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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)

The activities of the Inventory Research Office are described in this report. A list of Reports published since 1971 is also included.

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## INVENTORY RESEARCH OFFICE

### OVERVIEW

No Annual Report was published for FY 1975; consequently, this report covers activities of the IRO in FY 1975 and 1976.

Fifteen projects were completed during the two years. In addition to continuance of our main stream of research effort - methodologies to improve supply management techniques at the wholesale level of supply - some major excursions were made into the field of depot overhaul. Extensive work in the initial provisioning area also continued.

The office was shocked and saddened by the sudden and unexpected death of Peter Fatianow, one of our senior analysts, in July 1976. He carried a tremendous workload in the provisioning area and his outstanding contributions to our program will be sorely missed.

The personnel strength with Mr. Fatianow's death is now 10 professional, 2 clerical and administrative. Changes during the period:

Michael Lee and Arthur Hutchison finished their military duty under the Army's Scientific and Engineering Program in September 1974 and their termination marked the end of that program. Mr. Hutchison remained with the IRO as a Trainee OR Analyst and has now advanced to journeyman level; Mr. Lee went to Navy Air Development Center as a scientific programmer.

In addition to Mr. Hutchison, two new analysts joined the office in September 1945. They are:

Edwin P. Gotwals, III - PhD candidate at Temple University, with several years experience as supervising analyst on a hospital administration research project.

Richard Urbach - PhD candidate at Columbia University with several years experience with the NYC-Rand project.

Two other analysts, Robert Caltagirone and Harold Wyzansky, joined the office in July 1974 but left within a few months. A study was being made at the time of the possibility of moving the IRO out of Philadelphia and they did not want to move. Both are now employed as analysts in the Philadelphia area.

Our summer program continued with graduate students Charles Knopf (1974), Eric Gilmore (1975) and Mark Prestoy (1976). All are from the University of Pennsylvania.

## PROFESSIONAL ACTIVITIES

Mr. Rosenman served as General Chairman of the Joint National Meeting of the Operations Research Society of America and the Institute of Management Sciences, which was held in Philadelphia on 31 March - 2 April 1976. In addition, he finished his 4-year term on the Board of Directors of the Military Operations Research Society in July 1975.

Articles by Alan Kaplan and Donald Orr appeared in professional journals during this two year period; these, plus a number of papers presented at professional society meetings are listed elsewhere in this report.

INVENTORY RESEARCH OFFICE
COMPLETED FY 75 STUDY SUMMARY

TITLE: Methods for Physical Inventory and Location Survey

IDENTIFICATION NUMBER:
IRO 74215

REPORT:
"Conduct of Physical Inventories and Location Surveys," Steven Gajdalo, IRO Final Report, July 1974 (AD-785548).

SPONSOR:
Inventory and Location Survey Office, AMCSU-I
AMC Directorate of Supply

PROJECT OFFICER:
Mr. Steven Gajdalo

INITIATION/COMPLETION DATES:
February 1974/July 1974

ABSTRACT:
Methods for conducting physical inventories (reconciling stock records to actual stock on hand) and location surveys (verifying stock location records) were studied, with the principal objective of seeing if presently available devices (e.g., cameras, voice recorders, hand-held calculators, etc.) could be used to save time, reduce errors and lower costs. Electronic scales and hand-held electronic calculators were found to offer potential benefits in physical inventory procedures; for location surveys, procedures using either cameras or voice tapes were found to offer potential benefits. This report also discusses some procedural improvements that could be made that are not equipment oriented.

ASSUMPTIONS:
None.

METHODOLOGY:
Physical inventory, operational analysis, industrial survey electronic/audio/visual devices, cost/benefit analysis.

CRITICAL FACTORS AND CONSTRAINTS:
None.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

Use of scanners, portable data recorders, electronically encoded labels, and other such equipment would not be cost effective at this time. Positive conclusions are given in the abstract.

IMPLEMENTATION STATUS:

Most of the non-electronically oriented recommendations have been implemented.

RELATED STUDIES:

None.

INVENTORY RESEARCH OFFICE
COMPLETED FY 75 STUDY SUMMARY

TITLE: Measurement of Standardization Program

IDENTIFICATION NUMBER:
IRO 74216

REPORT:
"A Reporting System for the Defense Standardization Program,"
D.A. Orr, November 1974, IRO Final Report, November 1974 (AD-B000854)

SPONSOR:
Tech Data & Standardization Branch, AMCRD-EM
AMC Directorate for Development and Engineering

PROJECT OFFICER:
Dr. Donald A. Orr

INITIATION/COMPLETION DATES:
January 1974 - November 1974

ABSTRACT:
Specifications are developed for a reporting system by which activities in the Defense Standardization Program (DSP) would report workload, resources expended and resources required to higher level management. Effort in standardizing items and practices is detailed by type of standardization project in terms of manhours, costs, and number of projects worked upon in each quarter. Standardization work effort is classified into six categories in an attempt to obtain homogeneous groupings.

A methodology to measure performance and project future resource requirements utilizing report output is described.

ASSUMPTIONS:
In lieu of history, currently available information can be used to relate manhours to types of standardization work. Work is quantifiable to a degree that allows external causal drivers of workload to be found.

METHODOLOGY:
A review was made of reporting documents, of past effort and of functions performed in Standardization Offices. A "draft" reporting system was presented to a working conference of ARMCOM personnel, and, after suitable modification was sent out Command-wide for appraisal.

CRITICAL FACTORS AND CONSTRAINTS:

Problems of resource allocation and standardization project selection are not considered. Reporting system is not to be overly burdensome.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

The proposed reporting format should be adopted. When sufficient data is collected, workload factors can be determined.

IMPLEMENTATION STATUS:

A one year pilot test to analyze data usefulness was recommended but test was never initiated.

RELATED STUDIES:

1. Kaplan, A.J., Orr, D.A., "Methodology for Projection of Resource Requirements," Report #207, AMC Inventory Research Office, ALMC, November 1973.

2. Maroun Study, Phase II, 30 April 1972.

INVENTORY RESEARCH OFFICE
COMPLETED FY 75 STUDY SUMMARY

TITLE: Effects of Purpose Code Policies on Supply Performance

IDENTIFICATION NUMBERS:
IRO 75226

REPORT:
Briefing to AMCSU-K, 19 Sept 74.

SPONSOR:
Secondary Items Management Division, AMCSU-K
AMC Directorate of Supply

PROJECT OFFICER:
Mr. Alan J. Kaplan

INITIATION/COMPLETION DATES:
August 74/September 74

ABSTRACT:
Impact of reserving stock for special purposes was evaluated. Impact on overall supply performance as well as performance in support of the special customers was considered. Alternative reserve policies were also considered.

ASSUMPTIONS:
None.

METHODOLOGY:
Simulation, using actual demand histories.

CRITICAL FACTORS AND CONSTRAINTS:
None.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Reserves are of some value. The value would be enhanced if dynamic levels were used for intensively managed items, i.e., levels dependent on status of procurement due-in. The value of reserve levels is destroyed if a proliferation of inviolate reserves is permitted. When a non-dynamic reserve is used, it should be set to 3 months of special purpose demand.

