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This analysis evaluated the potential costs and benefits of the prototype Materiel Release Order Control (MROC) in use in the model Direct Support Unit (DSU) initiative at Fort Bragg, NC. The MROC provides documentable time savings in the areas of 1) receipt processing, 2) customer issue, 3) shipping, and 4) status checking. The comprehensive database and report generating capabilities should contribute to the Army goal of total asset visibility and enhance cross-levelling concepts. Reductions in ordering will eventually decrease ASL with a proportional reduction in inventory shrinkage, both of which may result in substantial cost avoidance. The expected benefits should easily offset the cost of procuring the MROC.

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April 1994

United States Army
TRADOC Analysis Center - Fort Lee
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Fort Lee, Virginia 23801

Analysis of Materiel Release Order Control (MROC)

Combat Service Support Battle Lab Initiatives - Model Direct Support Unit (DSU)

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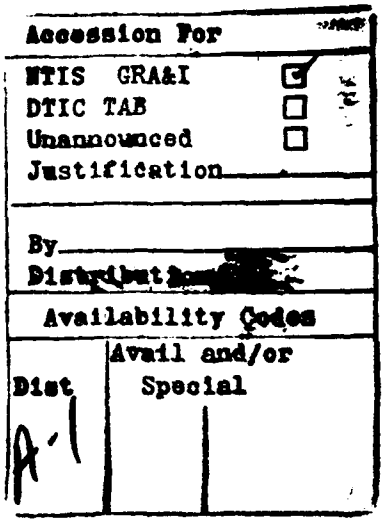

Analysis of Material Release Order Control (MROC) Combat Service Support Battle Lab Initiatives — Model Direct Support Unit (DSU)

1. Purpose. The purpose of this analysis is to evaluate the potential costs and benefits of the prototype Materiel Release Order Control (MROC) in use in the Model Direct Support Unit (DSU) initiative at Fort Bragg, NC.

2. Background. The Combat Service Support (CSS) Battle Lab Supply Support Task Force and the U.S. Army Quartermaster School (USAQMS) are working on several initiatives to help determine the future of Army Logistics. A Materiel Release Order Control (MROC) prototype has been developed to enhance the supply support operation of Direct Support Units (DSU) using the Standard Army Retail Supply System, Level 1 (Objective) (SARSS-1(O)). The MROC prototype uses Radio Frequency Data Communications (RF/DC) hand held terminals and portable printers, as well as new database files for the DSU which are designed to control the flow of MRO and provide the DSU supervisors with information on the performance and productivity of warehouse personnel. The prototype MROC includes Receipt Processing, Stock Picking, Customer Issue, and Shipping Documentation as applications. The objective MROC would also use the RF/DC terminals for on-line/real time Inventory, Location Survey, Location Maintenance (MLOC), and Denials/Confirmations. Currently, the Logistics Applications of Automation Marking and Reading Symbols (LOGMARS) hand held bar code scanners are used to capture information on incoming items. The collected data are then downloaded into SARSS via a hard-wired connection to the Tactical Army Combat Service Support Computer System (TACCS) computer. The system then generates MRO on the TACCS computer printer. For a complete system description refer to Reference f, Evaluation Report on Materiel Release Order Control, prepared by Vector Data Systems for the USAQMS. The CSS Battle Lab Supply Support Task Force and the USAQMS requested assistance from TRAC-LEE in the evaluation of the prototype MROC (references a and b).

3. Summary of Conclusions.

a. The procurement of the objective MROC represents an investment for the Army. The largest payoff is from the integrated software package which establishes a comprehensive database, enables numerous management reports to be generated, and allows real time queries which in turn save time.

b. The MROC provides documentable time savings in the areas of (1) receipt processing, (2) customer issue, (3) shipping, and (4) status checking, e.g., processing of denials. This time savings is evidenced by a smaller or non-existent backlog of incoming items. Readiness is thus increased by getting parts to customers faster.

c. The comprehensive database and report generating capabilities contribute to the Army goal of total asset visibility and should enhance cross-levelling concepts. The increased visibility and comprehensive audit trail should increase customer confidence in the system and ensure that items are used for their intended purpose. Such positive steps will reduce unnecessary ordering.

d. Any reduction in ordering will eventually decrease ASL with a proportional reduction in inventory shrinkage, both of which may result in substantial cost avoidance.

e. The procurement costs for the MROC can be expected to be 12% to 48% more than costs to maintain the status quo due to the need to replace existing equipment as it nears the end of its useful life. The expected benefits—most notably the decrease in ASL, inventory shrinkage, and OST—should easily offset the cost of procuring the MROC. Although no data was available, it's expected that sustainment costs—supplies and maintenance—would be offset similarly.

