RED RIVER ARMY DEPOT

TEXARKANA, TX

We Support the Soldier

Building It As If
Our Lives
Depend On It --
Theirs Do!

Robert T. Mason Award for Depot Maintenance Excellence

Nomination for
Robert T. Mason Award for Depot Maintenance Excellence

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Section 1- A - Depot-Level Nomination Package Information Sheet

1. Military Service and/or Command: Department of Army (DA)
   Army Materiel Command (AMC)
   Tank-automotive and Armaments Command Life Cycle Management Command (TACOM LCMC)

2. Specific major depot maintenance facility responsible for nominated program:
   Red River Army Depot (RRAD)

3. Identification of nominated program: High Mobility Multipurpose Wheeled Vehicle (HMMWV) Recapitalization (Recap) Program

4. Depot Facility Commander's name and mailing address:
   COL Douglas Evans
   Commander, Red River Army Depot
   100 Main Drive
   Texarkana, TX 75507

5. Primary Contact at nominated units:

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6. HMMWV Recapitalization Program, Red River Army Depot, TACOM LCMC

7. Background information for the nominated program:

The Army's HMMWV Recapitalization Program is focused on remanufacturing used vehicles to a like-new condition. Units that are returned from the field are often battle damaged or worn-out beyond their useful lives. Red River disassembles the vehicles, upgrades key systems such as power trains and suspensions, rebuilds the body and components, and then reassembles the vehicles. Final testing completes the verification of the units' like-new condition before returning them to the warfighter serving in Iraqi Freedom and the Global War on Terrorism.

8. Program size: Government Civilian, Large

9. Mission statement for the program:

Conduct recapitalization (Recap) of the Army's existing HMMWV fleet. This is achieved and sustained by dedicated RRAD team members, adhering to established customer requirements, understanding the warfighter's needs, and providing a quality product on time and within cost.

Section 1-B - Introductory Information

Red River Army Depot (RRAD) is a Department of the Army maintenance depot located on over 18,000 acres near Texarkana, Texas. The Depot operates in approximately 600,000 square feet of production space for core maintenance operations. More than 4,300 employees (including tenants and contractors) contribute to Army and the Department of Defense's (DoD's) success through their dedicated efforts. Supporting the soldier through LEAN Manufacturing technology, RRAD was the first Army depot certified to International Organization for Standardization (ISO) 9002:1994 standards and is currently an ISO 9001:2000 registered industrial complex providing:

- Responsive and innovative solutions for the DoD in repair, overhaul, recapitalization, and conversion of combat and tactical vehicles.
- The Center for Industrial and Technical Excellence (CITE) for:
    - Tactical Wheeled Vehicles (e.g. HMMWV)
    - Small Emplacement Excavator (SEE)
    - Bradley Fighting Vehicle System (BFVS)
    - Multiple Launch Rocket System (MLRS)
    - Phased Array Tracking Radar Intercept of Target (PATRIOT) Missile Recertification
    - Rubber Products (Roadwheels and Trackblocks)
- The only capability within DoD for remanufacture of roadwheel and track. Currently, the depot is the only qualified source of supply, public or private, for the M1 Abrams Tank roadwheels.
- The only Continental United States (CONUS) capability within the DoD for recertification of PATRIOT and Homing All the Way Killer (HAWK) missiles. The depot operates and staffs several recertification facilities at various sites throughout the world.
- Technical capabilities to design, fabricate, and manufacture a wide range of items from specialty parts to unique prototype weapon systems and vehicles.

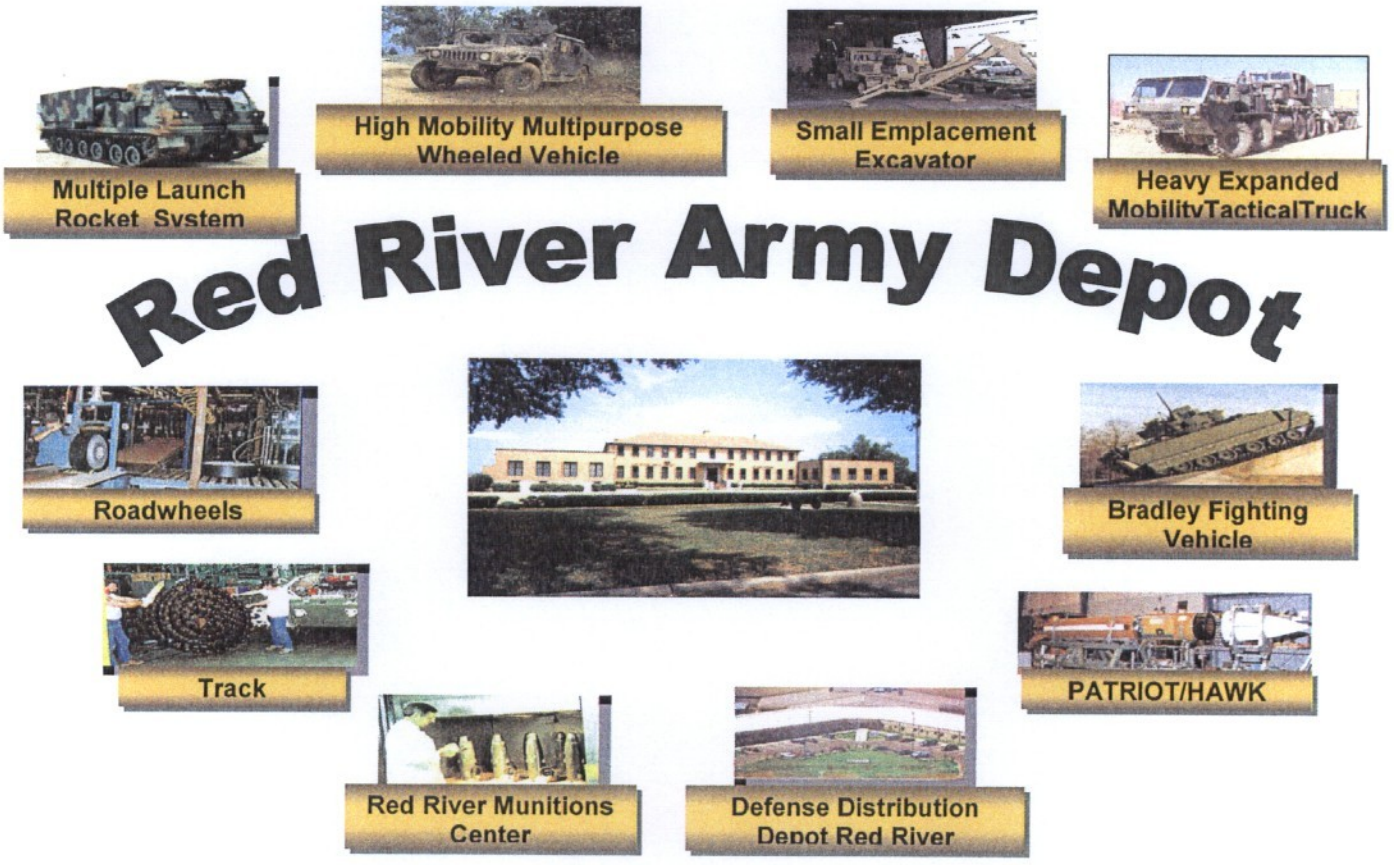
RRAD's industrial complex has the capacity and capability to completely overhaul/ remanufacture combat systems and tactical vehicles. The multi-function/multi-weapons systems capability fully supports the ongoing joint forces transformation. (i.e., Army modularity).

