AD NUMBER

ADB006692

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited.

FROM:

**Distribution authorized to U.S. Gov't. agencies and their contractors;
Administrative/Operational Use; JUL 1975. Other requests shall be referred to US Army Command and General Staff College, Fort Leavenworth, KS.**

AUTHORITY

ODDR&E ltr 20 Jan 1976

Production Control for a C/C Company

Henry H. Fitzpatrick, MAJ, USA
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas 66027

Final report 6 June 1975

A thesis presented to the faculty of the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2 GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
Production Control for a C&C Company

5. TYPE OF REPORT & PERIOD COVERED
Final report 6 Jun 75

6 PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
Fitzpatrick, Henry H., MAJ, USA

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Student at the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
US Army Command and General Staff College
ATTN: ATSW-DD
Fort Leavenworth, Kansas 66027

12. REPORT DATE
6 Jun 75

13. NUMBER OF PAGES
97

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

28 SEP 1975

16. DISTRIBUTION STATEMENT (of this Report)
Distribution limited to U.S. Government agencies only: Proprietary Information. Other requests for this document must be referred to U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES
Master of Military Art and Science (MMAS) Thesis prepared at CGSC in partial fulfillment of the Masters Program requirements, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

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)
See reverse.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

This study proposes a type production control system for use by a C&C Company to manage its materiel processing operation. The proposed system utilizes such standard Army production control tools as the production control board and tub file, modified and realigned to fit the mission requirements of a C&C Company. Accountability of all items processed by the company is provided by the proposed system's emphasis on the use of stock record cards to account for each item received by the company as well as each repair part and component that is recovered for return to the supply system.

Viability of the proposed system is proven through the system's provision of a visual means to assist in accomplishing the production control functions -- planning, scheduling, dispatching and follow-up, -- its facilitation of the accountability requirements and thus, is recommended for use in effectively controlling a C&C Company's materiel processing operation.

PRODUCTION CONTROL FOR

A C&C COMPANY

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements of the degree

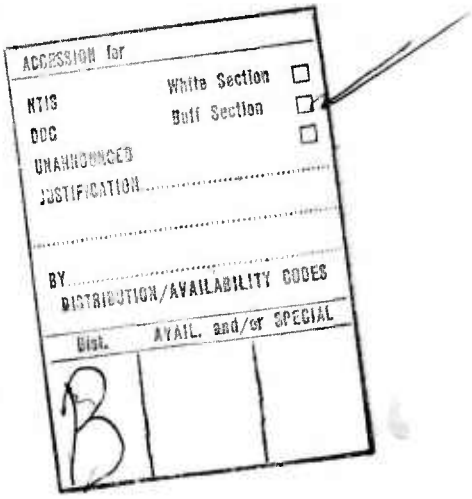
MASTER OF MILITARY ART AND SCIENCE

by

HENRY H. FITZPATRICK, MAJ, USA
B.S., North Georgia College, 1963
MBA, University of Georgia, 1971

Fort Leavenworth, Kansas
1975

5L5-3150


ACCESSION for
NTIS White Section
DDC Buff Section
UNANNOUNCED
JUSTIFICATION
BY
DISTRIBUTION/AVAILABILITY CODES
Dist. AVAIL. and/or SPECIAL
B

ABSTRACT

Materiel reclamation and salvage operations are vital functions that can substantially reduce logistical costs. Although these functions have a high economic impact, the Army has produced minimal doctrinal guidance on how to internally manage and control materiel processing operations of this nature. The TOE unit most affected by this absence of doctrinal guidance is the Collection and Classification (C&C) Company which must perform its assigned mission without adequate guidelines to control its production activities. For a materiel processing operation, or any other production oriented operation, production control enhances the planning, scheduling, dispatching, and follow-up functions that must be performed.

This study proposes a type production control system for use by a C&C Company to manage its materiel processing operation. The proposed system utilizes such standard Army production control tools as the production control board and tub file, modified and realigned to fit the mission requirements of a C&C Company. Accountability of all items processed by the company is provided by the proposed system's emphasis on the use of stock record cards to account for each item received by the company as well as each repair part and component that is recovered for return to the supply system.

To obtain data for this study, questionnaires were sent to the three active Army C&C Companies and to personnel knowledgeable in C&C Company operations. The field input information revealed the need for a production control system specifically oriented to the C&C Company's operations, a system that provided visual means of controlling work flow and a system that accommodated the accountability of all items received and processed by the company. The responses to the questionnaires provided information on procedures used by field units and formed a basis of comparison, analysis, and evaluation of the proposed system.

Viability of the proposed system is proven through the system's provision of a visual means to assist in accomplishing the production control functions — planning, scheduling, dispatching, and follow-up, — its facilitation of the accountability requirements and thus, is recommended for use in effectively controlling a C&C Company's materiel processing operation.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

THE PROBLEM

Introduction

The reclamation of Army materiel is an essential function that reduces the procurement of end items and costs of materiel operations. As early as 1847, an Army bulletin mentioned property disposal and advocated the principle underlying today's doctrine — reuse of serviceable materiel. The efficiency of a materiel recovery, reclamation or salvage operation is influenced by the internal operating procedures and production controls of the unit performing these operations.

Production control facilitates the planning, directing and controlling of work flow and provides immediate, accurate information needed to conduct managerial tasks in a timely manner. However, for the Collection and Classification (C&C) Company — the unit assigned to perform materiel reclamation and salvage functions — a type production control system or even simple guidelines concerning internal controls does not exist. Although the economic impact, in terms of equipment and materiel returned to the supply system by a C&C Company can be of tremendous benefit to a theater of operations, this company does not have a doctrinal type production control system by which to operate.

The purpose of this thesis is to develop a type production control system for use in a C&C Company's materiel processing

operation. Analysis of the C&C Company's operational tasks will identify the information and controls needed in the performance of its assigned mission. Research of production control systems and requirements will reveal the particular aspects of production control needed to meet the requirements of materiel processing accomplished by the C&C Company. Assimilation of the production controls required to manage a materiel processing operation will result in a type system for use by the C&C Company.

Historical Overview

Until World War I, the recovery and reuse of abandoned and unserviceable materiel was left to the discretion of combat commanders. During World War I, military property was recovered and repaired with responsibility for this activity assigned to the Quartermaster Corps.

At the beginning of World War II, the Quartermaster Corps was responsible for the collection and classification of unserviceable materiel and the disposition of economically repairable items for all services. Quartermaster salvage and reclamation operations constituted a major source for replenishing stocks of supplies and equipment. Salvage was concerned primarily with unserviceable articles but also processed new or usable articles that had been lost or abandoned on the battlefield by U.S. or enemy troops.

