

AD-A079 409

ARMY INVENTORY RESEARCH OFFICE PHILADELPHIA PA
ANNUAL REPORT - FISCAL YEAR 1979.(U)
NOV 78

F/G 15/5

UNCLASSIFIED

NL

[]
AD-A079 409

END
DATE
FILMED
2 -80
RDC

ADA 079409

LEVEL
ANNUAL REPORT
FISCAL YEAR 1979

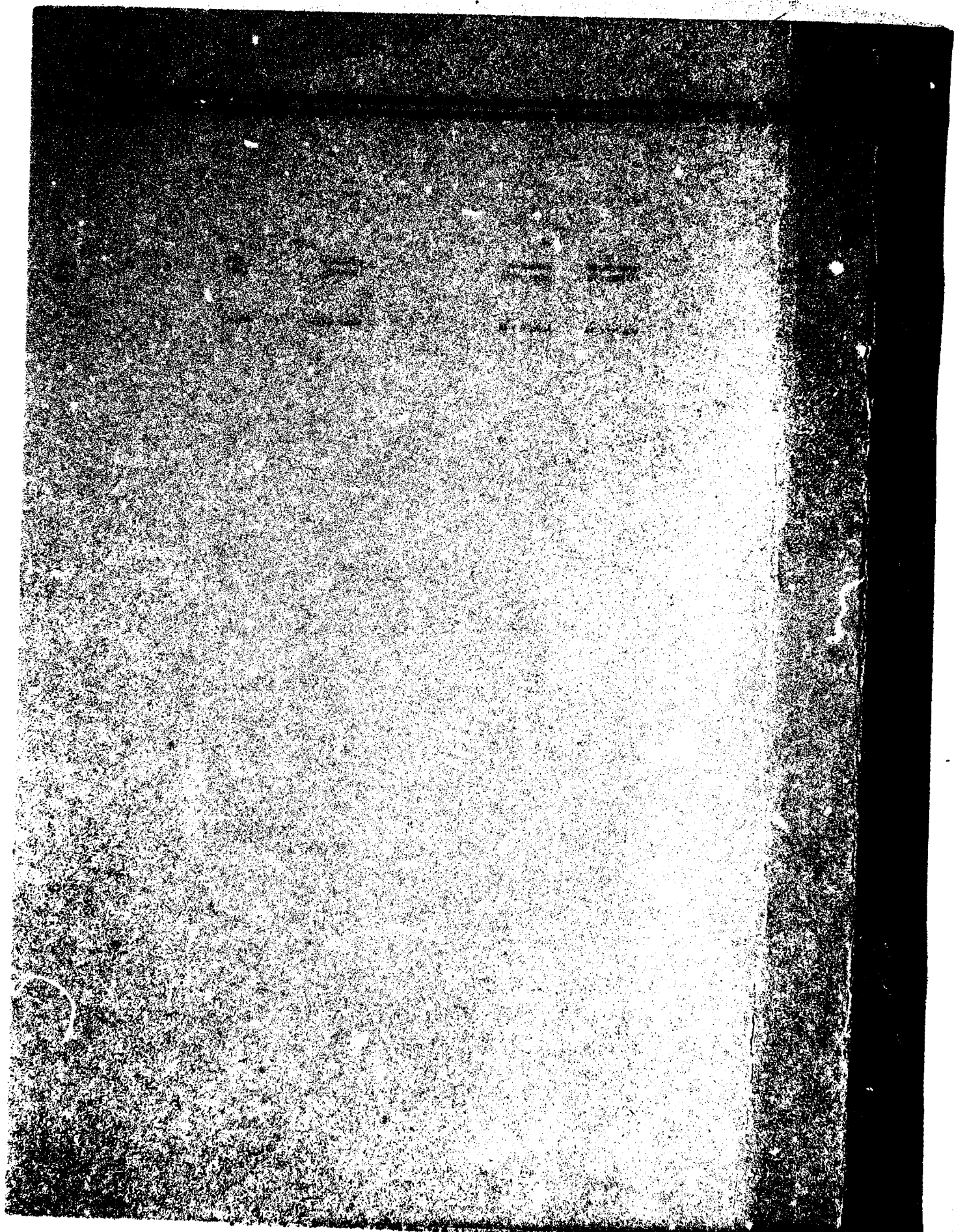
U.S. ARMY
INVENTORY
RESEARCH
OFFICE

November 1979

D D C
RECEIVED
JAN 14 1980
RECEIVED

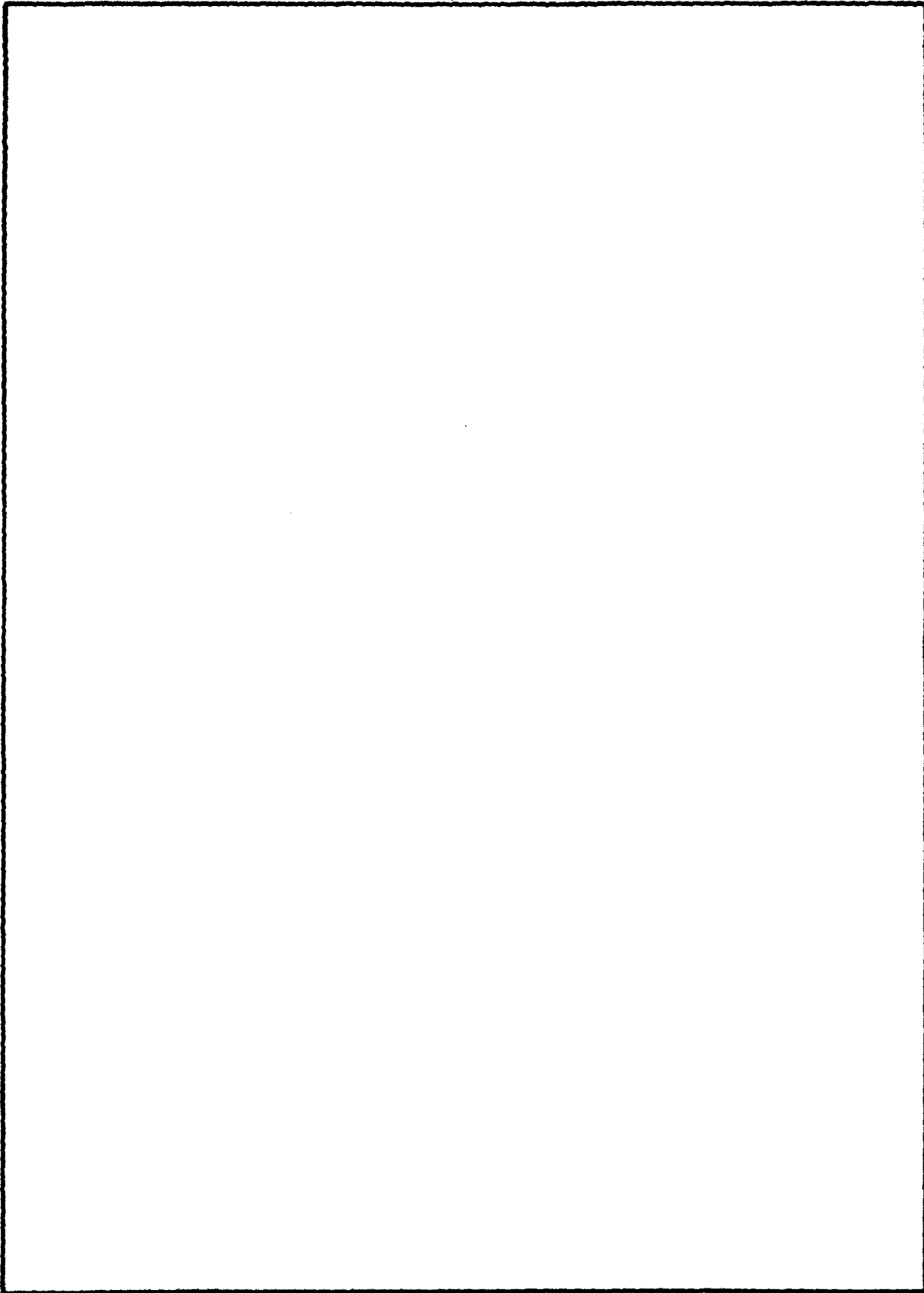
ROOM 806
U.S. CUSTOM HOUSE
2nd and Chestnut Streets
Philadelphia Pa. 19106