The depot's overall mission flexibility and responsiveness of the workforce, equipment and facilities provides the depot a competitive edge within the defense industry. Additionally, personnel supporting the combat and tactical vehicle missions possess a wide range of core skills that are essential to supporting the warfighter. As evidenced in recent operations (Global War on Terrorism & Operation Iraqi Freedom) RRAD quickly shifted priorities to meet changing combatant commander requirements. This was accomplished both on the

industrial complex and by deploying teams worldwide to improve near term readiness and provide for the long term sustainment of our combat and tactical fleets. RRAD's workload significantly increased from 2.8 M direct labor hours in FY04 to 4.1 M direct labor hours in FY05. As additional employees were required to execute the additional workload, the workforce increased from 2,427 employees in FY04 to 3,155 employees in FY05.

Public-Private partnerships are essential to the Army's transformation. RRAD proactively seeks industrial partners and has successfully negotiated numerous teaming and partnering arrangements. These relationships leverage the strengths of both parties and ultimately results in a better quality and lower-priced product for the warfighter. Examples of major current RRAD Supplier/Customer partnerships include:

- Lear Siegler Incorporated (LSI) – Supplies contract labor and is involved in HMMWV body and frame repair from a facility adjacent to the depot complex.
- Raytheon – Supplies and stocks hardware (i.e., nuts and bolts) directly to the assembly lines.
- W.W. Williams – Supplies HMMWV power packs and differentials.



Red River Army Depot – Product and Portfolio

While RRAD serves many customers and missions, the HMMWV Recapitalization Program is one of its core programs, representing approximately 22% of its total FY05 workload execution.

The depot's specific HMMWV recapitalization mission is to conduct recapitalization (Recap) of the Army's existing High Mobility Multipurpose Wheeled Vehicle (HMMWV) fleet. This is achieved and sustained by dedicated RRAD team members, adhering to established requirements, understanding the warfighter's needs, and providing a quality product on time and within cost.

Section 1-C - Award Submission Focus Program

Red River Army Depot (RRAD) is proud and honored to submit its application for the Robert T. Mason Award for Depot Maintenance Excellence for its High Mobility Multipurpose Wheeled Vehicle.

(HMMWV) Recap Program

Battle-damaged HMMWV

RRAD's Recapitalized/Remanufactured HMMWV

The Army's HMMWV Recapitalization Program is focused on remanufacturing used vehicles to a like-new condition. Units that are returned from the field are often battle-damaged or expended beyond their useful lives. Red River disassembles the vehicles, upgrades key systems such as power trains and suspensions, rebuilds the body and components, and then assembles the vehicles. Final testing completes the verification of the units' like-new condition before returning them to the operational forces. We also upgrade performance and safety - extending the serviceable life of the vehicle.

RRAD is the Army's Center for Industrial and Technical Excellence (CITE) for tactical wheeled vehicles, including the HMMWV program. As such, RRAD has established a leadership role among all Army installations for technical and program expertise for HMMWV maintenance, including recapitalization (remanufactured), and reset.

In addition, RRAD has deployed teams to improve near-term readiness and provide for long-term sustainment of our combat and tactical fleets. RRAD's highly responsive teams have provided significant in-theater HMMWV maintenance expertise at Army Prepositioned Stock (APS) locations in Kuwait and Korea. RRAD has completed 40 missions in support of Operation Iraqi Freedom (OIF) in Southwest Asia (SWA) with a total of 316 depot members deployed. RRAD's HMMWV recapitalization process, and the results of its LEAN transformation, served as the benchmark and set the standard for other AMC activities, such as establishment of Letterkenny Army Depot's (LEAD's) HMMWV program. Throughout the world, in a variety of roles, RRAD has earned recognition as the Army's maintenance leader for the HMMWV asset base.

Section 2-A – Mission Accomplishments

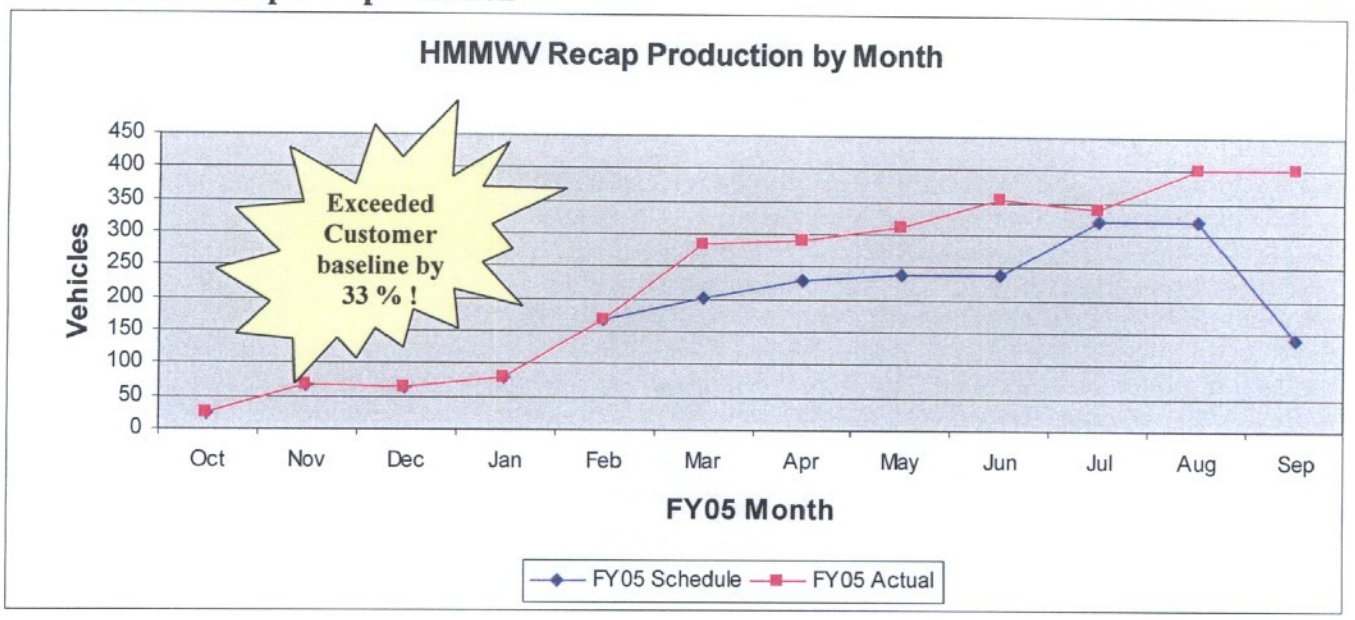
RRAD Recapitalized HMMWV

Red River's HMMWV Recapitalization Program has met or exceeded all of its key mission objectives. In particular, RRAD exceeded all customer and end-user requirements related to unit output, quality, cycle time reduction, and cost reduction.

HMMWV Recap Program – Unit output

Red River began its HMMWV Recap Program in August 2004 and produced a total of 43 units in FY04. In response to anticipated needs for FY05, RRAD engaged in aggressive and innovative programs to expand output to 2,789 vehicles. Clearly, creating and leveraging this surge capability has proven effective in the Army's Global War on Terrorism.