The economic magnitude of salvage operations is clearly shown in a report on a QM Salvage Collecting Company operating with the Fifth Army in Italy. This company "salvaged, repaired, cleaned and otherwise renewed — and shipped out for reissue —

QM equipment valued at $1,045,130 during a two-week period."[1] However, salvage recovery lagged behind all other Quartermaster services. Attempting to emphasize the importance of recovery and salvage, regulations, directives and plans were published by all headquarters. In a Sixth Army Salvage Collecting Plan, shown in Appendix B, paragraph one states "salvage collection is a command responsibility." Specific responsibilities and practices to be observed are outlined in subsequent paragraphs; however, paragraph three only gives a superficially addressing to accountability of "each item received."

Three types of units — salvage collecting companies, salvage repair companies, and salvage depots — were used in theaters of operations. Collecting companies attached to each corps evacuated salvage back to specific repair companies usually located deep in the Army zone. Salvage depots were sizeable, fixed installations, which had the intricate equipment needed for major repairs.[2] Although they were an asset to the supply system and processed an almost unbelievable quantity of materiel, it became apparent that technology had forced a reappraisal of the salvage concept. The salvage collecting companies were not capable, either by training or equipment, to handle the high densities

---

[1]U.S. Department of the Army, The Quartermaster Corps: Operations in the War Against Germany, by William F. Ross and Charles F. Romanus (Washington, D.C.: Government Printing Office, 1965), p. 226.

[2]U.S. Department of the Army, The Quartermaster Corps: Operations in the War Against Japan, by Alvin P. Stauffer (Washington, D.C.: Government Printing Office, 1956), p. 241.

of vehicles, equipment and repair parts. During the Italian campaign, General Sullivan, the Fifth Army Quartermaster, described salvage operations as "tremendous, apparently far beyond our capacity to handle."[3]

Further, the problems encountered in Korea with respect to evacuation of unserviceable materiels duplicated almost exactly the conditions encountered during World War II. The same lack of reclamation and maintenance capacity was felt throughout the war.

The history of supply and maintenance operations indicates that to support a large-scale military operation, a reclamation and maintenance system of adequate capacity is essential. Although the CO-STAR II study of 1962 addressed the importance of salvage operations, the Army entered the Vietnam War without adequate doctrinal procedures concerning collection, reclamation, evacuation and salvage operations.

C&C Company Production Control

The Army unit that has been given collection, reclamation, evacuation and salvage responsibility is the Collection and Classification Company which is allocated on the basis of one company per Corps Support Command (COSCOM) and one or more companies in the Communications Zone (COMMZ). The Collection and Classification (C&C) Company has the mission to "establish and operate a collection and classification facility for the receipt, inspection, segregation, disassembly, preservation, and disposition of service-

---

[3]Ross and Romanus, loc. cit.

able and unserviceable class VII and IX materiel."[4] Critical to the effective completion of these functions are the internal working procedures and controls employed by the unit. Control of the company's materiel processing or production is a minimal prerequisite to the effective, timely accomplishment of the unit's assigned mission.

Because a direct or general support maintenance unit's mission of returning equipment to a serviceable condition can drastically affect the combat readiness of a command, much has been written on how to perform the mission in a timely, efficient manner. Manuals and regulations are readily available to explain in detail how to control production, effect repair, provide repair parts and technical assistance and the myriad of other tasks performed by a maintenance unit. But a C&C Company is not a maintenance unit; nor, is it a supply unit. It is a collection and classification unit that performs certain functions that are also accomplished by both maintenance and supply units.

The Materiel Management Center (MMC) provides the C&C Company directions and guidelines concerning evacuation or disposal of end items and the reclamation of needed repair parts and components. These instructions can be classified as affecting "external" mission operations as opposed to "internal" operations of how the company is to accomplish its day-to-day mission.

---

[4] U.S. Department of the Army, Table of Organization and Equipment Number 29-139H (Washington, D.C.: Government Printing Office, 1974), p. 1.

Although the materiel processing function performed by a C&C Company is of a much greater magnitude than the maintenance operations performed by a similar size unit, a type production control system outlining the tools and internal controls to be used has not been established.

Benefits of Production Control

Production control is a vital prerequisite for effective operations management. A production control system is an invaluable vehicle for providing a degree of standardization of operations and for training of production control personnel. Additionally, a production control system for a C&C Company would provide benefits in the following areas:

Equipment accountability and control - the different types, makes and models of equipment received magnifies accountability and control problems for a C&C Company. A production control (PC) system will provide an audit trail to insure accountability and visibility of the exact status of equipment during its processing by the company.

Expedient return of materiel to the supply system - identified critical supply items can be expediently returned to the supply system because of the equipment status visibility and control provided by a PC system. In addition to impacting on materiel readiness, this benefit will result in a reduction in the procurement of repair parts and assemblies.

Work routing and progression — the work flow that results from use of a PC system will enable the identification and removal of bottlenecks and overloads and thus, increase the efficiency of the materiel processing operation.

Workload analysis — a PC system will facilitate the review of work in process and aid in improving resource utilization.

Hypothesis

The principle hypothesis of this thesis is that "a production control system can be designed to effectively control a C&C Company's materiel processing operation." This hypothesis will be tested by developing a type system and simulating in flow chart form the processing of materiel received by the company in each of the condition classification codes available. The proposed system will then be compared to the systems used by the field units to determine whether it is a more practical system for Army-wide adoption than other systems that have been employed.

Validating this hypothesis requires making one assumption to limit the problem. In all discussions of equipment being received and processed by a C&C Company, this thesis will use as its example the tactical wheel vehicle, one of the preponderant items of equipment found in a theater of operations. Possessed by all units and presenting a formidable task in their processing by a C&C Company, it is assumed that a PC system that can provide control during the processing and/or disassembly of tactical

wheel vehicles will also control the other items received by a C&C Company.

Thesis Overview

It is apparent from the brief discussion outlined above, that the C&C Company lacks standard guidelines concerning production control of its materiel processing operation. The purpose of this thesis is to develop a type production control system for use by a C&C Company.

To develop a production control system it is first necessary to understand production control as it relates to the management process and to examine the tools and theory of control systems. This will be accomplished through a review of production control texts and material to be presented in Chapter II. With the principles of production control as part of a management framework understood, the environment or operation in which production control is to be employed must be investigated.

In Chapter III, the organization and mission of a C&C Company will be analyzed. This analysis will reveal the information needed for control of the materiel processing and related operations accomplished by the company.

