related white-collar work. This case addresses two larger issues: first, how can the military or any government entity share the benefits of Lean with their customers, that is, how can government entities listen to and respond to the Voice of the Customer (VOC); and, second, how can any organization motivate its employees and unions to embrace Lean?

Under Col. Guinn, Letterkenny put two financial incentive programs in place to address these issues. He negotiated an employee bonus formula tied directly to increased efficiency and profitability, a useful but not novel step. (These were Letterkenny's *Surplus NOR Bonus checks* – described initially in the case.) And in collaboration with Dr. John Gray, his deputy, Col. Guinn championed a financing innovation that let the Army gain advantage from Letterkenny's Lean savings more promptly than under standard Army accounting practice. (These were Letterkenny's *Lean Refund* checks – described later in this case.) This case study focuses on these two Lean-supporting actions and the enterprise changes that they ignited. These enterprise responses extend beyond the depot's perimeter, as we discuss in the section labeled *Stakeholder Responses*.

An events timeline of Letterkenny's Lean transformation and related financial incentive programs appears as Appendix 1.

SURPLUS NOR BONUS CHECKS

As is true in other military installations, Letterkenny had a long history of paying bonus checks to its civilian workforce. Prior to the mid-1990s, supervisors rewarded deserving employees based on their individual performance. As in industry, military civilian employee rewards programs took on different designs over time, emphasizing individual versus collective efforts and other factors that were important to management and acceptable to unions. Over time, however, the Letterkenny unions became disenchanted with the element of discretion, seen as managerial favoritism. "Let's just give everybody the same, no matter what it was," the unions said.

Beginning in the mid-1990s, Letterkenny began paying every employee the same bonus based on financial performance of the depot, the NOR. Bonus checks took their inspiration from gain sharing programs introduced in private sector firms. A drawback was that maximum payouts were earned for meeting the depot's NOR target, with no reward for excelling. As Col. Guinn saw the need for broad-based workforce support for the nascent Lean initiative, he met a receptive union audience when he suggested changing to a plan that rewarded success more than merely meeting the plan. This would be the beginning of "Team Letterkenny."

Beginning in FY 2003, the non-discretionary bonus program, or Net Operating Result (NOR) bonus, took on its current shape. (NOR is equal to the depot’s total revenues minus its total expenses for the fiscal year ending September 30.) The bonus program continued to provide for equal dollar payments to each full-year civilian Letterkenny employee (FTE), and pro rated payments for partial-year workers, as it had since the mid-1990’s. Payouts were made in November, just after the depot’s books were closed for the fiscal year in which the NOR bonus is earned. The timing of the bonus payments, just as holiday shopping began, was popular with the south central Pennsylvania workforce. But now the revised program contained a higher, more challenging threshold or “trigger” amount before any payout would be made – the annual NOR target that headquarters expected from the depot, set before the beginning of the fiscal year. The Surplus NOR Bonus Checks were to be paid in increments of \$200 per employee for each \$1 million of NOR over and above the depot’s NOR target for the year (up to a maximum of \$5 million). In 2002, before Lean was implemented, each employee at Letterkenny received a bonus of \$131. (In FYs 2000 and 2001, Dr. Gray mentioned, “the bonus was nearly zero.”) In each of the first three years after Lean was implemented, the program paid the maximum bonus allowed: \$1000 per employee per year.

Table A shows Letterkenny’s targeted and actual NOR components, and the annual NOR Bonus Checks it paid to full-time employees since FY 2002.

Table A: Letterkenny NOR and NOR Bonus Checks

FY ending 30 Sept.:	Budget Revenue (\$mm)	Budget Expense (\$mm)	NOR Target (\$mm)	Actual Revenue (\$mm)	Actual Expense (\$mm)	Actual NOR (\$mm)	NOR Bonus Check / FTE	Total NOR Award (\$mm)
2002	152.5	173.6	(21.2)	168.5	200	(31.5)	\$131	0.139
2003	175.4	169.5	5.9	244.9	232.8	12.1	\$1,000	1.075
2004	310.6	287.5	23.1	299.9	261.7	38.2	\$1,000	1.078
2005	356.1	325.1	31.0	372.6	331.8	40.8	\$1,000	1.104

As the dollar savings of Lean started to be realized in 2003, the maximum Surplus NOR Bonus Checks were paid to civilian employees. The maximum bonus continued to be paid through FY 2005.

Col. Guinn faced another challenge in changing the NOR Bonus Checks mechanisms. Lean initially was focused only on the PATRIOT RECAP work, because he wanted the Lean efforts to start on his biggest program, where “there was more [financial] bang for the buck.” However, not all employees worked on PATRIOT; in each of the past three years, the depot had used direct labor on more than a dozen other weapons or troop mobility systems. In percentage terms, 35% to 75% of the depot’s annual direct labor budgets came from programs other than PATRIOT. Then there were also the “overhead” employees. For employees charging indirect labor or working on one of these other programs, what “line of sight” did they have to the PATRIOT Lean efforts, and how could they drive their annual bonus through their own efforts?

Col. Guinn dealt with this issue of tying goals and rewards to individual work in two ways. First, all employees were required to participate in early Lean events, whether or not they worked on the PATRIOT system. Col. Guinn’s position was: “If you’re going to get engaged, we’ll all get engaged.” The Lean efforts were only a couple of months old when Dr. Gray participated in his first rapid improvement event – in the paint area. So too did Col. Guinn’s administrative assistant and many other indirect employees, some more than once. “They were down on the shop floor, and all of a sudden they start ... coming back and saying ‘if we could just get them a fork lift, we could get a lot more work [done]’. It’s really been a neat thing to watch white collar and blue collar folks [develop] an appreciation of what the other does,” Dr. Gray noted, “and how each can help to reduce waste and increase efficiency that can capture the additional NOR that reflects faster - better - cheaper service to Letterkenny’s customers and leads to larger bonus checks for its employees.”

Second, Col. Guinn extended the Lean focus to other areas of the depot as soon as external (Simpler Consulting) and internal (Letterkenny’s Core Lean Team) resources permitted. By FY 2004, Lean was extended to three more PATRIOT programs, Special Forces’ Ground Mobility Vehicles, Avenger missile systems, Biological Integrated

Detection Systems, and newly-acquired HMMWV RECAP¹ work. Letterkenny also deeply promoted Lean in its non-manufacturing support functions. Nine rapid improvement events were conducted in the administrative functions associated with PATRIOT. Other Lean events in administrative areas recognized cross-functional spillover effects and reinforced the message that “we’re in this together” when it came to Lean improvements, the scope of surplus NOR capture, and the amount of Surplus NOR Bonus Checks.