RELATED STUDIES:
1. Kaplan, Alan J., "Stock Rationing," IRO Final Report, March 1968.

2. "Expected Number of Backorders with Control Levels," Navy FMSO report #110, May 1974.

INVENTORY RESEARCH OFFICE
COMPLETED FY 75 STUDY SUMMARY

TITLE: Determination of Management Parameters for DoDI 4140.39

IDENTIFICATION NUMBERS:
IRO 73232

REPORT:
None.

SPONSOR:
Secondary Items Management Division, AMCSU-K
AMC Directorate of Supply

PROJECT OFFICER:
Mr. W. Karl Kruse

INITIATION/COMPLETION DATES:
February 1974/June 1975

ABSTRACT:
Before the complete set of programs implementing DoDI 4140.39 was ready, AMC desired to use the management concepts in the DoDI. This project determined the Shortage Cost Factor to be used by each of the NICP's in the safety level calculations. Additionally, for those NICP's requesting it, a similar shortage factor was developed for use in the COSDIF stockage model. Both of these factors were produced through analysis of OROSS tapes. They were selected so as to provide performance targets set by AMC. All of these parameters were used in the interim, pending complete implementation of 4140.39.

ASSUMPTIONS:
None.

METHODOLOGY:
Based upon the demand catalog of each NICP, expected supply performance was computed for several values of the desired shortage factor. Curves of supply performance versus the shortage factor were prepared and recommendations on the size of the shortage factor were made.

CRITICAL FACTORS AND CONSTRAINTS:
Accuracy of supply performance predictors.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Temporary Shortage Cost Parameters set for each NICP.

IMPLEMENTATION STATUS:

Implemented beginning in June 1974.

RELATED STUDIES:

All Army work for DoDI 4140.39 and corresponding work in other services and DSA.

INVENTORY RESEARCH OFFICE
COMPLETED FY 75 STUDY SUMMARY

TITLE: Improvement to the Loss/Loss Recovery Reporting System

IDENTIFICATION NUMBERS:
IRO 75233

REPORT:
"Improvements to the Loss/Loss Recovery Reporting System,"
Steven Gajdalo, IRO Final Report, June 1975, (AD-A012151)

SPONSOR:
AMC Directorate of Supply, AMCSU-ML

PROJECT OFFICER:
Mr. Steven Gajdalo

INITIATION/COMPLETION DATES:
July 1974/June 1975

ABSTRACT:
For major items of equipment there is a need for loss and loss recovery data but there is no viable system to provide them. This report shows how the requisite data can be had as a by-product of the Continuous Balance System (CBS), which is a system to arrive at the world-wide asset position using transaction data. It also discusses operational deficiencies that might have an adverse effect on the quality of the data and recommends solutions.

ASSUMPTIONS:
None.

METHODOLOGY:
Operational analysis, definition of types of data required, development of specifications for processing transactions to provide requisite data.

CRITICAL FACTORS AND CONSTRAINTS:
None.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
See abstract.

IMPLEMENTATION STATUS:
Proposed procedures have been implemented in their entirety.

RELATED STUDIES:
None.

INVENTORY RESEARCH OFFICE
COMPLETED FY 75 STUDY SUMMARY

TITLE: Recomputation of Economic Inventory Procedure Tables

IDENTIFICATION NUMBERS: IRO 74235

REPORT:
"Inventory Costs at US Army Materiel Command Depots," R.L. Deemer, IRO Final Report, December 1975, (AD-A021717).

SPONSOR:
AMC Directorate for Installations and Services, AMCIS-S

PROJECT OFFICER:
Robert L. Deemer

INITIATION/COMPLETION DATE:
October 1974/February 1975

ABSTRACT:
The holding cost rate and the cost of ordering stock from the Inventory Control Points are estimated as they apply to supply management activities of the Installation Supply Accounts (ISA) of the DARCOM depots. These costs are composed of several consituent functions which are the dependent variables in a regression analysis.

ASSUMPTIONS:
Results are applicable only to the ISA activities at the DARCOM depots.

METHODOLOGY:
Regression analysis applied to constituent elements of holding and ordering cost.

CRITICAL FACTORS AND CONSTRAINTS:
Extension of the results beyond the regression values will lead to unknown results.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Yearly holding cost rate was found to be 25%. The order cost was found to be $18.40 and the cost to maintain an item on the ASL is $7.73.

IMPLEMENTATION STATUS:
Costs have been accepted by DARCOM and will be used to develop revised EIP tables for use in SPEEDEX.

RELATED STUDIES:

Kaiser, R.D. and H.J. Boisseau, "Army Inventory Cost Parameters," Logistics Management Institute, December 1974.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Supply Performance Analyzer

IDENTIFICATION NUMBER:
IRO 73180

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

SPONSOR:
Secondary Items Management Division, AMCSU-K
AMC Directorate of Supply

PROJECT OFFICER:
Mr. W. Karl Kruse

INITIATION/COMPLETION DATES:
June 1972/June 1976

ABSTRACT:
DoDI 4140.39, "Procurement Cycles and Safety Levels of Supply for Secondary Items" requires the services to determine safety levels and order quantities for secondary items according to specific guidelines. One requirement is for a tool to provide the relationship between funding levels and associated supply performance. The Supply Performance Analyzer, SPA, is that tool.

ASSUMPTIONS:
None.

METHODOLOGY:
A deterministic simulator is used to produce funding requirements for various shortage costs. Analytic supply performance estimators are used to estimate stock availability and average delay in filling a requisition.

CRITICAL FACTORS AND CONSTRAINTS:
Funding estimates must agree as much as possible with estimates of budget stratification system.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
A fast and accurate SPA was developed.

IMPLEMENTATION STATUS:
Implemented beginning in January 1976.

RELATED STUDIES:
All other work on DoDI 4140.39 by services and DSA.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Program Factor Analyzer

IDENTIFICATION NUMBERS: IRO 73182

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

SPONSOR:
Secondary Items Management Division, AMCSU-K
AMC Directorate of Supply

PROJECT OFFICER:
Mr. Martin Cohen

INITIATION/COMPLETION DATES:
June 1971/September 1975

ABSTRACT:
Empirical demand forecasting studies have raised doubt about the often-made assumption that repair part demand is porportional to end-item usage. The study was made to test this assumption using a data base consisting of demands on the Army Aviation Systems Command National Inventory Control Point (AVSCOM NICP) for thousands of stocked items. A simulation of the NICP supply function was used to test the assumption and various proposed forecasting algorithms. The criterion was least holding and ordering cost for constant time-weighted requisitions short. The assumption that demand is proportional to end-item program was supported at least for the items responsible for the largest part of the costs, and an improved algorithm was found.

ASSUMPTION:
Inherent relationship between demand and program data can be detected in historical data.

METHODOLOGY:
Compare cost and performance of various demand-forecasting algorithms as projected by the ALPHA 4140.39 Simulator driven by seven years of historical recurring demands for avaiation spares and repair parts.