The findings from a survey of personnel with C&C Company experience and from the current active Army C&C Companies will be presented in Chapter IV. Production control methods used by the survey respondents and their related problem areas will be discussed.

Chapter V will incorporate the informational needs of the C&C Company with the principles and tools of production

control to produce a proposed type PC system. The type system will be evaluated by simulating the processing of equipment received by the C&C Company in different condition classifications.

A summary, conclusions and recommendations for use of the proposed type PC system by a C&C Company will be presented in Chapter VI. The proposed system, if adopted by the Army, will result in more effective processing of materiel by a C&C Company and improve materiel management throughout the Army.

CHAPTER II

PRODUCTION CONTROL

Introduction

Before examining production control for a specialized operation, such as that performed by a C&C Company, it is necessary to fully define production control, discuss its evolution and need, and establish certain principles and functions that are inherent to any production control operation. This chapter will concern itself with these points. After establishing a definition of production control, discussing its importance to sound management, and outlining the intrinsic principles and functions of production control, some of the basic management tools and techniques used to control production operations will be reviewed.

Understanding production control begins with an overview of the production process. Any production process is an input-output system. The input is the raw material used in the product; the operation encompasses the transformation of the raw material into the finished product which is the output.[1] This process of inputs, outputs, operations and control can be depicted as in Figure 1 with management of this transformation called production management.

---

[1]William Voris, Production Control (Homewood, Illinois: Richard D. Irwin, Inc., 1966), p. 1.

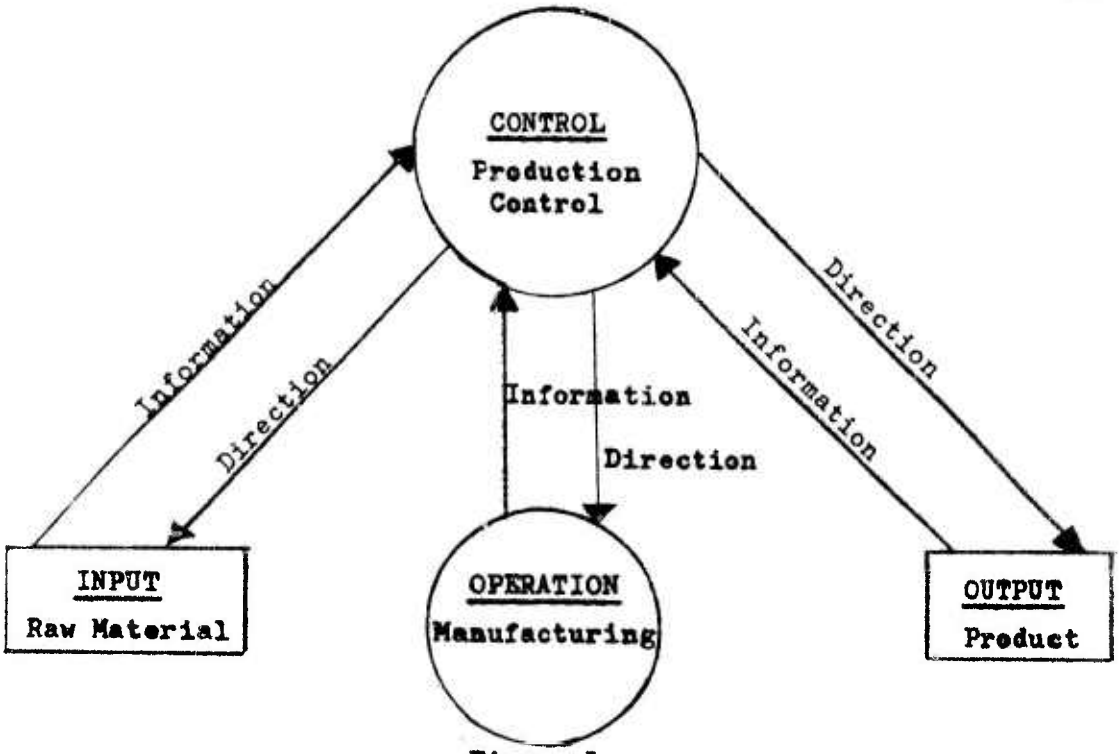


Figure 1

Production as an Input-Output Process[2]

The transformation process may be a very simple one, or it may be very complex. There are many combinations of things that may happen while the material flows through the factory or plant. However, one thing is certain: there must be some form of control over the process and this is where production control enters the picture.

Definition of Production Control

Before studying the control procedure for a particular production operation, the definition of the term production control must be addressed. Production control has been variously described as "regulating production," "constraining functions

---

[2]John E. Biegel, Production Control, A Quantitative Approach (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963), p. 4.

of production," or "monitoring production activities."[3]

In order for a production operation to accomplish its primary objective of producing goods in the proper quantity and quality, and utilizing the most economical methods, it must have a medium for coordinating its activities into a single organized effort. Production control is a group of physical activities, based upon modern management principles and concepts, and designed to guide production workers, machines, and materials to the realization of stated objectives. Production control is the technique of determining what items are to be produced and in what sequence the production operations must be applied to them. It determines the quantities, location, time and order in which the components of a product must be processed. Production control furnishes the forms and detailed instructions that must be followed in order to carry out the predetermined plan. Following this, production control performs a check on the progress by means of current records and reports that reveal troubled areas and furnishes valuable data for future planning.[4] Production control then may be viewed as a "service function which is intended to furnish management with the necessary systems, procedures, and forms required for the planning and control of production operations."[5]

---

[3]Voris, op. cit., p. 3.

[4]James A. Parton and Chris P. Steres, Production Control Manual (Philadelphia, Penn.: Chilton Company, 1955), p. 13.

[5]Ibid., p. 14.

The Dictionary of United States Army Terms, AR 310-25, defines production control as

> the process of directing and controlling the work in a manufacturing plant or maintenance shop in a manner that will result in a maximum output of quality work utilizing such tools of control as the production control board, tub file, job order register, and the variable repair time system.[6]

To further explain the importance of production control, FM 29-23 states that the

> maximum output of work, effective use of personnel and facilities, and orderly progression of work depend on the efficiency and effectiveness of the production control element.[7]

Paul D. O'Donnell, professor of Industrial Management at Boston College, defines production control as the

> directing of the manufacturing from the time the raw material is ready to enter the production process until it becomes a finished product. It includes the control of the raw material inventory, the routing, the scheduling, the dispatching, and the follow-up of the product.[8]

Discussed in detail later, these vital steps in production control affect the efficiency of a production control system to control a production operation.