HMMWV Recap Unit production

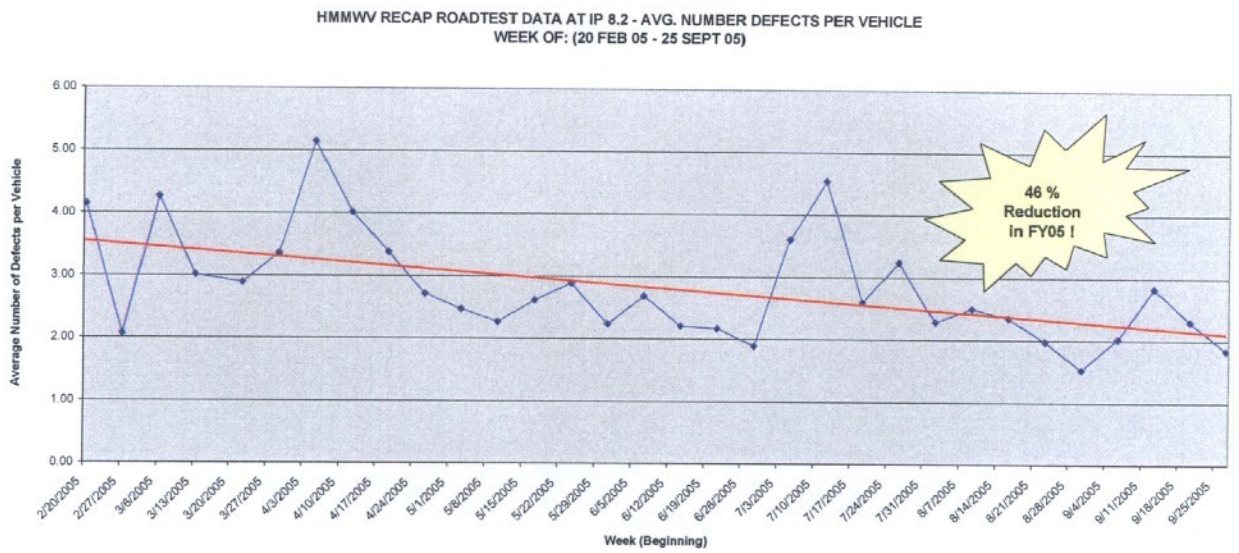


RRAD's FY05 HMMWV Recapitalization Program output *exceeded the planned FY05 output by a full 33 %.* RRAD's demonstrated performance in building and executing a superior maintenance system for providing support to the warfighter, resulted in another huge increase in HMMWV recapitalization workload. For FY06, RRAD's business plan included recapitalization of 3,530 HMMWVs, another 26 % increase over FY05 actual.

These outstanding accomplishments are a direct result of RRAD's intense LEAN manufacturing transformation focus on the HMMWV Recap line. This enabled rapid delivery of more recapped HMMWVs to the warfighter, at a higher quality and lower cost. RRAD earned the "manufacturer of choice" over all internal DA and external potential suppliers. The LEAN journey is detailed in Section 2-C of this application.

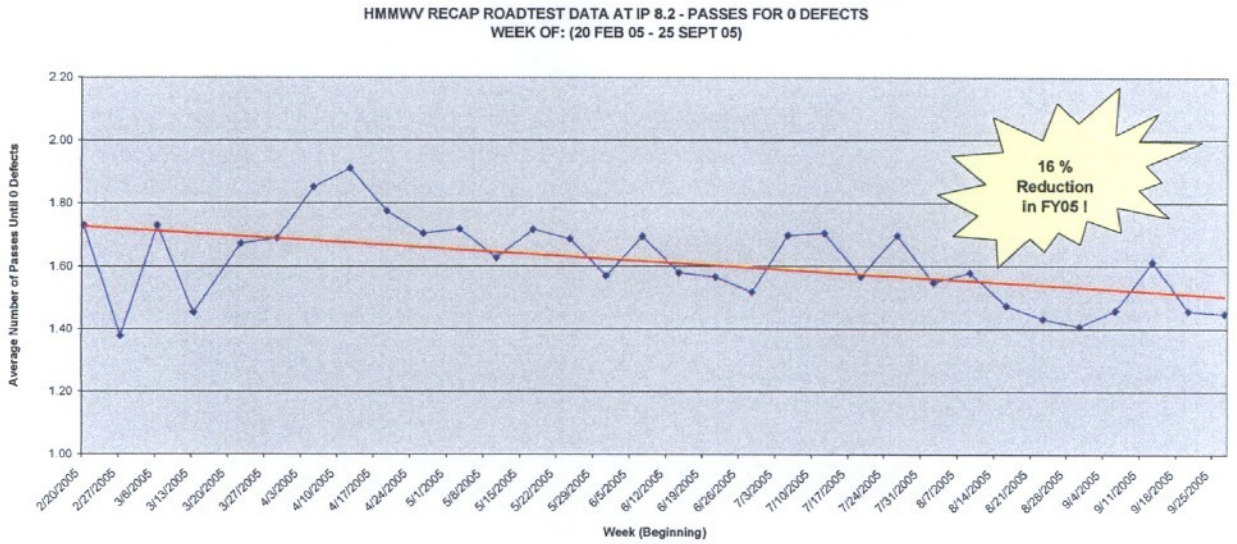
Quality – HMMWV Recap Total Defects Per Vehicle (Final Road Test)

RRAD's intense focus on quality has greatly improved the HMMWV Recap product delivered to the warfighter. In FY05, RRAD's focus on eliminating and preventing defects on HMMWV recapitalized units has resulted in a 46% reduction in final road test defects (Aug/Sept average. vs. Feb/Mar average.).



Quality – HMMWV Recap Total Defects Per Vehicle (First Pass Yield)

During FY05, RRAD was able to improve its Passes to Zero Defects performance for HMMWV recapitalized units by 16% (Aug./Sept. average. vs. Feb./Mar. average.) in its pursuit a "perfect" vehicle and its motto "Our Best – Nothing Less". Spike in April was due to line expansion and learning curve.



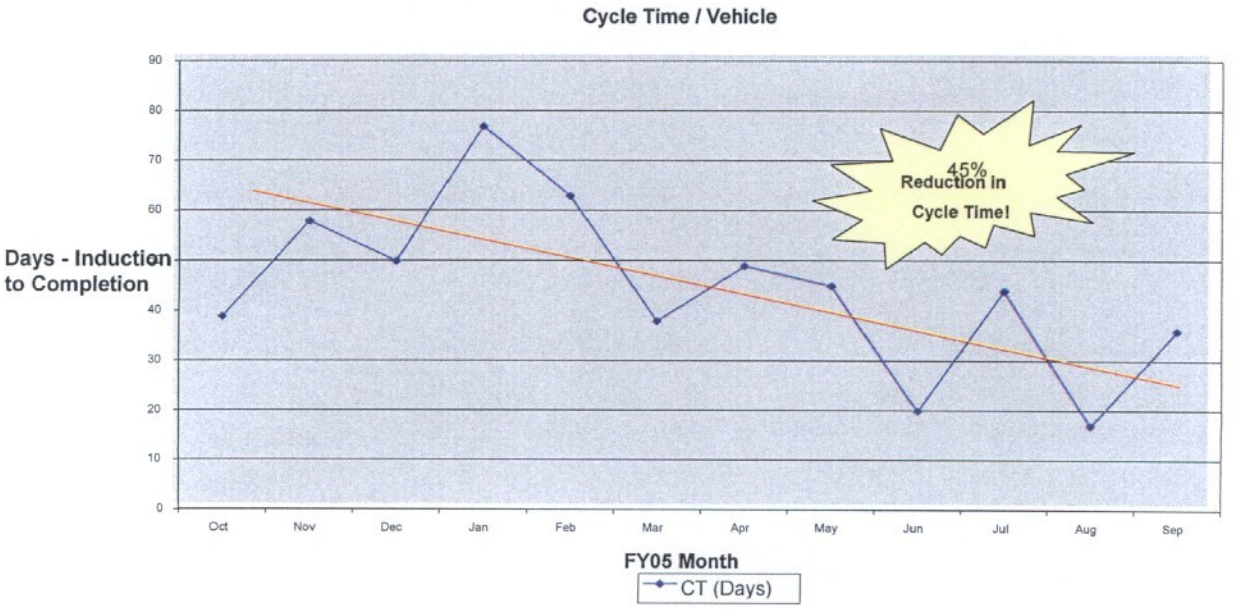
Quality – HMMWV Recap Customer Complaints

