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OPERATION PLAN

VOLUME I

PLANT EQUIPMENT PACKAGE
MODERNIZATION PROGRAM

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OPERATION PLAN
PEP MODERNIZATION

Report No. 75-86-R-8

PLANT EQUIPMENT PACKAGE (PEP) MODERNIZATION PROGRAM
VOLUME 8

Prepared for Project Manager
Munitions Production Base Modernization and Expansion

Administered by U.S. Army Armament Research & Development Command
Contract No. DAAA21-75-C-0303

June 1977

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In Association with Stetter Associates, Inc.

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PEP MODERNIZATION PROJECT

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I. INTRODUCTION

A. BACKGROUND

In accordance with Department of Defense policy, the U. S. Army relies on private industry, where feasible, to meet mobilization requirements for the production of munitions and munitions components. To encourage private industry to participate in a mobilization production base, the Government has established plant equipment packages (PEP's) where private ownership of munitions production equipment is not economical.

A PEP is a complement of active and/or inactive plant equipment that has been formally approved for retention as part of the munitions production base by the Assistant Secretary of Defense (Installation and Logistics) (ASD(I&L)) and which has been assigned an identification number by ASD (I&L). A munitions PEP consists of Government-furnished industrial plant equipment (IPE) costing more than \$1,000 and used to alter the physical, chemical, or electrical properties of materials, components, and end items as defined in AR700-90. In most instances, the PEP supplements producer-owned equipment to provide a complete production process for munitions items.

The objective of the PEP modernization program is to provide assurance that each PEP, if modernized, will be capable of meeting mobilization requirements. To justify its retention, a PEP must be able to produce at the capacity required to meet critical mobilization needs not otherwise obtainable from military industrial facilities or private industry. This capacity requirement must be in consonance with the policies set forth in DSAM 4005. 1, Industrial Preparedness Planning Manual.

Most of the existing PEP equipment was purchased during or before the Korean conflict. Some of the machinery and other equipment has been operated beyond its intended life expectancy. Some is in storage where the maintenance or layaway provisions have been ineffective and the equipment will require rehabilitation before it can be operated. Voids exist in some of the production lines because equipment was not furnished or it was reassigned to other lines. Changes in manufacturing processes or planned end items have derated capacity and reduced the capability of most existing munitions production lines to meet mobilization requirements.

Faced with a large inventory of production equipment in the Army Ammunition Plants and in the PEP's which is obsolete or worn out, the U. S. Army launched a modernization program in 1969 to bring its production base from a circa 1940 vintage into the modern era. Modernization of the Army Ammunition Plants is now in the execution phase based on a long-range plan developed in 1969-1970.

In charge of the modernization program is the Project Manager, Munitions Production Base Modernization and Expansion (PM-PBM). The PEP Modernization Program portion of the effort is managed by the PEP Division of PM-PBM and consists of two phases:

The initial phase conducted by the Government was designed to provide a detailed analysis of the current condition and capability of the equipment, to identify applicable descriptions of processes used to support existing or mobilization production, and to obtain producers' policies or recommendations relative to modernization.

The second phase is being performed by Kaiser Engineers in association with Stetter Associates, Inc. (KE/SAI) under contract for the PEP Division of PBM. The contract calls for a comprehensive and detailed analysis of the PEP's in the munitions production base and then the development of a time-phased plan to modernize the PEP's to meet forecasted mobilization production requirements.

B. SCOPE OF MODERNIZATION ANALYSIS AND PLANNING

The work required of KE/SAI is being performed as three major tasks as described below.

1. Task A. Condition Assessment Procedures Evaluation

The Government, utilizing personnel from Frankford and Picatinny Arsenals, DIPEC, and PM-PBM, performed condition assessments (CA's) of Government-owned industrial plant equipment (IPE) assigned to various PEP's. At the initiation of the PEP modernization program, KE/SAI evaluated the Government PEP modernization procedures for CA's, provided recommendations for performing the assessments, and prepared data collection forms for 75 generic types of equipment. A final report on that task was issued by Kaiser Engineers in November 1975.

The data developed during that task by the Government were provided to KE/SAI for use in followon analyses.

2. Task B. Modernization Analysis

Task B is divided into eight subtasks which provide an analysis and the preparation of a plant report for each PEP producer and a time-phased modernization program based on the individual plant reports. This overall plan will include total program costs and recommended priorities for implementation, by fiscal years, based on appropriation threshold levels.

Prior to the initiation of plant visits for data collection and the preparation of plant reports, model production lines for eleven specific key end items were developed. The model lines identify each operation, sequentially, in the conceptual process, describe the operation, and identify equipment required to perform it. Alternate processes or operations that may be used in producing an end item are similarly described. For those end items for which no model lines were prepared, reference lines were developed. The reference lines are similar to model lines but have not been published formally. The model lines and reference lines are used as reference bases to formulate process layouts, to make specific equipment assignments, and to identify voids in the line. The model lines have been published as the Volume 4 report of the Modernization Program.

Subtask B-5 comprises the analysis and the preparation of plant reports for each assigned PEP producer and includes the onsite analysis of PEP's and the design of individual modernized lines at designated producers' plants for mobilization production of specified end items.

The modernized line is based on combined usage of existing, rehabilitated, and new equipment for manufacturing the "make" parts for applicable bills of material defined by end item Technical Data Packages (TDP's). The modernized line must also be capable of producing the latest munitions in their larger sizes, to closer tolerances, and from metals with higher mechanical properties. Correspondingly, the newer fuzes are designed for greater safety, higher reliability, and wider application. Each modernized line must be designed to comply with existing pollution abatement and Occupational Safety and Health Act (OSHA) standards.

Specific limitations on the scope of work for the current effort include the following:

- Only specifically designated PEP producers are included. Generally, inactive producers, those currently being modernized, or those having current modernization plans are excluded. Only specific end items from the Production Base Analysis priority list are included.
- Certain categories of end items are excluded from coverage. Categories excluded are power supplies for proximity fuzes, explosive specialty items (such as detonators, leads, boosters, etc.), fuze assembly operations, and fuze part manufacturing activities for which separate facilitization or production programs have been initiated by the Government.

Within the objectives, limitations, and exclusions, plant analyses are being prepared for those PEP's where adequate data are obtainable within budget and schedule constraints of the program and are included as Volume 5.

Subtask B-8 is to identify activities required to be performed by the Government in:

- Implementing the approved recommendations contained in other PEP program tasks
- Updating and executing the time-phase modernization plan for the PEP Base (Volume 6)

The results of this task, Operation Plan, is this volume.

3. Task C. Production Modeling and Computer Support

Task C is the adaptation of Government computer models of the production base to include the PEP's and to serve as tools to determine modernization priorities for the PEP's. Task C supports Tasks A and B.

C. PURPOSE AND SCOPE OF STUDY TASK

Existing guidelines, policies, procedures and organizational entities established by direction of DRCPM-PBM and other Army agencies for program implementation are assumed to be valid and are not analyzed in this report; these include:

- POM Guidance Briefing "Modernization/Expansion Planning"

This briefing outlines the new guidance and its impact on munitions modernization project development and scheduling

- Briefing by Mr. James J. Pritchard titled "Modernization and Expansion Planning"

This document describes the integrated planning concept for industrial readiness, facilities modernization and ammunition procurement in terms of new developments in prioritization analysis, manufacturing technology and the methodology for planning modernization and expansion projects.

- Munitions Production Base Modernization and Expansion - Milestone and Financial Reporting System" dated 19 October 1976

This briefing documents the system used by DRCPM-PBM to exercise milestone and financial control of projects under his authority.

- FY77 Modernization/Expansion Plan Development

This plan contains the basic guidance to be used in project development and coordination including input to RAMEP.

- Configuration Management Plan - AMCPM-PBM March 1975

This plan promulgates policy and procedures with respect to modernization project execution to assure application of configuration management principles.

- Organization and Staffing of Plant Equipment Package Division
PBM-G

DRCPM-PBM has an organized and staffed PEP Division to manage and implement the PEP Modernization Program. No analysis of the detailed functioning and staffing of that Division has been made, nor is such an analysis deemed necessary.

Assuming the guidance promulgated by the foregoing, this study addresses the execution of PEP modernization as recommended in this program in terms of:

- 1) Interface considerations with other elements of integrated planning
- 2) Identification of task input from the PEP Modernization Program
- 3) Periodic updating and revalidation requirements
- 4) PEP equipment rehabilitation criteria

These topics are discussed in Section III; Section II contains a summary of the report.

The philosophy followed herein is that modernization of the PEP base is but one facet of the total goal of modernizing the entire conventional munitions production base. Consequently, PEP base modernization should be part of a systematic on-going program to achieve this overall goal. The implementation of each portion should be planned and executed as an integrated, coordinated effort in cooperation with the Single Manager for Conventional Ammunition.

II. SUMMARY

The purpose of the Operation Plan is to identify activities required to be performed by the Government in implementing and updating the approved recommendations contained in the PEP Modernization Program.

Existing directives pertaining to organization, staffing, financial reporting, modernization/expansion plan development and command cognizance are assumed valid.

The study addresses execution of PEP Modernization as recommended in the program in terms of four areas:

A. INTERFACE WITH INTEGRATED PLANNING

PEP modernization is viewed as one element of the PM&E plan prepared for execution by PM/PBM under the functions and missions projected for assignment to the Single Manager for Conventional Ammunition.

B. IDENTIFICATION OF TASK INPUT FROM THE PEP MODERNIZATION PROGRAM

1. Design of Modernized Lines (Task B-5)

Modernization analyses were performed for 155 production lines in 44 PEP's producing metal parts in the private sector. The analyses were predicated on:

- Current DD Form 1519 requirements
- Rehabilitation of existing plant equipment to meet current OSHA standards and production requirements
- Replacement of equipment for which rehabilitation is not feasible
- Procurement of new equipment to fill voids in production lines

The analyses and resultant modernization recommendations do not necessarily provide for upgrading to industrial equipment state-of-the-art.