80-111-007



REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER <i>Final rept. Oct 78 - Sep 79.</i>	2. GOVT ACCESSION NO.	3. RESUME/CATALOG NUMBER
4. TITLE (and Subtitle) <i>ANNUAL REPORT - FISCAL YEAR 1979.</i>	5. TYPE OF REPORT & PERIOD COVERED Annual Report	
7. AUTHOR(s)	6. PERFORMING ORG. REPORT NUMBER	
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Inventory Research Office US Army Logistics Management Center Room 800, US Custom House, Phila., PA 19106	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Materiel Development & Readiness Command 5001 Eisenhower Avenue Alexandria, Virginia 22333	12. REPORT DATE November 1978	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) <i>1240</i>	13. NUMBER OF PAGES 37	
16. DISTRIBUTION STATEMENT (of this Report) Approved for Public Release; Distribution Unlimited	15. SECURITY CLASS. (of this report) UNCLASSIFIED	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
18. SUPPLEMENTARY NOTES Information and data contained in this document are based on input available at the time of preparation. Because the results may be subject to change, this document should not be construed to represent the official position of the US Army Materiel Development & Readiness Command unless so stated.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes work done by the US Army Inventory Research Office during the period October 1978 - September 1979. Reports published during the period are listed, along with papers presented at professional meetings and notes on other professional activities.		

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)



SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

TABLE OF CONTENTS

	<u>Page</u>
OVERVIEW.....	2
COMPLETED STUDIES.....	3
ONGOING STUDIES.....	11
TERMINATED PROJECTS.....	28
LOGISTICS MANAGEMENT ASSISTANCE.....	29
PROFESSIONAL ACTIVITIES.....	31
REPORTS PUBLISHED.....	33
DISTRIBUTION.....	34

SEARCHED	INDEXED
SERIALIZED	FILED
APR 19 1968	
FBI - MEMPHIS	
Special	
A	

US ARMY INVENTORY RESEARCH OFFICE

OVERVIEW

This report describes IRO activities in FY 1979. Annual Reports for previous years go back to FY 1966.

Six projects were completed during the year. Two were terminated at sponsor's request (one later re-instated in the FY 1980 Work Program). Thirteen projects are carried over into the FY 1980 Work Program.

Substantial progress was made in several important areas, most notably under Project 255, Design of a Prioritized Depot Scheduling System for Secondary Item Repair, and Project 260, Operational Readiness Oriented Logistic Support Models. In the former, several short term improvements were made to the systems for managing depot repair of secondary items, particularly in the interfaces between the Materiel Readiness Commands, the Depot Systems Command and the Depots. In addition, conceptual design was completed for longer term system improvement. Significant reductions in Repair Cycle Times have resulted, with expectations of further improvements when the longer term system design concepts are implemented. These advances enabled DARCOM to meet management improvement goals set by DA and DoD in this area.

In Project 260, a standard multi-echelon, multi-item, multi-indenture model was programmed and distributed to MRC's and Project Managers. It is being widely used for initial provisioning computation, particularly for low density systems with high performance requirements. It has also come into use by some Army contractors (Boeing-Vertol, Hughes Aircraft, Martin-Marietta) and is being incorporated into a life-cycle costing model being developed by ARINC, Inc. for CERCOM.

In both of these projects, IRO provided technical direction to DARCOM Technical Working Groups, composed of both technical and functional people from the MRC's and other interested DARCOM activities such as DESCOM, ALMSA, AMSAA, etc. These TWG's proved to be very effective, contributing greatly to the progress made in these areas. In support of Project 260, IRO in conjunction with researchers at several universities, set up a series of conferences on multi-echelon theory and practice which have proved to be very successful. Further details are given in the write-up on Project 260.

The IRO staff remained unchanged in FY 1979. However, Mr. Bernard Price of the Army Satellite Communications Agency spent 4 months at the IRO in an assignment under the DARCOM Materiel Acquisition and Readiness Executive Development (MARED) program. He contributed significantly to developments under Project 260, and continues to serve as a member of the DARCOM Technical Working Group on Provisioning Models. In addition, Prof. Larry LeBlanc of Southern Methodist University spent a 2 week reserve officer assignment at the IRO in May. His field of specialization is mathematical programming. His services were engaged later in the year under the Army's Scientific Services Program to develop an improved optimizing algorithm for the RIMSTOP project.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Measurement and Implications of Production Leadtime Variability

IDENTIFICATION NUMBER:
IRO Project No. 229

REPORT:
"Measurement and Implications of Production Lead Time Variability,"
Martin Cohen, IRO Final Report, September 1979.

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:
Martin Cohen

INITIATION/COMPLETION DATES:
August 1974/September 1979

ABSTRACT:
The study entailed empirical work on methods of forecasting Production Lead Times for secondary items. The forecast and a measure of its variability are to be used in the Variable Safety Level (VSL/EOQ) module of the Commodity Command Standard System. A six-year data base of the procurement history for aviation components was compiled and utilized in simulations of the candidate forecast methods. A method was selected on the basis of smallest aggregate forecast error. A test of this method suggests a significant improvement over the presently-used forecast method.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
The best-performing PLT forecast method uses the present age of buys that have not been shipped yet in an average along with the PLTs of buys shipped in the last two years. It also makes use of an average of the PLTs of items bought on the same contract type when the item's own data is limited (few buys in the two-year base period).

IMPLEMENTATION STATUS:
An interim improvement in forecasting method (use of the 2 year average) is to be implemented in CCSS in Release 59. The full version of the proposed method is scheduled for CCSS Release 62. A SCR for incorporating PLT variability in the VSL/EOQ module is at ALMSA for programming.

RELATED STUDIES:
1. "Procurement Lead Time Forecasting Analysis," Maryann Dominiak, TARCOM SA-79-14, May 1979.
2. "Analysis of Lead Times," ARRCOM, forthcoming.
3. "Production Lead Time Forecasting," Laurence Wheelock, IRO Final Report, January 1972 (AD 736848).

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Stock Availability Improvement Program

IDENTIFICATION NO:
IRO Project No. 267

REPORT:
None. Letter Reports containing fundings and recommendations were given to sponsor.

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:
Bernard B. Rosenman/W. Karl Kruse/Sally Frazza

INITIATION/COMPLETION DATES:
April 1978/February 1979

ABSTRACT:
Declining supply performance led to the formation, in January 1978, of DARCOM Ad Hoc Group to Improve Stock Availability. After some preliminary analyses, IRO was tasked in April to undertake studies, along with others, to find causes for this condition and to recommend ways to improve performance. IRO was asked to concentrate on system problems, with emphasis on those related to the CCSS.

On-site operational analysis at MRC's and data analyses revealed a number of system-related problems. Recommendations to correct them were given to DARCOM in FY 78. Simulations were done in the Nov 78-Jan 79 time frame to determine cost impact of implementing these changes at the MRC's.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

- a. Stay with the CCSS supply management system rather than adopt arbitrary "quick-fix" actions outside the system. Simulations showed that this would be a far more cost-effective course of action.
- b. Update Cost to Order/Cost to Hold/Backorder Penalty costs to reflect inflation. Failure to do so had caused procurement frequencies to increase, safety levels to decrease.
- c. Introduce Procurement Lead Time variability into the VSL/EOQ module. Fix a problem in the incremental deliveries sub-routine.
- d. Raise ceiling on Safety Levels and Procurement Cycle quantities. These were found to inhibit achieving supply performance targets.
- e. Re-institute use of the Supply Performance Analyzer (SPA).

Project 267 (Cont'd)

IMPLEMENTATION STATUS:

All recommendations were accepted by DARCOM. SCR's were prepared for necessary changes to the CCSS and are at ALMSA for programming. Recommendation for raising VSL/EOQ ceilings are awaiting DoD action. Project was initiated with CERCOM to improve the SPA and to adapt it for use on a weapon system basis.