THE BASICS OF DEPOT FINANCES

As defined previously, a depot’s NOR equals its total revenues minus its total expenses for a September 30-ending fiscal year. The Army Materiel Command (AMC) sets each depot’s direct labor and materiel rates for a fiscal year based on cost projections and rate recommendations provided by the depot. These rates are submitted eighteen months before the fiscal year begins. In addition, the depot’s expected overhead costs are allocated across its share of the expected direct labor hours authorized by the President’s budget. The business for which the depot has contracted and its AMC-approved rates lead, respectively, to the facility’s expected annual revenues and expenses. The depot’s projected net result is its target Net Operating Result (NOR) for the year.

Like other depots, Letterkenny sells its services through fixed price contracts: it receives the fixed price for its services, whether its actual costs turn out to be higher or lower than the fixed price. If the depot *actually* reduces its expenses in a given year, it will increase its NOR for that year. Under Army policy, however, depots are not designed to “make money” over a multi-year period. Instead, after each September 30 fiscal year closes, two accounting operations occur at the depot. The depot closes its books for the just-concluded fiscal year (for example, the FY 2002 books close during the early months of FY 2003). Over the next few months, the depot calculates prospective rates for the fiscal year that is two years after the current fiscal year and loads them into the Army budget system (for example, proposed FY 2005 rates are loaded around the middle of FY 2003). In the beginning of the following fiscal year (i.e., early in FY

¹ Under a RECAP contract, a depot completely disassembles the system, cleaning and/or replacing every component, subcomponent and part, and reassembles and tests the equipment: “zero miles and zero hours.”

2004), AMC reviews and adjusts the rates proposed by its depots for the next-to-begin fiscal year (i.e., for FY 2005). The overall intent is to hold rate growth fairly steady (i.e., predictable) while “giving back” to depot customers most of the positive NOR previously earned by the depot or, in the case of negative NOR, surcharging future depot customers. In this example, FY 2003 serves as the work period in which FY 2002 numbers are closed out and FY 2005 rates are estimated, proposed and “locked in” at the depot, and FY 2004 as the period in which AMC finalizes the FY 2005 rates, budgets and NOR targets of all depots.) Thus, positive or negative variance from a depot’s targeted NOR in a fiscal year is recognized and reversed through rates applicable to the work it performs three years later. AMC’s intent is to maintain each depot’s multi-year Accumulated Operating Result (“AOR”) near zero; that is, to target the ongoing sum of a depot’s annual NOR amounts to be as close to a zero balance as possible.

By analogy, FY 2002 rates were themselves depot-proposed in FY 2000 and AMC-finalized in FY 2001 based on the depot’s performance in FY 1999 and its AOR at the end of FY 1998. Thus, a depot’s performance in any fiscal year sits in the middle of a seven-year period. That year’s labor rates and NOR targets result in large measure from activities during the prior three years, and depot performance in that year kicks off another three-year cycle leading to its future rates. With respect to performance in FY 2002, the retrospective and prospective effects span seven years, from FYE 1998 AOR through FY 2005 rates.

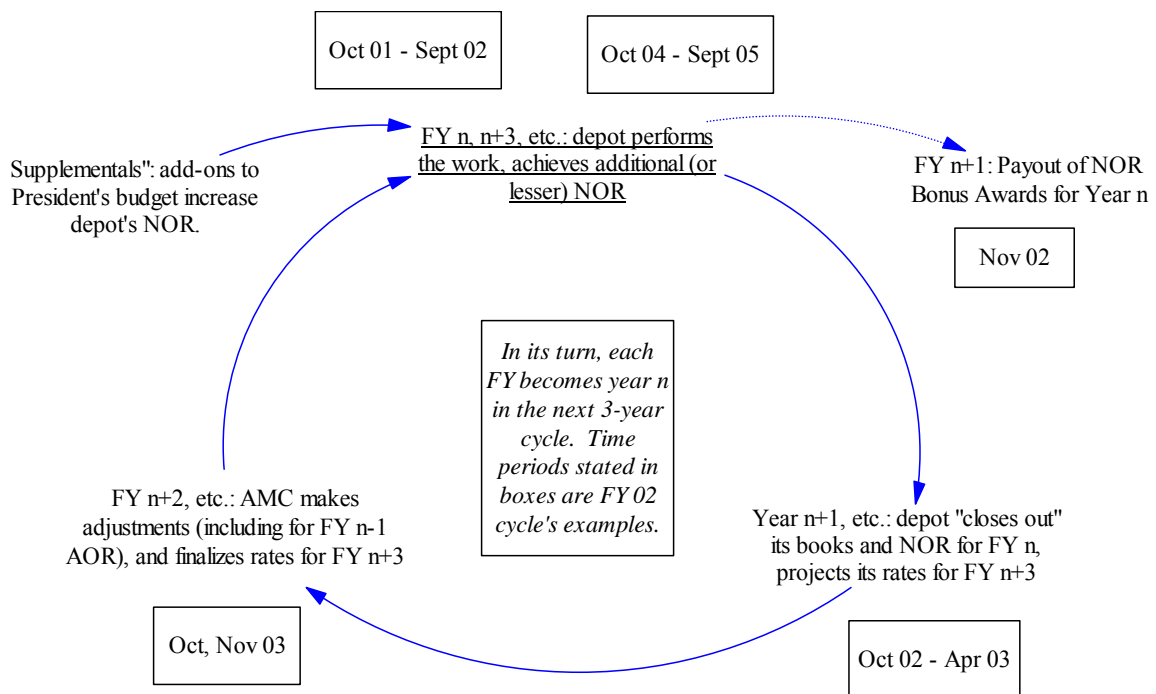
Figure A below combines the recurring timelines of depot performance, labor rate estimations and adjustments in generic terms. Year “n” is the focal year of the generic cycle, and dates relating to FY 2002 as year “n” are inserted as a specific example.

- To understand the prospective rates impact of FY 2002 on future rates, trace the cycle’s path clockwise from the underscored text for year n (here, October 2001 through September 2002) through depot books-closing activity (early in FY 2003 for FY 2002) and rate proposal activity (later in FY 2003 for FY 2005) and then to AMCOM approval (early in FY 2004) of the depot’s labor rates and its NOR target for the next-to-begin fiscal year, i.e., for year n+3 (here, October 2004 through September 2005).