CRITICAL FACTORS AND CONSTRAINTS:
None.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

Simulation of a variety of simple formulas for predicting repair parts demand revealed that a formula based on a regression equation was more cost-effective than the program-factor formula now in use. The study also found that there is no benefit gained by dividing the items into groups by unit price or average demand rate and applying different forecast formulas to the different groups.

IMPLEMENTATION STATUS:

Implementation was deferred pending completion of IRO Project 76219; system analysis for implementation of both is now in progress at ALMSA.

RELATED STUDIES:

Similar work has been done by the Air Force, Navy and Defense Supply Agency based on their own demand data.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Implementation of IRO Insurance Items Model

IDENTIFICATION NUMBERS: IRO 75203

REPORT:
None.

SPONSOR:
Secondary Items Management Division, AMCSU-K
AMC Directorate of Supply

PROJECT OFFICER:
Robert L. Deemer

INITIATION/COMPLETION DATES:
February 1975/September 1975

ABSTRACT:
Guidance given to ALMSA for the procedure for managing insurance items. Programming and testing of technique have been accomplished and the management of insurance items is ready to be automated.

ASSUMPTIONS:
Characteristics of demand for items at one NICP are not inherently different from other NICP's demand pattern.

METHODOLOGY:
Mathematical model and computer programming.

CRITICAL FACTORS AND CONSTRAINTS:
None

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Programming completed and ready for management of insurance items.

IMPLEMENTATION STATUS:
Computational technique programmed at ALMSA in Study portion but not in STRAT. Implementation now in process for the STRAT.

RELATED STUDIES:
1. "Insurance Items Stockage Policy," IRO Final Report, R.L. Deemer, January 1970, AD691732.
2. "Test of Updating Methodologies for Insurance Items," IRO Final Report, R.L. Deemer, January 1973, AD756378.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Methodology of Demand Forecasting

IDENTIFICATION NUMBER: IRO 76219

REPORT:
"Demand Forecasts Using Process Models & Item Class Parameters," D.A. Orr, IRO Final Report, April 1976 (AD-026081).

SPONSOR:
Secondary Items Management Division, AMCSU-K
AMC Directorate of Supply

PROJECT OFFICER:
Dr. Donald A. Orr

INITIATION/COMPLETION DATES:
March 1974/December 1975

ABSTRACT:
Theoretical and statistical results are presented on forecasting a time series (Dt) in conjunction with a correlated series (Ht). In the particular problem Dt is demand for a part which is on an aircraft which flies Ht hours in period t. Reasonable recursive models of the underlying demand process are postulated and it is shown that theoretically rigorous or heuristically satisfactory forecast algorithms can be obtained by applying Kalman filter or weighted moving average techniques to 4 time series: Dt, Dt/Ht, log Dt, log Dt/Ht. An important forecasting parameter - denoted k - is developed for the structural models; k is the ratio of the noise variance of a process to the variance of random changes in the process mean. Included are stratified results on error measure values of the algorithms. Their performances are also tested in a simulation of the supply system.

It is found that forecasts utilizing flying hours do give improved performance; the "best' algorithm is a Kalman filter with a varying weighting parameter which depends upon the flying hours in a period and k, which is determined by the item's demand frequency class. When the program variable is end item density rather than flying hours, the algorithm is identical but with different k-values.

Projected savings, over the current Army method of forecasting demands on the wholesale supply system, were 1.8 million dollars annually on the 10,000 parts in the data base.

ASSUMPTIONS:

Past history of demand or demand per program is a viable indicator of future demand.

There are models of underlying demand process and related forecasting algorithms which will be "best" over a group of items.

METHODOLOGY:

Postulate models and algorithms. Determine parameter values for item classes. Screen forecast algorithms using statistical error measures on past history. Make final selections based on cost-performance in the simulation model of Army supply management system.

CRITICAL FACTORS AND CONSTRAINTS:

Forecast procedures are to be applied in CCSS for predicting recurring demand for Army managed Class IX secondary items. Two years of history is kept on file in the computer.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

1. Forecast algorithms utilizing flying hours perform better on the AVSCOM data base than strictly demand dependent algorithms.
2. Recommended technique (Kalman filter) yields substantial improvement in terms of cost savings.
3. The technique should be applied across Commodity Commands with only a change in algorithm parameter values.

IMPLEMENTATION STATUS:

System analysis for implementation in process at ALMSA for inclusion in CCSS.

RELATED STUDIES:

1. Cohen, Martin, "Demand Forecasting with Program Factors," USAMC Inventory Research Office, IRO #182, Sept 1975, AD #A017858.
2. Orr, D.A., "Kalman & Moving Average Filters for Forecasting," DRC Inventory Research Office (To be published).
3. Cohen, Martin, "ALPHA 4140.39 Simulator," DRC Inventory Research Office, May 1973, AD #762-348.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Calculation of EOQ When Large Non-Recurring Demands are Expected

IDENTIFICATION NUMBER:
IRO 75234

REPORT:
IRO letter to AMCSU-KP, 10 June 1975, Subject: Computation of EOQ When Large Programmed Demands Are Present.

SPONSOR:
Secondary Items Management Division, AMCSU-K
AMC Directorate of Supply

PROJECT OFFICER:
Mr. W. Karl Kruse

INITIATION/COMPLETION DATES:
August 1974/July 1976

ABSTRACT:
Economic Order Quantities are computed by the Army NICP's assuming constant demand rates. It can happen that large one-time demands are predicted, thus violating the basic assumption.

There are models and heuristics available for computing EOQ with non-stationary demands. However, all of these assume deterministic demand, and none seems to really dominate the others in terms of cost reduction even when evaluated in a deterministic environment.

Because of the above, and because the problem does not seem to be a major one, we developed a simple heuristic which tells the item manager whether to cut back or extend the EOQ. Use of this technique is at the manager's option.

ASSUMPTIONS:
None.

METHODOLOGY:
Simple analytic cost expressions were developed which indicated situations for which EOQ months should be cut or extended.

CRITICAL FACTORS AND CONSTRAINTS:
None.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Problem is not serious, but solution provided is simple enough to be used quite easily if item manager sees fit.

IMPLEMENTATION STATUS:

Procedure provided to each NICP.

RELATED STUDIES:

None.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Improvement of Aircraft Overhaul Management Procedures

IDENTIFICATION NUMBER:
IRO 75237

REPORT:
None.

SPONSOR:
AMC Directorate of Maintenance, AMCMA-X

PROJECT OFFICERS:
Mr. W. Karl Kruse and Mr. Bernard B. Rosenman

INITIATION/COMPLETION DATES:
April 1975/June 1976

ABSTRACT:
Basic objective of the project was to find ways of reducing aircraft overhaul Turn-Around-Times. Major areas of concentration were: production planning, scheduling and control procedures; parts support; data input automation; impact of program changes; managerial reports.