2. Producers' Modernization Plan (Task B-6)

Task B-6 produced a time-phased modernization plan for selected producers encompassing the 70 production lines for which modernization plans are still valid after a comparison with current mobilization production requirements. All of the 155 lines planned in the B-5 analyses were screened against the current mobilization requirements to determine their viability for modernization. Because of the addition of new items, deletion of former items, and revisions to production rates, the remaining 85 lines planned in Task B-5 will require replanning to revise production capacities or to convert the lines to the production of items other than those now planned.

3. Other Tasks

Other task recommendations that should be considered for implementation are presented in final reports on the following tasks:

- Task A - Condition Assessment Procedures Evaluation
- Task B-3 - Equipment Rehabilitation Plan
- Task B-4 - Equipment Layaway Plan
- Task E - Initial Production Facilities for M42/M46 Grenade Metal Parts
- Task F - Study of Effects of Automation/Mechanization on Startup Time
- Task B-9 - Current PEP Concept for Munitions Metal Parts Production in the Private Sector.

A basic premise of this report is that a systematic and integrated approach is essential for bringing the recommended modernized Resources Management System "on-line". A suggested apportionment of tasks between DRCPM-PBM and ARRCOM is presented. The detailed tasks are shown to be mutually interdependent and, hence, to require a coordinated approach under the aegis of the Single Manager for Ammunition.

C. VALIDATION AND UPDATE REQUIREMENTS

The fluctuations which are generally characteristic of munitions base planning and frequent changes in producers' capabilities result in a dynamic planning environment. Keeping the production base synchronized with changing requirements and capabilities requires an ongoing planning effort. This ongoing planning activity should include manufacturing engineering analyses to:

- Incorporate current industrial equipment state-of-the-art
- Convert production lines to meet revised requirements
- Develop input to ARRCOM's management data bank
- Reallocate GFE
- Recommend action with respect to plant equipment package modernization, accession, consolidation, revision and termination.

D. PLANT EQUIPMENT REHABILITATION

Corrective action to modernize and update PEP's is, to a large degree, associated with the task of equipment rehabilitation to bring each piece to its design capability and to incorporate current OSHA requirements. Some of the policy decisions required in this area are identified in Section III. A listing of over 200 machine tool rebuilding companies that could be considered for employment in the rehabilitation program is contained in the Appendix. It is recommended that these firms be surveyed to develop a list of qualified rebuilders.

III. PEP MODERNIZATION ACTIVITIES

A. GENERAL

The chart "Integrated Planning for Industrial Readiness, Facilities Modernization and Ammunition Procurement" (Figure III-1) at the end of this section, portrays development of the Production Modernization and Expansion (PM&E) Plan as a major step in the planning cycle. It is shown stemming from total mobilization requirements as promulgated in the Production Base Analysis (PBA) and the Production Base Plan (PBP). The PBA, essentially a long-range mobilization production plan, includes mobilization production requirements, producer assignments, and a listing of end items required. The PBP, essentially a five-year procurement plan, contains data on warm-base producers, cold-base producers, current year production stockpile, condition of stockpile, and mobilization requirements.

Modernization and expansion planning for upgrading the base capability uses the PBA, the PBP, plant workloading studies, and long- and short-range procurement plans. The Producers' Modernization Plan (Task B-6) identifies production lines for modernization for that portion of the base allocated to metal parts production in the private sector as included in the Task B-5 planning.

The Single Manager's functions include managing the Industrial Preparedness and Modernization Program; his industrial preparedness mission states the following: "The Single Manager will modernize ammunition plants, facilities and plant equipment packages." These responsibilities are projected for fiscal year 1980 implementation.

This section addresses the execution of the PEP Modernization Plan, together with other recommendations stemming from the program. It is viewed as one element of the PM&E plan prepared for execution by the PM/PBM under the functions and missions projected for assignment to the Single Manager for Conventional Ammunition.

Subsection B discusses the recommendations included in the PEP Modernization Program.

Subsection C describes the dynamic environment of munitions planning in regard to frequently changing guidance, requirements, capabilities and other munitions production parameters. A periodic updating and revalidation of the plan is recommended as a major function of the PEP Division of PM/PBM.

Subsection D outlines the decisions required in executing plant equipment rehabilitation.

B. PEP MODERNIZATION PROGRAM INPUT

1. Task B-5

A modernization analysis for each of the 44 PEP producers included in the current program was produced under Task B-5. These analyses encompassed 155 production lines in the metal parts private sector and were predicated on meeting mobilization production requirements as shown on the current DD Form 1519's held by the producers at the time of plant visits.

The modernization planning for each producer's line is based on the visit to the producer's plant, the Government-supplied condition assessment data, the appropriate model line as developed by Kaiser Engineers/Stetter Associates, Inc., and the producer's recommendations regarding modernization.

Specifically, the modernization analyses provided IPE identification, assignment and costs for modernization of each of 155 lines in terms of:

- GFE for filling voids in each line
- Upgrading GFE to OSHA standards
- Refurbishing of GFE to meet current production requirements
- Replacement of GFE which could not be rehabilitated
- Same as items 1-4 above for the producer-owned equipment integral to the respective production lines.

Data were gathered as input to Task B-9 for evaluation of each producer's general capabilities. The evaluation was confined to a subjective evaluation of the data with respect to the criteria considered by each field team. The plant visits were made specifically to gather data for existing and required production line equipment. Other capability-oriented criteria such as management skills and financial backing were not evaluated. Therefore, the data reviewed do not represent the entire spectrum of considerations

that would be appropriate to a comprehensive analysis of the individual producer's total capabilities. Details of each plant visit and specific data collected are included in the Task B-5 plant reports and pertain to the following eleven criteria:

- a. Performance of mobilization planning
- b. Existence of sufficient commercial work to sustain operations and retain skilled help during periods of low military requirements
- c. Adequacy of manufacturing engineering staff
- d. Existence of complete and up-to-date plant layouts
- e. Production equipment assignments and use of equipment to produce more than one item
- f. Possession of complete and updated Technical Data Packages (TDP's)
- g. Adequacy of compliance with OSHA and pollution abatement requirements
- h. Documentation of QA programs
- i. Capability for designing, manufacturing and maintaining required tools and gages
- j. Adequacy of test and laboratory facilities
- k. Adequacy of facility space for concurrent production and material storage of planned items.

In summary, the B-5 analyses:

- Were predicated on meeting DD Form 1519 mobilization production requirements. (Peacetime production, including surge capability, was not evaluated.)

- Included only IPE. Other plant equipment (OPE) and special test equipment (STE), were not analyzed in detail for mobilization unless specific equipment was considered essential to the production line.
- Were based on rehabilitating existing equipment to meet the original production capacity. Recommendations do not address elimination of equipment solely for reasons of obsolescence or because it is no longer manufactured. In other words, current industrial state-of-the-art equipment has not been recommended for replacement of equipment that is capable of meeting production rates solely to upgrade to modern standards. However, costs to bring the equipment up to current OSHA standards are included. Replacement of obsolete equipment by modern designs could have ancillary benefits in terms of lesser requirements for facility floor space and decreased needs for operator skills and/or labor.
- Did not include fuze production lines that are assembly operations. Analyses were confined to those lines that manufacture parts and components for items to be assembled in-house. Sub-contractors' and suppliers' capabilities were not reviewed.
- Reviewed each plant against eleven criteria to evaluate the overall capabilities of the producers.
- Included only currently active producers in the metal parts private sector. The unassigned (X) PEP's and inactive producers were not analyzed in this study. Likewise, neither the public sector, GOGO's, and GOCO's were included in the study.

2. Task B-6

Under Task B-6, a time-phased modernization plan was developed for selected producers among the 44 active PEP's surveyed in Task B-5 and includes costs for modernizing 70 production lines and recommended priorities for implementation of the program by fiscal year based on appropriation threshold levels supplied by the Government. Revised munitions mobilization production requirements have been established that include new items, revised production rates for existing items, and deletion of some items.

The impact of these revised requirements on the planning performed under Task B-5 was determined; and, as a result, the only lines programmed in the Producers' Modernization Plan (Task B-6) are those with current mobilization production requirements that meet one of two criteria with respect to currently planned items:

- a. Total-item production requirements are not greater than the production planned under Task B-5.
- b. Item requirements are less than the Task B-5 planning but no significant cost savings can be realized by replanning.

Using these criteria, plans for 70 production lines (of the 155 lines analyzed in Task B-5) are still valid under the current production requirements. The 85 lines that are not included in the Producers' Modernization Plan require further analyses to determine the impact of current production requirements that differ from those in use during this study.

3. Other PEP Modernization Program Input

Other task reports of the PEP Modernization Program contain findings and recommendations pertinent to implementing the modernization program. Some of these recommendations are repeated in differing contexts due to the diverse nature of the subject matter surveyed. The following paragraphs present a brief of their principal input.

a. Condition Assessment (Task A)

The condition assessment plan evaluation confirmed the need for current, accurate information on PEP equipment in order to select equipment for rehabilitation, production assignment, or surveying. Procedural recommendations made in that report are pertinent to updating and revalidation actions required pursuant to modernization program implementation. Special attention is invited to:

- The need for a continuous PEP equipment inventory updating system that includes current condition assessment data.