It is sufficient to state that production control encompasses those activities which are necessary to manage production

---

[6]U.S. Department of the Army, AR 310-25, Dictionary of United States Army Terms (Washington, D.C.: Government Printing Office, 1972), p. 410.

[7]U.S. Department of the Army, FM 29-23, Direct Support Maintenance Operations (Washington, D.C.: Government Printing Office, 1971), p. 4-21.

[8]Paul D. O'Donnell, Production Control (New York: Prentice-Hall, Inc., 1952), p. 4.

in a manufacturing or processing environment. Emphasizing the management functions of directing and controlling, production control employs basic control tools and permeates the entire spectrum of production operations and management.

Evolution and Need

The science of production control was not developed overnight, nor was it developed entirely by one person. Production control techniques have evolved out of the necessity for certain systems and procedures to control production activities in an ever increasingly complex industrial age.

In surveying production control, the contributions of military history reveal the elaborate plans and controls necessary in waging war. In military tactics, great emphasis is placed on preliminary planning and careful assignment of duties to separate individuals without overloading any one person. Great flexibility is obtained by centralizing only the general features of the plan of operations to assure harmony in the execution of the plan. Officers of all ranks, at all levels, are required to use the principles of sound planning and control to assure the satisfactory accomplishment of the work to which they are assigned.

The first record of a complete production and control system applied to a manufacturing plant was at Watertown Arsenal in the 1880's.[9] This system was followed by Frederick Taylor's

---

[9]Evan D. Scheele, William L. Westerman, and Robert J. Wimmert, Principles and Design of Production Control Systems (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968), p. 5.

concept of scientific management which brought greater emphasis to the need for better planning and control and the tools and techniques which would bring it about. It was Taylor's theory that the various jobs of line foremanship should be split up and assigned to specialist foremen, each responsible for one function. The various clerical duties were to be divided among four men, as follows:

1. The time and cost clerk
2. The instruction card clerk
3. The order-of-work and route clerk
4. The disciplinarian[10]

Two of these functional foremen's jobs, the instruction card clerk and the order-of-work or route clerk, marked the beginning of those specialized activities which are now associated with the term "production control."

Like Taylor, Henry L. Gantt was very much interested in the "efficient utilization of labor through scientific investigation"[11] and devised control charts showing each job to be done and the daily progress of each worker in the performance of the assigned job. This type of control chart has since been found very useful for recording production control activities.

The continuing work in this area has resulted in the refinement of production control tools and techniques to the point where it would be almost unthinkable for a modern industrial

---

[10] Parton and Steres, op. cit., p. 11.

[11] Daniel A. Wren, The Evolution of Management Thought (New York: The Ronald Press Company, 1972), p. 150.

plant to be without them; certainly the plant that does not have them is very inefficient and usually fighting for survival.

Sound production control is basic to good management. It is the only means by which all levels of management can accurately and effectively forecast, plan, and control the operations of a production organization. An industrial plant might have the most efficient production facilities and methods in the world, but they are of little value without the controls to insure the accomplishment of what is intended.[12]

Principles of a Production Control System

Having briefly addressed the evolution and need of production control, the next step is to describe the principles of a sound production control system. Scheele, Westerman and Wimmert in their book, Principles and Design of Production Control Systems, promote the following principles that should be followed in designing a production control system. The system must:

1. Furnish timely, adequate and accurate information. This probably is the most important of all of the principles. Information obtained from the system is worthwhile only if it is there when needed, it is adequate but not excessive, and it is accurate. Otherwise, it is useless. Information flow is the basis of any production control system; without it, there is no system.
2. Be flexible. Flexibility of a system refers not only to the system's ability to adjust for variations in

---

[12]Scheele, Westerman and Wimmert, op. cit., p. 6.

workload, but also in terms of modifying the system itself to accommodate changes in the operation or the conditions that exist in the activity. Most activities are dynamic, i.e., they are in a constant state of flux. For this reason, it is necessary that a system be able to adjust to changing conditions within the organization. This must be done without complete disruption of the work that has been done in the past.

3. Be simple and understandable. The system must be understandable to everyone connected with it. It is not necessary that everyone understand the system in all phases, but only that part of the system which applies to an individual in a particular function. That which is not understood is usually not supported or supported only half-heartedly.

4. Be economical. Economy, in terms of money and time, is the basic reason for having a production control system. A production control system is not worth its cost unless this cost is more than offset by payoffs in terms of production costs, faster and better response to job requests, more on-time production, and no sacrifice in desired quality.

5. Force prior-planning and corrective action. Actually no system can force planning and corrective action. But a good production control system will force the essential information into the sphere of attention of

those who plan, replan, and are responsible for corrective action.

6. Permit management by exception. A system which permits management by exception is one which reports to management only those things which require action by management. The system must assure management that the unreported events are proceeding according to plan and that it is not necessary for management continually to follow up the details.[13]

Each of these principles must be applied to all aspects of production control. They may also be used as qualitative measures for evaluation of the system.

Functions of Production Control

The objectives of a production control system are to provide the organization with the essential procedures and paper work for coordinating the men, materials, and machinery of production. This is accomplished through planning and scheduling the work, dispatching it to the working sections and controlling the progress of work in the shop. The fundamental elements of production control which are assigned to the production control personnel are these:

1. Planning
2. Scheduling
3. Dispatching
4. Follow-up

---

[13] Ibid., p. 25.

Each of these functions will be discussed so as to describe exactly what is included in the accomplishment of that function.

1. Planning

In any type of work activity, planning the details of the work to be done must be accomplished. Beginning with the estimation of future workloads, planning addresses the number of personnel, inventories and tools available or required to perform a specific job. A second facet of planning involves the determination of where the work is to be done and by whom.

If work is to be accomplished, it must begin with a specific document authorizing it. The preparation of this document will be completed as part of planning; however, the release of the document to actually start the work will come later.

In summary, planning is the determination of where the work is to be done with the assurance of the presence of the factors of production, such as men and materials.

2. Scheduling

Scheduling follows chronologically after planning and can be defined as "the time coordination of production in advance of performance"[14] or the determining of the "when" of production. It consists of time-phasing of the workload and must consider shop

---

[14]Voris, op. cit., p. 74.

capacity, present workload, inventory position and required rate of production to establish both the starting and ending time for the work to be done. It is the job of the scheduling function to plan the timing of production activities so that idle time and costly fluctuations in the workload are held to a minimum.

The question of when work is to be performed in order to meet suspense dates, based on the original planning, is answered by scheduling.