4. Scope/Limitations.

a. All analysis is based upon the best data available. No extrapolations were done to generate data.

b. Intangible and non-quantifiable tangible benefits are identified, but no attempt was made to quantify or rank these items.

c. Only procurement costs are evaluated. Labor costs/ savings were not quantified except to identify personnel who may be available to perform other duties associated with the same jobs.

d. Only peacetime operations were evaluated.

5. Assumptions.

a. The handheld barcode scanners currently in use with LOGMARS will have to be replaced. Some units are at the end of their useful life; others have several years left.

b. Peacetime benefits are transferable to wartime operations.

c. Costs and benefits for a single DSU are representative of each DSU in the Army.

d. Any reduction in needed military manpower that may be identified will be considered only as an improvement in productivity in that military personnel will be freed to perform

other duties associated with their jobs.

6. Methodology.

a. Observe operations at Direct Support Units using the prototype and the current systems to generate MRO.

b. Identify tangible and intangible benefits, classify them according to source, and significance, if possible, based upon observations and the contents of the Vector Data Systems Evaluation report.

c. Identify costs associated with the procurement of the alternative and any costs associated with maintaining the status quo.

d. Conduct a literature search to identify previous reports or related analysis. (See reference list in paragraph 10.)

7. Findings.

a. Discussion of operations and benefits. The U.S.Army Quartermaster School (USAQMS) contracted with Vector Data Systems to conduct an independent evaluation of the prototype MROC installed at the DSU of the 503rd Light Maintenance Company at Fort Bragg, NC. Reference f is the report from that effort. The evaluation is based in part upon a comparison between operations at the DSU of the 503rd Light Maintenance Company and those at the DSU of the 659th Light Maintenance Company, also at Fort Bragg. Both DSU service approximately the same size maintenance companies, handle the same types of items, and have roughly the same volume each month. The units differ markedly in facilities and in addition, Vector personnel came to the conclusion that soldier expertise in the use of LOGMARS was not equal. The Model DSU (503rd) is located in a permanent building with very good lighting, ventilation, and most importantly, space. All work spaces are neat and organized efficiently. There is room to segregate newly arrived shipments from items being unpacked and room to move dollies and other large items of equipment from the receiving area to the storage areas without having to clear pathways or worry about tripping hazards. On the other hand, the 659th is in a temporary building with limited space which is not organized for peak efficiency. The area is cluttered and work tables are used for storage rather than sorting of supplies. The work environment can have a measurable effect upon productivity. Any conclusions reached based on observable differences between the two units must be considered in light of the above differences. Variations such as these in DSU Army-wide may affect the magnitude of expected benefits or savings.

b. The expected benefits advertised by the MROC proponents and identified in the Vector report are derived from either

improved barcode reading technology, radio frequency capabilities, or software or some combination of the three. The following discussions all relate to direct observations at Fort Bragg.

(1) Improved receipts processing is a function of the improved technology, the software, and to a lesser extent the radio frequency capability. With MROC, items are scanned more quickly; however, the portable laser printers cannot keep up with the scanning process and there is a slight delay in printing labels. This forces the soldier back into a "batch" processing mode although the batches are much smaller than those occurring using the current barcode readers. A faster printer would eliminate the backlog, but might not be worth the cost. The impact of the RF capability as opposed to a direct download to the computer varies depending upon where the receipts are being processed and the volume of items. It eliminates the manual interface with the computer and allows the soldier to continue receipt processing while the database is being updated and labels are printing. The interactive software is imperative for this operation to proceed smoothly. There is a considerable time saving in the speed with which the MRO are generated due to the interactive database. This makes the labels available more quickly to affix to incoming items. Even with the slow printers, the Vector report cites close to a 400% gain in efficiency in the area of receipt processing for the MROC as compared to the current procedures.

(2) The stock picking process is expedited by the real time reports generated by the interactive software and the RF capability. The information on items to be picked is relayed via RF to the stock pickers who then scan the bin labels and the items. According to the Vector report, there was no evidence of time savings since there is an extra scanning operation involved; however, the accuracy and visibility of the work improved dramatically. The software provides an audit trail not previously available.

(3) Issues to customers are expedited due to the automatic reports generated by the software. As soon as the items are scanned, the paperwork is completed and the customer has an itemized list of parts issued. The RF capability makes a contribution, but a partial time savings could still be achieved if a hardwired downlink were used, provided that the software could generate the reports quickly. The Vector report cites close to a 200% gain in efficiency in the area of receipt processing for the MROC as compared to the current procedures.