- The importance of data concerning accessories and modifications to the equipment that affect productive capacity
- The problems associated with the condition assessment of producer-owned equipment

b. Equipment Rehabilitation Plan (Task B-3)

The Equipment Rehabilitation Plan recommendations included:

- Criteria for selection of equipment to be rehabilitated or replaced
- Considerations for selection of rehabilitation sources
- Methods for accomplishment of rehabilitation programs
- Revised definitions to clarify various levels of rehabilitation

c. Equipment Layaway Plan (Task B-4)

The Equipment Layaway Plan report identifies the inadequacy of layaway and startup planning and recommends actions required to improve the confidence level that reliable, fast reactivation can be achieved under mobilization conditions.

d. Analysis of Automation vs. Layaway

The analysis of automation vs. layaway addressed current practices in the application of automation and mechanization to the production of munitions in terms of complexity levels and resulting impact on startup times. The report presents recommended guidelines to assist in planning the appropriate combination of automated/mechanized/manually operated production lines in implementing modernization programs.

e. Analysis of Current PEP Concept (Task B-9)

The objective of Task B-9 was to analyze and recommend improvements to the current PEP concept and the system of PEP management in terms of their impact on planned munitions metal parts production in private industry, thereby facilitating attainment of the PEP modernization program objectives.

The analysis led to the conclusion that the Government does not have accurate data concerning the total production resource requirements and capability to manufacture planned items in producers' plants, and that existing munitions production management systems must be modernized. Existing industrial preparedness planning for the munitions production base, in many cases, cannot ensure that a responsive and committed production capacity can be achieved to meet stated requirements.

Another major conclusion was that the munitions base management task requires a modernized package of management tools, policy and practice.

The report developed an extensive set of conclusions and recommendations. The salient feature of the recommendations is that, although wide-ranging, they are intrinsically inseparable. That is, no single area of the recommendations can be effectively implemented without drawing on information developed in response to other recommendations. The desired end result is the resolution of existing problems and correction of deficiencies identified in the munitions production base, so as to achieve a common objective of modernization of the munitions production base management system.

The basic premise of this objective is that a systematic and integrated approach is essential for bringing the recommended Resource Management System "on-line". A suggested apportionment of tasks between DRCPM-PBM and ARRCOM is presented. The detailed tasks are shown to be interdependent and hence, to require a coordinated approach under the control of the Single Manager for Conventional Ammunition.

Execution of the PEP modernization plan by the PBM-G Division, being one facet of the entire base modernization effort, would be coordinated at the Single Manager level through a task force organization. Therefore, any action taken by ARRCOM with regard to the Task B-9 report recommendations will impact substantially the PBM-G Division work effort.

C. PEP MODERNIZATION PLAN UPDATING AND REVALIDATION

1. Munitions Base Industrial Preparedness Planning (IPP)

Munitions preparedness planning is characterized by the following:

- a) Fluctuations in production requirements and needed response time, depending on the current planning scenario, force levels, and estimated consumption rates.
- b) Technological developments that introduce new items into the production base.
- c) Planned producers leaving or joining the base.
- d) Changes in policies and practices of the Department of Defense and Department of the Army.

The Industrial Preparedness Planning List (IPPL) identifies those items that require planning with industry. The RAMP Study concluded that:

"Present criteria for selection of these items are inadequate, and there is no system of priorities, so, that attention may be devoted to critical items instead of those of lesser importance. The priority items should receive complete planning. The number of items (1,683) contained in the IPPL indicates that reviewing/approving authorities should give more attention to formulation of the IPPL."

The RAMP Study further addressed the problem of fluctuation of mobilization requirements and concluded that:

"Fluctuation of mobilization requirements hinders meaningful industrial preparedness planning. Such fluctuation induces a lack of confidence in requirements computations. The feasibility of a separate, stable, planning requirement for all IPPL items, on a two- or three-year cycle, should be evaluated."

The PEP Modernization Program did not review specifically the adequacy and priority of industrial planning staffing, nor the determination of requirements. However, KE/SAI strongly concur with the need for setting priorities within the IPPL to provide completed planning for critical items. Priorities assigned in the IPPL should provide a primary guideline for implementing the PEP Modernization Program.

2. Base Capability

a. Evaluation of Active Producers

Forty-four active producers were evaluated in terms of the 11 significant criteria listed in subsection 1; these did not include management and financial capabilities. Results of the survey indicate the following:

- None of the 44 producers met all 11 criteria.
- About 21 percent of the firms lacked engineering staff capability and QA resources.
- About one third of the firms surveyed lacked adequate facility space for mobilization production/storage, or lacked plant layout drawings and IPE control data.
- More than half of the firms have OSHA and pollution problems; lacked tooling production capability, TDP's, laboratory facilities, and adequate mobilization planning; were substantially dependent on military work.

Based on this sample of representative active producers, the ability of all current PEP producers to meet planned mobilization assignments must be validated. This analysis was performed for the 44 active producers during the current PEP Modernization Program in terms of their capabilities to meet the existing DD Form 1519 mobilization requirement as outlined in subsection 1.

b. Current Trends

Since cessation of hostilities in SEA, the following trends have been evident:

- Termination of a significant number of active producer contracts and subsequent closing down of their facilities.
- Withdrawal of some producers from the planned mobilization base - about 15 within the past two years.
- Emergence of foreign military sales (FMS) as a significant element in munitions production.
- Increase in the number of unassigned (X) facilities.
- Increase in the number of planned producers slated for inactive status.
- Policy emphasis directed toward achievement of early response capability as distinguished from incorporation of state-of-the-art refinements if those refinements lengthen startup time.
- Changes in planning scenario and PPGM direction which highlight the need for an improvement to the system for contingency planning of plant equipment resources of which the PEP's are a constituent part.
- Emphasis directed toward the maintenance of competitive equity among producers and to protect their proprietary data.
- Assignment to the Army of the role of Single Manager for Conventional Ammunition.

3. Impact on PEP Modernization Plan

The fluctuations which are generally characteristic of munitions base planning combined with the aforementioned changes in base capability combine to produce a dynamic planning environment. Keeping the production base synchronized with changing requirements and capabilities requires an on-going planning effort.

In terms of PEP Modernization Planning, the impact of these changes requires periodic updating and revalidation by the PEP Division prior to the implementation of annual programs. This revalidation should include the following factors and considerations:

- a) End item requirements are subject to periodic revision.
- b) Modernization should include analyses to eliminate obsolete equipment in favor of proven SOA in the interests of economy, floor space and skills requirements.
- c) Validation of priorities are required because: a) the Producers' Modernization Plan (Task B-6) is a partial plan, not covering all PEP's, and/or b) end-item priorities are subject to revision.
- d) Producers' lines that are not included in the modernization plan should be considered for replacement by new compatible lines (i. e. , additional mobilization assignments) in order to prevent having a capable producer with committed equipment and floor space but with no mobilization planned items assigned thereto. The needed analysis would balance assignments among the base producers, insofar as practicable, thereby utilizing excess capacity on an economic basis.
- e) Reallocation of GFE among planned producers should be studied with the objective of filling voids and otherwise improving efficiency of the producers' lines.
- f) The Analysis of the PEP Concept (Task B-9) led to the conclusion that there is a critical need for a means of comparing planned item production requirements with the types, quantities, and conditions of IPE available in the industrial base. This comparison requires IPE data from all privately owned equipment that is relevant to munitions production, as well as Government-owned IPE in both the private and public sectors.

A conceptual approach for analyzing IPE using a matrix technique to determine the optimum practicable distribution of resources against requirements, which is found in subsection VI. E of the Task B-9 Report, should be further developed and tested for feasibility and suitability.

- g) Alternate proven processes (MM&T industrial state of the art) should be addressed and tradeoffs analyzed prior to commitment of modernization action.
- h) In view of changing mobilization production requirements, modernization projects should be sufficiently analyzed to determine each line's capability to produce potential replacement item(s).
- i) Plants previously visited require analysis to convert their current capabilities to meet updated mobilization requirements.
- j) The PEP Modernization Program task reports should be reviewed for pertinent recommended action.

4. On-going Analyses

Incorporation of the foregoing factors and considerations requires updated manufacturing engineering and plant equipment analyses of each planned producer's line to accomplish the following:

- a) Develop or convert current metal parts model lines to reflect industrial equipment state of the art in order to provide a benchmark for equipment and process selection.
- b) Determine action needed to convert the planned line(s) to meet the revised production requirements and to incorporate current industrial state-of-the-art technology.
- c) Identify optimum mix of producers and capabilities against revised requirements and formulate recommended modernization precedence for the candidate lines.
- d) Identify and assess the condition of all IPE currently assigned to the private sector (i. e. , both PEP-assigned and non-PEP IPE) to establish accountability and validated assignments to meet revised mobilization requirements. Non-PEP Government-owned equipment, if required for production, should be included in the revised PEP's.
- e) Plan the conversion of existing production lines to produce new items and validate current modernization planning in the light of the most recent directives.

- f) Provide other input to the management data bank in terms of plant equipment inventory and condition as listed below.
- A complete inventory and condition assessment of Government-owned equipment should be maintained, including X-facilities, active and inactive PEP's, related-item tooling, special test equipment, and other plant equipment that is essential to production.
 - A complete inventory and condition assessment of producer's equipment relevant to planned-item production should be maintained.
 - U.S. Government title to all end-item tooling and test equipment required for mobilization production should be ensured.
 - A continuous review of equipment available from the Department of Defense Industrial Equipment Reserve (DODIER) should be performed and military facility phaseout programs reviewed to identify replacements to upgrade the munitions PEP's.
- g) Take corrective action on plant equipment voids or redundancies as follows:
- Equipment that is needed to supplement existing capacity to support revised requirements should be selected from unassigned equipment in other PEP's or from the DODIER, if available, and assigned to the requiring PEP; otherwise, procurement actions for new equipment should be initiated.
 - The following alternative courses of action should be considered for redundant equipment:
 - a) Reassignment to other PEP's, including GOCO's and/or GOGO's.
 - b) Reassignment to DODIER with the stipulation, where appropriate, that the equipment is reserved for support of projected munitions mobilization production.
 - c) Surplusing to DIPEC for reassignment or disposal, without any stipulations.