The most notable finding was the lack of managerial information in the SPEEDEX Management Information System. Thus it was difficult for Depot management to detect abnormal conditions quickly and to recognize longer-term conditions and trends that called for corrective action. Specifications were therefore developed for a set of Production Management Reports, including methodology for determining shop capacity and for doing capability analyses, and for a set of Supply Performance Reports for highlighting part support problems by source of supply. Specifications were also developed for interactive time-sharing and longer-term shop workload simulators to assist in assessing effects of workload changes. Additionally, specifications were developed for a DARCOM-wide Depot Requirements Objective system to improve the management of repair parts at the depot level, and assistance was given to LSSA in the programming for inclusion in the SPEEDEX system.

ASSUMPTIONS:
Management at CCAD has the latitude of action to make short-term adjustments to work force, work flow schedules, etc., and to make recommendation on longer-term adjustments to overhaul personnel and facilities.

METHODOLOGY:

Observations of overhaul operations; analysis of policies and procedures; interviews with personnel at all levels. Observations and analyses of similar operations in Navy, Air Force and commercial airlines.

CRITICAL FACTORS AND CONSTRAINTS:

Fluctuations and changes in quantity and mix of overhaul workload serve to de-limit the amount of control over Turn-Around-Times that can be achieved by the Depot Commander.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

Managerial reports and the workload simulators can provide tools for better control of the overhaul process and should be implemented.

IMPLEMENTATION STATUS:

Programming of the Supply Performance Report is in process; other actions in abeyance due to CCAD need to concentrate resources on pilot implementation of OSD Standard Accounting System.

RELATED STUDIES:

1. ADPE In-Process Review for Automatic Data Collection System (ADCS), Corpus Christi Army Depot, September 1975.

2. Industrial Surveys of Depot Maintenance Operations, conducted by Major Item Data Agency, 1975-76.

3. Project EARLYBIRD, RAND Corporation, 1975.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Calculation of Economic Maintenance Production Quantities

IDENTIFICATION NUMBER:
IRO 75239

REPORT:
Letter Report to DARCOM Headquarters, 28 June 1976.

SPONSOR:
AMC Directorate of Maintenance, AMCMA-PS

PROJECT OFFICER:
Mr. W. Karl Kruse

INITIATION/COMPLETION DATES:
March 1975/June 1976

ABSTRACT:
Operational analysis revealed that there are few secondary items whose overhaul involves significant set-up time and cost except for certain large components like engines, transmissions, etc., and that most of these large components are overhauled on a continuous basis. Thus, the application of classical economic lot size models is not appropriate for most items. The analysis also revealed, however, that long periods of time may elapse between the time when the need to initiate a repair action is determined in an NICP Supply Control Study and the time when the unserviceable components are actually inducted into the Depot shops. This condition arises because NICP requirements determination and depot induction scheduling are independent processes, the former paced by continuous requirements reviews and the latter governed by overhaul program schedules developed far in the past. Data obtained on Repair Administrative Lead Times during the course of the study show the compelling need to look into the possibility of using a requirements-driven depot induction procedure. Since procedures of this kind may call for the overhaul of small quantities, a formula is given for calculating the Minimum Economic Repair Quantity, based on earlier work by Gajdalo. A straightforward Economic Maintenance Production quantity is also given for those few items requiring substantial set-up effort.

ASSUMPTIONS:
Data on set-up effort, which was hard to come by in this study, can be obtained with further effort at the Depots.

METHODOLOGY:

Meetings were held with Depot personnel to elicit information and data on repair set-up requirements, and repair operations were observed at Letterkenny, Corpus Christi, New Cumberland, Anniston, Lexington-Blue Grass and Tooele Army Depots. Data on the elements of Repair Cycle Times were obtained for a number of reparable items from all NICP's and actual repair time data on the same items were obtained form Major Item Data Agency files.

CRITICAL FACTORS AND CONSTRAINTS:

None.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

Above all else, a system is needed for inducting reparables into the repair shops that is responsive to current needs for serviceable items. Economic repair quantity formulas are of secondary importance.

IMPLEMENTATION STATUS:

IRO has been tasked to develop a requirements-driven depot induction system. Work is to begin in September 1976.

RELATED STUDIES:

"Heuristics for Computing Variable Safety Levels/Economic Order Quantities for Reparable Items," Steven Gajdalo, Final Report, AMC Inventory Research Office, ALMC, February 1973 (AD-760528).

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Functional Enhancement of Army Maintenance Management Data Exchange System (AMMDEX)

IDENTIFICATION: IRO 75240

REPORT:
Supplemental Class "A" Guidance for Enhanced AMMDEX (Draft), 2 July 1975.

SPONSOR:
Plans and Systems Division, AMCMA-PS
AMC Directorate of Maintenance

PROJECT OFFICERS:
Messrs. Steven Gajdalo and Alan J. Kaplan

INITIATION/COMPLETION DATES:
April 1975/June 1975

ABSTRACT:
AMMDEX pertains to a system for interchanging the data between Major Subordinate Command, Major Item Data Agency and Depot necessary for rebuild workload scheduling and control, and related functional areas (e.g., supply management).

The AMMDEX objectives had been implemented in different forms by the various Commands. All existing systems were evaluated and specifications were developed for an enhanced system combining the best features of these systems as well as ideas adapted from other functional areas and industry practices.

ASSUMPTIONS:
None.

METHODOLOGY:
Operational analysis.

CRITICAL FACTORS AND CONSTRAINTS:
Only features which were technically possible within Commodity Command Standard System were considered.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Improvements were made in "processing" areas to improve ease of use of the system; and in functional areas, to permit more automation, improved control over assets, and the ability to answer "what if" questions in responding to budgetary targets.

IMPLEMENTATION STATUS:

Conclusions and recommendations were accepted by AMC and sent to ALMSA (design agency) for implementation subject to a cost analysis for each recommendation.

INVENTORY RESEARCH OFFICE
COMPLETED FY 76 STUDY SUMMARY

TITLE: Security Assistance Logistic Support

IDENTIFICATION NUMBER:
IRO 76245

REPORT:
"Security Assistance Logistics Support," Alan Kaplan and Steven Gajdalo, IRO Final Report, March 1976 (AD-024340).

SPONSOR:
DARCOM Directorate for International Logistics, DRSIL-WP/C

PROJECT OFFICER:
Messrs. Steven Gajdalo and Alan Kaplan

INITIATION/COMPLETION DATES:
January 1976/March 1976

ABSTRACT:
This study examines two areas of Security Assistance Logistics Support: planning, and policy and procedures.

It is concluded that with some modifications the means exist for adequate planning for impact of the Security Assistance Program. The required modifications include amplification of the data collected for the Military Security Assistance Projections and inclusion of the DARCOM Subordinate Commands on the distribution for the projections data.

Problems related to policies and procedures are discussed and solutions provided. It is concluded that the Security Assistance Program will have favorable impact on our readiness as long as established controls are followed and the recommended solutions in the problem areas discussed are implemented. Two necessary follow-on efforts are also identified.

ASSUMPTIONS:
None.