RELATED STUDIES:

None.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Investigation of Minimum Buy Concept

IDENTIFICATION NUMBER:
IRO Project No. 269

REPORTS:

1. "An Investigation of Minimum Buy Policies," Sally Frazza and Alan J. Kaplan, IRO Final Report, August 1979.
2. "Probabilities of Zero Demand," Sally Frazza, IRO Technical Report, September 1978 (AD A060010).

SPONSOR:

DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICERS:

Sally Frazza/Alan J. Kaplan

INITIATION/COMPLETION DATES:

May 1978/August 1979

ABSTRACT:

This study investigated the general economics of minimum buy for non-stocked items, and evaluated alternatives for determining the size of the minimum buy, including a form of EOQ tailored to non-stocked items.

In addition, IRO's demand history file of AVSCOM data was used to reestimate the probabilities of zero demand, which are an important input to the COSDIF stockage model.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

The study finds that minimum buy is economical, but to take maximum advantage of it, some modification is required in how it is implemented in the standard computer system (CCSS). The AVSCOM (TSARCOM) probabilities of zero demand are very similar to TACOM's (TARCOM). Both new sets of probabilities are lower than those currently used in CCSS.

IMPLEMENTATION STATUS:

Results are being reviewed by the MRC's.

RELATED STUDIES:

1. "COSDIF Probabilities for TACOM," C. Herrera, TACOM Systems Analysis Office, Report No. 75-35.
2. "Implementation of Quantity Discount Procedures at DARCOM Materiel Readiness Commands," IRO Project No. 254.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Improvement of Requirements Computation Processes for EW/SIGINT Support

IDENTIFICATION NUMBER:
IRO Project No. 270

REPORT: "Improvement of EW/SIGINT Support," Robert L. Deemer, RO Final Report, July 1979 (AD A074627).

SPONSOR: DARCOM Directorate for Materiel Management
Programs and Projects Office, DRCMM-L

PROJECT OFFICER:
Robert L. Deemer

INITIATION/COMPLETION DATES:
July 1978/September 1979

ABSTRACT: Since DARCOM took over responsibility for EW/SIGINT Materiel in 1977, supply performance statistics have been below target. Data from Electronics Materiel Readiness Activity (EMRA) were gathered and analyzed. A modified Commodity Command Standard System (CCSS) computation process for both range and depth of stock was developed, based on the CCSS Insurance Item model, the VSL/EOQ module and the basic COSDIF model. Values of cost parameters unique to EMRA were derived for use with these models. Guidance for implementation of these computational processes in the ACCLAIMS system was developed and sets of decision tables were computed so that the procedures could be implemented manually prior to computer implementation, if desired.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
A computer simulation was written and run with actual EMRA data and results indicated that a substantial improvement in supply performance can be achieved by use of these computational procedures. In fact, it was shown that supply performance targets can be achieved with only a slight funding increase. Recommendation was made to EMRA and to CERCOM, which now has operational control of the EMRA mission, that the procedures be implemented as soon as possible.

IMPLEMENTATION STATUS:
Implementation recommendations were accepted by EMRA, CERCOM and DARCOM. EMRA has begun to use the manual decision tables, applying them as items reach their Reorder Points. Implementation in the ACCLAIMS system is still uncertain; programming priorities relative to other applications have not been decided.

RELATED STUDIES:
"Evaluation of Several VSL/EOQ Models," R. L. Deemer and W. K. Kruse, IRO Final Report, May 1974 (AD 781948).

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Methodology for Inter-Depot Transfer

IDENTIFICATION NUMBER:
IRO Project No. 273

REPORT:
"Inter-Depot Transfer Model," Steven Gajdalo, IRO Final Report,
August 1979.

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Supply & Distribution, DRCMM-SP

PROJECT OFFICER:
Steven Gajdalo

INITIATION/COMPLETION DATES:
October 1978/August 1979

ABSTRACT:
Rapid changes in demand patterns result in stock imbalances at the depots. An earlier model developed by the Inventory Research Office is available to correct imbalances but it is outdated. This report discusses refinements to the model and an automated system developed for economic Inter-Depot Transfer (IDT). The system was approved for implementation in the Commodity Command Standard System.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
An automated economic Inter-Depot Transfer System is feasible for implementation in the Commodity Command Standard System (CCSS).

IMPLEMENTATION STATUS:
The model is being implemented as a stand alone system by ALMSA. Current milestones call for full implementation with CCSS Release 59.

RELATED STUDIES:
1. "Methodology for Inter-Depot Transfers," Alan J. Kaplan, IRO Final Report, November 1971 (AD 736847).
2. "Improvement of Distribution Effectiveness," current IRO study, Project 253.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Propriety of the 90/90 Criteria in Initial Deployment of Weapon Systems

IDENTIFICATION NO.
IRO Project No. 274

REPORT: "A Simple Model for Assessing the Impact of Spare Parts During Initial Deployment of New Weapons Systems," W. Karl Kruse, IRO Technical Report, June 1979 (AD A074319).

SPONSOR: DARCOM Directorate for Materiel Management
Associate Director for Supply & Distribution, DRCMM-SP

PROJECT OFFICER:
W. Karl Kruse

INITIATION/COMPLETION DATES:
March 1979/October 1979

ABSTRACT: The original objective of this project was to assess the impact or operational readiness of several rules for determining when parts support is satisfactory for fielding a new weapon system. Because of severe modelling difficulties, the study instead, provided a new method which corrects some of the a priori faults of the 90/90 type rule. In addition, suggestions were made to the sponsor on a method for consolidating parts shipments, and for a report which displays parts status.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

It is important to consider the failure rate of the parts on hand, not only the number of parts. Likewise, it is important to consider whether the parts are repairable or consumable, since the lack of a consumable part can cause a more severe problem. A simple model was developed around these considerations to indicate the degree of available parts support in terms of a percentage factor.

In order to prevent parts deliveries from straggling in to the field, the parts should be delivered nearly concurrently with the fielding of the weapon system. A simple way to do this was developed which takes advantage of the existing consolidation features at the depots. This was presented as a more economical alternative to creating a consolidation point. If the decision to field the system is not to be based on any hard and fast rule, then it is important for the decision maker to have relevant and understandable reports on parts status. A sample report format was developed which summarizes the status of on-hand and due in stocks.

Project 274 (Cont'd)

IMPLEMENTATION STATUS:

Attempts are being made to test the recommendations on some
weapon systems which are being fielded in the near future.

RELATED STUDIES:

None.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Improvement of Distribution Effectiveness

IDENTIFICATION NUMBER:
IRO Project No. 253

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Supply & Distribution, DRCMM-S

PROJECT OFFICER:
Robert L. Deemer

INITIATION/PROGRAMMED COMPLETION DATES:
February 1977/November 1979

PROBLEM:
Concern about requisitions that are not filled from the closest area oriented depot.

OBJECTIVE:
Develop and validate procedures for modifying release of low priority backorders so that distribution effectiveness can be improved with little or no degradation to supply performance.

CURRENT STATUS:
In work finished in October 1978, analysis was done of MICOM data to see if distribution effectiveness could be improved without serious delay to the customer if low priority backorders were to be held in the expectation of receiving another delivery from procurement within a short time. DARCOM had decided that a 20 day delay would be tolerable. This analysis showed that some delay, but less than 20 days, could be endured on batch delivery contracts but that no delay should be applied to phased delivery contracts.

After review of these findings, sponsor asked that analysis be extended to other MRC's and that a more in-depth analysis be done on the phased delivery contracts. This new work is just about finished. While analysis is not complete, it appears that original findings apply to all MRC's and that the previous recommendations on phased delivery still hold.

RELATED REPORT:
"Effects of Backorder Release Policies on Distribution Effectiveness and Customer Wait," Robert L. Deemer, IRO Final Report, October 1978 (AD A060022).