(4) Shipping is impacted in the same manner as stock picking and issue. RF capability makes the process go more smoothly and the software does the work. Vector did not evaluate the shipping process in detail.

(5) Since the software/database contains more information on all parts ordered/received/issued, processing of denials, status checks and other administrative searches, etc., are expedited. This all provides more information and reports for managers which may or may not be beneficial—the reports themselves do nothing—it's up to management to use the information. The database has the potential to enhance asset visibility across units and make cross-levelling easier to accomplish. The Vector report cited the need for system training in the use of the MROC, but familiarization with the reports and their uses is also needed.

(6) Order Ship Time (OST), the average time it takes to process a requisition from the initiation of the request until the time that the item is received and posted to the Supply Support Activity's (SSA's) stock record accounts, is also reduced since one of its components, receipt processing, is reduced. Since OST is used to compute stockage levels, a reduction in OST will eventually reduce ASL stockage levels.

b. Discussion of costs. According to the Program Executive Office for Standard Army Management Information Systems and the Project Managers for Tactical Management Information Systems and Automatic Identification Technology, an Automatic Identification Technology (AIT) contract is currently under evaluation and is expected to be awarded later in FY 94. If this contract goes through, it would be the source for all equipment of the type called for to support the MROC and also any replacement for the LOGMARS related hardware.

(1) The items listed in table 1 were procured by PM AIT in support of the Model DSU Proof of Principle. Dollar amounts are for FY 93 and do not reflect any possible large quantity savings.

(2) The $37,770.25 total from Table 1 represents what is needed to setup an MROC which is integrated with the current Army computers. The only item which may not be needed for each DSU is a site survey. The above does not include the costs of writing integrated software since that would be done by the software Development Center - Lee at Fort Lee. The Model DSU also uses a Lowry Thermal printer which operates more quickly than the portable laser printers and is estimated to be equal in cost to two of the portable printers and is already in the inventory. It is expected that these dollar amounts would be significantly reduced due to volume purchase if the aforementioned contract goes through. The prototype setup with the CPU separate from SARRS was not costed.

Table 1. Model DSU Proof of Principle Procurement

Part Number	Item Description	Qty	U/I	Unit Price	Amount
3800-CERP05E	Scanner	10	EA	$2206.75	$22067.50
3850-03RS	Spread Spectrum Transceiver (Modem)	3	EA	646.75	1940.25
3880-106	Holster-LRT/LDT	10	EA	32.50	325.00
3057-FOX	Null Modem Cable	1	EA	32.50	32.50
3860-100	Cradle-CAM Kit	1	EA	549.25	549.25
3861-101	Cradle-CAM ADD-ON	2	EA	507.00	1014.00
C5D-Y001	Site Survey	1	EA	1950.00	1950.00
6200-201	STEP Enabler Software	1	EA	126.75	126.75
2070-021	Serial Access Brigade	1	EA	1231.75	1231.75
2080-000	Serial UNIX Enabler	1	EA	1296.75	1296.75
PS-1004	Portable Printer	7	EA	1166.75	8167.25
50-04999-075	Battery for Thermal Printer	7	EA	65.00	455.00
3870-101	Printer Interface Module	7	EA	71.50	500.50
50-04000-055	Battery Charger	7	EA	16.25	113.75
				TOTAL	$37,770.25

(3) If the radio frequency capability were not procured (i.e., doing a minimal upgrade, only replacing current equipment as it wears out), the cost for newer technology scanners should be less than that for the scanner shown above; however, the difference may not be substantial. The PM cited a comparable scanner for $1837.50, but also indicated that the Army requires an intrinsically safe model (one that can be used in explosive environments) which could run as high as $3123.75. In this scenario existing Lowry printers would continue to be used instead of the portable printers. Assuming that 10 scanners

would still be required, a comparable cost would be in the range of $18,375.00 to $31,237.50.

(4) With the uncertainty associated with these estimates, the only conclusion that can be drawn is that the MROC can be expected to cost from 12% to 48% more than just replacing the scanners. [$18,375.00 and $31,237.50 as compared to $35,820.25 (model MROC cost less site survey).]

d. Potential Savings/Cost Avoidance.

(1) The improved audit trail provided by MROC will allow the supply and unit personnel to verify the status of supply items. This increased visibility should reduce unnecessary ordering—items won't be lost, misplaced, forgotten, or diverted as easily—and will help to ensure that they are, in fact, used for their intended purpose. The increased visibility and better audit trail should improve customer confidence in the system which will decrease ordering of items "just to be on the safe side."