- To understand how FY 2002 rates themselves were calculated, trace the cycle again from the underscored text, but now using FY 1999 as year n and arriving at FY 2002 as year n+3. The starting AOR value to be taken into account this time is the depot's accumulated operating result at the close of FY 1998.

Thus, every fiscal year's labor rates and NOR targets stand in the middle of two three-year moving cycles. Here FY 2002 stands between rate-creating activity for that year in fiscal years 1999 through 2001, plus AOR at the end of FY 1998; and rate-creating activity in fiscal years 2002 through 2004 that is based on FY 2002 performance and AOR at the end of FY 2001 and that leads to FY 2005 rates.

Figure A. The Multi-year Cycles of Depot Performance and Rate Estimation and Adjustment



In Appendix 3, Figures E and F present the same information as Figures A and B, but in a color-coded flow chart format which some readers may prefer.

LEAN REFUND CHECKS

Initial data reported on Leaning the PATRIOT RECAP program suggested that Lean had freed up about 1200 man-hours of “touch” labor, leading to probable savings at the end of FY 2003 of over \$1 million in costs. These savings appeared real, but they would not be “realized” savings unless Letterkenny could answer three key questions: What were the actual Lean dollar savings, net of Lean-related expenditures? What would the freed-up employees do over the remaining months of the fiscal year? What would Letterkenny do with the savings? The answers to these critical questions follow.

Net Lean savings. Soon after the Lean kickoff, the Letterkenny Directorate of Resource Management (i.e., its finance office) developed accounting procedures to determine auditable savings flowing from Lean. In the months and years that followed, depot employees conducted nearly 200 rapid improvement events (“RIEs”). Each RIE actively involved 10 team members: 3-4 employees from the functional area being Leaned, 3-4 employees from other locations in the depot, and 3 members from the Lean Core Team. At the end of each RIE, the Lean Core Team members validated savings by performing detailed “before” and “after” time, space, and dollar calculations. Savings were audited and verified by the depot’s Resource Management Directorate.

Letterkenny’s Shingo Prize application details the procedure:

Monthly, using an off-line database, definitive Direct Labor Hours (DLH) and materials savings are tabulated as a direct result of Lean activities held. All savings are auditable hard numbers. Savings are based on 100-percent DLH savings and program duration (short term: less than one year; or long term: multi-year). Lean costs are considered as one-time expenses within a given year and savings are realized over the period of the program for no more than five years out. Net Lean savings are calculated by subtracting Lean costs from the savings.

Both the scope and the quantity of RIE initiatives, and the rapid development of this audit and verification process for Lean savings, demonstrated the “just go do it” spirit that pervaded Letterkenny and accelerated Lean’s momentum within the depot.

Continued employment. Col. Guinn committed at the Letterkenny Lean kickoff that the Lean initiative would not lead to layoffs of civilian employees.² If freed-up employees could not be used in other areas, they still would be paid, but savings wouldn't be counted because they were not *realized* savings. To make any claimed manpower savings tangible and creditable, Letterkenny stipulated:

If during an RIE, it is determined that a FTE person(s) will no longer be required to perform the work, the Lean Core Team captures the savings ... [T]o take credit for FTE redeployment, the MRO shop supervisor must provide a specific name and a specific work site that the person has been moved to.

Through September 30, 2005, the depot redeployed 62 full-time employees at an estimated annual savings of \$ 4.7 million.

How were freed-up employees re-deployed? At the outset, most of the workers were deployed onto what was essentially an extension of the successfully- and early-closed contracts. (As described below, the depot performed additional work for the customer at no charge, keeping its workforce fully employed.) As time went on, other Letterkenny contracts, including newly-acquired business, absorbed the freed-up labor. The depot's Lean success with one of the add-on businesses, the Biological Integrated Detection Systems Program, is discussed below in the *Stakeholder Responses* section. The central role that add-on work from existing and new customers (i.e., business growth) played in Letterkenny's continuing Lean success is considered more fully in the pages that follow.

Use of Lean-generated Savings. The first Letterkenny customer to benefit from its Lean efforts was the Lower Tier Air and Missile Defense Project Office (LTPO) under Col. Tommy Newberry. A PATRIOT battery consists of 40 missile launchers, but Col. Newberry's budget permitted recapping only 36 of them. The depot's Lean changes were on track to complete those launchers 2.5 months (20%) ahead of schedule with \$1.2 million of direct labor unused. Because the RECAP contract was on a fixed price basis,

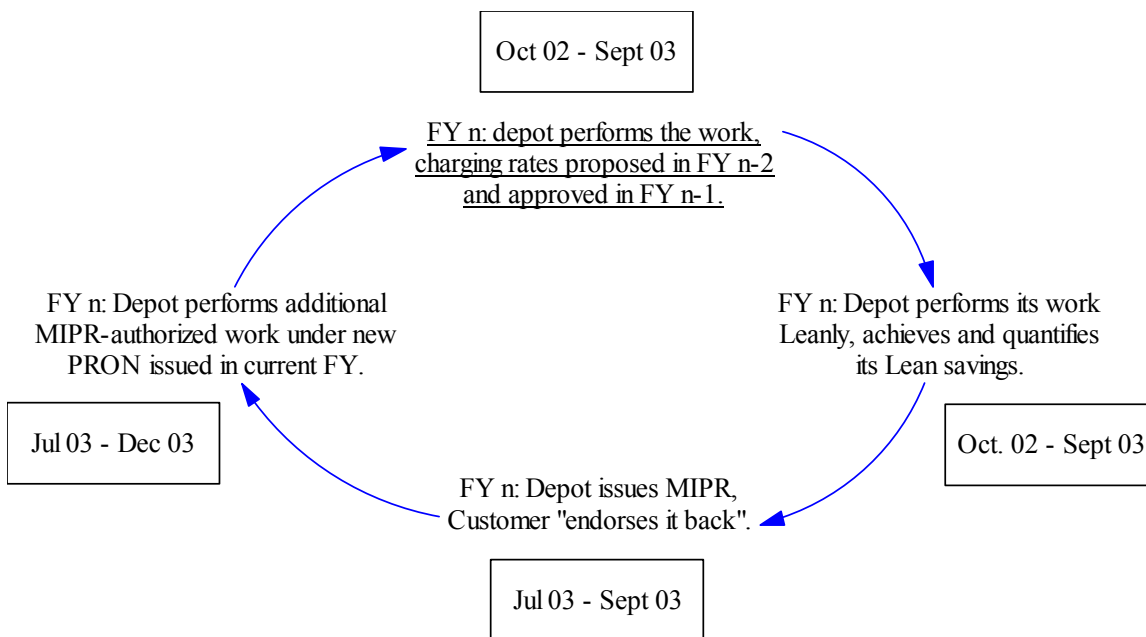
2. A "no layoffs" commitment often is found in Lean campaigns and is expected of its clients by Simpler Consulting. Letterkenny had provided for the ramp-up of labor demands by increasing its use of contract labor. Contract labor swelled from 50 to 700 people within a total workforce of 2000. Contractors are mostly blue collar, temporary labor with an understanding that their tenures are at greater risk if business demands ebb. Higher numbers of contract laborers reduce the risk of layoff for career civilian employees in the military and give the depot more flexibility during peacetime periods.