RELATED STUDIES:
"Performance Standards for Depot Initial Fill Rates," Alan J. Kaplan, IRO Final Report, May 1972, (AD 744786).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Implementation of Quantity Discount Procedures at DARCOM Materiel
Readiness Commands

IDENTIFICATION NUMBER:
IRO Project No. 254

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICERS:
Steven Gajdalo, IRO
Wayne Zabel, PRO
(This is a joint project with Procurement Research Office, Fort
Lee, VA)

INITIATION/PROGRAMMED COMPLETION DATES:
July 1977/January 1980

PROBLEM:
The Materiel Readiness Commands do not take advantage of the
economies of quantity discounts when procuring secondary items.
Doing this would be especially timely now in view of declining
resources and supply performance over the past few years.

OBJECTIVE:
To develop and test economic procedures to obtain quantity dis-
counts in the procurement of secondary items.

CURRENT STATUS:
Proposed Quantity Discount procedures for MRC use have been
developed and tested at MICOM and TARCOM. Test data have been
collected and analyzed. Preliminary results support implementa-
tion but some procedural difficulties will have to be overcome.

RELATED STUDIES:
"Project EOQ: A Success Story in Implementing Academic Research,"
L. M. Austin, Interfaces, Volume 7, Number 4, (August 1977).

INTERIM REPORT:
"The Application of Quantity Discounts in Army Procurements,"
W. V. Zabel and S. Gajdalo, March 1979 (AD A066583).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Design of a Prioritized Depot Scheduling System for Secondary Item Repair

IDENTIFICATION NUMBER:
IRO Project No. 255

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:
Arthur Hutchison

INITIATION/PROGRAMMED COMPLETION DATES:
July 1977/October 1980

PROBLEM:
There are problems in the secondary item repair system in maintaining readiness and emphasizing reduction in Repair Cycle Time inventory investment costs. Defense of the PAA budget requests is impaired since the elements of RCT are not clearly defined or measured.

OBJECTIVES:
Develop a requirements-driven depot operation where MRC's identify quantity and urgency of repair programs. Depots develop short term induction schedules based on MRC requirements.

Develop a management system which emphasizes reduction of RCT for high dollar secondary items.

CURRENT STATUS:
During earlier phases of this project, short term changes were made in existing procedures that resulted in substantial reductions in Repair Cycle Times, particularly in the Repair Accumulation and Repair Lead Time elements, and in improvements in repair scheduling procedures that facilitated changes in depot workloading to adjust to changing priorities. During the past year, automated procedures were implemented for identifying highest priority repair programs and for ranking items in terms of their potential contribution to RCT reduction. Partially automated procedures were developed for handling these items in the depot scheduling process. Conceptual design for a fully automated system was completed and approved for implementation by DARCOM/DA. Implementation plan was drawn up; it is to be monitored by DARCOM Hqtrs with IRO furnishing technical assistance.

RELATED STUDIES:
"Requirements-Driven Repair Scheduling System for Secondary Items," Arthur Hutchison, IRO Final Report, September 1977 (AD A046579).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Failure Factors for Contingency Planning

IDENTIFICATION NUMBER:
IRO Project No. 257

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICER:
Donald A. Orr

INITIATION/PROGRAMMED COMPLETION DATE:
August 1977/June 1980

PROBLEM:
Failure factors 2 and 3 (Combat and Geographical factors) used to adjust the peacetime failure factor 1 do not have consistent definitional, methodological, and empirical bases. Field experience in war time conditions on replacement rates is sparse. Contingency requirements are being investigated under DARCOM project PRECOMP with a pilot test at TSARCOM. AMSAA is developing theoretically under their SPARC study some combat damage factors. Designing scenario coding and a data structure within the PMR for revamped failure factors 1, 2, 3 needs to be done.

OBJECTIVES:
Investigate the feasibility of developing failure-replacement rates for combat conditions using available, limited data. Develop a structure and implementable procedure for developing rates in an up-to-date fashion as data become available.

CURRENT STATUS:
This project was originally in our FY 77 work program but was suspended at the sponsor's request because MRC participation could not be secured. Work was resumed at the start of FY 79.

A strawman package of working papers has been developed to define factors, describe scenarios, code and store scenario information and factors, and to update the various factors using inference techniques on experienced wholesale or retail demand data. This approach is undergoing review by the MRC's and other activities such as MRSA, ALMSA, AMSAA, that have a stake in the solution of the problem.

RELATED STUDIES:
On-going IRO Project 275 - Updating Failure Factors.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: War Reserve Requirements for New Weapon Systems

IDENTIFICATION NUMBER:
IRO Project No. 258

SPONSOR:
DARCOM Directorate for Plans, Doctrine and Systems, DRCPS-P

PROJECT OFFICER:
Donald A. Orr/Bernard B. Rosenman

INITIATION/PROGRAMMED COMPLETION DATES:
September 1977/March 1980

PROBLEM:
Heretofore War Reserve requirements have not been developed for new weapon systems until they have actually been deployed. It is desired, however, to estimate what these requirements will be for budgetary purposes far in advance of that time.

OBJECTIVES:
To develop a procedure for estimating War Reserve budgetary requirements for new weapon systems that are scheduled for deployment in the POM/FYDP period. The procedure must be capable of use during early phases of weapon system development when data on expected failure rates, maintenance support planning, etc., are only partially available.

CURRENT STATUS:
The Bare Bones Standard Initial Provisioning (BBSIP) Model, previously developed by IRO, was adapted for use for War Reserve computations. This new model, The Bare Bones War Reserve Model, was tried out on six new weapon systems by estimating their funding requirements for 1980-84 POM. Briefings on the procedure and results of the computations were given at DARCOM, DA and DoD, resulting in approval of its use as a standard procedure.

Since then, the procedure was used to compute War Reserves requirements for a number of new systems for the FY 81-85 POM and another round of computations is beginning for the FY 82-86 POM. For each round, changes are made to the computer program and computational procedures to conform to changes in War Reserve Guidance, seminars are given to Project Manager and MRC personnel and assistance is given to them during the computations. It is hoped that the procedures will be "institutionalized" after this year's round so that IRO involvement in future years will be minimal.

RELATED STUDIES:
"Bare Bones: A Method for Estimating Provisioning Budget Requirements in the Out-Years," Donald A. Orr, IRO Final Report, July 1977 (AD A044508).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Operational Readiness Oriented Logistic Support Models

IDENTIFICATION NUMBER:
IRO Project No. 260

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS
Associate Director for Maintenance, DRCMM-MP

PROJECT OFFICERS:
Alan J. Kaplan/Martin Cohen

INITIATION/PROGRAMMED COMPLETION DATES:
October 1977/

PROBLEM:
Multi-echelon models offer great potential for achieving needed system operational availability at least cost. While a number of models exist, none was fully satisfactory either conceptually or in terms of ease of use.

OBJECTIVE:
Promote use and evaluation of multi-echelon models.

CURRENT STATUS:
IRO has given technical direction to a DARCOM working group overseeing efforts in the multi-echelon area. Improvements in existing models have been made, and a program oriented to DARCOM needs and current DARCOM computer systems and data bases has been developed. This program is widely used and has been evolving in response to user needs and theoretical advances.

As a corollary to this effort, IRO, in conjunction with researchers at a number of universities, initiated a multi-echelon conference series, attended by research people and model users, at which theoretical developments and implementation considerations are discussed. Conferences have so far been held at Cornell, George Washington and Purdue Universities, with the next to be held at IRO in November 1979.

RELATED REPORTS:

1. SESAME Computer Program, distributed to Materiel Readiness Commands in February 1979, Alan Kaplan and Martin Cohen.
2. "A Heuristic for Multi-Echelon, Multi-Indentured Inventory Problem," Meyer Kotkin, IRO Technical Report, December 1978 (AD A066590).
3. "An Exact N Echelon Inventory Model: The Simple-Simon Method," W. Karl Kruse, IRO Technical Report, March 1979 (AD A067762).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: RIMSTOP Implementation

IDENTIFICATION NUMBER:
IRO Project No. 261

SPONSOR:
Deputy Chief of Staff for Logistics, Army
Assistant Director for Supply Management, DALO-SMS

PROJECT OFFICERS:
Arthur Hutchison/Bernard B. Rosenman

INITIATION/PROGRAMMED COMPLETION DATES:
May 1978/September 1983

PROBLEM:
As result of work done by a study group under its auspices, DoD issued DoD Directive 4140.44 and DoD Instructions 4140.45 and .46 containing policies for the management of consumable and reparable secondary items at the consumer and intermediate levels of field supply. It is required that all DoD components implement these policies, which include the requirement for use of inventory models that are far more advanced than those now in use. There are a number of technical and human-computer interface problems that must be overcome in order for implementation to be done successfully.