D. PEP EQUIPMENT REHABILITATION

A major finding during the PEP Modernization Program is that one of the primary PEP equipment deficiencies is the lack of rehabilitation and preservation of IPE prior to layaway; this, in turn, is attributed to lack of funding and policy implementation. As noted in subsection B, the Task B-5 analyses were based primarily on the economic rehabilitation of existing PEP equipment.

Therefore, corrective action to modernize and update PEP's is to a large extent, associated with the task of equipment rehabilitation to bring each piece to its design capability and to incorporate current OSHA requirements.

It is estimated that between 15,000 and 20,000 pieces of IPE may require rehabilitation over the next decade. Therefore, the problems associated with funding, scheduling, administration, technical supervision, and revalidation, of the modernization program constitute a major and continuing task for the PEP Division of PBM. Furthermore, an emergency requirement for greatly increased production could result in equipment rehabilitation being a principal bottleneck. Actions required to implement the modernization program are deemed to include:

- Development of schedule priorities
- Formulation of procedures to minimize disruption to current production and current readiness of the mobilization base
- Analysis of the economics associated with grouping machines by generic type for refurbishment versus priority of affected item production and stockpiling
- Definition of policies and procedures for rehabilitation of producer-owned equipment
- Establishment of criteria for identifying OPE required for rehabilitation
- Establishment of criteria for determining the performance level to which equipment will be rehabilitated for specific operations
- Formulation of policy for the allocation or assignment of rehabilitation work among government and nongovernment sources.

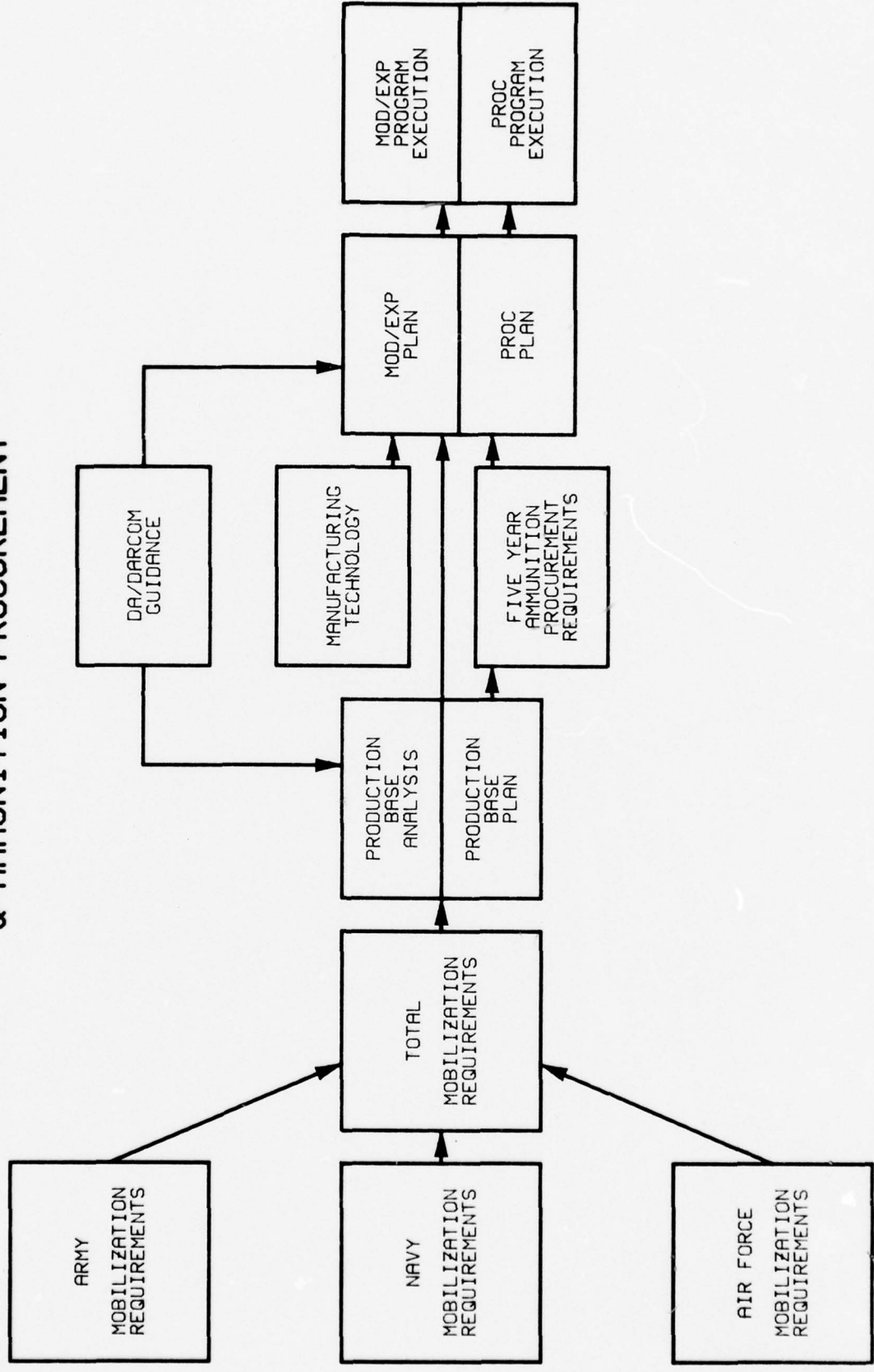
There are four primary source assignments for equipment rehabilitation:

- Government-operated depots
- Original equipment manufacturers
- Commercial rebuild companies
- Planned producers

Appendix B contains the names of over 200 machine tool rebuilding companies listed by region. It is recommended that these firms be surveyed preliminary to developing a listing of qualified rebuilders.

- Prepare a PEP rehabilitation manual to consist of all pertinent policies and procedures for use during execution of the modernization program.

FIGURE III-1
**INTEGRATED PLANNING FOR
 INDUSTRIAL READINESS, FACILITIES MODERNIZATION
 & AMMUNITION PROCUREMENT**



APPENDIX

APPENDIX A

PEP MODERNIZATION OPERATIONS PLAN

This Appendix contains four exhibits, as described below, of typical analysis data used in the preparation of the Producers' Modernization Plan (Task B-6). Complete sets of data are contained in that plan.

Exhibit A: Requirement Analysis for Production Lines Planned in Task B-5

Exhibit B: Summary of KE and Government Item Planning and Identification of Selected Items Having a Shortfall in Capacity

Exhibit C: Modernization Cost Analysis

Exhibit D: Total Estimated Direct IPE Modernization Costs by item PBA Schedule Number and Plant

APPENDIX A
EXHIBIT A

EXHIBIT A
REQUIREMENTS ANALYSIS FOR PRODUCTION LINES
PLANNED DURING TASK B-5

An example of the 155 production lines planned in Task B-5 are identified and listed in order of PBA schedule number on the page following. The first task was to measure the compatibility of Task B-5 planning with current mobilization requirements. The planned capacities were compared to the mobilization requirements (the higher of Case 1 or Case 2) with following results:

- Seventy-three lines are sized less than or equal to the mobilization requirements (LT or EQ C1/C2)
- Twenty-seven lines are sized between one and two times the mobilization requirement (BT 1&2 x C1/C2)
- Fifty-five lines are sized at greater than twice the mobilization requirements (GT 2X C1/C2)

EXHIBIT A

REQUIREMENTS ANALYSIS FOR PRODUCTION LINES PLANNED DURING TASK 9-5
PEP MODERNIZATION PROGRAM

PAGE: 1
DATE: MAY 13, 1977

PBA SCHED NO	ITEM DESCRIPTION	3/11/77 REQUIREMENT		C1/C2 SEL ALLIES K PC/MO	ITEM PROC PRI	PLANNED PLANT PIN	PLANNED PLANT NAME	PLAN(1519) LINE CAP, K PC/MO	COMPARE OF PLAN LINE CAPACITY TO C1/C2 REQMTS
		ALT I, K PC/MO	C1/C2, K PC/MO						
10290	GRENADE, HAND & RIFLE, S M34	18.9	87.0	0.0	21.7	050365	CHAMBERLAIN, WTRLOO	242.0	GT 2 X C1/C2
10550	BOOSTER, M125A1, ASSEMBL Y	25.8	48.0	13.2	39.0	000248 391060 00113T 328550 391106	LEAR SIEGLER INC GEN TIME CORP AMER GEAR & PINTON ETOWAH MFG CO INC GEN TIME-WESTCLOX	500.0 750.0 500.0 1000.0 750.0	GT 2 X C1/C2 GT 2 X C1/C2 GT 2 X C1/C2 GT 2 X C1/C2 GT 2 X C1/C2
10650	BOX METAL M548	39.1	110.0	2.4	34.8	559365	KISCO CO INC	30.0	LT OR EQ C1/C2
11305	CANISTER APERS M593E1 90 MM	0.0	0.0	0.0	0.0	000436	NORTHROP ELECTRO M	19.0	GT 2 X C1/C2
11815	CASE, CART, M103, 20MM,	1945.8	3590.0	240.0	50.6	000444	AMRON-ANTIGO	3500.0	LT OR EQ C1/C2
11860	CASE CART M118 40MM	713.5	1563.0	300.9	36.9	000444	AMRON-ANTIGO	3035.0	RT 1&2 X C1/C2
11861	CASE CART M118 (MOD) 40M M	17.0	40.0	0.0	42.5	000444	AMRON-ANTIGO	52.0	BT 1&2 X C1/C2
11865	CASE CART M169 40MM	35.0	55.0	0.0	63.6	000444	AMRON-ANTIGO	925.0	GT 2 X C1/C2
11872	CASE, CART., XM195, 40MM	39.5	184.0	3.3	21.1	000444	AMRON-ANTIGO	210.0	BT 1&2 X C1/C2
11885	CASE CTG. M30A1B3 57MM	0.0	0.0	0.0	0.0	559365	KISCO CO INC	8.0	GT 2 X C1/C2
11950	CASE CART M1981 90MM	0.0	0.0	0.0	0.0	828485	RHFEM MFG CO	18.5	GT 2 X C1/C2
11960	CASE CART M108B1 90MM	4.3	7.0	4.3	23.7	828485	RHEEM MFG CO	80.0	GT 2 X C1/C2
11965	CASE CART M112 90MM	0.0	0.0	0.0	0.0	454956	MARTIN MARIETTA ALU	80.0	GT 2 X C1/C2