RRAD's improvement in internal quality drove dramatic results in another important quality metric, Customer Complaints. In FY05, RRAD processed only 20 customer complaints against its entire production base of 2,789 vehicles - a rate of less than 1 % !

HMMWV Recap Cycle time reduction

Through the innovative application of LEAN manufacturing practices throughout its supply chain, RRAD improved service to the warfighter by dramatically reducing cycle time for returning assets to the field. By expending end items through the recapitalization process more quickly, additional assets were deployed to the field and in the hands of our warfighters.

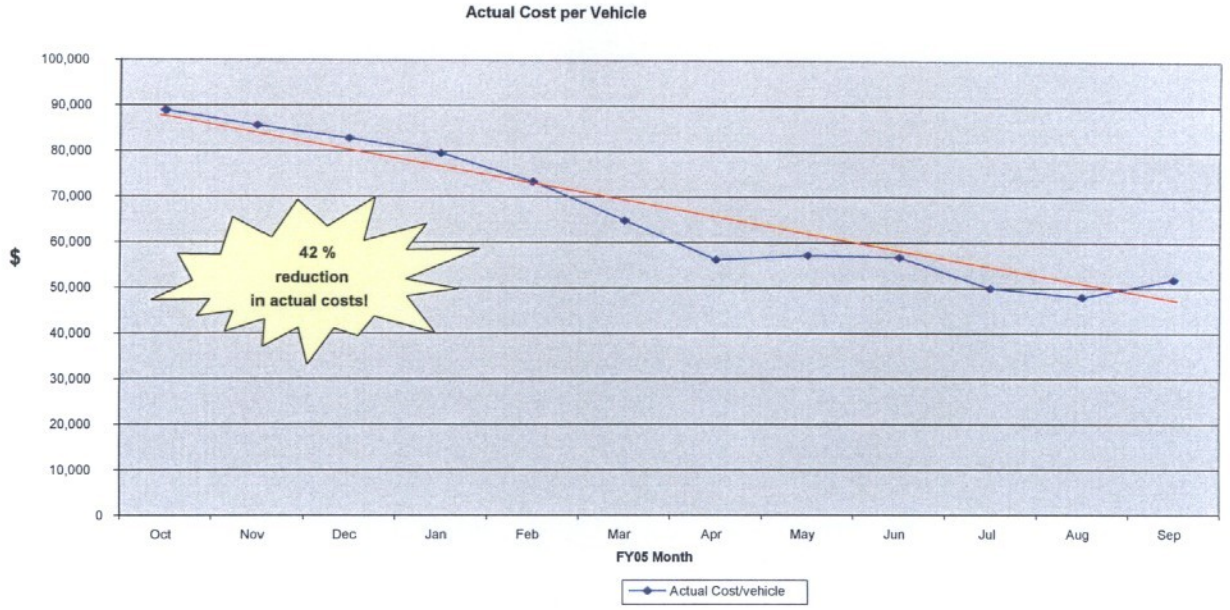
HMMWV Recap Cycle Time – Induction to Shipment



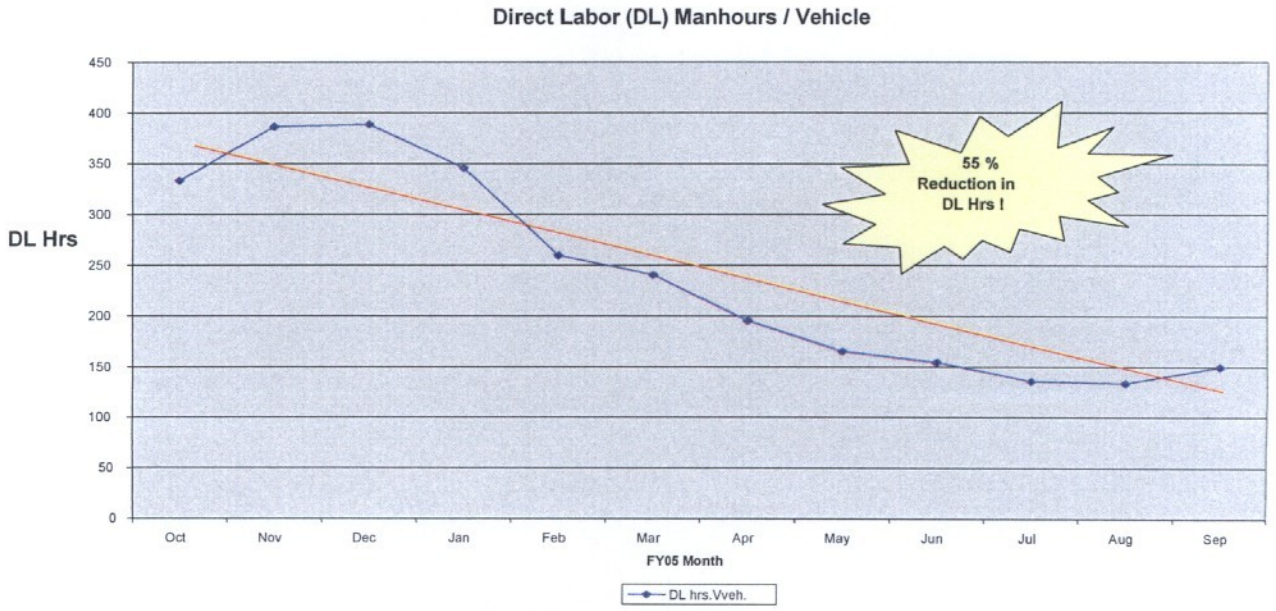
HMMWV Recap Cost Reduction

Similarly, RRAD's continuous improvement approach has dramatically driven down costs of the HMMWV Recapitalization Program by reducing the actual production costs per vehicle and direct labor man-hours.

HMMWV Recap Actual Costs per Vehicle



HMMWV Recap Direct Labor Manhours per Vehicle



This steep reduction in direct labor manhours and average vehicle recap costs allowed the Army to complete the planned recapitalization program while avoiding spending approximately $30 M in FY05. This spending avoidance allowed limited funding to be spent for the recapitalization of additional HMMWVs or distributed to other Global War on Terrorism programs and assets.