OBJECTIVES:
Evaluate implementation alternatives and modify as necessary. Develop computer and procedural guidance necessary to implement. Conduct pre-implementation tests and provide assistance during implementation as required.

First phase of the project will be handled primarily by Army Logistics Center and will involve implementation of basic variable stockage criteria, variable safety level, and variable operating level models for consumable items. A follow-on phase will be handled primarily by IRO and will involve extensions of these models for handling essentiality, mobility, personnel and funding constraints. Investigation will also be done on the feasibility of applying multi-echelon, multi-indenture models to relate supply availability to weapons system readiness.

Project 261 (Continued)

CURRENT STATUS:

This project was suspended during FY1978 while DA was developing its implementation approaches. IRO resumed work in April 1979. Work to date has concentrated on operational analysis conducted at activities at Fort Bragg and Fort Hood and on setting up data bases for developing and evaluating PLL's/ASL's. Research is proceeding under contract with Southern Methodist University (Prof. Larry LeBlanc) on optimization algorithms.

RELATED STUDIES:

"DoD Retail Inventory Management and Stockage Policy," Working Group Report, Office of Assistant Secretary of Defense (I&L), Volume I, April 1976; Volumes II and III, September 1976.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Integrated Forecasting Techniques for Secondary Item Classes

IDENTIFICATION NUMBER:
IRO Project No. 263

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICERS:
Edwin P. Gotwals III/Donald A. Orr

INITIATION/PROGRAMMED COMPLETION DATES:
December 1977/December 1980

PROBLEM:
With the addition of four years of demand history to the TSARCOM data base, it is reasonable to review and/or update the "k-parameter" for the new forecast algorithm cited by Orr in his previous work and to extend IRO's research efforts in demand forecasting to both "common" and "inactive" secondary items.

OBJECTIVE:
Develop updated parameters and algorithms for the remaining classes of items and synthesize concepts into an overall implementation package for demands and returns forecasting at the wholesale level.

CURRENT STATUS:
Extensive empirical work has been done on the new data base to determine the relationship between statistical measures and performance in an inventory environment (via simulation). Various forecast algorithms have been tested on nine stratification classes of data (requisition activity x dollar demand activity). Significant problems have been encountered owing to incompatibility between results from statistical error measure and simulation runs. Other problems have arisen from sensitivity of simulation results to behavior of just a few items. While results are not yet conclusive, it appears that optimal forecast techniques may be class dependent. Empirical work is continuing in an effort to find a set of techniques that will give significant improvement over techniques now in use.

RELATED STUDIES:
"Demand Forecasting with Program Factors," Martin Cohen, IRO Final Report, September 1975 (AD A017858).

"Demand Forecasting Using Process Models and Item Class Parameters: Application of Ancillary Variables," D. A. Orr, IRO Final Report, April 1976 (AD A026081).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Evaluation of Provisioning Procedures

IDENTIFICATION NUMBER:
IRO Project No. 265

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICER:
Donald A. Orr

INITIATION/PROGRAMMED COMPLETION DATES:
May 1979/

PROBLEM:

Many Army proponents feel initial support requirements (Spare & Repair Parts), when determined in accordance with DoDI 4140.42 policies, are inadequate to support newly fielded systems at their required operational availability. To bolster or belie this intuition, evaluations of provisioned quantities based on field performance are needed. Although Army policy requires such evaluations (Post Provisioning Review) 360 days after initial deployment of the end item, such analyses have been barely extant at best. A main (but not the only) reason for the dearth of reviews has been a lack of a paradigm and consequent systematic procedures for collecting and analyzing data in a reasonable, feasible manner.

With the advent of SIP and the sophisticated SESAME program, it is feasible to compute part quantities in accordance with .42 or with some cost effective optimal technique. These programs, suitably adjusted, can also evaluate the impact of these support quantities and other possibly realized quantities in terms of system availability. Another potentially solvable problem via the program is to assess the impact on quantities and operational readiness when the actual provisioning parameter set (experienced field values of repair times, task distributions, washout and failure rates) differs from the original parameter set used to ascertain initial issue.

OBJECTIVES:

Phase 1 - Design an evaluative system for detailed comparisons of theoretical, hypothetical, and actual provisioning quantities and subsequent operational readiness values. Consider computed SIP, ERPSL models' quantities and real life adjustments thereof. Use the above evaluator on data obtained from pilot tests on selected end items and identify any shortcomings in DoDI 4140.42 procedures.

Project 265 (Continued)

Phase 2 - Simplify the above system such that evaluating provisioning on a semi-routine basis is feasible and practical.

CURRENT STATUS:

This project was suspended at sponsor's request until May 1979. Strawman evaluation scheme has been designed with data requirements for special and semi-routine evaluation. Candidate end items have been selected and initial parameter estimates (Provisioning Master Records) have been obtained. Decisions are now being made on how the post-provisioning data are to be collected.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Supply Management Mini-Computer Applications

IDENTIFICATION NUMBER:
IRO Project No. 268

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:
W. Karl Kruse

PROBLEM:
This project entails assisting DARCOM Headquarters in determining, from a functional user's point of view, how the capabilities of mini-computers might best be exploited in a distributed processing mode. The ALMSA is currently programming a first-phase mini-computer supply management application and IRO is assisting in this effort in a minimal way. Work on later phases, when more innovative approaches will be explored, has been deferred until this initial application is operational.

OBJECTIVE:
Develop functional guidance, to include mathematical models as required, for more advanced mini-computer applications in the supply management area. Decision support system approaches are to be explored.

CURRENT STATUS:
IRO involvement during this FY remained minimal while design of the ISIS application continued. Exploration of more innovative distributed processing approaches is expected to begin next year.

RELATED STUDIES:
None.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Pilot Test of Driver Concept for Projecting Resource Requirements

IDENTIFICATION NUMBER:
IRO Project No. 271

SPONSOR:
DARCOM Plans and Analysis Directorate, DRCPA

PROJECT OFFICER:
Donald A. Orr

INITIATION/PROGRAMMED COMPLETION DATES:
August 1978/December 1979

PROBLEM:
Future DRC manpower and funding requirements require rational justification. One such methodology - external, causal drivers - was developed by IRO to allow Readiness Commands to project necessary resources; this method places less emphasis on historical, possibly non-rational, expenditure of resources and relies on causal predictable variables (e.g., weighted items managed, fielded systems, demands) and related needed resources. The DARCOM Directorate of Resources Management requested that IRO perform a test of our concepts at CERCOM and, later in the year, at TARCOM.

OBJECTIVES:
Assess the availability of typical data necessary to compute drivers and determine the difficulty in extracting data. Compute drivers for recent years and relate to actual resources expended and resources that should have been needed. This effort is to be done by AMS codes in Materiel Management and Support Directorates.

CURRENT STATUS:
The test at CERCOM was satisfactorily concluded. While data in Maintenance Support are much more difficult to extract than supply management data, it was possible to relate man-hours to drivers in a satisfactory way in both functions.

Work at TARCOM is nearly complete. Supply management data were found to contain some errors and are being corrected. Satisfactory analysis is expected to result. In Maintenance Support, however, the data base is not sufficiently well broken out to give results that would be more than marginally useful.