APPENDIX A
EXHIBIT B

EXHIBIT B
SUMMARY OF KE AND GOVERNMENT ITEM PLANNING
AND
IDENTIFICATION OF SELECTED ITEMS HAVING
A CAPACITY SHORT FALL

The Task B-5 planning ("KE") and the current Government planning ("GOV") from the March 11, 1977 PBA are shown on the page following. The number to the right of the "GOV" indicates the Government's planned order of production priority to be assigned to each producer during mobilization. The criteria used to select items for listing in Exhibit B are as follows:

- Production of the item was planned at a PEP producer in Task B-5
- Production of the item is planned at a PEP producer by the Government, including those producers for which only condensed plant reports have been made.
- The item has a production capacity shortfall to the current mobilization requirements and it requires a manufacturing process similar to other items at PEP producers.

EXHIBIT B
 SUMMARY OF BOTH KE & PRIOR GOVERNMENT ITEM PLANNING
 AND IDENTIFICATION OF SELECTED ITEMS HAVING A CAPACITY SHORT FALL

PAGE: 1
 DATE: JUNE 6, 1977

PBA SCHD NO	ITEM DESCRIPTION	3/11/77 PBA SCENARIO		ITEM SELECTION REASON	PLANT PIN	PEP NO	PLANT NAME	PLANNED LINE CAP		PLAN MADE BY
		ALT 1, K PC/MO	CI/C2, K PC/MO					K	PC/MO	
10069	ADAPTER BOOSTER NOSE M14 3 (T45) APTS	17.0	49.0	GOV PLN, TB-5 PEP	080700 321320	0670 0790	AVCO SYSTEM DIV ENCR RSCH INC	250.0 96.0	GOV-1 GOV-2	
10200	GRENADE, HAND & RIFLE, S MOKE M34	18.9	87.0	TASK B-5 PLANNED	050365 050365	0455 0455	CHAMBERLAIN, WTRLOO CHAMBERLAIN, WTRLOO	242.0 242.0	KE 0 GOV-1	
10350	RCMB BODY 500 LB MK 82	38.3	69.0	GOV PLN, TB-5 PEP	039053 507675	0857 UNKN	AMF INC, YORK DIV PLANT NAME UNKN	63.0 24.0	GOV-1 GOV-2	
10532	BOOSTER M25	0.5	12.6	GOV PLN, TB-5 PEP	039792 745736	0831 0098	AMER MFG OF TEXAS NORRIS IND LOS ANG	35.0 2.0	GOV-3 GOV-4	
10550	BOOSTER, M125A1, ASSEMBL Y	25.8	48.0	TASK B-5 PLANNED	328550 391060	0773 0757	ETOWAH MFG CO INC GEN TIME CORP	93.0 750.0	GOV-1 KE 0	
10619	BOX, SMALL ARMS, MK1	0.4	1.3	CAP'Y SHORT FALL	328550 000248	0773 0208	ETOWAH MFG CO INC LEAR SIEGLER INC	1000.0 500.0	KE 0 KE 0	
10620	BOX M2A1	466.3	658.0	CAP'Y SHORT FALL	001131 391106	0794 0436	AMER GEAR & PINTON GEN TIME-WESTCLOX	500.0 750.0	KE 0 KE 0	
10630	BOX METAL M19A1	346.7	858.0	CAP'Y SHORT FALL	328550 957950	0773 0219	ETOWAH MFG CO INC WALTERS E CO INC	1000.0 800.0	GOV-1 GOV-2	
10650	BOX METAL M54B	39.1	110.0	TASK B-5 PLANNED	814066 391060	0780 0757	REDM CORP WAYNE NJ GEN TIME CORP	700.0 750.0	GOV-3 GOV-4	
					442167 036268	0208 0794	LEAR SIEGLER/EID AMER GEAR + PIN	500.0 200.0	GOV-5 GOV-6	
					036268 267200	0794 0771	AMER GEAR + PIN ALCOTRONICS	300.0 700.0	GOV-7 GOV-8	
					000011	UNKN	M-DAY ACTION MPTS	0.0	GOV-1	
					893090 606511	0000 0000	STD CONTAINER CO LDMART MFG CO	350.0 120.0	GOV-1 GOV-2	
					893090	0000	STD CONTAINER CO	350.0	GOV-1	
					559365 559365	0768 0768	KISCO CO INC KISCO CO INC	30.0 45.0	KE 0 GOV-1	
					798800 894705	0000 0000	POPORON PROD INC STD PRESSED STEEL	30.0 133.0	GOV-2 GOV-3	

APPENDIX A
EXHIBIT C

EXHIBIT C
MODERNIZATION COST ANALYSIS

Modernization cost analysis is defined in the context of this report as a comparison of the incremental modernization cost to the resultant increase in the modernized line capacity.

The objectives of this analysis were to:

1. Provide a visual tool for financial analysis of the planned lines.
2. Indicate the interrelationships of modernization cost to modernized capacity.
3. Determine if any lines, although overplanned, are theoretically cost effective and should be programmed.

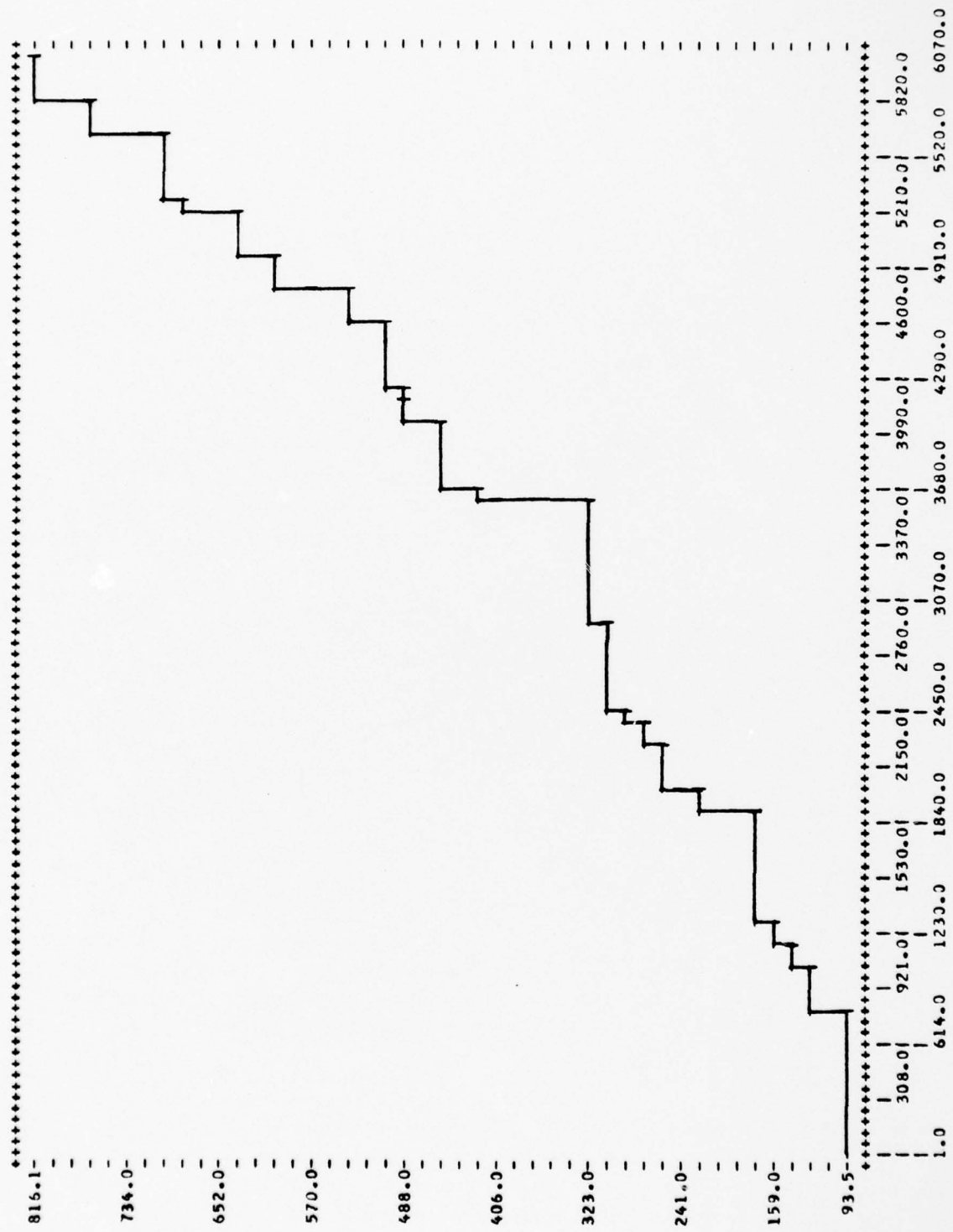
This analysis used the cost and capacity data developed during Task B-5 for both producer and Government owned equipment. When a choice of assignment between two pieces of equipment was required, the one with lower estimated modernization cost was assigned first. The modernization costs were summed and recorded for each plateau of modernized production line capacity. This is similar to a traditional pinch point analysis except that the maximum line capacity was determined during Task B-5 from the DD Form 1519 requirements, and projections beyond that point were not made.