METHODOLOGY:
Operational analysis, formulation of solutions, working committee reviews, interaction with representatives on the Joint Logistics Commander's sub-panel and with DARCOM proponent for AR710-1.

CRITICAL FACTORS AND CONSTRAINTS:
None.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

See Abstract. Some required changes in policies and procedures are identified.

IMPLEMENTATION STATUS:

Some recommendations have been implemented. Remaining recommendations have been accepted by sponsor but not yet implemented.

RELATED STUDIES:

None except concurrent efforts of the Joint Logistics Commander's sub-panel on IL.

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Implementation of Logistic Performance Indicators

IDENTIFICATION NUMBER:
IRO 73213

SPONSOR:
DRC Directorate of Management Information Systems, DRCMS

PROJECT OFFICER:
Mr. Bernard B. Rosenman

INITIATION/PROGRAMED COMPLETION DATES:
August 1973/June 1977

PROBLEM:
IRO developed a methodology in FY 73 for estimating inventory-related savings attributable to implementation of new ADP systems. The methodology was tested at TACOM using the ALPHA system as the test ADP system. As result of AMC decision to apply the methodology at other Commands, IRO was tasked to assist in further DELPHI sessions at TROSCOM, ECOM and ARMCOM, and to set up a system for collecting actual inventory-related savings resulting from ALPHA implementation.

OBJECTIVES:
Expected savings based on results of DELPHI sessions have been calculated for TACOM, ECOM, ARMCOM and TROSCOM. Computer programs have been written for collecting pre- and post-ALPHA values of Logistics Performance Indicators at these Commands and for translating the measures into inventory - related savings resulting from ALPHA implementation. Data have been collected on a quarterly basis for these Commands.

Based on one year of pre-ALPHA and one year of post-ALPHA data beginning one year after implementation, actual inventory-related savings are to be calculated for each of the Commands.

ASSUMPTIONS:
None.

METHODOLOGY:
DELPHI, inventory models.

CRITICAL FACTORS AND CONSTRAINTS:

Calculation of actual savings depends on ALPHA implementation schedule and on IRO limited capability to handle processing of large number of tape files.

RELATED STUDIES:

"Logistic Performance Indicators for Cost-Benefit Analyses of ADP Systems," IRO Final Report by Bernard B. Rosenman (IRO) and Boleslaw Olejarz (School of Mgt Info Systems, ALMC), April 1973, AD 763910.

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Evaluation of Provisioning Techniques

IDENTIFICATION NUMBER:
IRO 73217

SPONSOR:
Maintenance Division, DRCMM-M
DRC Directorate for Materiel Management

PROJECT OFFICER:
Dr. Donald A. Orr

INITIATION/PROGRAMED COMPLETION DATES:
March 1974/To be determined

PROBLEM:
Provisioning policies, procedures and techniques have been extensively revised in recent years. The Inventory Research Office has been assigned the task to assess the current effectiveness of the provisioning process used by DARCOM.

OBJECTIVES:
Develop methodology for assessing effectiveness of provisioning processes. Apply this methodology to DARCOM provisioning processes to determine weaknesses in established policies, procedures, and management technique. Make recommendations for improvements.

ASSUMPTIONS:
None.

METHODOLOGY:
Detailed assessment techniques will be developed in two parts. One part will be a policy, procedure and technique audit directed toward identifying opportunities for improving provisioning processes. The other part will be a case study using data derived through existing TAMMS sample data collection plans and provisioning documentation on recently fielded systems.

CURRENT STATUS:

Programming is underway to compare estimates of provisioning parameters obtained from field data (Sample data Collection plans) against initial estimates provided in the provisioning master data record (PMDR). Programs will be tested on maintenance actions generated on the XM880 1-1/4 ton truck and the AN-30 radio beacon. Pilot tests will run until late 1977.

A report will be forthcoming in Sept-Oct 1976 on potentially promising techniques of obtaining estimates of maintenance factors, condemnation rates, maintenance and replacement task distributions; and for developing essential support items lists.

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Analysis of Large Requisitions

IDENTIFICATION NUMBER:
IRO 75220

SPONSOR:
Secondary Items Division, DRCMM-RS
DRC Directorate for Materiel Management

PROJECT OFFICER:
Mr. Arthur Hutchison

INITIATION/PROGRAMED COMPLETION DATES:
June 1975/October 1976

PROBLEM:
To develop better methods of identifying large erroneous requisitions without affecting the customer's readiness or supply performance.

OBJECTIVES:
Develop models for use at the intermediate level of supply which will "flag" requisitions which are suspect for error. Analyze the current wholesale editing policy, and recommend necessary system changes and alterations to the current Maximum Release Quantity (MRQ) model.

METHODOLOGY:
Operational analysis of editing system, model development and on-line test of several wholesale and intermediate edit screens.

CRITICAL FACTORS AND CONSTRAINTS:
None.

RELATED STUDIES:
"Calculations of Requisition Maximum Release Quantity Based on Variance to Mean Ratio of Demand," IRO Final Report, Chung-Mei Chern (nee Ho), February 1969 (AD-689463).

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Measurement and Implications of PLT Variability

IDENTIFICATION NUMBER:
IRO 73229

SPONSOR:
Secondary Items Division, DRCMM-RS
DRC Directorate for Materiel Management

PROJECT OFFICER:
Mr. Martin Cohen

INITIATION/PROGRAMED COMPLETION DATES:
January 1975/Project temporarily suspended.

PROBLEM:
Variability of the Production Lead Time for the manufacture of secondary items results in increased uncertainty in the amount of stock that will be demanded before the next replenishment order arrives. This uncertainty is reflected in higher safety levels and thus increased inventory costs to maintain needed supply performance. In the past few years lead times have been increasing very sharply. This has been attributed to the economic conditions that have been causing inflation in all sectors of the national economy. Previous studies have addressed the problem of forecasting production lead time in stable situations, but the present problem of runaway lead times has not been addressed except in qualitative terms.

OBJECTIVE:
Develop and compare various models of the production lead time process suitable for use in forecasting including models that consider the effects of exogenous economic variables.

ASSUMPTIONS:
None

METHODOLOGY:
Postulate forecasting models based on experience in other forecasting research; evaluate models by means of computer simulation using data base consisting of a long history of procurement actions.

CRITICAL FACTORS AND CONSTRAINTS:
None.

RELATED STUDY:

1. Procurement Economic Evaluation Program, Report on Project PRECEP, September 1974, Defense Supply Agency.

2. "Production Lead Time Forecasting," by Lawrence Wheelock, IRO Final Report, January 1972 (AD-736848).

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Use of End Item Age and Usage in Demand Forecasting

IDENTIFICATION NUMBER:
IRO 74236

SPONSOR:
Secondary Items Division, DRCMM-RS
DRC Directorate of Supply

PROJECT OFFICER:
Mr. Edwin P. Gotwals

INITIATION/PROGRAMED COMPLETION DATES:
October 1974/August 1976

PROBLEM:
The use of program data (e.g., end item population) in forecasting implies that part failure rates are independent of the age of the vehicle or miles traveled by the vehicle. Intuitively, it would seem that failure rates should be dependent to some degree on vehicle age and/or use; if this is so, data on end item age and/or use could be taken into account in the forecasting of repair parts.