Section 2-B – Effective Support to the Warfighter

Extraordinary Support to Operational Forces

Production Line Development

The Depot Commander created a HMMWV Recap Office comprised of specific personnel to maintain intensive management, to perform required reporting tasks, and assure production schedules were met. Initial capacity requirements and production processes were identified, to include redesign of the shop floor layout. Special tooling requirements necessitated RRAD fabricating all lifts, slings, rotisseries, and power pack stands. The fabricated power pack stands were featured in *PM Magazine.* RRAD's recapitalization process also served as the benchmark for launching Letterkenny Army Depot's HMMWV production line. Aggressive implementation of production operations enhanced and sustained the support the warfighters received in the field.

Support to Letterkenny Army Depot (LEAD) and Maine Military Authority (MMA)

RRAD management welcomed LEAD and MMA participation in site visits to RRAD to review operational processes and systems required to achieve their production rate. RRAD provided technical data, production process flow charts, drawings for equipment, and LEAN principle applications to assist them in improving their production processes. Concepts developed by RRAD were the benchmark for AMC, and contributed to the success of establishing facilities at all production sites.

When parts shortages impacted LEAD's completion of a pilot vehicle effort, RRAD took the lead in providing the necessary parts from RRAD's parts inventory. RRAD packaged and expedited parts shipments from the depot's local stock as needed to support LEAD's shortfalls. After completion of the pilot, additional shipments were provided until LEAD obtained adequate stock. LEAD's ability to maintain production operations was a direct result of the unselfish support from RRAD.

As a result of recognizing that each production partner played a significant role in providing support to the warfighter, RRAD assured success was achieved in providing that support at all production sites.

Impact on Operational Forces

The aggressive nature of RRAD's production schedule insured there was no impact to planned deployments, redeployments, or training missions. RRAD met or exceeded all customer delivery and equipment fielding requirements. This resulted in Program Manager-Light Tactical Vehicles (PM-LTV) accelerating the fielding schedule of vehicles to several units. For example, Ft Stewart, GA originally scheduled 229 vehicles shipped, but that was increased to 253; Ft. Lewis, WA's original schedule was for 568 vehicles, but later increased to approximately 1000. All units received a final product on schedule, that the warfighters trusted to accomplish their mission, as evidenced by the following statement from a satisfied customer:

"The RRAD HMMWV RECAP program realized measurable, documented improvements in product quality. They incorporate LEAN practices to continuously improve their process and output quality. Their regular involvement of the line workers' input and use of the "5 S's" clearly indicates they have embraced a modern QA system and recognize its benefits." – Mr. Russell Swan, Lead Quality Assurance Specialist, PM-LTV.

Response to Unforeseen Demand

Due to increased production requirements, it was necessary to obtain supplemental work space equivalent to 9,900 square feet to accommodate the HMMWV Recap with no adverse impact on other programs. Depot personnel site visits to AM General were made to view their production lines, processes, and special tools prior to redesign of the production line.

Staffing was also increased to accommodate the surge. All HMMWV Recap Team Chiefs were initially trained in every process to achieve cross training in all production line areas. Once Team Chiefs completed training, employees within the work centers were cross trained. This cross training allowed the establishment of "floaters" to replace employees who were on leave as well as other absences from the work station.

The depot also rapidly responded by adjusting employee work schedules. RRAD employees worked 12 hour days, 6 days a week in lieu of the normal tour of 10 hour days, 4 days a week. All holidays, with the exception of Thanksgiving and Christmas, were also considered work days.

RRAD placed funded parts requisitions for the entire FY05 program to support TACOM's and the Defense Logistics Agency's (DLA) ability to procure parts. This foresight allowed RRAD to not only exceed its production for the increase of planned quantities, but also to support production operations at LEAD.

Warfighter priority needs were sustained through RRAD's innovative approaches to assure the accelerated mission was accomplished.

Innovative Solutions – Surging for the Warfighter

In July 2004, then Depot Commander Colonel Michael Cervone engaged a LEAN team with the goal to meet 200 vehicles per month by June 2005. This team was convened to conduct the initial Value Stream Analysis with a primary goal to plan a series of week-long rapid improvement events and project activities geared towards meeting the 200-a-month target.

The Value Stream Analysis identified 13 week-long team events to meet the production goals. Nine were deemed critical and were planned immediately for completion by the end of August 2004. When the first nine events were accomplished, the program activity was further accelerated. As a result, the target goal was reached December 2004, six months ahead of schedule.

A second Value Stream Analysis was conducted in December 2004 to further optimize the process. The second Value Stream Analysis created a new production goal of 18 vehicles per 10-hour shift and resulted in adjusted Takt Time (the pace of production required to meet the customer demand on a one-by-one vehicle basis). By February 2005, prepatory work for the newly-designed production teardown and assembly cells was completed and the changes were implemented over a three-day weekend.

A third Value Stream Analysis was conducted in June 2005 and resulted in plans to drive output to a new height of 32 vehicles per 10-hour day. As a direct result, in June 2005 the HMMWV Team accomplished a new one-day record by producing 21 vehicles in a 10 hour work shift. The new implementation timeline for the 32-a-day goal had a production ramp-up target date of 28 August 2005.

The ramp-up initial goal of 200 units monthly was achieved six months early. The accelerated production ramp-up also forced support groups (commodity sub-assembly area, purchased parts group and hardware supply group) to conduct LEAN Six Sigma events to accelerate their output towards the goals.

Key LEAN Six Sigma implementation tools used in this effort:

- Establishing standard work for each work station
- Implementing one-kit-flow to the assembly line stations
- Locating trigger points throughout the facility for supply delivery
- Establishing "Waterspider" routes for trigger replenishment
- Conducting 6S (Sort, Set in Order, Shine, Standardize, Sustain and Safety) events throughout the HMMWV value stream
- Establishing the line balancing and manpower levels
- Moving sub-assembly operations in-line to assembly
- Posting "at-a-glance" visual management tools
- Training of all involved in managing the system

One of the principles of the LEAN Six Sigma process is to strive for perfection. Evolution of the HMMWV Recap line ramp-up has embodied this principle. Waste removal has occurred at every juncture. The HMMWV team is developing standard work visual systems that will guarantee future success and further increases in vehicle output, while at the same time reducing the manhours of work required to produce those vehicles. Benefits included improvement of product quality, reduction of cost, increased productivity, enhanced readiness, and most importantly, greater customer satisfaction.

Section 2-C - Logistics Process Innovation

As a remanufacturer, RRAD does not control design of the products they produce. In most cases, the products are designed by the Original Equipment Manufacturer, AM General for the HMMWV, with design modification input from AMC's engineering research centers. In working with their product design partners, RRAD generated and implemented $11.6 million in one Value Engineering proposal during FY05, nearly twice the $5.8 million goal.

Excerpt below taken from the Value Engineering Brochure:

HMMWV RECAP/RESET Run Flat Tire Assemblies

During the scheduled HMMWV RECAP/RESET processes at RRAD, GSIE purchased HMMWV run flat tire assemblies at a substantial cost. A Value Engineering (VE) study was initiated to look into direct purchase of the HMMWV tires from a commercial source. A contract was awarded decreasing the price per unit by 48%.