the unused funds were Letterkenny's to keep. In fact, under Army regulations, the depot could not simply give the unused dollars "back" to its customer, and it had no authority to perform additional work for LTPO.

Col. Guinn approached his customer with a suggestion: Letterkenny would memorialize a portion of the savings on a form known as a Military Interdepartmental Procurement Request or "MIPR". (A MIPR serves as a "check between military agencies".) If LTPO would endorse the "check" back over to Letterkenny with a request for added RECAP work, the depot could provide more services at no charge. These services would be performed under a new Procurement Request Order Number ("PRON") opened during the current fiscal year, even if the work itself extended by a few months into the next fiscal year. This procedure meant that the depot would receive both a request for added work and a "check" to fund it. Not only did Col. Newberry like the idea of "free work," but he found \$300,000 in additional LTPO funds to supplement Letterkenny's Lean savings. The result: Letterkenny was able to RECAP all four remaining launchers for the PATRIOT battery. The Warfighter had received additional weapon systems at "no" added cost.

Letterkenny's customer refund innovation short-cut the Army's multi-year AOR smoothing process by putting spendable current year budget dollars back in the hands of current customers. The depot translated the additional dollars into additional, current weapon systems deliveries to the nation's Warfighter customers. Figure B below shows this short-cut superimposed with arrows on a portion of Figure A. In this example, fiscal year n is represented as FY 2003, the first year in which Letterkenny employed its finance innovation. Note that all entries in Figure B refer to that single fiscal year, rather than to multiple years of a three-year cycle as in Figure A.

**Figure B: Letterkenny’s Financial Short-cut:
Rapid Realization of Emerging Savings**



Since 2003, Letterkenny has used this approach three more times to put additional spendable budget dollars back in customers’ hands. Letterkenny’s procedure identified refund amounts on a timely basis so customers could spend their refund dollars during the current fiscal year. The depot made available 60% of its savings dollars to its customers; and its leadership decided to retain the balance as a hedge against any savings setbacks and for its investment in depot infrastructure. Table B shows the savings portions passed back to each customer and the dispositions of the refunded funds. The depot-developed Lean savings Flow Chart appears in Appendix 2.

Table B: Letterkenny’s Lean “Refund Checks”

Refund Amount (\$ mm)	Affected Program	Benefiting Customer	FY	Additional Work provided through re-used "Refund"
1.20	PATRIOT Recapitalization	LTPO, COL Tommy Newberry	2003	Rebuild 4 PATRIOT Launchers
0.99	Ground Mobility Vehicles	SOCOM, LTG Philip Kensinger	2004	Complete 18 GMVs at no cost
2.50	PATRIOT and Avenger Missile Systems	IMMC, Messrs Chapman, Hartwell	2004	Financed other unfunded Army maintenance needs
0.30	Biological Integrated Detection Systems Program	Joint PM Biological Defense, COL Dan K. Berry, M.D.	2005	Demil of 40 M31 BIDS at no cost

The depot-retained 40% share was invested in facilities improvements. Colonel Guinn stated that Letterkenny “paved every road and painted every building” based on its Lean savings. Such tangible investments in the BRAC-threatened installation and improvements in work conditions contributed to Lean acceptance in the workforce, reinforcing the message of the NOR Bonus Checks.

Letterkenny did not simply transmit a MIPR and then provide additional, cost-free services to its customers in “stealth” mode. Col. Guinn had more than the heart of a soldier; he also had the eye of a marketer. His goal, and the depot’s, was to save Letterkenny from BRAC 2005. Letterkenny needed to publicize its new Lean productivity throughout military and political circles. To this end, Col. Guinn worked with Letterkenny’s Lean Core Team, its Public Affairs Office, and shop floor workforce to make the refunds “larger than life.” Col. Guinn handed over surfboard-sized “refund checks” to customers in well-publicized ceremonies. Decision-makers — whether prospective military customers or BRAC commission members and staff — had to hear about Letterkenny’s turn-around. Satisfied customers such as Col. Newberry helped out:

Letterkenny is the first depot to achieve these accomplishments. I applaud the hard work that employees at Letterkenny have accomplished. Letterkenny is to be commended for sharing these savings with us. This will undoubtedly allow us to get more bang for the PATRIOT RECAP buck and Letterkenny will see more PATRIOT RECAP work heading their way sooner than expected.

Lean savings checks helped to build customer loyalty, as when LTPO staff determined that the best way to use the refund check was to “endorse it back” to Letterkenny to fund the RECAP of additional Launchers. Figure C shows a surfboard refund check.

Figure C: COL Newberry Holds the First Lean Savings Check



Letterkenny tried to leave little to chance in gaining customer “endorsements back” of their MIPRs. The depot developed new procedures as its Lean sophistication grew:

Coordination between the customer and depot must be performed with the intent for both [of us] to achieve a benefit (win-win). The customer gets the benefit of more work for the same money and the depot gets more work. A key factor driving a spirited workforce to achieve savings is that operative and fiscal stability within the planned depot budget cycle must be maintained. This is best achieved by joint agreement that all direct labor hour savings is returned to the depot. Either renegotiation of the existing PRON for additional work/services or funding of a new program for an equivalent direct labor hours workload before the savings are returned accomplishes this.

In three of four cases to date, Letterkenny’s customers’ have endorsed back their savings checks, authorizing additional “free” work beyond the scope of the initial contract.