RELATED STUDIES:
"Methodology for Projection of Resource Requirements," A. Kaplan, D. Orr, IRO Final Report, November 1973 (AD 771049).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Maximum Release Quantity (MRQ) Edits under Mobilization

IDENTIFICATION NUMBER:
IRO Project No. 272

SPONSOR:
DARCOM Directorate for Materiel Management
Programs and Projects Office, DRCMM-L

PROJECT OFFICER:
Arthur Hutchison

INITIATION/PROGRAMMED COMPLETION DATES:
July 1978/December 1979

PROBLEM:
During the mini-mobex exercise at Fort Bragg, NC, an evaluation of wholesale edit procedures to detect large quantities was made. About 2% of the requisitions were rejected. Two questions were formulated based on the results. Under a mobilization build-up would MRQ rejects adversely affect requisition processing time? Would the proposed MRC model (see Related Studies) based on the average requisition size of the item result in an unacceptable number of rejects?

OBJECTIVE:
Determine the impact of the current and proposed MRQ edit checks on requisitions submitted during MOBEX-78.

CURRENT STATUS:
The 55000 MOBEX-78 requisitions were processed against the current and proposed MRQ's. For the current MRQ, 4.3% of the requisitions were rejected. An abnormally high reject rate was observed at TSARCOM because they use a MRQ 1/3 lower than the other MRC's. A high percentage of these rejects occurred on non-stocked items. This results from using the item maximum end article application for non-stocked items.

The IRO-recommended AIQ model resulted in a reject rate of 4.9%.

The project sponsor determined the results of the study indicated no serious impact on readiness would result from either MRQ model during mobilization. It was decided, however, that the retail level should implement MRQ edit checks proposed by IRO to identify large quantity requisitions before they enter the wholesale system. The Army Logistics Center will be advised of the results and DARCOM's recommendations. Final report on this project is being prepared.

RELATED STUDIES:
"Analysis of Large Requisitions," Arthur Hutchison, IRO
Final Report, February 1977 (AD A036003).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Updating Failure Factors

IDENTIFICATION NUMBER:
IRO Project No. 275

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICER:
Donald A. Orr

INITIATION/PROGRAMMED COMPLETION DATES:
April 1979/January 1980

PROBLEM:
Engineering estimates of failure factors (replacement rates of components) often do not reflect actual experience once the end item is fielded. Updating of these estimates is particularly needed for the later provisioning requirements of long-term procurement and deployment programs (including FMS).

OBJECTIVE:
Develop an automated method of combining initial failure factors with experienced replacement rates for parts in fielded systems.

CURRENT STATUS:
A strawman package of working papers has been developed to define factors, describe scenarios, code and store scenario information and factors, and to update the various factors using inference techniques on experienced wholesale or retail demand data. This is undergoing review by various DARCOM activities to determine feasibility of implementation.

RELATED STUDIES:
On-going IRO Project 257, Failure Factors for Contingency Planning.

"New Concepts for Provisioning Parameter Estimates, Part I,"
Donald A. Orr, IRO Technical Report, December 1976 (AD A034589).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: ORF/ERPSL Tradeoffs

IDENTIFICATION NUMBER:
IRO Project No. 276

SPONSOR:
DARCOM Directorate for Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICER:
Alan J. Kaplan

INITIATION/PROGRAMMED COMPLETION DATES:
April 1979/February 1980

PROBLEM:
Both ERPSL (Essential Repair Parts Stockage List) inventory of secondary items and ORF (Operational Readiness Float) inventory of end items are designed to improve readiness. On any given system it is not clear whether there should be just one or the other or both, and if both, how much should be invested in each.

OBJECTIVE:
To develop a methodology to solve problem and demonstrate it on one weapon system.

CURRENT STATUS:
Original objective was achieved. Results were briefed on an informal basis but not formally because of difficulty in getting Project Manager to release data. Based on informal briefings, IRO was asked to apply methodology to a second weapon system of a completely different type.

RELATED STUDIES:
1. IRO Project 260, Operational Readiness Oriented Logistics Support Models (IRO study in progress).
2. "Study of Army Maintenance Float Policies and Management Practices," Edwin Gotwals, Larry Smith, W. Karl Kruse, John Fortune, IRO Final Report, September 1977 (AD A048270).

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Management of Wholesale Stock by Weapon System

IDENTIFICATION NUMBER:
IRO Project No. 277

SPONSOR:
US Army Communications & Electronics Readiness Command
Directorate of Materiel Management

PROJECT OFFICER:
W. Karl Kruse

INITIATION/PROGRAMMED COMPLETION DATES:
July 1979/June 1980

PROBLEM:
The Commodity Command Standard System (CCSS) contains an application called the Supply Performance Analyzer (SPA) which is intended as a budgetary and management tool to enable the MRC to determine the safety level investment needed to achieve supply performance goals. For a variety of reasons, the SPA is difficult to use and its projections of costs and performance are subject to substantial error. As a consequence, it has fallen into disuse despite the fact that it is the only means available to relate supply performance and cost.

OBJECTIVE:
To provide CERCOM with the tools necessary to budget for and to control Safety Level investment by various weapon system groupings. The long term goal is to implement these concepts in CCSS and the budget process.

CURRENT STATUS:
The October 1979 stratification is being used to test programs. An off-line Supply Performance Analyzer has been developed which is more flexible than its namesake in CCSS. It has the capability of summarizing by group key and fund. The technique for predicting availability will be modified to make the prediction more compatible with the real world measurement of availability. Efforts are also underway to obtain the COSDIF data file so that the VSL/EOQ and COSDIF systems can be integrated. It is hoped that the tools developed can be used for the FY 82 budget cycle which begins in March 1980.

RELATED STUDIES:
"Supply Performance Analyzer," W. Karl Kruse, IRO Final Report, June 1976 (AD A029711).

US ARMY INVENTORY RESEARCH OFFICE
TERMINATED PROJECTS

PROJECT NO.

SPONSOR

264

Standard System for Computation of
Contingency Requirements

DRCPS-P

IRO recommended that this computational system design be integrated with a system development effort already underway for computation of other types of war reserves. DARCOM Hqtrs did not believe that such an approach should be undertaken at that time. The project was then cancelled by the sponsor. (There has been a change in mind since that time and a project for development of an integrated war reserves requirements system is to appear in the IRO FY 1980 Work Program)

266

Referral Policy under SIMS-X

DRCPS-S

This project was to involve evaluation of alternative requisitioning policies for requisitions emanating from overseas Commands under SIMS-X where DARCOM MRC's would have knowledge of overseas assets. However, a DA change in retail retention policies made this issue moot and the sponsor therefore cancelled the project. No work had been done.

US ARMY INVENTORY RESEARCH OFFICE

LOGISTICS MANAGEMENT ASSISTANCE

In addition to its formal work program, the IRO provides assistance upon request to DARCOM Headquarters and its Commands, and to other DA and DoD activities. This assistance involves work of a short term nature, generally requiring no more than a few man-months of effort. Some of the tasks worked on in FY 1979 are described below.

Functional Coordinating Groups - IRO continues to provide representation on the FCG's for Supply Management, Maintenance Management, Provisioning, War Reserves and Major Items. This involves attendance at meetings where System Change Requests are evaluated and doing short term studies on problems of immediate interest to the Groups. Attendance at the DARCOM Logistics Systems Review Committee meetings is also involved, where review of IRO projects is sometimes on the agenda.

XMI Tank Provisioning Task Force - Dr. Orr continued to serve as IRO representative on this Task Force formed by the Commander of TARCOM at the request of the XMI Project Manager, to review and evaluate provisioning decisions made by the PM to date. The Bare Bones SIP Model was applied in determining provisioning requirements for major components of this system.

Repair Cycle Float - Interest again revived in this area when Logistics Evaluation Agency undertook a study to revise applicable Army Regulations. Messrs. Gotwals and Kruse and Larry Smith (AMSAA) took part in several meetings where recommendations made in the earlier IRO/AMSAA study were again discussed. It is beginning to look as if these recommendations are now receiving a more favorable reception. One off-shoot of these discussions has been the LEA request that the ERPSL/FLOAT Tradeoff model be run on a tank system (see Project No. 276) since they may want to cover this area in the revised AR.