"Value Engineering remains a viable and effective program at RRAD as reflected in the savings identified and generated through the years." -Jack Page, RRAD VE Manager

SAVINGS TO GOVERNMENT = $11,556,856

Applying process improvements to production lines is expected in today's manufacturing world. However, attempting to analyze and implement process improvements within the logistical support areas is less common and in some ways more difficult. To achieve the increase in production required to meet our warfighters' needs, RRAD recognized the correct number of parts for the scheduled number of vehicles that must be accomplished.

The integration of LEAN and Sigma principles within RRAD'S non-manufacturing functional units has been systematically and methodically applied within production management support areas to ensure the correlation of parts with vehicle requirements. To analyze these needs, a Value Stream Analysis (VSA) was performed and yielded numerous opportunities for improvements that were identified, prioritized and scheduled for Rapid Improvement Events (RIE).

The first RIE analyzed Vehicle Pre-Inspection processes and was the first non-manufacturing support type event conducted at Red River Army Depot. Our vision and mission statements

provided direction and clearly indicated that base support area improvements were vital to our successful LEAN journey. To properly identify, analyze and link together support requirements, the team needed to include members from outside agencies. There was no other way to identify and determine value from our customer's perspective without their involvement. This event was monumental in teaching that the key LEAN thinking integrator is focusing our vision on our customer. As time passed, the differences between logistical support process functions and manufacturing process functions disappeared. The application of LEAN principles provided opportunities for improvements clearly within our vision and throughout our depot.

Parts management processes were identified, analyzed and dissected into manageable portions of the parts supply process flow. The first Parts Management RIE began with Phase 1 of the process of receiving an End Item Code (EIC) Program Notice and ended with establishing forecast for Installation Support Account (ISA) Stock. During the RIE, the Parts Support Branch was structured to mirror the Planning Branch and Operations Directorate - these were the customers supported daily. Meetings, e-mails, and "taskers" were identified, with duplication of "taskers" targeted as one of the major wastes of time. The LEAN processes were applied just like in the manufacturing functional areas. Standard work processes were not documented and there had been a tremendous turnover of employees. Forty-two percent of the organization's employees had less than one year of experience. Accomplishments included developing a training plan for current as well as future employees. Another large waste involved preparation of materials and attendance at required production meetings. The entire process of what needed to be reviewed and reported and how it needed to be presented was analyzed and changed to include identifying potential attendees and structuring the meeting to ensure the most efficient use of time. As simple and "common sense" as this sounds, it was a monumental task that reaped a cost avoidance of over $250,000.

Within a month, a follow-on RIE was conducted with Phase II Parts Management processes beginning with the Expediter Requisitions Parts and ending with Updating EIC Mortality. Among the many accomplishments of this event was establishing and aligning Parts Management Support Cells to the HMMWV production lines. A "Help Chain" for parts problems was developed. Amazing as it may sound, confusion abounded concerning who to ask for help should problems occur in obtaining parts for the production lines. This event further demonstrated how important communication is when providing exceptional parts supply to our production lines. New and improved processes and procedures were identified and mapped and a new employee training hand book was developed. Employees were formally trained and the first visual "red/blue" clothes pin guidance was developed and distributed. The training schedule for new employees within the Division was developed for all six identified production management courses.

The next RIE focused on Production Controllers/Planners and their integration in support of the HMMWV lines. The process began when the Program Notice was received or when a cost estimate was requested. It ended in one of two ways: Program completion or Cost Estimate completion. Many of the functions performed did not fall under the scope or

control of the depot; however, the Work Process was standardized, Work Process Flow was documented and a Request Log was developed to track response times back to the customer. The structure and topics of required meetings were defined and revised (Pre-Planning, Pre-Production, Program History, Journal Vouchers, Military Interdepartmental Purchase Request (MIPR). Metrics were developed during the event and have been improved after the event and are monitored monthly to measure performance as shown in the following chart:

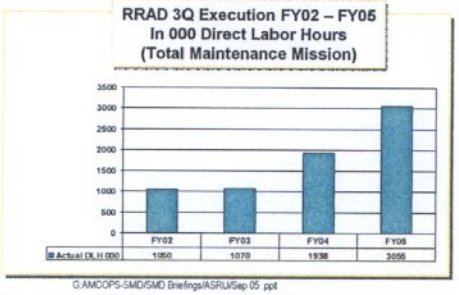
Total HMMWV
RRAD = 3,602
LEAD = 1,406
MMA = 453
Total = 5,461

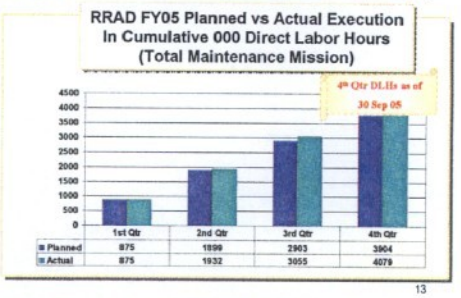
Red River Army Depot Production Status

Ahead of Schedule
Behind Schedule

The Scheduled Qty thru End FY05 includes both RRAD and Contractor production.

= SORTS SYSTEM	FY00 - FY01 Average Monthly Production	FY05 Planned Monthly Production	Un-serviceable on hand for Induction	Scheduled Qty Completions thru 30 Sep 05	Actual Qty Completed thru 30 Sep 05	Scheduled Qty Completions Thru end FY05
HMMWV	44	270	377	3602	3762	3,602
BFVS	12	10	547	151	151	151
MLRS	7	2	42	45	45	45
HEMTT FOV	7	38	223	331	316	331
6/10K Forklift	7	3	66	46	46	46
5 ton Truck	6	51	210	515	542	542
SEE	12	55	112	241	266	266
Crane	12	0	10	19	19	19
Roadwheels	1	7954	27,023	80396	79442	80396
Track	6,492	19,914	308,562	368456	369781	368456
Bradley XMNS	79	68	518	491	507	491





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Note: SORTS is Status of Resource and Training System, FOV is Family of Vehicles and XMNS is Transmissions.

Even with all the parts management, planning and scheduling events above, waste was rampant with excess parts. With the Value Stream Manager's commitment to continuous improvement, a RIE was scheduled to attack the non-value added approach of over buying parts. Strategic identification of true excess parts by location was established. Work processes causing excess parts were identified to include turn-in documents not processed, backorders not cancelled, material not transferred as new programs were received, consumption of parts was not recorded correctly at the end of the programs, and credit card buy procedures were not controlled. Each "cause" was analyzed and addressed by the cross functional team. Forecast Accuracy was identified as the metric to track our performance. Other logistical support RIEs continue to be identified in various directorates across the depot to include Public Works and Resource Management. Our commitment to continuous improvement projects and changes in our work processes throughout the depot provide unlimited opportunities to eliminate waste and identify non-value added activities in all functional units of RRAD. Previous and current leadership strive to conquer these challenges on a daily basis.

Reliability, Maintainability and Supportability Improvements

As part of the Army's strict standard of work and to ensure producing the highest quality vehicle possible, the following modifications were made by the RRAD HMMWV Team:

Overhauling the transmission to a like new transmission supporting the new 6.5 litre detuned engines was essential to reliability, maintainability and supportability of the HMMWV. The 6.5 litre detuned engines are more durable and better equipped to handle the daily war zone requirements of our warfighters than the old 6.2 litre engines.