3. Dispatching

The issuance of authority to initiate production activities is called dispatching. It is the transition from a planning phase to an action phase and consists of the actual release of the detailed work authorization to a work section. The major element of the dispatching function is the "assignment of work according to importance or precedence."[15]

Thus, we see that the dispatching function is responsible for issuing orders to the working sections according to the priority set by the scheduling function.

4. Follow-up

Once the work has been started in an activity, it is necessary to evaluate the progress in terms of

---

[15]Parton and Steres, op. cit., p. 26.

the plan so that deviations can be detected and corrected as quickly as possible. The follow-up function is responsible for checking the status of work orders after they are released to the shop, and taking any necessary action to insure the smooth flow of work. It is principally a coordinating function and generally involves some system for maintaining records on the progress of work in the shop. In addition, it will reveal the requirement for corrective action when production problems occur that threaten the successful and timely completion of work orders.

Follow-up is, therefore, the guiding hand which endeavors to see that operations are actually carried out as planned.

Tools of Production Control

To achieve effective control, a manager must have reliable and timely information. The age-old truism that subjects are better understood and facts more graphically conveyed if pictures, charts or some visual records are used was never more applicable than it is in the field of production control. It is most important that there be visual charts or boards available to a manager so that current shop workloads and progress can be readily discerned.

The numerous methods and devices that have been developed as control tools include such items as the:

1. Produc-Trol Board
2. Sched-U-Graph
3. Boardmaster
4. Gantt Chart
5. PERT Network
6. Production Control Board
7. Tub File

Each of these control tools is best utilized in specific types of operations and working conditions and is only a small representation of the management tools that may be used. A brief explanation of the first five control tools is provided in Appendix C.

U.S. Army maintenance doctrine advocates the use of a production control board and tub file as effective production control tools to provide timely management information. These two tools provide current information on the status of jobs within a shop and store the pertinent paperwork for each job. A detailed explanation on the design and use of these important production control tools is contained in Appendix D.

Management tools to provide reliable, timely information are essential for any production control system to be effective. It must be remembered, however, that the informational needs of the production control system should be established first and that the best device in the world will fail if it is applied to a situation for which it was not designed.

Summary

Production control is unquestionably a critical aspect of

any production operation. Employing production control in numerous environments throughout its logistical system, the Army defines production control as

> the process of directing and controlling the work in a manufacturing plant or maintenance shop in a manner that will result in a maximum output of quality work utilizing such tools of control as production control board, tub file, job order register and the variable repair time limit system.[16]

Production control may be summarily defined as covering all activities necessary to control production in a manufacturing or processing environment.

As a production control system accomplishes its objective of coordinating the men, material and machinery of production, certain basic functions required in a production operation are completed. The planning, scheduling and dispatching functions cause the production operation to begin. The follow-up and initiation of any required corrective action results in the production being completed as efficiently as possible.

Overall efficiency of a production control system, however, must be traced to the system's design. To be used to manage a specific type of operation, a production control system must:

1. Furnish timely, adequate and accurate information
2. Be flexible
3. Be simple and understandable
4. Be economical

---

[16] AR 310-25, Dictionary of United States Army Terms, loc. cit.

5. Force prior planning and corrective action

6. Permit management by exception

These principles provide a guide to developing a sound production control system and enhance the continuous evaluation of that system.

The production control board and tub file, as production control tools, have proven effective in providing reliable, timely information. Visual control aids keep a manager informed as to the activities for which he is responsible and assure him that his plans are being carried out according to schedule.

CHAPTER III

COLLECTION AND CLASSIFICATION (C&C) COMPANY

TOE 29-139H

Introduction

Throughout the history of the U.S. Army, unserviceable equipment has proven to be an important means of satisfying supply requirements by providing repair parts, assemblies and components needed to maintain other equipment in a serviceable condition. Because of its importance, unserviceable equipment or materiel must be controlled from the time it is recovered until final disposition is made. This chapter will discuss the organizations most involved in processing unserviceable materiel — the C&C Company and the Materiel Management Center (MMC) which controls materiel evacuation and provides instructions for the disposition of this materiel. The C&C Company's mission and organization will be analyzed followed by a review of the operational relationship between the company and its controlling MMC.

Mission

Organized under TOE 29-139H, the C&C Company's stated mission is as follows:

> Establishes and operates a collection and classification facility for the receipt, inspection, segregation, disassembly, preservation, and disposition of serviceable and unserviceable class VII and IX materiel and similar foreign materiel (except items peculiar to cryptographic

materiel, missile systems, aircraft, airdrop equipment, drones, and medical materiel).[1]

In the performance of its mission of operating a collection facility, the C&C Company directly benefits the supply system by performing such functions as:

1. Removes serviceable repair parts and assemblies from uneconomically repairable end items and returns them to supply channels.
2. Evacuates repairable end items and components to maintenance units for repair.
3. Evacuates or disposes of foreign materiel.
4. Operates a cannibalization point and when authorized by higher headquarters performs controlled cannibalization.[2]

A C&C Company is assigned to the Corps Support Command (COSCOM) and performs its collection mission in support of a corps area of operations. One or more companies are assigned in the COMMZ to provide support in the rear of a theater of operations.

Organization

Figure 2 depicts the organizational structure of the C&C Company. The major elements of the company and their primary functions are:

---

[1]U.S. Department of the Army, Table of Organization and Equipment Number 29-139H (Washington, D.C.: Government Printing Office, 1974), p. 1.

[2]U.S. Department of the Army, FM 29-24, General Support Maintenance Operations (Washington, D.C.: Government Printing Office, 1971), p. 6-8.