(2) The reduction in ordering has a ripple effect. Demand analysis programs in SARRS will, in turn, compute lower stockage levels. This directly affects the dollar value of the ASL. When ASL decreases, there will be a proportional reduction in inventory shrinkage, i.e., lost, damaged, and/or expired or obsolete items which must be replaced, which results in cost avoidance.

(3) A sampling of 6 DSU, including the Model DSU before the MROC installation, revealed an average inventory value of $33 million, ranging from $4.3 million to $65 million, with an Inventory Adjustment Ratio (IAR) ranging from .003% to over 31%. The IAR is the amount of recorded losses and gains, i.e., the adjustment in inventory, compared to the total value of the inventory. If MROC can reduce stockage requirements by even 1% ($430,000 on average), the cost avoidance alone would quickly pay for equipping each DSU with the MROC. It should also reduce the IAR and associated costs.

(4) Reduction in OST also has a ripple effect. Less inventory tied up in transit equates to a cost avoidance. Not enough information was available to put a dollar value on this.

8. Conclusions. It would be good to keep in mind a quote attributed to Henry Philcox, chief information officer at the Internal Revenue Service, cited in the September 1993 issue of **Government Executive**: "Technology for technology's sake does not increase productivity or mission effectiveness. If you start with a mess and simply add technology, you end up with an automated mess." The current conditions in DSU Army-wide vary

markedly. Benefits derived from the introduction of the MROC will vary also.

a. The procurement of the objective MROC represents an investment for the Army. The largest payoff appears to be from the integrated software package which establishes a comprehensive database, enables numerous management reports to be generated, and allows real time queries.

b. The MROC provides documentable time savings in the areas of (1) receipt processing, (2) customer issue, (3) shipping, and (4) status checking, e.g., processing of denials. This time savings is evidenced by a smaller or nonexistent backlog of incoming items. Readiness is thus increased by getting parts to customers faster.

c. The comprehensive database and report generating capabilities contribute to the Army goal of total asset visibility and should enhance cross-levelling concepts. The increased visibility and comprehensive audit trail should increase customer confidence in the system and ensure that items are used for their intended purpose. Such positive steps will reduce unnecessary ordering.

d. Any reduction in ordering will eventually decrease ASL with a proportional reduction in inventory shrinkage, both of which may result in substantial cost avoidance.

e. The procurement costs for the MROC can be expected to be 12% to 48% more than costs to maintain the status quo due to the need to replace existing equipment as it nears the end of its useful life. The expected benefits—most notably the decrease in ASL, inventory shrinkage, and OST—should easily offset the cost of procuring the MROC. Although no data was available, it's expected that sustainment costs—supplies and maintenance—would be offset similarly.

9. Recommendations.

a. Proceed with the MROC procurement. Vigorously pursue the software modifications to the SARRS to establish an on-line database and the report generating capabilities.

b. Review day to day operations in all DSU and clean-up work sites and rearrange where necessary to improve efficiency. (See discussion in paragraph 7a.) This action should be accomplished before any new equipment is put in place.

c. Re-look the procurement costs for the RF handheld devices and portable thermal printers once the Automatic Information Technology (AIT) contract is in place. Consider doing partial buys to mitigate the high up-front expense. Check

for higher speed portable printers and alternative printer paper since the Vector report cited a reluctance on the part of the users to use the portable printers due to high paper cost.

10. References.

a. Memorandum, USACASCOM&FL, ATCL-B, 28 June 1993, Subject: Request for Abbreviated Cost and Operational Effectiveness Analysis for Combat Service Support Battle Lab Initiatives.

b. Meeting, Quartermaster Automation Office, 21 July 1993, SAB.

c. Site visit, Ms. Jeannette Blumenthal to the DSUs of the 503rd and 659th Light Maintenance Companies and the Vector Office with Mr. Gordon Cross and Mr. Chester Pasko at Fort Bragg, NC, 16 September 1993.

d. Automation Economic Analysis (AEA) for the Logistics Applications of Automated Marking and Reading Symbols (LOGMARS) Required Operational Capability (ROC); USALOGC, January 1984, revised April 1985.

e. Logistics Applications of Automated Marking and Reading Symbols, LOGMARS, Cost/Benefit Analysis, USAMC Materiel Readiness Support Activity (MRSA), June 1981.

f. Preliminary Evaluation Report on Materiel Release Order Control, Vector Data Systems, Fort Bragg, NC, October 1993.

g. Memorandum, USATRADOC Analysis Center - Fort Lee, ATRC-LP, Request for Abbreviated Cost and Operational Effectiveness Analysis for Combat Service Support Battle Lab Initiatives— Model DSU, 7 October 1993.