Installing new lower gear ratio differentials provides a quicker "get-away" for our soldiers. It also increases traction response. Our soldier's rely on a quick response from their vehicles – their lives depend on it! Other enhancements were:

- Heavy duty springs which provide increased payload capacity and support for the much needed armor.
- Replacing rear shocks 100% with new heavy duty shocks increases absorption for more reliable control of the vehicle.
- Heavy duty half shafts (constant velocity joint) are replaced 100% for increased sustainability and maintainability in the harsh war zone conditions.
- Lower control arms are replaced 100% with the Heavy Duty version to increase the payload capacity. It is required in support of the extra weight of the add-on armor.

Producing quality vehicles beyond the scope of work requirements requires research and determination to achieve the necessary changes. Parts were misidentified in Technical Manuals (TMs) and corrected as well so the HMMWV, which was originally designed as a throw-away vehicle, can now be remanufactured. This provides more options for the Army and Marine Corps in maintaining and supporting their respective HMMWV fleets while improving the HMMWV's reliability at the same time. One example is the recommendations of RRAD HMMWV Team, to replace the HMMWV brake lines 100% with new stainless steel lines. The stainless steel material eliminates rust and corrosion problems. This resolved serious safety issues and increased the maintainability and the reliability of the vehicles supporting our warfighters on the battle field.

Stepping "outside the box" but staying within the Army's requirements requires courage and team innovation. Parts supply, especially with increased demand can impede production. Based on a LEAN HMMWV VSA, the need was determined to create a HMMWV Kitting Process with a designated area for parts to be kitted. As program requirements increased, continuous process improvement events also increased. LEAN events established the designated kitting area, kit configurations, trigger points, minimum and maximum kit levels, visual management tools, a picture book, routes for new parts to be delivered, Takt time, and staffing requirements. LEAN events provided the foundation for the HMMWV new part kitting process.

HMMWV Recap Cost Avoidance & Resource Use Improvements

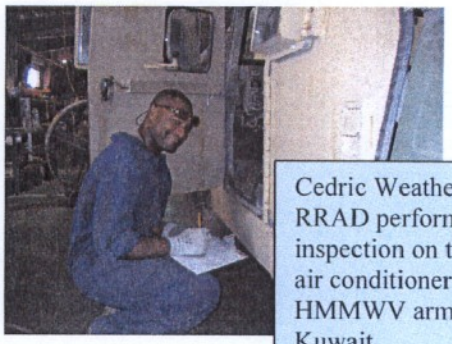
	Before LEAN transformation Oct 04	After LEAN transformation Sep 05
Cost ($ / vehicle)	$89,029	$51,927
Cost Avoidance FY05		**$86 Million**

The 29 July 05 *Red River Review* headlines read "*Rush is on to Armor HMMWVs*".
CAMP ARIFJAN, KUWAIT –Workers at the Forward Repair Activity (FRA) are working 16-hour shifts up armoring and installing air conditioning systems on HMMWVs, just arrived via ship from the US. "When we get a surge like this, we run 16 hours per day, seven day per week, even 18 hours per day, whatever it takes to get the vehicles out," said Division Chief Randy Hughes.

Almost 50 vehicles were received and have been staged out for the up armor process, air conditioner replacement and final inspection check-out. "We'll have this group finished and ready to roll on July 2,"said Hughes.

The Arifjan facility has installed over 3,000 armor kits and AC units on HMMWVs for use in Afghanistan and Iraq. The FRA is part of the Army Forward Support Brigade, South West Asia, under the Army Materiel Command, which is responsible for all of the Army's tactical vehicles.

Sport Bryant normally works at the electrical accessory shop at RRAD. At Camp Arifjan, Kuwait, Bryant drills holes to support armor during HMMWV up armor process.



Cedric Weatherall, a worker from RRAD performs a quality assurance inspection on the installation of new air conditioner equipment and HMMWV armor at camp Arifjan, Kuwait.

HMMWV Recap Cycle Time Improvements

Recognizing the importance of logistical support to the production line, several Rapid Improvement Events were focused on the Commodity Center (reclaim sub assembly build up area). RRAD provides depot level maintenance support; therefore, reclaiming parts is an integral portion of our processes.

Cycle time is the total time it takes from start to finish to produce a remanufactured HMMWV. This includes disassembling, repairing and reassembling to "like new" condition.

This portion of the logistical support process historically is time consuming. To successfully improve cycle time, and create an overall synergistic flow, the Commodity Center had to be streamlined.

Reference Page 8 of Section 2A, Cycle time results significantly improved with the creation of the second Commodity Center. The original line layout included one Commodity Center that was not centrally located. This caused excess travel and movement to and from the line as well as the parts supply chain.

As a result, an additional Commodity Center was established to support the structural groups (frame/body). One item flow, pull, triggers and standard work was developed for each new entity. The additional Commodity Center allowed items to be produced on one 10-hour shift rather than two 10-hour shifts.

HMMWV Recap's Effective Technology in Processes & Products

A VSA was conducted in June 05 and plans were developed to drive output to a new height of 32 vehicles per one 10-hour shift per day. The current line configuration was two 10-hour shifts per day. Reconfiguring the line was critical to provide warfighters the required HMMWVs at the lowest cost, with the highest quality, delivered as quickly as possible. An implementation timeline was established.

The bay-type disassembly area was completely gutted – new concrete was poured – and the floor was repainted to establish visual management with triggers. A track was installed in the floor for carts to travel from work cell to work cell to more efficiently move the vehicle. This replaced a manual rotisserie device that moved the frames and body of the vehicles by forklift. This outdated process required mechanics to physically push, guide and maneuver each vehicle to each work station. This was not only time consuming but was also a safety concern.

A body line conveyor system was installed to facilitate the movement of the body after demating. A one piece flow was established for the body disassembly process. Standard work was developed, employees were trained, and work processes were posted within the work cells.

Additional improvements included installing a conveyor system to accommodate wire parts baskets. This eliminated multiple handling of reclaimed parts through the cleaning process. The end result was that individual parts were placed in designated baskets to go to designated power washers. This allowed the power washers to remain on a constant setting. This eliminated the need to reset power washers after each wash cycle. Setup time was greatly improved.

The next priority on the timeline was to establish a frame assembly line in-house that had previously been outsourced to a local contractor. This provided a significant cost reduction per vehicle, it allowed the line to increase throughput and reduce cycle time.

The following changes were implemented:

- installed rails for movement of vehicle
- installed hoists
- reduced travel time by moving subassemblies processes to the actual work cells
- relocated parts and hardware to the point of use
- established and posted standard work
- established trigger points
- created pull
- established flow

One very innovative initiative accomplished during this ramp up was the creation of a table specially designed for differential build up. This was previously accomplished using an old metal table with one mechanic manhandling each part numerous times to complete one differential. The new process allows multiple stations, performing designated work processes to create balance and flow.

The body buildup phase of reconfiguring the line began by installing additional conveyors. This extended the production line from 8 work cells to 12 work cells. Key LEAN tools were:

- Establishing standard work for all work cells
- Implementing one kit flow to the assembly line work cells
- Locating trigger points for each work cells
- Establishing line balance and manpower levels
- Relocating sub-assembly operations to work cells
- Conducting 6S events

While technology improvements are required to improve the process, manpower improvements are also critical to the success of the HMMWV production lines. A water spider (material handler) was establishd and dedicated to move parts, allowing mechanics to focus their efforts on mechanical needs rather than logistical support requirements.