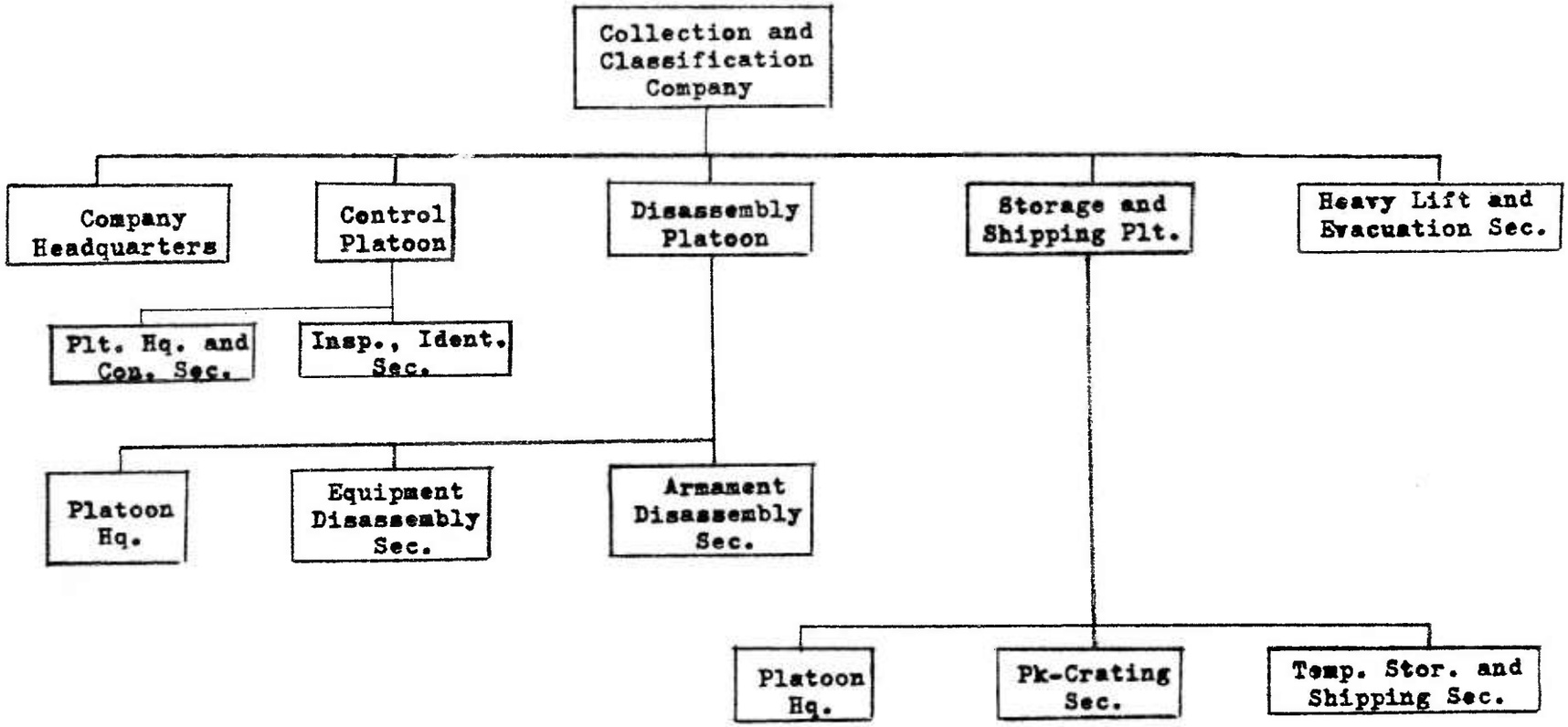


Figure 2

Collection and Classification Company
TOE 29-139H

1. Company Headquarters — This section provides the overall command and control and performs organizational administration, maintenance, supply and food service functions for the company.
2. Control Platoon — This section provides operational control over all mission activities. It is responsible for the receipt, identification, inspection and condition classification of each item of equipment received by the company. Based on instructions from the MMC, this section directs other elements of the company in the processing and disposition of materiel received by the company. The administrative records and reports required by mission operations are prepared and maintained by this section.
3. Disassembly Platoon — This section performs the disassembly of equipment processed by the company. Equipment is disassembled to remove only certain designated parts and assemblies with the residue materiel disposed of as salvage.
4. Storage and Shipping Platoon — This section preserves, packs, and crates serviceable and repairable items reclaimed by the company for return to supply channels.
5. Heavy Lift and Evacuation Section — This section lifts and moves heavy materiel within the company and performs limited recovery and evacuation operations.

Concept of Operation

Coordination and control of the evacuation of end items,

assemblies, and components is the direct responsibility of the COSCOM MMC. Thus, the MMC exercises technical direction and control over the C&C Company's mission operations by providing priority lists and disposition instructions to guide the reclamation activities of the company.[3]

The items received by the C&C Company, the majority of which are unserviceable, are inspected, classified and reported to the MMC. Although unserviceable, these items are assets of the command that must be beneficially utilized. Depending on the exact condition of the item, the criticality of the item, workload of maintenance units and numerous other factors, the MMC determines the appropriate disposition of these items. Reclamation of selected assemblies, components and repair parts is determined by the MMC and specific instructions provided to the C&C Company. To the extent feasible, automatic or standard disposition instructions are published to facilitate routine processing and shipment of materiel generated by the C&C Company. Materiel generated by the company is generally disposed of in one of several ways:

1. Shipped to a GS maintenance unit for repair
2. Evacuated to a COMMZ maintenance facility
3. Returned to CONUS
4. Returned to the local supply channels for re-issue
5. Evacuated to property disposal for processing as scrap

Regardless of the destination of the materiel processed through a C&C Company, the MMC serves to control the evacuation

---

[3]Ibid., p. 4-6.

of materiel by directing the shipment of equipment from a using or supported unit into the C&C Company.

By providing the C&C Company with specific instructions of what to do with this equipment, i.e., reclaim selected repair parts and components, ship to a maintenance facility for repair, or disassemble and salvage as scrap metal, the MMC insures the most effective management of materiel for the command.

From the C&C Company's viewpoint, the instructions provided by the MMC must be classified as external. Internal instructions outlining in specific detail exactly how to manage and control equipment processed by the company must be developed by each C&C Company. Current Army regulations, manuals and other forms of doctrinal literature do not prescribe even rudimentary guidelines concerning a C&C Company's internal mission management.

Summary

Organized to perform a materiel collection and classification mission, the C&C Company is responsible for performing its mission in support of a corps' area of operations. The major elements of the company are functionally organized to store, disassemble and evacuate materiel of any condition classification. In accordance with instructions provided by the MMC, the C&C Company returns designated repair parts and components to the supply system, ships equipment to a maintenance facility for repair, or disposes of the equipment as scrap metal.

CHAPTER IV

SURVEY OF C&C COMPANY PRODUCTION CONTROL

Introduction

Presently the only C&C Companies in the active Army are the 296th C&C Company, the 508th C&C Company, and the 538th C&C Company, all located in USAREUR. To obtain an understanding of the production control systems and procedures currently employed by C&C Companies, a survey of these companies was conducted.

The records of all students and the staff and faculty assigned to the Command and General Staff College were screened to identify anyone with experience in a C&C Company. The records screened revealed two personnel who had served in a C&C Company in either Vietnam or Europe, and these personnel were surveyed concerning the production control procedures utilized in their units. One other person, a former C&C Company Commander, was identified and included in the survey.