OBJECTIVES:
1. Determine to what extent part failure rate is dependent with age and usage.

2. Develop repair part demand forecast algorithms which will incorporate information on age and usage.

3. Evaluate the effectiveness of the various algorithms.

ASSUMPTIONS:
There exists a relationship between part failure rate and age/or miles traveled by the vehicle.

METHODOLOGY:
Forecasting Models, Statistical Analysis, Simulation

CRITICAL FACTORS AND CONSTRAINTS:
Applicable forecasting models limited to the two year provisions period.

RELATED STUDIES:

AMSAA Report, "Vehicle Useful Life Study for Truck, Cargo: 2-1/2 Ton, 242, M35A2," October 1973.

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Rework Economic Inventory Policy Tables

IDENTIFICATION NUMBER: IRO 75238

SPONSOR:
DRC Directorate for Installations and Services, DRCIS-S

PROJECT OFFICER:
Robert L. Deemer

INITIATION/COMPLETION DATES:
February 1975/October 1976

PROBLEM:
Present EIP tables of AR 710-2 are based on costs going back to 1957. Also recent studies have shown that different probability distributions of demand would give better results than the distribution used in the old tables.

OBJECTIVES:
Revise Tables A, B and C of Figure 3-9 of AR 710-2 based on current costs and revised probability distribution of demand. Provide necessary guidance for implementation of revised tables.

ASSUMPTIONS:
Characteristics of demand at one DARCOM depot is not inherently different from other DARCOM depots. It is also assumed that current supply procedures for use of tables will be retained and the Depot Maintenance Rebuild Test Program will not be implemented.

CURRENT STATUS:
Methodology for computing reorder point, operating level and stockage policy table have been selected. A methodology for calculating the order and ship time and its variance have also been developed. The tabular values are the only remaining aspect of project to be completed.

METHODOLOGY:
Difference equations, probability methods, statistical analysis

CRITICAL FACTORS AND CONSTRAINTS:
Tables will be limited to DARCOM depots.

RELATED STUDIES:
"Inventory Costs at U.S. Army Materiel Command," IRO Final Report, R.L. Deemer, December 1975 (AD-A021717).

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Budgetary Constraints on Retail Stockage

IDENTIFICATION NUMBER:
IRO 76241

SPONSOR:
Supply Division, (DALO-SMS-R)
Deputy Chief of Staff for Logistics, Army

PROJECT OFFICER:
Mr. Alan J. Kaplan

INITIATION/PROGRAMMED COMPLETION DATES:
May 76/October 76

PROBLEM:
There is currently no standard capability to assess the impact of budgetary constraints on supply performance at the retail level, nor a standard procedure to modify supply policy to react.

OBJECTIVES:
Develop the ability to project impact and identify supply policies which can minimize degradation in supply performance due to budget restrictions.

ASSUMPTIONS:
None.

METHODOLOGY:
An analytical analyzer will be developed. Input will be information about a supply unit's items - asset position, demand rates, etc. Output will be supply performance and dollars spent as a function of the supply policy being tested. This analyzer will be applied to real world data bases and alternative supply policies to accomplish objectives of the study.

CRITICAL FACTORS AND CONSTRAINTS:
State of the art techniques will be accepted as necessary to permit achievement of objectives within the time frame.

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

2. Navy Fleet Material Support Office Report #122 "VOSK Analyzer Manual," December 1975.

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Budget Estimating Methodology for Out-Year Provisioning Requirements

IDENTIFICATION NUMBER:
IRO 75242

SPONSOR:
Maintenance Division, DRCMM-M
DRC Directorate for Materiel Management

PROJECT OFFICER:
Mr. Richard Urbach

INITIATION/PROGRAMED COMPLETION DATES:
August 1975/Project suspended Sep 75 - Jul 76. New completion date not yet established

PROBLEM:
Budget estimates for provisioning requirements prior to the time the system design has been finalized have been coming under increasing criticism because of inadequacy of justifications for estimates. No standard methodologies or guide lines exist governing development of estimates.

OBJECTIVES:
Develop a set of guide lines and, to the extent appropriate, methodologies for estimating out-year provisioning requirements that are in consonance with the data available at the time. Methodologies are to be quantitative to the extent possible.

ASSUMPTIONS:
None.

METHODOLOGY:
Cost-effectiveness analysis, life cycle costing, logistic support analysis.

RELATED STUDIES:
"Repair Part/System Acquisition Cost Ratio for Safeguard ABM Budget Estimates," B. Rosenman and J. Denham, IRO Final Report, Aug 1970 (AD 876778).

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Techniques for Forecasting Unserviceable Secondary Item Returns

IDENTIFICATION NUMBER:
IRO 73243

SPONSOR:
Secondary Items Division, DRCMM-RS
DRC Directorate for Materiel Management

PROJECT OFFICER:
Mr. Richard Urbach

INITIATION/PROGRAMED COMPLETION DATES:
November 1975/August 1976

PROBLEM:
Returns of unserviceable secondary items to the Depots for overhaul are erratic. Forecasting methods currently used give large forecast errors, causing serious difficulties in the planning and execution of the overhaul program.

OBJECTIVES:
Develop and evaluate forecasting methods that will give better forecasts of unserviceable returns.

ASSUMPTIONS:
Only data on returns of aircraft components are available. Assumption must be made that methodology will give equivalent results with other commodities.

METHODOLOGY:
Forecasting models developed for demand forecasting, including the Kalman Filter model, will be tested and adapted for the return problem as necessary. Computer simulations with a 5-year history of AVSCOM returns and program data will be used for evaluation.

RELATED STUDIES:
"Demand Forecasts Using Process Models & Item Class Parameters: Application of Ancillary Variables," Donald A. Orr, IRO Final Report, April 1976 (AD-A026081).

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Over-Ocean Cargo Forecasting System

IDENTIFICATION NUMBER: IRO 75244

SPONSOR:
Supply & Distribution Division, DRCMM-S
DRC Directorate for Materiel Management

PROJECT OFFICER:
Robert L. Deemer and Donald A. Orr

INITIATION/COMPLETION DATES:
December 1975/October 1976

PROBLEM:
Army forecasts of over-ocean cargo requirements are frequently inaccurate on a route by route and sea transportation commodity basis. Individual ICP's forecast differently using various techniques and data. These forecasts are consolidated at Logistics Control Activity (LCA) which is developing a feedback system which could pinpoint individual problem areas.

OBJECTIVES:
Find the best agency to do the over-ocean forecast and if a standard procedure is a feasible and desirable alternative. Also find a data base and techniques to forecast the requirements.

ASSUMPTIONS:
Improvement of cargo forecasts will improve overall submission to the Transportation Agencies. Underlying this assumption is that variabilities beyond the scope of this project are not overly significant. Poor forecasts from other sources will not render these findings useless and the LCA feedback will be sufficient to measure accuracy of ICP forecasts.