A typical example of this analysis is shown on the page following. This example is for the 40mm M118 cartridge case which is planned for 6,070 pc/hr at Amron Corporation. The mobilization requirement from the 11 March 1977 PBA is equivalent to 3,126 pc/hr. If the production line were replanned from 6,070 to 3,126 pc/hr, there would be a potential savings of approximately \$500,000 (approximately 60% of the estimated direct modernization cost); therefore, it is recommended that the line be replanned to a lower capacity. Note that a modernization investment of \$93,500 is necessary to obtain a modernized capacity of 1 pc/hr. At some plants, equipment is heavily shared between items (lines); however, this analysis does not consider costs for shared equipment assigned to other items (lines).

There is a theoretical economic justification for programming production lines although now planned in excess of the current mobilization requirement. Production lines with higher mobilization requirements should produce more munitions during the mobilization period and, therefore, less inventory costs would be incurred. However, only those oversized production lines where the incremental additional investment is small were programmed, since it is unlikely that this theory would justify large investments when the competition for funds is considered.

MODERNIZATION COST VERSUS MODERNIZED LINE CAPACITY ANALYSIS
 EXHIBIT C
 PEP MODERNIZATION PROGRAM
 DATE: 27 APR 1977
 PAGE: 24

FOR PRODUCTION OF: CASE CART M118 40MM
 AT: AKRON-ANTIGO
 PIN: 000444
 MAXIMUM CAPACITY: 6070 PC/HR DR 3035 KPC/MO @ 500 HRS/MO
 PBA: 11860



>>>> MODERNIZED LINE CAPACITY, P I E C E S / H O U R >>>>
 V V MODERNIZATION COST, 1000 \$ V V V V V

APPENDIX A
EXHIBIT D

EXHIBIT D

TOTAL ESTIMATED DIRECT IPE MODERNIZATION
COSTS BY ITEM PBA SCHEDULE NUMBER AND PLANT

An example of the breakdown of estimated direct costs for each line planned during Task B-5 are shown on the page following. The breakdown shows costs for voids, replacement, rehabilitation and OSHA for producer owned and government owned IPE. Quantities of IPE in these categories are shown. Included is a count of equipment not requiring modernization or funded by other programs.

TOTAL ESTIMATED DIRECT PIPE MODERNIZATION COSTS
BY END ITEM PRA SCHEDULE NUMBER AND PLANT

PEP MODERNIZATION PROGRAM

PTN	PEP PLANT IDENTITY	LINE CAP, UN/HR	VOIDS COST, \$	REPLACEMENT		REHA3 INCL		USHA ONLY COST, \$	NO (FUND) COSTS	TOTALS COST, \$	IPE			
				IPEI	COST, \$	IPEI	COST, \$					IPEI	IPEI	
PBA: 15310 - FUZE, ROCKET, M427														
391106	0436 GEN TIME-WESTCLJX	200	PVT	0	0	0	347,300	35	8,000	8	0	0	355,300	43
			GOVT	968,000	71	4725,000	57	722,100	62	3,000	3	4	648,100	197
			TOTAL	968,000	71	4725,000	57	1069,400	97	11,000	11	4	6773,400	240
PBA: 535898 0843 KDI CORP														
		880	PVT	0	0	0	162,200	7	0	0	3	0	162,200	10
			GOVT	758,000	13	0	213,600	13	0	0	1	0	971,600	27
			TOTAL	758,000	13	0	375,800	20	0	0	4	0	1133,800	37
PBA: 15338 - FUZE POINT DETONATING M505A3 MPTS														
378300	0762 GALTON AMCO CORP	5400	PVT	0	0	0	68,000	4	43,250	27	7	0	111,250	38
			GOVT	0	0	0	98,000	4	3,000	4	0	0	101,000	8
			TOTAL	0	0	0	166,000	8	46,250	31	7	0	212,250	46
PBA: 967810 0465 WELLS MARINE INC 2400														
		2400	PVT	0	0	0	95,000	10	6,000	4	0	0	101,000	14
			GOVT	464,000	10	0	0	0	0	0	0	0	464,000	10
			TOTAL	464,000	10	0	95,000	10	6,000	4	0	0	565,000	24
PBA: 15355 - FUZE PI BD M509A1														
007664	0489 ACTION MFG CO-PLT 3 680		PVT	0	0	0	0	0	0	0	0	0	0	0
			GOVT	1464,100	26	0	0	0	0	0	0	0	1464,100	26
			TOTAL	1464,100	26	0	0	0	0	0	0	0	1464,100	26
PBA: 15416 - FUZE PROXIMITY M532E1														
391060	0757 GEN TIME CORP	100	PVT	0	0	0	0	0	0	0	0	0	0	0
			GOVT	111,400	10	0	60,000	2	0	0	0	0	171,400	12
			TOTAL	111,400	10	0	60,000	2	0	0	0	0	171,400	12
PBA: 15432 - FUZE, PD, M536														
995960	0600 HONEYWELL - TCAAP	450	PVT	0	0	0	0	0	0	0	0	0	0	0
			GOVT	226,000	4	0	142,100	10	0	0	0	0	368,100	14
			TOTAL	226,000	4	0	142,100	10	0	0	0	0	368,100	14
PBA: 15467 - FUZE, PD, M550, MPTS														

APPENDIX B
LISTING OF MACHINE TOOL
REBUILDING COMPANIES

This list should not be considered as all inclusive, nor that any specific company included is recommended for particular work.

ORIGINAL EQUIPMENT MANUFACTURERS REBUILDERS

PRESSES

- 1 B & H Press Div Earle Gear & Machine Co
4707 Stenton Ave
Philadelphia, Pa
(215) 848-2600
- 2 Bliss E. W. Co
530 S Elsworth Ave
Salem, Or
(216) 337-3445
- 3 Dennison Div Abex Corp
1161 Dublin Rd
Columbus, Oh
(614) 481-7297
- 4 Erie Foundry Co
1253 W 12th St
Erie, Pa
(814) 455-3941
- 5 H P M Corp
820 Marion Rd
Mount Gilead, Oh
(419) 946-0222
- 6 Progress Corp
4629 Hamilton St
Cleveland, Oh
(216) 391-2955
- 7 South Bend Lathe Inc.
400 W Sampler St
South Bend, Ind
(219) 289-7771
- 8 USI Clearing Div of U S Industries
6499 W 65th St
Chicago, Ill
(312) 767-8700

- 9 Farrel Co Div of USM Corp
565 Blossom Rd
Rochester, NY
(716) 288-4600
- 10 Verson All Steel Press Co
155 E 93rd St
Chicago, Ill
(312) 734-8200
- 11 Walsh Press Co Kay Industries Inc
4709 W Kinzie St
Chicago, Ill
(312)

MACHINE REBUILDERS

SOUTHWEST AREA

- 1 Machine Repair Inc
2020 W 9th Ave
Denver, Col
(303) 623-5551
- 2 Van Guard Mech & Elect Service
360 S Navajo
Denver, Col
(303) 744-2375
- 3 Laird Mach'ry & Equip Co
10339 Shady Trail
Dallas, Tex
(214) 350-4085
- 4 Custom Specialties Co
2520 Norwich
Dallas, Tex
(214) 631-8550
- 5 Atlas Machine Rebuilders
1249 Black Dr
Houston, Tex
(713) 467-1943
- 6 Hadleys Machine Tool Rebuilders
Nolan River Rd
Cleburne, Tex
(817) 645-5848
- 7 R O Kask Co
809 Prestwick
Bedford, Tex
(814) 352-0965
- 8 Machine Tool Scraping-Aligning & Rebuilding Co
9859 Brokbank Dr
Dallas, Tex
(214) 352-0965

- 10 Hagemann & Nielson Mach Rebuilding Co
13409 So Alameda
Compton, Ca
(213) 636-3201
- 11 Dayton & Bakewell Co
5301 Pacific Ave
Huntington Park, Ca
(213) 583-6941
- 12 Tomlinson Bros Inc.
9515 Sorenson Ave
Santa Fe Springs, Ca
(213) 698-0516
- 13 Abbotts Machine Rebuilding & Scraping
12223 S Woodruff Ave
Downey Ca
(213) 864-4426
- 14 Precision Machinery Rebuilders
20954 Currier Rd
Long Beach, Ca
(213) 965-1915
- 15 Cal Western Machine Tool Rebuilding Inc.
7828 Maine St
Los Angeles, Ca
(213) 588-8217
- 16 Machine Tool Rebuilding Co
708 Dunn Way St
Downey, Ca
(213) 588-3400
- 17 L A Machine Co
6921 S Santa Fe Ave
Huntington, Ca
(213) 588-3400
- 18 Coast Machine Tool Inc
1560 S Gephart St
Los Angeles, Ca
(213) 723-9091

EQUIPMENT REBUILDERS

NORTHWEST AREA

- 1 Boeing Equipment Service
7755 E Marginal Way
Seattle, Wa
(206) 655-1200
- 2 P & V Machine Inc.
3345 E 22nd St
Portland, Or
(503) 233-7728
- 3 Whitney Manufacturing Corp
6200 N Columbia Way
Seattle, Wa
(206) 286-3331
- 4 Yancy Machine Tool Co
4110 S W Macadam Ave
Portland Or
(503) 228-7259
- 5 Halladie Machinery Co
4975 3rd St
Seattle, Wa
(206) 762-7600
- 6 Maron Machine Tool Rebuilding Co
3303 1st St
Portland Or
(503) 622-7763
- 7 West Coast Machine Tool Inc.
512 Strandler Ave
Portland, Or
(503) 244-3260
- 8 Elmac Machine Inc
17326 S E McLoughlin Blvd
Milwakiie, Or
(503) 659-2134