The questionnaire utilized is shown in Appendix G. Except for one question, all of the questions used in the survey were free-response, open-ended questions so as to encourage the respondents to "talk freely and at length about the subject,"[1] and thereby provide a more accurate picture of their C&C experience. Free-response questions are especially useful

---

[1]Charles H. Backstrom and Gerald D. Hursh, Survey Research (Evanston, Ill.: Northwestern University Press, 1963), p. 73.

> when the researcher has limited knowledge as to the kinds of answers a particular question is likely to provoke [and] where he anticipates a great range of responses.[2]

The questionnaires administered to the identified C&C Company population were all returned except the one from the 508th C&C Company and explained production control systems employed by different C&C Companies in Europe and Vietnam during the period 1963-1975. In addition to the questionnaire, letters of explanation, copies of the unit's SOP, policy letters, local forms and production reports were also returned for evaluation and use in the survey.

This chapter will outline and discuss the survey respondents' production control systems. Survey comments concerning the critical aspects of production control and C&C operations will be provided and addressed as to their relevance and importance.

Review of Field Systems

Analysis of the survey answers revealed the use of five different or "special" systems or methods of controlling production operations of a C&C Company. Each of these systems has certain distinct characteristics applicable only to that system and at the same time certain similar aspects or characteristics relative to all systems. These systems and their characteristics are outlined in Table 1. In developing the matrix presented in Table 1, if a survey respondent did not specifically state the use of a control

---

[2]Ibid.

Table 1

Field Systems

Evaluation Characteristic	A	B*	C	D	E
Brief description of system procedures	3x5 cards are prepared for any item to be stripped. This card travels with the item as it moves from the disposition lot to the stripping holding lot, stripping floor, cannibalization yard and finally the dead file.	Extended use of tub file; individual folders prepared for each significant item of equipment.	When an item is received, a request for disposition (FTE)** is sent forward. A copy of the FTE or the response to it (FTR) is kept on file by job status.	Production is controlled 1st by what vehicles are available for disassembly, 2nd by mandatory recoverable lists, lastly, by corps needs.	The unit has standing authority to disassemble Code H noncombat vehicles (wheel vehicles). Production is determined by a COMMZ mandatory recoverable list, special requirements to support production programs and responses to deadline requisitions.
PC Board	No	No	No	No	Modified
Tub File	No	Yes	No	No	Yes
Forms	Local	TAMMS	Local	Local	TAMMS
Contributes to:					
Planning	No	Yes	No	No	Yes
Scheduling	No	Yes	Partially	Partially	Yes
Dispatching	Yes	Yes	Yes	No	Yes
Follow-up	No	Yes	No	No	Yes
Equip. Accountability	Partially	Partially	Partially	Unknown	Partially

* System B was used in RVN by a C&C Company whose mission must be considered "atypical" to the conventional doctrinal mission of a C&C Company.

** The FTE and FTR cards are used in USAREUR with the Tactical Maintenance Control System (TMCS). TMCS is a special automated system that is being used on a test basis to control USAREUR maint. operations. The FTE card is used to transceive a request for disposition instructions from a C&C Co. to the MMC. The FTR card is the MMC's answer that is sent to the company.

tool, e.g., production control board, the assumption was made that the benefits accruing from the use of that control tool were not fully achieved by that system. Had those advantages of a particular control tool been realized by a system it is believed the use of that control tool would have been mentioned by the survey respondent. The indication as to a system's capacity to contribute to planning, scheduling, dispatching, follow-up, and equipment accountability is the author's subjective evaluation based on the system description provided in the survey answers. A supplementary analysis of each system is provided below.

System A

System A uses a 3x5 card for each item being processed by the company. The card travels with the item of equipment as it moves through the processing operation, i.e., from the disposition lot to the stripping holding lot, to the stripping floor, to the cannibalization yard and finally to the dead file. These cards are highly susceptible to being lost as they move with the equipment through its processing cycle and are also adversely affected by climatic conditions. With each item of equipment represented by one 3x5 card, as the workload increases the number of cards that must be managed also increases and could become difficult to physically handle and control.

The use of 3x5 cards does allow the dispatching function to be accomplished; however, system A does not facilitate the planning, scheduling, and follow-up functions required for an effectively run production control system. Use of a production control board to provide visibility of the complete workload

would enable these vital functions to be effectively accomplished.

The local forms used in this system represent an unnecessary additional administrative requirement. The preparation production, and personnel training requirements that accompany the use of local, non-standard forms are time-consuming tasks that detract from efficient management. Use of forms available under TAMMS would negate these deficiencies.

System B

System B makes extended use of the tub file which does allow the production control personnel to plan, schedule, dispatch and follow-up their operation. A production control board is not utilized due to manpower shortage; however, if a control board was used, the company's ability to manage its total operation would be improved. A chart board is used to record information on the amount of equipment ready for movement, the amount moved, and other related information.

The unit operating this system was located in Vietnam and charged with a mission that must be classified as "atypical" to the conventional doctrinal mission of a C&C Company. The major portion of the unit's mission was simply to retrograde equipment out of country. The company operated under pressure resulting from requirements to meet shipping schedules and, therefore, expended minimal effort in the disassembly of equipment.

System B did utilize TAMMS forms in carrying out its materiel processing operation and, thereby, not burden itself with unnecessary, additional administrative and personnel training requirements.

System C

System C is operated in conjunction with the Tactical Maintenance Control System (TMCS) employed in USAREUR. TMCS is an automated maintenance and supply control system that USAREUR is testing for possible Army-wide adoption.

Under TMCS and in accordance with AR 755-1, Disposal of Supplies and Equipment, system C uses an FTE card to transceive a request for disposition instructions to the MMC. The MMC uses an FTR card to provide the C&C Company its answer of how to process the equipment it has received. Equipment for which automatic disposition instructions have been published do not require the use of an FTE card but are processed according to the published instructions. A copy of the FTE or FTR card is kept on file by job status.

This method of maintaining job status does not facilitate the planning and follow-up functions of production control because equipment is categorized only by major job status. Identification of specific types of equipment within a particular status would cause the work planning and follow-up to be completed more effectively. Scheduling is partially accommodated by having a group of files, e.g., equipment, that is "awaiting shop" and,therefore, must be scheduled for processing. After determining which items will be scheduled for processing, the dispatching function is accomplished by directing that the processing of these items begin.

The dispatching is accomplished by the use of a local form that lists the stock number of every possible part that is to be recovered for a particular type item, i.e., 1/4 ton truck. But

1/4 ton trucks have several different end item stock numbers. The repair parts and components for 1/4 ton trucks with different end item stock numbers often have different stock numbers also. To produce a local form that arbitrarily lists all possible parts that might be recovered from a particular type item of equipment is an unnecessary administrative burden on a company. The items to be recovered will change based on local supply demands and, therefore, necessitate a change in the form. Additionally, a form of this format and listing would not be applicable in different areas of operation due to different conditions and supply system demands.