Customer loyalty and “endorsement back” of the MIPR/surfboard checks were not just fortunate developments for Letterkenny, but necessary ones. In other circumstances, an employer might lay off “Leaned” workers to reduce its labor expense and thereby increase profitability. But Col. Guinn’s promise of “no Lean layoffs” meant

that he could not increase the depot's NOR by simply reducing labor expenses. The additional work due to "endorsement back" did not add to the depot's top line, nor did its Lean labor savings fall directly to its bottom line. The "endorsement back" of MIPRs and the additional labor requirements funded by them simply kept Letterkenny's direct labor productively working and made them more receptive to the Lean efforts.

Lean-created Capacity and New Business Development. John Gray and his finance staff knew, however, that Letterkenny's receipt back of endorsed refund MIPRs did not represent any new revenues. In order to achieve surplus NOR, Letterkenny had to bring truly new work to the depot or receive supplemental-to-budget funding. That work would generate additional NOR to boost the NOR bonuses to employees and continue to align the workforce with Lean. To quote Col. Guinn, "nothing brings work like success ... with success, business will come knocking at your door."

New fixed price contracts bring two contributions to depot NOR. First, the re-engagement of freed-up direct labor means that the depot receives revenues for those same hours under both the original and the added program. Because the depot's fixed overhead already was covered under the first contract, overhead rate payments under the follow-on contract fall directly to NOR.

"Supplemental allocations" also add to NOR. As John Gray explained, All of [a depot's] overhead accounts already are paid out of the President's budget number by the time "supplementals" come along. That's where you're making a lot of money [i.e., NOR], because you're recovering the overhead in the added workload from supplementals as well as in the base program upon which you built your rate. "It's gravy" just like in industry, when you've already covered your fixed costs.

Even before Col. Guinn arrived at Letterkenny, Mark Sheffield, the depot's Chief of Staff, had been tasked to uncover and develop work from customers "new" to the depot. Sheffield, serving in a business development role, promoted the depot's maintenance competencies to prospective customers. Over time, the Lean successes achieved at Letterkenny added another arrow to his marketing quiver. During FYs 2003 through 2005, the depot added work on material handling equipment (forklifts and 7.5 ton cranes), mobile kitchen trailers for the Army, and tactical wheeled vehicles

(HMMWV's)³ for all the armed services. From FY 2002 through FY 2006, the depot's business increased from \$123 million to almost \$500 million in revenues and from 0.9 to 2.4 million of labor hours. Employee headcount increased 8%, with additional man hours supplied by contractor hires. (The substantial increase in depot maintenance budgets particularly through supplemental budgets across the Army during these years should be noted.)

STAKEHOLDER RESPONSES TO LETTERKENNY'S ACTIONS

Looking beyond the depot itself, how did Letterkenny's Lean transformation affect others in its value stream? Specifically, what impact did the depot's financial innovations have on its customers, unions, and headquarters?

Letterkenny's customers. Did current customers "come to expect" refund checks and were they motivated to contract with Letterkenny because of the refund checks? Dr. Gray reported a mixed response: one or two customers made real-time inquiries, but the history of depot refunds seemed too new to spark recurring expectations.

Col. Dan Berry received Letterkenny's fourth surfboard check: \$300,000 in November 2005. Col Berry headed the Joint Program Executive Office for Chemical and Biological Defense, and the refund represented 60% of Lean-enabled savings that Letterkenny had achieved on its Biological Integrated Detection Systems ("BIDS") program. For Col. Berry and Dave Whitcraft, the BIDS Team Leader, the refund was a "godsend." At the time, the program had an immediate mandate, but no funding, to retire and reprocess components of the first generation of BIDS. The Letterkenny refund provided those needed dollars for the mandated activity.

The BIDS experience from 2001 through 2005 is even more instructive on the mutual customer-depot benefits of L6σ. In 2001, under pressure to build a second pre-planned product improvement (P³I) BIDS company, the Joint Program Office looked for prospective industry or military manufacturing sites. (The P³I effort would have exceeded the R&D office's production capabilities.) Letterkenny offered BIDS the production capacity it needed; the offer was made prior to Lean initiatives at the depot.

³ One week before this case study was finalized, as one of several Army recipients Letterkenny received a 2006 Public Sector Silver Shingo Prize for its HMMWV RECAP work.

Team Leader Whitcraft reported that BIDS first learned of Lean when Letterkenny called in mid-FY 2004 to discuss how lean manufacturing could save the program money, and recommended a robotic arm to increase the precision and efficiency of the shelter drilling operation. BIDS agreed to buy the robotic arm in advance of any possible savings. “It was encouraging to know that they [Letterkenny] were looking to save money, cost savings that were large compared to what we could achieve in-house.” As a result of the robotics, Letterkenny ramped up from 7.5 systems per month built by nine employees to 8.5 systems per month using just five workers, nearly a sixty percent increase in productivity. And the holes were “all in the right place, every single time.” BIDS’ early investment in its supplier led to cost and quality improvements, benefits which BIDS continues to receive today.

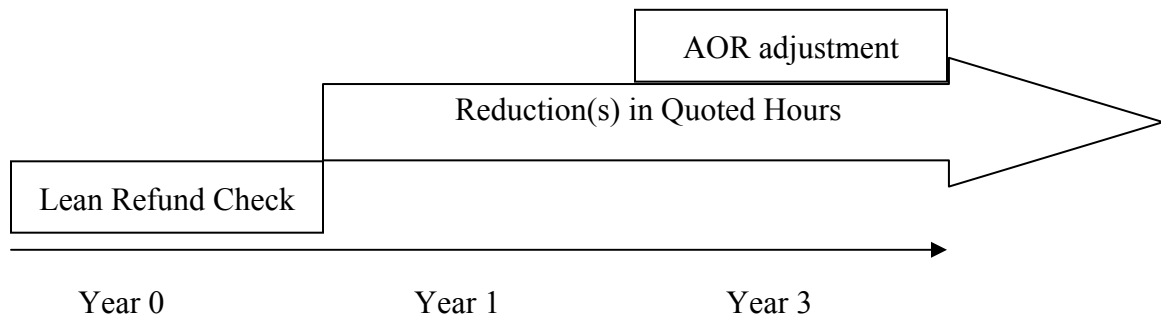
The BIDS office was “pleasantly surprised and very pleased” with the refund from Letterkenny, Col. Berry stated. “We did not ask them to reduce their costs. They went out and did it on their own after the contract was signed. People who act like that want a long-term relationship [with their customers]; it’s very wise.”