- 19 A & A Machine Tool Rebuilders
8030 S Westminster Ave
Whittier, Ca.
(213) 698-1510
- 20 Custom Machine Tool Co
6509 Salt Lake Ave
Bell, Ca
(213) 588-1718
- 21 D & I Engineering
10524 S Norwalk Ave
Santa Fe Springs, Ca
(213) 941-3735
- 22 Precision Machine Industries
15672 Chemical Lane
Huntington Beach, Ca
(714) 898-2591
- 23 Precision Machine Rebuilding Co
255 W Benedict St
San Bernardino, Ca
(714) 885-2705
- 24 Sheperds Machine Tool Rebuilding Co
5713 E Liveoak Blvd
Bell Gardens, Ca
(213)
- 25 Studwel-Tooling Co
11331 Penrose St
Sun Valley, Ca
(714) 767-7504
- 26 Amerix Inc
1828A Industrial Way
Redwood City, Ca
(415) 365-6767
- 27 Fensco Inc.
681 Market St
San Francisco, Ca
(415) 362-4930

MACHINE REBUILDERS

MIDWEST AREA

- 1 Kron Gear & Eng Inc
501 Morgan Ave
Akron, Oh
(216) 773-6608
- 2 Manufacturing Serv Co
2025 Harsh St SE
Massillon, Oh
() 833-2896
- 3 Cincinnati Mach'ry Co
3900 Kellog Ave
Cincinnati, Oh
(513) 871-0853
- 4 Dejay Machine Co
7921 Blue Ash Rd
Cincinnati, Oh
- 5 Eastern Mach'ry Co
1000 Tenn Ave
Cincinnati, Oh
(513) 242-1241
- 6 Fredricks Industries Inc
424 Findlay St
Cincinnati, Oh
(513) 241-6673
- 7 Ohio Valley Mach'ry Inc
3261 Spring Grove Ave
Cincinnati, Oh
(513) 542-6670
- 8 Maintenance Service Co
232 S Curtis Rd
Milwaukee, Wis
() 771-4940

- 28 Hahn Manufacturing Co
1370 Harrison St
San Francisco, Ca
(415) 621-5782

- 29 CST Precision Scraping & Rebuilding Co
36158 Indian Wells Dr
Newark, Ca
(408) 792-5577

- 30 Columbia Machine Works
934 75th Ave.
Oakland, Ca
(415) 568-0808

- 31 Pen-Mar Inc.
715 Stierling Rd
Mountain View, Ca
(408) 965-1911

- 32 Union Machine Works
534 2nd St
Oakland, Ca
(415) 451-8989

- 33 Worrell Industries Inc
724 Camelia St
Berkley, Ca
(415) 527-0884

- 9 Gahir Machinery Co
1920 St Clair Ave
Cleveland, Oh
(216) 531-0053
- 10 Dayton Machine Tool Co
1280 McCook Ave
Dayton, Oh
(513) 224-8528
- 11 Grinders Clearing House Inc
2679 Conner Ave
Detroit, Mi
(313) 821-9300
- 12 Goldberg Emmerman Inc
2550 Arthur Ave
Elk Grove, Ill
(312) 439-6500
- 13 Detroit Press & Equipment Co
Detroit, Mi
- 14 Horn International Mach'ry Co (Waytaboring)
2679 Conner Ave
Detroit, Mi
(313) 961-4030
- 15 Behr Machinery Co
501 Eighteenth Ave
Rockford, Ill
(815) 962-7721
- 16 Production Equip Co Inc
5741 Russel St
Detroit, Mi
(313) 875-4900
- 17 U S Equipment Co
6542 E Palmer
Detroit, Mi
(313) 925-1910

- 18 Miles Machinery Co
2025 E Genesee Ave
Saginaw, Mi
(517) 752-3103
- 19 Ecese Machinery Sales & Rebuilders
75 Southfield Rd
Detroit, Mi
(313) 383-2100
- 20 Accurate Machine Rebuilders
14355 Meyer St
Detroit, Mi
(313) 491-4484
- 21 Alcoa Machinery & Tool Co Inc
6520 Epworth St
Detroit, Mi
(313) 895-3100
- 22 American Machine Tool Service Co
21914 Schmeman St
Warren, Mi
(313) 779-6350
- 23 American Scraping Co
1299 N Wayne Rd
Detroit, Mi
(313) 728-7270
- 24 Automatic Screw Machine Tool Co
5600 12th St
Detroit, Mi
(313) 873-9070
- 25 Detroit Broach & Automatic Mach Div of B & W
950 S Rochester Rd
Detroit, Mi
(313) 651-9211
- 26 Flex Manufacturing Inc
18115 Sherwood St
Detroit, Mi
(313) 892-6555

- 27 General Equipment & Machine Inc
4115 McKinley Blvd
Detroit, Mi
(313) 561-5660
- 28 Gentry Machine Rebuilders
1350 Piedmont St
Troy, Mi
(313) 566-3166
- 29 Grinders For Industry Inc
51300 W Pontiac
Detroit, Mi
(313) 624-5755
- 30 Harden Precision Scraping Inc
578 Sumpter Rd
Bellville, Mi
(313) 697-3111
- 31 Kasper Manufacturing Co
29275 Stephenson Hwy
Madison Hts, Mi
(313) 547-3150
- 32 Kirby Machine Repair Co
22813 Dequindry St
Detroit, Mi
(313) 548-8992
- 33 Master Rebuilding & Scraping Co
17301 Sherwood St
Detroit, Mi
(313) 365-6700
- 34 Michigan Machinery Rebuilders Co
26674 Liberal St
Detroit, Mi
(313) 759-4311
- 35 Monarch Mutal Machine Tool Inc
11863 Brook field
Livonia, Mi
(313) 425-4445

- 36 Process Manufacturing Co
101 Surban St
Detroit, Mi
(313) 381-9540
- 37 Production Machinery Rebuilders Inc
2543 Willis St
Detroit, Mi
(313) 364-6479
- 38 Roseville Machine Repair & Scraping
11223 E Eight Mile Rd
Detroit, Mi
(313) 759-0200
- 39 Shultz & Burgess Co
50650 E Russel Schmidt Blvd.
Detroit, Mi
(313) 949-2660
- 40 Universal Rebuilders Inc
3801 Trenton St
Detroit, Mi
(313) 584-5586
- 41 Jordon Machinery Co
512 S Fifth St
Milwaukee, Wi
(414) 272-0828
- 42 T & K Company
S-8241 Hillendale Ave
Muskego, Wi
(414) 679-1372
- 43 Machine Rebuilders Inc
3127 W Cameron Ave
Milwaukee, Wi
(414) 444-5500
- 44 Precision Machine Inc
5000 S Second St
Milwaukee, Wi
(414) 481-8130

- 45 Courtney Machine & Electronic Service
14133 Dragoon St
Indianapolis, In
(219) 255-3510
- 46 K-C Machine Co
8180 Country Club Place
Indianapolis, In
(317) 274-1519
- 47 Wrights Machine Co
4940 W Washington Ave
Indianapolis, In
(317) 243-9643
- 48 King Tool Div of Kingsbury Mach Tool Corp
33333 W 12 Mile Rd
Farmington Hills, Mi
(313) 479-2300
- 49 Fort Industry Machine Service Inc
532 Enterprise Blvd
Toledo, Oh
(419) 726-2675
- 50 Precision Machinery Co
5809 Angola St
Toledo, Oh
(419) 865-5535
- 51 Liberty Machine Works Inc
2410 N 9th St
St Louis, Mo
(314) 231-7423
- 52 Ramming Machine Co
4591 McRee St
St Louis, Mo
(314) 771-3211
- 53 United Engineering Co
Hwy 61/67 Imperial St
St Louis, Mo
(314) 464-5171

- 54 Jones Scraping & Machinery Co
Kenneth Rd
St Louis, Mo
(314) 296-2058
- 55 Acme Machine Tool Rebuilders Inc
500 Higgens Rd
Elk Grove, Ill
(312) 259-2495
- 56 Astro Machine Corp
160 Scott St
Elk Grove, Ill
(312) 956-0926
- 57 Chicago Machinery Rebuilders Inc
7083 Barry St
Des Plaines, Ill
(312) 297-0660
- 58 Crown Machine Co Inc
1640 W Kinsie St
Chicago, Ill
(312) 666-1151
- 59 Industrial Scraping Service
2010 N Ruby St
Melrose Park, Ill
(312) 865-2041
- 60 J & H Engineering Co
1958 N Seminary Ave
Chicago, Ill
(312) 525-6218
- 61 J & J Engineering Co
80 Gordon St
Elk Grove, Ill
(312) 593-3340
- 62 J & J Machine Repair Co
4305 W Lincoln St
Chicago, Ill
(312) 281-4620

- 63 Machine Tool Service Co
210 N Morgan St
Chicago, Ill
(312) 243-1620
- 64 Mecury Foundry & Machine Co
44 W 38th St
Chicago, Ill
(312) 536-0300
- 65 Midwest Machine Co Inc
1710 W 25th St
Melrose Park, Ill
(312) 681-3430
- 66 Paul Machine Tool & Engineering Co
4600 S Kedze St
Chicago, Ill
(312) 847-1750
- 67 Midwest Tool & Metal Products Corp
3743 W Belmont St
Chicago, Ill
(312) 583-4035
- 68 R & B Machine Tool & Engineering Co
917 S 76th St
Chicago, Ill
(312) 582-1747
- 69 R & G Machine Tool & Engineering Co
22 N 029 Pepper Rd
Lake Barrington, Ill
(312) 381-7443
- 70 Rebuilders Machinery Inc
7350 W Lawrence Ave
Chicago, Ill
(312) 867-8800
- 71 United Machine Rebuilders
3212 N Manhiem St
Franklin Park, Ill
(312) 455-8108