Standardized/Combat PLL/ASL's - Several DA and DARCOM activities such as Army Log Center, XVIII Corps, MRSA and AMSAA are involved in projects designed to improve PLL/ASL's for use in combat. Some of the IRO work under RIMSTOP implementation (see Project No. 261) is related to these efforts. Consequently, we have been involved in a number of meetings with these activities where information on approaches, results of analyses and future work plans were discussed. We continue to keep in close touch with one another as the work progresses.

DoD Ad Hoc Study Groups - Several meetings were held at OASD (MRA&L) to discuss the way DoDI 4140.39 was implemented in the Army and how it is being used. Other meetings were held, attended also by representatives from Air Force, Navy, Marine Corps and Defense Logistics Agency, in which criticisms of DoD Supply Management practices made by Office of Management and Budget were discussed. These led to formation of formal Ad Hoc study groups, which are expected to do analyses of possible problem areas during FY 1980.

Assistance to Other Activities - IRO furnished representatives to a number of ad hoc study groups during the year, such as a DARCOM group evaluating a proposal to transfer management of consumable items to DLA and a DoD group working on an improved methodology for computing spare aircraft requirements. IRO personnel gave briefings on provisioning models at DoD request to Navy and DLA and similar briefings were given at the DARCOM Integrated Logistics Support Conference. Assistance was given on numerous occasions to the MRC's, particularly as problems arose in operation of the CCSS supply management and provisioning systems.

US ARMY INVENTORY RESEARCH OFFICE

PROFESSIONAL ACTIVITIES

Papers published in technical journals, participation in meetings of professional societies and other professional activities are reported here:

Technical Papers

"Waiting Time in an s-1,S Inventory System with Arbitrarily Distributed Lead Times," W. Karl Kruse, Journal of the Operations Research Society of America (To be published)

"Problems of Quantitative Models in Large Management Information Systems," Bernard B. Rosenman, INTERFACES (To be published)

Papers Presented at Professional Meetings

Steven Gajdalo, "The Application of Quantity Discount Concepts in the U. S. Army," presented at joint national TIMS/ORSA meeting, New Orleans, LA, 30 Apr - 2 May 1979.

Edwin Gotwals, III, "Forecasting Demand in the Army Supply System," presented at Army Research Office Workshop and Tutorial Seminar on Time Series, Aberdeen Proving Ground, MD, 25-28 September 1979.

Alan J. Kaplan, "Empirical Comparison of Multi-Echelon Models," presented at Multi-Echelon Inventory Systems Conference, George Washington University, Washington, DC, 20-21 November 1979.

W. Karl Kruse, "A Multi-Echelon Inventory Model: The Simple-Simon Approach," presented at Multi-Echelon Inventory Systems Conference, George Washington University, Washington, DC, 20-21 November 1979.

W. Karl Kruse, "Dynamic Model of a Continuous Review Inventory System," presented at joint national TIMS/ORSA meeting, Los Angeles, CA, 13-15 November 1978.

W. Karl Kruse, "Army Provisioning Models," presented at 43rd Military Operations Research Symposium, US Military Academy, West Point, NY, 19-21 June 1979.

Bernard B. Rosenman, "A Model for Linking Parts Availability and Weapon System Readiness," presented at 42nd Military Operations Research Symposium, U. S. Naval War College, Newport, RI, 5-7 December 1978.

Bernard B. Rosenman, "Automation of Inventory Management in the U. S. Army," presented at annual joint meeting of the Data Processing Management Association and the National Accounting Association of Northeastern Pennsylvania, Wilkes-Barre, PA, 13 February 1979.

Bernard B. Rosenman, "Planning for Army Weapon System Support in the 1980's," presented at TIMS New York City Chapter meeting, 8 March 1979.

Bernard B. Rosenman, "Unsolved Problems in Information Systems," panel discussion, joint national TIMS/ORSA meeting, New Orleans, LA, 30 April - 2 May 1979.

Bernard B. Rosenman, "Problems of Quantitative Models in Large Management Information Systems," presented at XXIV International TIMS meeting, Honolulu, HI, 18-22 June 1979.

Other Professional Activities

Mr. Kaplan served as referee for an article that is to be included in a textbook on multi-echelon production and inventory theory, edited by Prof. Leroy Schwarz, Purdue University.

Mr. Rosenman was guest lecturer at Cornell University on applied inventory models in graduate seminars in inventory theory and industrial engineering. He also completed his second term as Chairman of the Geographical Sections Committee of the Operations Research Society of America.

US ARMY INVENTORY RESEARCH OFFICE

REPORTS

The following reports were published in the period October 1978 - September 1979:

"Effects of Backorder Release Policies on Distribution Effectiveness and Customer Wait," Robert Deemer, Final Report, October 1978, AD A060022.

"Annual Report Fiscal Year 1978," November 1978, AD A066548.

"A Heuristic for Multi-Echelon, Multi-Indentured Inventory Problems," Meyer Kotkin, Technical Report, December 1978, AD A066590.

"An Exact N Echelon Inventory Model: The Simple-Simon Method," W. Karl Kruse, Technical Report, March 1979, AD A067762.

"The Application of Quantity Discounts in Army Procurements," Steven Gajdalo and Wayne Zabel (PRO), Final Report, March 1979, AD A066583.

"A Simple Model for Assessing the Impact of Spare Parts During Initial Deployment of New Weapons Systems," W. Karl Kruse, Technical Report, June 1979, AD A074319.

"System Availability with Redundancy and Spares, Alan J. Kaplan, Technical Report, July 1979, AD A073743.

"Improvement of EW/SIGINT Support," Robert Deemer, Final Report, July 1979, AD A074627.

"Inter-Depot Transfer Model," Steven Gajdalo, Final Report, August 1979.

"An Investigation of Minimum Buy Policies," Sally Frazza and Alan J. Kaplan, Final Report, August 1979.

"Measurement and Implications of Production Lead Time Variability," Martin Cohen, Final Report, September 1979.

DISTRIBUTION

COPIES

<u>1</u>	Deputy Under Sec'y of the Army, ATTN: Office of Op Resch
<u>1</u>	Asst Sec'y of the Army (I,L&FM), Pentagon, Wash., DC 20310
	Headquarters, US Army Materiel Development & Readiness Command
	Commander
<u>1</u>	Deputy Commander
<u>1</u>	DRCPA-S
<u>1</u>	DRCMS
<u>1</u>	DRCDMR
<u>1</u>	DRCPS
<u>1</u>	DRCPS-D
<u>1</u>	DRCPS-P ATTN: Mr. Boehm
<u>1</u>	DRCPS-S
<u>1</u>	DRCMM
<u>1</u>	DRCMM-R
<u>1</u>	DRCMM-S
<u>1</u>	DRCMM-RS
<u>1</u>	DRCMM-SP
<u>1</u>	DRCMM-ST
<u>1</u>	DRCMM-SL
<u>1</u>	DRCMM-M
<u>1</u>	DRCMM-MS
<u>1</u>	DRCMM-MP
<u>1</u>	DRCMM-E
<u>1</u>	DRCRE
<u>1</u>	DRCRE-F
<u>1</u>	DRCRE-I
<u>1</u>	DRCCP
<u>1</u>	DRCPP
<u>1</u>	DRSAC
<u>1</u>	DRCIS
<u>1</u>	Dep Chf of Staff for Logistics, ATTN: DALO-SMS, Pentagon, Wash., DC 20310
<u>1</u>	Dep Chf of Staff for Logistics, ATTN: DALO-RDZ-X, Pentagon, Wash., DC 20310
<u>1</u>	Dep Chf of Staff for Logistics, ATTN: DALO-PLZ-X, Pentagon, Wash., DC 20310
<u>1</u>	Dep Chf of Staff for Logistics, ATTN: DALO-SML, Pentagon, Wash., DC 20310
<u>2</u>	Defense Logistics Studies Info Exchange, DRXMC-D
<u>10</u>	Defense Documentation Center, Cameron Sta., Alexandria, VA 22314
<u>1</u>	Commandant, US Army Logistics Mgt Center, Ft. Lee, VA 23801
<u>1</u>	Office, Asst Sec'y of Defense, ATTN MRA&L-SR, Pentagon, Wash., DC 20310