What about the prospects of future refund checks and how the checks might influence the BIDS customer? “Letterkenny already had reduced its rates FY 2006 over 2005 [as a result of Lean, thus providing BIDS] a more permanent type of refund,” Dave Whitcraft observed. Even if a business case analysis will be required in future years in sourcing hundreds of funded BIDS systems, “Letterkenny has [gained] a clear advantage with a definite track record that Lean manufacturing has reduced cost. It is positioned very well.”

The Lean-enabled savings may presage even greater “refunds” for BIDS and for other Letterkenny customers. As mentioned above, “new” business like BIDS, performed Leanly, added to the Letterkenny’s NOR in the current year as the depot used freed-up capacity to accommodate it. The AOR adjustment for a Fiscal Year’s NOR variance comes into play two years later on top of the reductions in quoted labor hours first passed through to the customer in the intervening Fiscal Years, as mentioned by Mr. Whitcraft. Because the Army rate-setting system generally requires each depot to “give back” surplus NOR, in later years customers may receive added benefits from AMC-directed rate-per-hour reductions at Letterkenny and other depots that embrace

Lean. Taken together, the Lean savings realized and converted through business growth accumulate as shown in Figure D.

Figure D: Additive Lean Financial Benefits to Customers



Letterkenny's unions. How have Letterkenny's unions responded to the surplus NOR Bonus Checks program? Dr. Gray acknowledged some pressure to raise the \$1,000 per employee ceiling: "Yes, because last year we were up \$5 million on top of that [i.e., the first \$5 million in Surplus NOR]. The unions came to us and said, 'why don't we keep on going?'" Management proposed and all agreed to add another \$250,000 in bonus awards but these would be awarded to the top performers in the workforce rather than distributed evenly among all civilian employees.

Other forms of reward have increased employees' buy-in, beyond the Bonus Checks program. Employees were acutely aware of their importance to the war effort and their support of the soldier in the field. Letters and pictures from soldiers whose lives were saved from roadside bombs by up-armored cabs provided important patriotic motivation. So did the re-investment in Letterkenny facilities made possible through Lean savings and the retention of well-paying jobs when BRAC closure was avoided.

Headquarters. What are the longer-term implications of Lean at Letterkenny Army Depot, and of its related finance initiatives? Three historical factors give pause:

- The time period traced in this case was one of burgeoning depot business opportunities and swelling supplemental appropriations on top of sizeable Presidential budgets. What happens to the motivation of leaders and workers to embrace Lean once supplemental appropriations disappear and defense budgets begin to wind down?

- Historically, it appears the multi-year smoothing process inherent in zero-balance AOR targets and rate adjustments has accomplished its purpose – to make the depots breakeven entities within the Army’s accounting system. How will “pegging” of NOR Bonus Awards to surplus NOR amounts, and the “short-cutting” of the AOR smoothing process, impact depot performance in the future?
- There has always been a difference of opinion on individual incentive pay versus equal bonuses between employers and unions. This was an issue at Letterkenny. How might NOR bonus awards change as the Army moves toward “pay-for-performance” compensation plans?

Officials at AMCOM provided their assessments as follows.

Col. Robert English served as depot commander at Letterkenny from 2000 through 2002, just before Col. Guinn’s tenure. Since his departure in July 2002, Col. English served as head of the Maintenance Directorate and then as Chief of Staff at AMCOM. As a leader both at a depot and at AMCOM headquarters, Col. English offered a unique, informed perspective on the finance mechanisms that supported Letterkenny’s Lean effort. He spoke wearing both a customer and an oversight hat.

Wearing his “customer” hat, Col. English indicated that Letterkenny’s ability to translate Lean-generated savings into no-charge additional services “absolutely instills more confidence in depots as an efficient, best value supplier.” He believed the customer refunds affect behavior of Program Managers (PMs), for whom cost usually is the most important criterion when sourcing maintenance work. Although depots do not often compete directly with one another, PMs may place maintenance orders with civilian companies (subject to limits under federal law). Depots’ ability through Lean to generate such savings and their willingness to refund those dollars currently can operate together to make depots more competitive with the private companies. The Letterkenny financial innovations are “absolutely... better for the Army,” Col. English said.

Col. English also spoke wearing his AMCOM depot-oversight hat. He confirmed that the success of Letterkenny’s customer refund innovation seemed to depend on the availability of additional maintenance work, which would fill the gap when the initial direct workload at a depot had been Leaned successfully. He indicated that the “white collar” areas which were especially amenable to Lean efforts were those in which insufficient numbers of properly-skilled indirect employees were on board to accomplish

their required tasks. There, reductions in administrative “waste” would permit white collar areas to complete their essential duties within their current workforce numbers.

He indicated that “all” Army installations were currently pursuing Lean efforts and savings, and that the Corpus Christi depot, following Letterkenny’s lead, had issued its first customer refund check.

Marilyn Phillips, Chief, Depot Maintenance Programming for the Integrated Materiel Management Center, AMCOM life cycle management command, discussed the Letterkenny finance practices. In her post, Ms. Phillips has responsibility for the system administration of depot labor and materiel rates and their budgets. The life cycle management command, or “LCMC”, has merged program sustainment and project management responsibilities at AMCOM and at its headquarters, Army Materiel Command. Project managers or executive officers fund depot work; they “give me the money,” and her staff loads their allocations into the Army’s computerized budget system. Other commands also may decide to fund work at Letterkenny, as has been noted; in fact, AMCOM supplied Letterkenny with 60% of its workload in FY 2006.⁴

Ms. Phillips confirmed the foregoing general description of depot rate setting, NORs and AORs (Figure A) from the headquarters point of view. She then addressed how Letterkenny’s refund check innovation had affected others in its value streams. Project managers, she said, had to “see it as a great and wonderful thing. In the past, project managers didn’t understand that depots could be efficient.” Resource managers, charged with the overall financial affairs of five Army depots, might take a different view of a depot’s localized re-use of its Lean savings, but they have not raised that concern to date.

Would the NOR Refund Checks practice “work” in years when Army budgets and supplemental appropriations were not at their levels of recent years? Did she “like” the refund practice, and should other depots follow it?