- 72 V & H Machine Rebuilders Inc
7040 W Column St
Chicago, Ill
(312) 457-0630
- 73 Peifer Machine Div Of Ressler Enterprises
North East Zone #5
Mt Aetna, Pa
(717) 933-4615
- 74 L J Stephens & Son Inc
North East Zone #5
Philadelphia, Pa
(215) 521-2961
- 75 Hirschey Machine Tool Rebuilding Co
S W 1st St
Staples, Mn
(218) 894-3617
- 76 Kurt Manufacturing Co
5280 N E Main St
Minneapolis, Mn
(612) 566-5500
- 77 Benning Inc
3615 50th Ave N
Minneapolis, Mn
(612) 53 -2243
- 78 Chelsa Machine Service Co
2401 Valley Pike
Dayton, Oh
(513) 233-6330
- 79 Do-Rite Machinery Service Inc
1123 E Second St
Dayton, Oh
(513) 224-8528
- 80 Salem Machine Service Inc
10 N Kilmer Dr
Dayton, Oh
(513) 268-1355

- 81 W & W Scraping Service
790 Utopia Pl
Dayton, Oh
(513) 252-1123
- 82 Weldon F Stump & Co
1313 Cambell St
Toledo, Oh
(419) 243-6221
- 83 Lincoln Rebuilders/Mingo Equip Co Inc
240140 Detroit St
Cleveland, Oh
(216) 871-6340
- 84 Master Rebuilders
24900 Rockside Ave
Cleveland, Oh
(216) 232-5882
- 85 Cobran Scraping & Machinery Co
8905 Dickens St
Cleveland, Oh
(216) 721-3737
- 86 World Wide Equipment Co
3900 Schafer Way
Detroit, Mi
(313) 846-4450
- 87 International Forging Equipment Corp
5000 Van Epps Rd
Cleveland, Oh
(216) 749-1970
- 88 Industrial Precision Products Co
1650 N Arlington Rd
Arlington Hieghts, Ill
(312)
- 89 Adams Machinery Co
6452 N Hamilin St
Chicago, Ill
(312)

- 90 M P Heinze Machine Co
6302 N Northwest Hwy
Chicago, Il
(312)
- 91 E W Lancaster Inc
2421 W Hubbard St
Chicago, Il
(312) 666-2316
- 92 Machinery Rebuilders
2223 W Chicago St
Chicago, Il
(312)
- 93 International Equipment Mfg Co
2824 Birch
Franklin Park, Il
(312)
- 94 Special Machine Co of Rockford
1930 11th St
Rockford, Il
(312)
- 95 Central States Machine Service Inc
2720 17th St
Elkhart, In
()
- 96 Indianapolis Machinery Inc
1967 S Meridian St
Indianapolis, In
()
- 97 Doefer Corp
P O. Box 647 A
Cedar Falls, Ia
()
- 98 Century-Detroit, Div Babcock & Wilcox
6099 Concord Ave
Detroit, Mi
()

MACHINE REBUILDERS

SOUTHEAST AREA

Cross Metal Co
4511 Fulton Industrial Blvd
Atlanta, Ga

Mid South Equipment Co
7201 Lee Industrial Blvd
Atlanta, Ga

Smith Machine Co
2372 C Street
Mt Lithonia, Ga
() 482-7831

Dixie Machinery Rebuilding Co
Nashville, Tn

Mull Machinery Co
90 N River Rd
Wheeling, W Va
(304) 233-3369

- 99 Schroeder Tool & Engineering, Inc
18616 Mt Elliott St
Detroit, Mi
()
- 100 Leitelt Iron Works
2311 Turner N W
Grand Rapids, Mi
()
- 101 Reliable Equipment Corp
633 Richmond N W
Detroit, Mi
()
- 102 R & B Machine Tool Co
E Mich & Hall St
Saline, Mi
()
- 103 Mid-America Machine & Mfg Co Inc
15903 Commerce Dr
Brook Park, Oh
(216) 433-7350
- 104 Laurens Bros Inc
2788 Highland Ave
Cincinnati, Oh
()
- 105 Production Experts Inc
4257 E 49th St
Cleveland, Oh
(216) 883-3220
- 106 Ohio Broach & Machine Co
Industrial Park Way & R R St
Willoughby, Oh
()
- 107 Buhr Machine Tool Co
839 Green St
Ann Arbor, Mi
()

Mohawk Machine Tool Rebuilders Inc.
175 Great Arrow Ave
Buffalo, NY
(716) 874-6605

R & B Machinery Corp
20 Riverview Blvd
Buffalo, NY
(416) 875-8806

Lafayette Machinery Corp
400 Henry Ave
Buffalo, NY
(716) 236-0221

E & B Holmes Machinery Co Inc
59 Chicago St
Buffalo, NY
(716) 854-2914

Fredrick Machine Repair Inc
22 Louisen St.
Buffalo, NY
(716) 892-1425

Pneumatic Applications Co
522 Cottage Grove Ave
Bloomfield, Cn
(203)

J. L. Lucas Machinery Inc
P.O. Box 3006
Bridgeport, Cn
(203) 259-3393

Gavlick Machinery Corp
Franklin & Rte 6
Bristol, Cn
(203)

Fairfield Equipment Co. Inc
70 Stanford St
Fairfield, Cn
(203)

Miller Machinery Corp
P O Box 10 Dept 106
Madison, Cn
(203) 245-7323

D & L Engineering Co
586 Surff Ave
Stratford, Cn
(203)

Machinery Trading Operation Div Colt Industries
549 Oakwood Ave
West Hartford, Cn
(203)

Berlin Foundry & Machine Co
489 Gobel St
Berlin, NH
(603)

B & B Machinery Co
665 T Ave E
Bayonne, NJ
(201)

John C Dusenbery Co Inc
373 T Allwood RD
Clifton, NJ
(201)

Round Valley Machine Co
Rte 22-T
Lebanon, NJ
(201)

Reuther Engineering & Machine Co
124 S 14th St
Newark, NJ
(201)

Lyons Machine Works Inc
746 River St
Paterson, NJ
(201)

Manex Machine Co
117-T Wayne Ave
Paterson, NJ
(201)

Precision Services
94T Illinois Ave
Paterson, NJ
(201)

Atals Machine Tool Corp
253-257 Highland Cross
Rutherford, NJ
(201) 933-3636

L W Tool & Machine Co Inc
5 Dunbar Rd
Springfield, NJ
(201)

Wallington Machine Co Inc
75 Paterson Ave
Wallington, NJ
(201)

Seaberg Precision Rebuilding Inc
31 Baiting Place Rd
Farmingdale, NY
()

Centaur Machinery Corp
18-T-E Sunrise Hwy
Freeport, NY
()

Evans City Machine & Tool Co Inc
Center St
Evans City, Pa
()

Thomas Machine Inc
Buttler Rd Rt 8
Glenshaw, Pa
(412) 961-0150

Elsner Engineering Works Inc
465 Frame Ave
Hanover, Pa
()

Gimple Machine Works Inc
254 N Woodbourne RD
Langhorwe, Pa.
()

Press & Shear Machinery Corp
2940 E Tioga St
Philadelphia, Pa
()

Hoffacker C.O. & Co
1140 Pontiac Ave
Cranston, Pa
()

Hammond & Barrie Div
45 Roger Williams Ave
East Providence, RI
()

Simmons Machinery Co

Albany, NY

NORTHEAST AREA

Acme Machine Tool Rebuilders
427 Water Street
Wakefield, Ma
() 378-7125

Botwick Bros
333 Welton St
Hamden, Cn
(203) 785-5571

Bradley & Hook Co
65 Williams St
Bridgeport, Cn
(203) 333-2650

Contract Machine Co
250 Moffet St
Stratford, Cn

Coulter & McKinsey Machine Co
35 Union Ave
Bridgeport, Cn
(203) 355-2571

Excello Tool & Eng Co
11 Mayfield
Milford, Cn
(203) 878-4073

L & L Machinery Rebuilding Co
120 Wildflower Lane
Fairfield, Cn
(203) 259-8462

K & P Tool & Machine Co
61 Sperry Ave
Stratford, Cn
(203) 375-7461

Macon Inc
700 Birtch St
Bristol, Cn
(203) 589-8189

New England Service Co Inc
11 Christiana Lane
New Britian, Cn
(203) 224-3717

Currier Machine Co
303 State St
North Haven, Cn
(203) 288-3571

Johnston Mach'ry Co
245 Frelinghuysen Ave
Newark, NJ
(201) 242-2300

Universal Machine Co
115 Ketchum Rd
Stratford, Cn
(203) 378-7125

Precision Rebuilding Corp
422 W Sixth St
Lansdale, Pa
(215) 368-1651

Ace Machine Repair & Rebuilding Co
671 Frelinghuysen Ave
Newark, NJ
(201) 242-1588

American Machine Tool Repair & Rebuilding Co
16 Little Rd
Hanover NJ
(201) 387-0742

Federal Machine Co, Inc
807 Garfield Ave
Jersey City, NJ
(201) 435-1500

Stiel Machine Co
91 Chestnut St
Newark, NJ
(201) 589-6562

Glaubinger Machinery Co
234 Emmitt St
Newark, NJ
(201) 824-3100