An additional technology insertion in the work process included establishing a new table designed for reclaiming and rebuilding geared hubs. This process was originally bogged down by specialized mechanics performing this work process from start to finish. If that mechanic was on leave, the process was hindered. Process improvements also benefited numerous mechanics by allowing additional learning and training opportunities. The improvement and application of LEAN principles created efficiencies that facilitated the increased production with one shift instead of two.

HMMWV Recap Maintenance Concepts

Based on the HMMWV VSA, it was determined that we needed to create a HMMWV Kitting Process and a designated area for the new parts to be kitted. As program requirements increased, continuous process improvement events also increased. The initial RIE was Sep 2004. This event established the designated kitting area, kit configurations,

trigger points, minimum and maximum kit levels, visual management tools, a picture book, routes for new parts to be delivered, Takt time, and staffing requirements. This RIE was the foundation for the HMMWV new part kitting process.

The second RIE for HMMWV new parts was conducted in November 2004. This event focused on the timeframe from when the parts requirements were identified and ended when the kitting clerk documented the parts status on the Production Control Boards located within the work area. The current state of this event revealed a need to hire 2 additional employees, create a Production Control Board , create a parts shortage board, establish a standard of work for kit supply replenishment, improve safety and establish a kitting process that supported the production of 14 vehicles per day.

The third RIE was conducted Feb 2005 and facilitated the support of 18 vehicles per day. Although the previous RIE identified wastes resulting in production improvements, additional waste was identified. Current staff was able to absorb the added workload with improved processes.

The last event provided the production line with enough kits to support increased production of 32 vehicles per day. Support to our most important customer – the soldier in the field – required a "ramp-up" plan. We established a new standard work, new minimum and maximum kitting levels, we color coded box pallets, re-established trigger points and reconfigured the kits. Who said you can't change the Army's standard supply system!

The overall results of all these efforts were an increase in production from 2,097 scheduled for FY 05 to an actual production of 2,789 vehicles, reduced average defects per vehicle by 46%, reduced cycle time by 45%, reduced actual costs per vehicle by 42%, and reduced the number of direct labor manhours per vehicle by 55%.

Summary

Shaking conventional wisdom is not easy for a governmental installation. With strict regulatory guidelines and ever-decreasing resources, it is especially challenging to tackle difficult remanufacturing process improvements that have not been attempted before – even by private industry. Red River Army Depot chose LEAN Six Sigma as the transformation catalyst to establish work cells within the HMMWV Recap program that would tackle the problems and wastes, while focusing our attention on continual process improvements. By eliminating wastes, we were able to continually improve cost, quality and delivery of our products to the most important customers in the world – our soldiers in the field.

The Depot is proud of the progress it has made in its LEAN transformation journey. The evaluation of the progress is highlighted within this package. As RRAD's LEAN journey is just beginning, we are anxiously looking forward to continuing with new product programs, expanding the transformation focus to administrative/support value streams and continually refining our current delivery value streams. RRAD's motto "Our Best - Nothing Less" is a core value in our exciting enterprise-wide LEAN transformation.

Section 3 – Award Citation

CITATION FOR:	Robert T. Mason Award for Depot Maintenance Excellence
RECIPIENT:	Red River Army Depot, Texarkana, Texas 75507-5000
PROPOSED CITATION:	In recognition of excellence for the FY05 HMMWV Recapitalization Program, Red River Army Depot outperformed expectations on every level. The results were an increase in production from 2,097 scheduled for FY 05 to an actual production of 2,789 vehicles, reduced average defects per vehicle by 46%, reduced cycle time by 45%, reduced actual costs per vehicle by 42%, and reduced the number of direct labor manhours per vehicle by 55%. The depot workforce's responsiveness, exceptional work ethics, and dedication to the mission provided vehicles to support our warfighters of Operation Iraqi Freedom and the Global War on Terrorism is above reproach. Your "Our Best, Nothing Less" attitude resulted in the implementation of LEAN manufacturing practices which in turn streamlined the overhaul/ remanufacturing processes of HMMWVs from a completion rate of 0.5 vehicles every day to 21 vehicles every day. You stand proudly as each vehicle rolls off the assembly line stating "We build it as if our lives depend on it, theirs do!" This demonstrated leadership has served as a benchmark for other depots and arsenals to emulate, and this reflects great credit upon the employees of Red River Army Depot, the Army Materiel Command and the Department of the Army.

Simpler®

June 20, 2005

To: BRAC Commissioners
Subject: RRAD LEAN Transformation

It has been our great pleasure and honor to work with the fine people of Red River Army Depot for the past 3 years. Having worked with numerous different industries including healthcare, nuclear power generation, banking, and other DoD clients, Red River's progress has been second to none.

The magnitude of the changes over the last year, especially, have been amazing! To think that last summer, the HMMWV Re-Cap line was producing 2 to 3 vehicles per *week*... This week, the HMMWV team completed 20 trucks in just one *day*! 15 vehicles per day is an average day. Amazing. My background is in the automotive industry and I can tell you that I have NEVER witnessed such a rapid new product introduction. How was this accomplished? Lot's of very hard work and a truly dedicated workforce. During one rapid improvement event the LEAN team, along with the line mechanics, came in on a Friday and Saturday to rearrange the assembly line and ready it for production that following Monday morning. When the line started on Monday, it barely skipped a beat. This team is always up for a challenge.

The above examples are only a sampling of the type of dedication and devotion to one's Army and one's Country that you will find here in Bowie County, Texas at Red River Army Depot.

In our history of guiding clients through "LEAN Transformations", it has been our experience that clients typically "hit their stride" and find sustainable momentum for change after year 2 or year 3. I would urge you to take RRAD's performance over the last year as evidence that they are truly running an efficient, flexible, and quality conscious organization. I would also urge you to reconsider your decision to close such a world class organization. To close a facility such as this would be a great loss to the U.S. Army, in my professional opinion.

Respectfully,

Kurt Knoth

Kurt Knoth
Manager of Consulting Services
Simpler Consulting
Cell: 336-491-2430

Enclosures: HEMMT One pager.ppt, HMMWV One pager.ppt, SEE One pager.ppt

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War Fighter Testimonials

While clearly satisfying all its customers, the depot is probably most proud of the positive feedback that it continues to receive from the end user of its products, the Soldier.

There are numerous testimonials by the soldiers that have first-hand knowledge of the RRAD's products and their superior performance. One such soldier is Spc. Dustin Plant who served in Baghdad as a part of Bco 1/156 AR BN of 256 BCT. In a note to the depot, Spc. Plant stated "…My Company has been hit by seven roadside bombs and two car bombs and we have only suffered minor injuries. Everyone that I talked to said that they believe the armor is what saved their lives. …Please let everyone know at Red River we appreciate all the hard work they are doing. It is saving lives over here."

One other testimonial is by Colonel Douglas J. Evans, currently serving as the Red River Army Depot commander. In his first address to the workforce, Col. Evans told of his personal experience with services provided by Red River. While deployed to Iraq, his HMMWV received an up-armor kit installed by volunteers from Red River. His comments were "On our first convoy after receiving the up-armor we were headed north to Tikrit, home of Saddam. My vehicle was hit by an Improvised Explosive Device (IED) but we were able to travel right through it, never stopping. I told some of the people it felt like we were going through a hail storm. So you see I am personally grateful for what the folks of Red River are doing for our soldiers that are fighting in Iraq." But then that's only to be expected at a depot with a motto: "Building it as if our life depends on it…theirs do!"