Concurring with Dr. Gray and Col. English, Ms. Phillips indicated that the first question was a difficult one. As this case shows, **the generation of surplus NOR by a depot requires both efficiency improvements and the capturing of additional work**

⁴ Such percentages may vary during a fiscal year as various commands increase or decrease their requirements for a depot’s workload. In FY 2005 or as of early in FY 2006, for example, this percentage was closer to 30%.

for its freed-up labor to perform. The dynamics of this financial shortcut are unclear when funding for such work is level or declining. All three individuals pointed out that a depot's sources of additional work were not limited to work that had been traditionally performed at installations. Each noted the depots' increased opportunities, provided by using Lean thinking and practices, to first make them more competitive and to partner with private industry. Through Lean and other performance improvement efforts, depots might efficiently subcontract work from military contractors or even perform production tasks on non-military contracts.

Once Lean helped make it more efficient, Letterkenny had found a way through its NOR Refund Checks to do two things, Ms. Phillips observed. It had served its customers better, providing them with more products at no additional cost. And, unlike other depots, it had found a way to very effectively market its growing efficiency. What's not to like, she asked?

RISK AND REWARD IN DEPOT INNOVATIONS

Letterkenny Army Depot received the public sector Shingo Prize and widespread public recognition for applying Lean principles and tools to its PATRIOT recapitalization program. While it was Leaning its production systems, the depot implemented two innovative and effective reward systems: one to reward employees, the other to reward customers. The reward systems were innovative because they occurred in a not-for-profit organization, and they were effective because they motivated customers, employees, and unions to embrace Lean.

Each of Col. Guinn's Lean-related decisions carried some risk. The agreement to base employee Bonus Checks on *surplus* NOR could have backfired if Lean-enabled savings had fallen short. The decision to share 60% of the depot's savings with customers immediately upon their calculation, and to retain 40% for depot purposes, could have been challenged within the Army, an institution that was and is still young in its pursuit of "entrepreneurial" administrative behavior. Freeing up direct labor through Lean, without being certain which program or service might reengage it, clearly risked depot morale and challenged inter-service boundaries.

Risk-taking seemed to come naturally to Col. Guinn even though he gained support from several mentor-superior officers. He did not seek prior approval for many of his decisions; as John Gray says, “there were only two possible responses, and only 50% of those were attractive.” Gen. Kern, commander of Army Material Command at the time, later “gave him top cover.” And as Dr. Gray asked rhetorically, “why not [refund the Lean savings]? Otherwise, what will happen to that \$1 million of Army money? ... And when you have that sort of 'top cover', nobody's going to come down and say 'you're doing a bad thing.'”

SUMMARY

This case described the Lean-related financial changes at Letterkenny Army Depot, the organizational conditions leading to these innovations, and the responses to them among its customers, unions and headquarters.

Letterkenny first negotiated a revised process for awarding NOR-related bonus to promote Lean buy-in. It established a threshold approach to determine the size of the employee payouts. By achieving annual Lean-enabled surplus NOR of at least \$5 million, Letterkenny employees could and did receive annual bonus checks of \$1,000 in three successive years.

Letterkenny then introduced a customer-focused budget innovation, its use of “surfboard checks” to publicize its return of Lean savings to its customers within the current budget year. The case traces the military finance system in which this innovation arose: the flow of contract revenues and costs, the proposal and approval of annual depot rates, the development of positive or negative annual NOR, and the making of labor rate adjustments by headquarters to target depot breakeven AOR.

What Letterkenny did in embracing Lean, and then earning, creating and publicizing its surfboard Lean refund checks, was three-fold. First, it short-cut the Army’s multi-year AOR smoothing process by putting spendable budget back in the hands of current customers. Second, it translated that additional spendable budget into additional, current weapon systems deliveries to the nation’s Warfighter customers. Third, by aggressively marketing its improved productivity through the surfboard checks, the depot gained national attention as the “The New, Lean Letterkenny” and saved itself

from the 2005 BRAC list. In fact, as a result of 2005 BRAC, Letterkenny was awarded additional business from other BRAC-downsized depots and installations. The financial innovations supported, and were in turn supported by, the depot's Lean vision and execution.

Appendix 1

Time Line: Lean Transformation and Finance Innovations at Letterkenny LEtterkenny Arrmy Depot (“LEAD”)

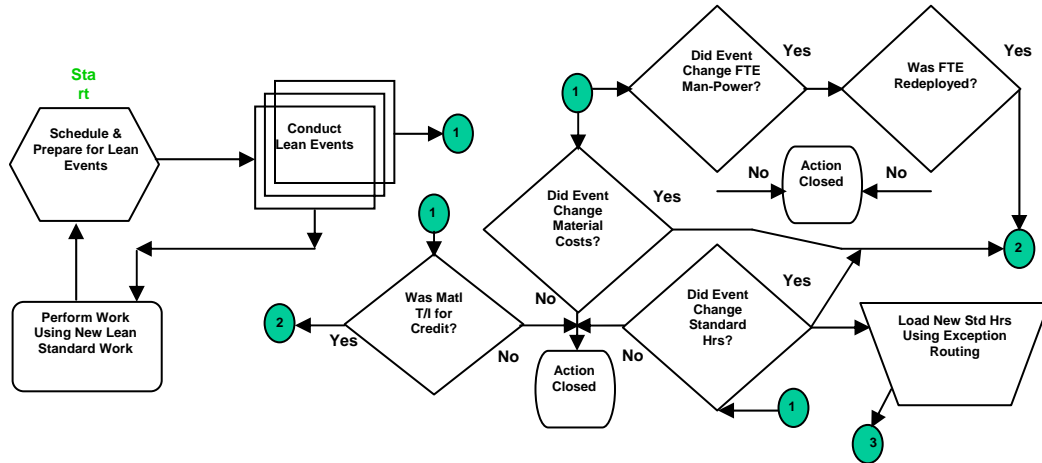
October 2002	Col. Guinn reinvigorates Lean at LEAD: PATRIOT Launcher undergoes a value stream analysis.
October 2002 through October 2003	Lean is extended to 3 more PATRIOT contracts.
December 2002 through Sept. 2005	179 rapid improvement events conducted at LEAD.
Spring 2003	LEAD agrees with unions on a Surplus NOR program design for Lean-supporting employee bonuses.
Summer 2003	LEAD develops its auditable savings method and its customer refund process.
September 2003	First customer refund: \$1.2 mm on PATRIOT RECAP.
November 2003	LEAD pays out the first of three successive years of \$1,000/ employee Lean-related NOR Bonus Checks.
February 2004	Second customer refund: \$0.99 M check to Special Operations Command (SOCOM) Ground Mobility Vehicles.
August 2004	Third customer refund: \$2.5 M check to Aviation and Missile Command (AMCOM) for Lean savings on the PATRIOT and Avenger missile systems.
March through May 2005	LEAD prepares lean production line for HMMWV RECAP contract.
September 2005	Letterkenny avoids the 2005 BRAC list as approved by the President.
September 2005	Col. Swenson continues Lean effort at Letterkenny as successor to Col. Guinn.
October 2005	Col. Swenson and key Lean employees accept the 2005 Shingo Public Sector Silver Prize.
November 2005	Fourth customer refund: \$0.3 M check to Joint Program Executive Office for Chemical and Biological Defense for Lean savings on the Biological Integrated Detection Systems program (“BIDS”) units.
January 2006	LEAD cumulative customer refunds and facility reinvestments exceed \$13 M.