COPIES

1
1
Commander, USA Armament Materiel Readiness Cmd, Rock Island, IL 61201
ATTN: DRSAR-MM
ATTN: DRSAR-SA

1
1
Commander, USA Communications & Electronics Materiel Readiness Cmd,
Ft. Monmouth, NJ 07703
ATTN: DRSEL-MM
ATTN: DRSEL-SA

1
1
Commander, USA Missile Command, Redstone Arsenal, AL 35809
ATTN: DRSMI-S
ATTN: DRSMI-D

1
1
Commander, USA Troop Support & Aviation Materiel Readiness Command,
St. Louis, MO
ATTN: DRSTS-SP
ATTN: DRSTS-SPSS 1 DRSTS-BA(1)

1
1
1
Commander, US Army Tank-Automotive Materiel Readiness Command,
Warren, MI 48090
ATTN: DRSTA-F
ATTN: DRSTA-S

1
1
Commander, US Army Tank-Automotive Research & Development Command,
ATTN: DRDTA-V, Warren, MI 48090

1
1
Commander, US Army Armament Research & Development Command,
ATTN: DRDAR-SE, Dover, NJ 07801

1
1
Commander, US Army Aviation Research & Development Command,
St. Louis, MO 63166

1
1
Commander, US Army Communications Research & Development Command,
ATTN: DRSEL-SA, Ft. Monmouth, NJ 07703

1
1
Commander, US Army Electronics Research & Development Command,
ATTN: DRDEL-AP, Adelphi, MD 20783

1
1
Commander, US Army Mobility Equipment Research & Development Cmd,
ATTN: DRDME-O, Ft. Belvoir, VA 22060

1
1
Commander, US Army Natick Research & Development Command,
ATTN: DRXNM-O, Natick, MA 01760

1
1
Commander, US Army Logistics Center, Ft. Lee, VA 23801

1
1
Commander, US Army Logistics Evaluation Agency, New Cumberland
Army Depot, New Cumberland, PA 17070

1
1
Commander, US Army Depot Systems Command, Chambersburg, PA 17201

1
1
Commander, US Air Force Logistics Cmd, WPAFB, ATTN: AFLC/XRS,
Dayton, Ohio 45433

1
1
US Navy Fleet Materiel Support Office, Naval Support Depot,
Mechanicsburg, PA 17055

1
1
Mr. James Prichard, Navy Sea Systems Cmd, ATTN: PMS3061, Dept
of US Navy, Wash., DC 20362

1
1
George Washington University, Inst of Management Science & Engr.,
707 22nd St., N.W., Wash., DC 20006

1
1
Naval Postgraduate School, ATTN: Dept of Opns Anal, Monterey,
CA 93940

COPIES

1 Air Force Institute of Technology, ATTN: SLGQ, Head Quantitative
Studies Dept., Dayton, OH 43433

1 US Army Military Academy, West Point, NY 10996

1 Librarian, Logistics Mgt Inst., 4701 Sangamore Rd., Wash., DC 20016

1 University of Florida, ATTN: Dept of Industrial Systems Engr.,
Gainesville, FL 32601

1 RAND Corp., ATTN: S. M. Drezner, 1700 Main St., Santa Monica,
CA 90406

1 US Army Materiel Systems Analysis Activity, ATTN: DRXSY-CL,
Aberdeen Proving Ground, MD 21005

1 Commander, US Army Logistics Center, ATTN: Concepts & Doctrine
Directorate, Ft. Lee, VA 23801

1 Wallace M. Cohen, Asst Director Systems Analysis, FGMSD, General
Accounting Ofc, Wash., DC 20548

1 ALOG Magazine, ATTN: Tom Johnson, USALMC, Ft. Lee, VA 23801

1 Commander, USDRC Automated Logistics Mgt Systems Activity,
P.O. Box 1578, St. Louis, MO 63188

1 Director, DARCOM Logistics Systems Support Agency, Letterkenny
Army Depot, Chambersburg, PA 17201

1 Commander, Materiel Readiness Supply Activity, Lexington, KY 40507

1 Director, Army Management Engineering Training Agency, Rock Island
Arsenal, Rock Island, IL 61202

1 Defense Logistics Agency, Cameron Sta, Alexandria, VA 22314

1 Dep Chf of Staff (I&L), HQ USMC-LMP-2, ATTN: MAJ Sonneborn, Jr.,
Wash., DC 20380

1 Commander, US Army Depot Systems Command, Letterkenny Army Depot,
ATTN: DRSDS-LL, Chambersburg, PA 17201

1 Logistics Control Activity, Presidio of San Francisco, CA 94120

1 Chuck B. Foster, Communications Security Logistics Activity,
DRSEL-CCM-NMP, Ft. Huachuca, AZ

1 HQ, Dept of the Army, (DASG-HCL-P), Wash., DC 20314

1 Operations Research Center, 3115 Etcheverry Hall, University
of California, Berkeley, CA 94720

1 Dr. Jack Muckstadt, Dept of Industrial Engineering & Operations
Research, Upson Hall, Cornell University, Ithaca, NY 14890

1 Prof Herbert P. Galliher, Dept of Industrial Engineering,
University of Michigan, Ann Arbor, MI 48104

1 Mr. Ellwood Hurford, Scientific Advisor, ATCL-SCA, Army Logistics
Center, Ft. Lee, VA 23801

1 Commandant, USA Armor School, ATTN: MAJ Harold E. Burch,
Leadership Dept, Ft. Knox, KY 40121

1 Prof Robert M. Stark, Dept of Stat & Computer Sciences,
University of Delaware, Newark, DE 19711

1 Prof E. Gerald Hurst, Jr., Dept of Decision Science, The Wharton
School, University of Penna., Phila., PA 19174

1 Logistics Studies Office, DRXMC-LSO, ALMC, Ft. Lee, VA 23801

1 Procurement Research Office, DRXMC-PRO, ALMC, Ft. Lee, VA 23801

1 Dept of Industrial Engr. & Engr. Management, Stanford University,
Stanford, CA 94305

COPIES

1 Commander, US Army Communications Command, ATTN: Dr. Forrey,
CC-LOG-LEO, Ft. Huachuca, AZ 85613

1 Commander, US Army Test & Evaluation Cmd, ATTN: DRSTE-SY,
Aberdeen Proving Ground, MD 21005

1 Prof Harvey M. Wagner, Dean, School of Business Adm, University
of North Carolina, Chapel Hill, NC 27514

1 Dr. John Voelker, EES Bldg. 11, Argonne National Laboratory,
9700 S. Cass Ave., Argonne, IL 60439

1 DARCOM Intern Training Center, ATTN: Jon T. Miller, Bldg. 468,
Red River Army Depot, Texarkana, TX 75501

1 Prof Leroy B. Schwarz, Dept of Management, Purdue University,
Krannert Bldg, West Lafayette, Indiana 47907

1 US Army Training & Doctrine Command, Ft. Monroe, VA 23651

1 US General Accounting Office, ATTN: Mr. J. Morris, Rm 5840,
441 G. St., N.W., Wash., DC 20548

1 Operations & Inventory Analysis Office, NAVSUP (Code 04A) Dept
of Navy, Wash., DC 20376

1 US Army Research Office, ATTN: Robert Launer, Math. Div.,
P.O. Box 12211, Research Triangle Park, NC 27709

1 Prof William P. Pierskalla, 3641 Locust Walk CE, Philadelphia,
PA 19104

1 US Army Materiel Systems Analysis Activity, ATTN: DRXSY-MP,
Aberdeen Proving Ground, MD 21005

1 Air Force Logistics Management Center, ATT: AFLMC/LGY,
Gunter Air Force Station, AL 36114

1 Engineer Studies Center, 6500 Brooks Lane, Wash., DC 20315

1 US Army Materiel Systems Analysis Activity, ATTN: Mr. Herbert
Cohen, DRXSY-MP, Aberdeen Proving Ground, MD 21105

1 Commandant, ALMC, ATTN: Jon T. Miller, DAS, DRXMC-A, Ft. Lee, VA
23801