CURRENT STATUS:
Several data bases and agencies have been selected for the forecasting procedure. The advantages/disadvantages of the techniques must be evaluated with sponsor's aid and the impact of the forecasts must be ascertained.

METHODOLOGY:
Operational analysis, probabilistic and statistical techniques.

CRITICAL FACTORS AND CONSTRAINTS:
Study limited to DARCOM over-ocean (CONUS outbound) long and short range forecasts.

RELATED STUDIES: None

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Evaluation of Support Alternatives for COMSEC Installation Kits

IDENTIFICATION NUMBER:
IRO 76247

SPONSOR:
USA Communications Security Logistics Agency
National Inventory Control Point

PROJECT OFFICER:
Mr. W. Karl Kruse

INITIATION/PROGRAMMED COMPLETION DATES:
April 1976/September 1976

PROBLEM:
COMSEC has been experiencing both cost and availability problems with Installation Kits, IK's. Because of previous arrangements, hastily constructed during the Vietnam conflict, the IK's can only be obtained through manufacture within the Army Depot system since Procurement Data Packages for many of the items have not been prepared. With several new sets of IK's to be deployed shortly, COMSEC desires to know the best way of obtaining them. This study is evaluating various alternatives for doing so.

OBJECTIVES:
To recommend to COMSEC NICP a preferred way of obtaining IK's.

ASSUMPTIONS:
None.

METHODOLOGY:
Define and cost, if possible, the separate functions required under each alternative.

CRITICAL FACTORS AND CONSTRAINTS:
None.

INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Guidance for Major Items Management System

IDENTIFICATION NUMBER:
IRO 73248

SPONSOR:
DRC Directorate for Plans, Doctrine and Systems, DRCPS-S

PROJECT OFFICER:
Mr. Steven Gajdalo

INITIATION/PROGRAMED COMPLETION DATES:
May 1976/December 1976

PROBLEM:

1. An integrated and automated system for management of major items is desired but specifications for such a system are lacking.

2. Authorization data play a major role in requirements determination/distribution of major items. Errors in the data are known to exist and improvements are desired.

3. Management procedures are inadequate for major items that are assemblies of components.

OBJECTIVES:
Develop specifications for an automated and integrated system; for processing and editing authorization data; and for management and control of major items assemblages.

ASSUMPTIONS:
The automated system will be within the Commodity Command Standard System (CCSS) framework.

METHODOLOGY:
Operational analysis; review of existing major item related systems for need; review of CCSS; develop specifications.

CRITICAL FACTORS AND CONSTRAINTS:
None.

RELATED STUDIES:
Major Item Data Agency (MIDA) is concurrently doing a study for the same sponsor as IRO related to automation and integration of major item systems. IRO will concentrate on applications at the Major Subordinate Commands (MSC's) while MIDA will concentrate on all other activities. MIDA/IRO coordination procedures have also been established.

RELATED STUDIES (CONT):

Concepts Analysis Agency is doing a Management of Change (MOC) study on changes to authorization data. Liaison will be maintained for mutual exchange of information between CAA and IRO.

INVENTORY RESEARCH OFFICE
CONSULTING PROJECT SUMMARY

TITLE: Organizational Clothing and Equipment

IDENTIFICATION NUMBER:
IRO 73094

SPONSOR:
DALO-SMS-R
Director of Supply and Maintenance, DCSLOG

PROJECT OFFICER:
Mr. Steven Gajdalo

INITIATION/COMPLETION DATES:
December 1975/January 1976

DESCRIPTION:
Special and costly procedures were required for field asset reporting for organization clothing and equipment. Our investigations revealed that these special procedures could be eliminated because they were in existence primarily as a vehicle to provide authorization data and not so much the asset data, and that the existing general procedures would provide the desired authorization data.

Our recommendations were implemented in full.

INVENTORY RESEARCH OFFICE
CONSULTING PROJECT SUMMARY

TITLE: Joint DoD Retail Inventory Management Stockage Policy (RIMSTOP) Working Group

IDENTIFICATION NUMBER:
IRO 76246

SPONSOR:
Assistant Secretary of Defense (Installations and Logistics)

PROJECT OFFICER:
Mr. Bernard B. Rosenman

INITIATION/PROGRAMED COMPLETION DATES:
January 1976/September 1976

DESCRIPTION:
DoD chartered the RIMSTOP Working Group to develop standard management and stockage policies for use by the Services in the retail supply system and to evaluate these proposed policies against those in current use. The IRO acted as the Army's Operations Research member on the Data Analysis and Evaluation Panel. Duties include review and recommendation of changes, where feasible, to the computer simulation programs by means of which evaluation is to be done, experimental design of the simulation experiments, review of preliminary analyses of the data bases to cull out bad data and to estimate certain system parameter values, development of candidate stockage models, review and analysis of simulation results and recommendation of policies. Policies are to be contained in a DoD Directive and DoD Instructions that are to be written by the Group.

INVENTORY RESEARCH OFFICE
CONSULTING PROJECT SUMMARY

TITLE: Implementation of Standard Initial Provisioning Models

IDENTIFICATION NUMBER:
IRO 73211

SPONSOR:
DRC Associate Director for Maintenance, DRCMM-MP

PROJECT OFFICER:
Messrs. Alan J. Kaplan, Martin Cohen and Bernard B. Rosenman

INITIATION/PROGRAMMED COMPLETION DATES:
May 1973/March 1977

DESCRIPTION:
This is a collection of tasks surrounding the implementation of Initial Provisioning Models developed by the IRO, including programming assistance and advice to the ALMSA; advice and assistance to the ALMC School of Assets in the writing of the Army regulation on provisioning and in the development of training courses; and advice and assistance to DCSLOG, to DARCOM Hqtrs and to Major Subordinate Commands on technical aspects of provisioning requirements. An additional task was assigned late in FY 1976 involving development of a model for constructing Essential Support Item Lists (ESIL) and, in conjunction with MICOM, constructing demonstration ESILs under old and new procedures for the TOW-Cobra system.