Appendix 2

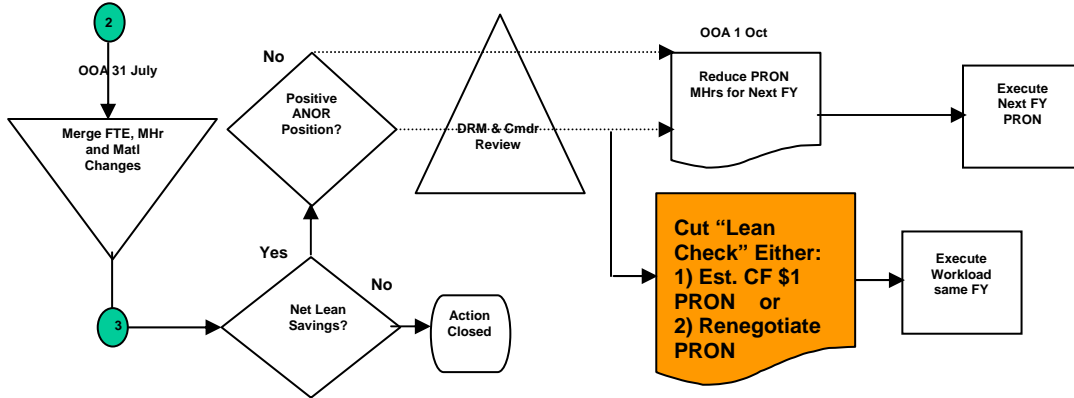
Letterkenny's Flow Charts for Lean Savings

The flow chart which Letterkenny developed to depict its identification and disposition of Lean savings appears below. For a more complete discussion of its steps, see pages 35-37 of the depot's Shingo Prize Achievement Report.

Depot Lean Event Related Savings Identification



Savings Finalization & Customer Savings Return Process



Appendix 3

Alternate Versions of Figures A and B

In understanding a depot's procedures for rate-setting and accounting for annual and accumulated operating results, some readers may prefer the flow chart drawings that follow in Figures E and F to the cycle drawings of Figures A and B above. Each pair of drawings, whether in cyclical or flow chart format, is intended to depict the same practices; i.e., those described in the pages 8 through 14 of the case study text.

Figure E below combines the recurring timelines of depot performance with labor rate estimations and adjustments, using as an example FY 2002 depot performance and the effect of that performance on rates set in FY 2003 for review and approval in FY 2004 and depot use in FY 2005. Earlier, as shown, FY 2003 rates were themselves proposed by the depot in FY 2001 based on its performance in FY 2000 and its AOR at the end of FY 1999. The rates proposed in FY 2001 were "locked in" to an Army computer system, and then reviewed and approved or adjusted at its headquarters, Army Materiel Command, early in FY 2002. Thus, each fiscal year's labor rates and NOR targets are based on a multi year moving cycle. Overall, the retrospective and prospective effects span seven years, FYE 1999 AOR through FY 2005 rates. **As each fiscal year unfolds, it simultaneously contains both a "Performing" component in which the depot performs customers' work and an "Accounting" component in which the depot closes out its books for the prior year and builds and "locks in" its proposed rates for the year after next.**

Figure E is best viewed in color. In it, we consistently identify each activity that relates to a fiscal year in a distinct color. For example, each activity that relates to FY 03 is marked in red, which is the color "of" that year. Please contact the first author if you need but do not have access to a color version.

FY 02	
"Performing"	"Accounting"
FY 02, all Qs: Rates proposed in FY 00 and approved in FY 01 are charged throughout FY 02, as depot performs work and achieves its NOR.	FY 02: Q1: FY 01 books are closed, and finalized NOR for FY 01 is added to the FY 00 AOR. FY 02, Q3: Rates for FY 04 are proposed or "locked in," subject to HQ approval in FY 03, Q1.

Figure E: The Multi-year Cycles of Depot Performance and Rate Estimation and
 (FYs refer to actual government fiscal years from FY 2000 through FY 2005, although other sequential years may be substituted. "Q" refers to government fiscal quarters: e.g., Q2 = January through March.)

FY 03	
"Performing"	"Accounting"
FY 03, all Qs: Rates proposed in FY 01 and approved in FY 02 are charged throughout FY 03, as depot performs work and achieves its NOR.	FY 03: Q1: FY 02 books are closed, and finalized NOR for FY 02 is added to the FY 01 AOR. FY 03, Q3: Rates for FY 05 are proposed or "locked in," subject to HQ approval in FY 04, Q1.

FY 04	
"Performing"	"Accounting"
FY 04, all Qs: Rates proposed in FY 02 and approved in FY 03 are charged throughout FY 04, as depot performs work and achieves its NOR.	FY 04: Q1: FY 03 books are closed, and finalized NOR for FY 03 is added to the FY 02 AOR. FY 04, Q3: Rates for FY 06 are proposed or "locked in," subject to HQ approval in FY 05, Q1.

FY 05
"Performing"
FY 05, all Qs: Rates proposed in FY 03 and approved in FY 04 are charged throughout FY 05, as depot performs work and achieves its NOR.

Rates impact of "Performing" work in a Fiscal Year skips both the next FY, in which its "Accounting" takes place and future rates are proposed, and the following FY, in which HQ adjusts and approves the proposed rates and prospective budgets for use in the next FY.

Letterkenny’s customer refund innovation short-cut the Army’s multi-year AOR smoothing process by putting spendable current year budget dollars back in the hands of current customers within the current Fiscal Year. Figure F below shows this short-cut superimposed with arrows on a portion of Figure E, now using FY 03 as the focal year. Figure F simply converts Figure B from a cycle to a flow chart format.