## IRO REPORTS

Since a number of our current projects, particularly those dealing with implementation, involve the use of material contained in earlier reports, we have listed below all IRO reports that have been published and distributed since June 1971. Copies, when available, can be obtained either from the IRO or through the Defense Documentation Center.

| TITLE | DATE | AD NUMBER | AUTHOR |
|---|---|---|---|
| STOCK ALLOCATION IN A MULTI ECHELON SYSTEM | APR 71 | 723415 | KAPLAN<br>DEEMER |
| THE ECONOMIC STOCKAGE MODEL | JUN 71 | 727694 | ORR<br>KAPLAN |
| ANNUAL REPORT FOR FY 71 | | 728451 | |
| *EXPERIENCE WITH THE EXPERIMENTAL ACIMS/DA 1352 DATA BASE | JUL 71 | | COHEN |
| A MULTI PRODUCT JOINT ORDERING MODEL WITH DEPENDENT SETUP COST | SEP 71 | 730938 | CHERN |
| INSURANCE ITEMS STOCKAGE POLICY TEST | NOV 71 | 732843 | DEEMER |
| METHODOLOGY FOR INTER-DEPOT TRANSFERS | NOV 71 | 736847 | KAPLAN |
| ACCOMMODATION AND TURBULENCE PROJECTIONS USING ONE AND TWO YEAR DEMAND BASES | DEC 71 | 735716 | ORR |
| PRODUCTION LEAD TIME FORECASTING | JAN 72 | 736848 | WHEELOCK |
| DISTRIBUTION OF CUSTOMER WAIT AT A SUPPLY POINT WHOSE INVENTORY POLICY IS R,Q | FEB 72 | 738552 | KRUSE |
| DoD AIRCRAFT ENGINE REQUIREMENTS STUDY | MAR 72 | 745396 | KRUSE |
| PERFORMANCE STANDARDS FOR DEPOT INITIAL FILL RATES | MAY 72 | 744786 | KAPLAN |
| AN EMPIRICAL APPROACH TO VARIABLE SAFETY LEVELS FOR ARMY OVERSEAS THEATRES | MAY 72 | 745397 | CHERN |
| A SUMMARY OF MULTI-ECHELON INVENTORY MODELS & CONCEPTS | JUN 72 | 745941 | KRUSE |

*Copies not available.

| TITLE | DATE | AD NUMBER | AUTHOR |
|---|---|---|---|
| PHYSICAL INVENTORY DECISION MODEL | JUN 72 | 748087 | KAPLAN<br>KIRKPATRICK<br>ORR |
| ANNUAL REPORT FOR FY 1972 | | | |
| *A MULTI-PRODUCT JOINT ORDERING MODEL WITH DEPENDENT SETUP COST | JAN 73 | | CHERN |
| IMPACT OF USING NON-OPTIMAL REORDER POINTS | JAN 73 | 755863 | KAPLAN |
| TEST OF UPDATING METHODOLOGIES FOR INSURANCE ITEMS | JAN 73 | 756378 | DEEMER |
| THE USE OF FORCE STRUCTURE INFORMATION IN DETERMINING SECONDARY ITEM REQUIREMENTS | JAN 73 | 775450 | KRUSE<br>KIRKPATRICK |
| HEURISTICS FOR COMPUTING VARIABLE SAFETY LEVELS/ECONOMIC ORDER QUANTITIES FOR REPARABLE ITEMS | FEB 73 | 760528 | GAJDALO |
| *DRAFT - STANDARD INITIAL PROVISIONING MODEL OF CHAPTERS 10, 11, 12, 13, 14 OF DRAFT TM 38-715-1 | APR 73 | | FATIANOW |
| A MODEL FOR SCHEDULING PHYSICAL INVENTORIES | APR 73 | 763202 | KAPLAN<br>ORR |
| LOGISTIC PERFORMANCE INDICATORS FOR COST-BENEFIT ANALYSES OF AUTOMATIC DATA PROCESSING SYSTEMS | APR 73 | 763910 | ROSENMAN<br>OLEJARZ |
| ALPHA 4140.39 SIMULATOR | MAY 73 | 762348 | COHEN |
| VARIABLE SAFETY LEVEL TABLES FOR MEDIUM, HIGH & VERY HIGH DOLLAR VALUE ITEMS | MAY 73<br>(REVISED) | | |
| ECONOMIC ORDER QUANTITY TABLES FOR HIGH AND VARY HIGH DOLLAR ITEMS | MAY 73<br>(REVISED) | | |
| EVALUATION OF POLICIES FOR RENEGOTIATION OF SUPPLY SUPPORT ARRANGEMENTS WITH COOPERATIVE LOGISTICS CUSTOMERS | OCT 73 | 771040 | ROSENMAN |

*Copies not available.

| TITLE | DATE | AD NUMBER | AUTHOR |
|---|---|---|---|
| METHODOLOGY FOR PROJECTION OF RESOURCE REQUIREMENTS | NOV 73 | 771049 | KAPLAN<br>ORR |
| ANNUAL REPORT FOR FY 1973 | | | |
| DATA ENRICHMENT FOR SIMULATION | JAN 74 | A001507 | KAPLAN<br>ORR |
| *METHODOLOGY FOR REVISED SAMPLING PLANS OF AR 740-26 | MAR 74 | | GAJDALO<br>ORR |
| *TEST OF IRO PHYSICAL INVENTORY DECISION MODEL | MAR 74 | | GAJDALO |
| MATERIEL RELEASE DENIAL RATES AND ERROR MAGNITUDE FOR UNCOUNTED AND RECONCILED ITEMS IN A SAMPLE INVENTORY | MAR 74 | 922968 | ORR |
| AN ALTERNATIVE TO THE CLASSICAL ECONOMIC ORDER QUANTITY | APR 74 | 779515 | KAPLAN |
| EVALUATION OF SEVERAL VSL/EOQ MODELS | MAY 74 | 781948 | DEEMER<br>KRUSE |
| ESTIMATION OF DEMAND VARIABILITY PARAMETERS | MAY 74 | 781942 | KAPLAN |
| CONDUCT OF PHYSICAL INVENTORIES AND LOCATION SURVEYS | JUL 74 | 785548 | GAJDALO |
| ANNUAL REPORT FOR FY 1974 | | | |
| EXPONENTIAL SMOOTHING WITH GROUPED DATA | OCT 74 | A001508 | KAPLAN |
| FREQUENCY OF REQUIREMENTS DETERMINATION | OCT 74 | A003227 | DEEMER |
| A REPORTING SYSTEM FOR THE DEFENSE STANDARDIZATION PROGRAM | NOV 74 | B000854 | ORR |
| SURVEY OF THE USE OF STRUCTURED PROGRAMMING TECHNIQUES | NOV 74 | A007130 | ROSENMAN |
| APPLICATION OF NEGATIVE BINOMIAL PROBABILITY TO INVENTORY CONTROL | DEC 74 | A003225 | DEEMER<br>KAPLAN<br>KRUSE |
| COMPARISON OF ASSET RETURN FORECASTING TECHNIQUES | DEC 74 | A003997 | KRUSE |

*Copies not available.

| TITLE | DATE | AD NUMBER | AUTHOR |
|---|---|---|---|
| (R,Q) INVENTORY PROBLEM WITH UNKNOWN MEAN DEMAND AND LEARNING | MAR 75 | A007129 | KAPLAN |
| OVERHAUL FACTOR FORECASTING | MAY 75 | A012491 | FATIANOW |
| IMPROVEMENTS TO THE LOSS/LOSS RECOVERY REPORTING SYSTEM | JUN 75 | A012151 | GAJDALO |
| DEMAND FORECASTING WITH PROGRAM FACTORS | SEP 75 | A017858 | COHEN |
| INVENTORY COSTS AT US ARMY MATERIEL COMMAND DEPOTS | DEC 75 | A021717 | DEEMER |
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