Failure of this system to employ a control board prevents the system from providing an overall picture of the complete workload. Were overall workload visibility available, the system's capacity to facilitate planning, enhance scheduling, and provide more accurate accountability would be improved.

System D

Production under system D is determined and controlled by first, what vehicles are available; second, by a mandatory recoverable list, and lastly, by a list of corps needed items. Production control that is driven by these three factors is correct. But these are only the driving forces. Once the production starts, i.e., vehicles begin to be disassembled and parts recovered, the company must have a means to plan and organize its workload, its production, account for all items, determine current workload and current backlog and, if necessary, change the type items being disassembled. This system has the proper driving

force, but does not possess a means to internally promote the efficient management of its materiel processing operation. Consequently, the planning, scheduling, dispatching, and follow-up requirements are not accomplished as efficiently as they might be.

This sytem does use TAMMS forms and, therefore, does not burden itself with unnecessary administrative requirements associated with using local forms. Because the TAMMS procedures and forms are taught throughout the Army service schools, newly assigned personnel should be familiar with the forms and not require extensive training in forms preparation and processing.

System D does not employ standard production control tools such as the production control board and tub file and, hence, does not avail itself of the advantages and benefits associated with these control tools. Use of these tools would prevent many of the deficiencies listed above.

System E

System E more closely resembles the production control system proposed by this thesis than any other system described. This system uses a modified production control board that employs color-coded tags to depict the different statuses in which an item of equipment may be found. The accompanying paperwork for the equipment is filed in a standard tub file.

A unique factor affecting this system is that the unit had standing authority to disassemble non-combat vehicles that were unserviceable and uneconomically repairable (Code H). This was primarily wheel vehicles and composed a large percentage of the total workload. Combat vehicles (track vehicles) were

disposed of in accordance with instructions from a higher headquarters.

Exactly what parts and components are recovered is determined by a mandatory recoverable items list published by the COMMZ, by special requirements for parts and components needed to maintain theater production programs, and by the parts needed to remove equipment from deadline.

This system's capacity to aid in planning, scheduling, and dispatching must be rated as very good due to two factors -- the use of a production control board and the standing authority to disassemble non-combat Code H vehicles. Follow-up under system E can be accomplished; however, this system, like all the field systems surveyed, does not provide the complete accountability needed in a materiel processing operation. The repair parts and components recovered in the disassembly of an item of equipment are not accounted for by these systems. Those items being returned to the supply system, as well as an end item being eliminated from the Army inventory, must be accounted for.

The use of TAMMS forms is a favorable characteristic of this system that is cost effective, does not require excessive administrative time, and eases training requirements of new personnel.

Additional Survey Comments

The current C&C operators and other personnel knowledgeable in C&C Company materiel processing operations submitted the following factors as being critical aspects of production control for a C&C Company.

1. Visual means of controlling flow of materiel through cycle of operation.
2. Identify position of the items in the cycle.
3. Account for every action taken concerning an item.
4. Generate accurate data on components and repair parts returned to supply system.
5. Identification and location of items being processed.
6. Status of equipment moving in and out of Disassembly Section and the equipment moving to PDO.

Two other answers that were submitted, though not germane to the issue of internal production control by a C&C Company, are extremely important to the unit's overall operation and are also listed.

1. Obtaining timely disposition instructions.
2. Accurate listing of mandatory recoverable items.

Comments that add insight into the operational environment and problem areas encountered by C&C Companies are as follows:

1. Accountability is our biggest problem.
2. Takes a lot of guidance and standing instructions from a MMC to effectively utilize a C&C Company.
3. Few people realize the mission of the company. Most consider the unit a junkyard and do not feel they should have to use supply procedures to get parts from this unit.
4. Construct a simple system that can be operated by a few personnel. Mission pressure will necessitate establishing priorities and administrative matters

may be of a low priority.

Addressing the six factors listed as critical aspects of production control, the five field systems provide for or satisfy these requirements as outlined in Table 2.

The survey comments concerning accountability, need for guidance and instruction, people's lack of knowledge on the mission of the company, and the need for a simple production control system tend to corroborate the already stated needs of a C&C Company. Stressed throughout this thesis, accountability is unquestionably one of the biggest problems encountered by a C&C Company. The volume of equipment processed by the company and the fact that much of that equipment is eliminated from the Army inventory serves to underscore the importance of accounting for and controlling all equipment received by the company.

The comment that "few people realize the mission of the company" is quite apropos. Granted, the C&C Company is a very low density unit in the Army structure; it, nevertheless, provides a service of tremendous magnitude and must be given adequate guidance under which to operate. The fact that minimum time and doctrinal effort has been expended on behalf of the company is the reason that a modicum of doctrinal guidance has been published. The company is not simply a "junkyard," but is a service support unit that can materially enhance the readiness posture of a command and, therefore, must be governed and operated under the same procedures and requirements applicable to other service support activities. As explained in the concept of operation section of Chapter III, the MMC must provide all members of the command

Table 2

Field System's Satisfaction of Critical Requirements

Critical Requirement	How Satisfied by Designated System				
	A	B	C	D	E
1. Visual means of controlling flow of materiel through cycle of operation					PC Board
2. Identify position of the items in the cycle	3x5 Cards	Tub File	Job Status File	FTE/FTR Card File	PC Board
3. Account for every action taken concerning an item	After the initial receipt of an item, accountability for other actions taken on an item is questionable				
4. Generate accurate data on components and repair parts returned to the supply system					
5. Identification and location of items being processed	3x5 Cards	Tub File	Job Status File	FTE/FTR Card File	PC Board Tub File
6. Status of equipment moving in and out of disassembly and of the items moving to PDO					PC Board

instructions as to how to obtain parts from the C&C Company and in so doing not only improve materiel posture but also achieve the maximum utilization of this company.

One of the principles listed in Chapter II to be followed when designing a production control system was that the system must be "simple and understandable." The survey comment testifying to the need for a "simple system that can be operated by a few personnel" is in strict conformance to this principle. The system that provides the required accountability and control must be simple and feasibly operated by the three clerical personnel assigned to the Control Section. The inherent "can do" attitude of the American soldier results in maximum effort being expended to provide the support services for which he has been charged. When mission pressures occur, and they will occur even under ideal conditions, one of the first things that will slip will be the administrative requirements, especially those that are complex and time-consuming. Production control systems, like maintenance, personnel, mess or any other system, must be simple and easy to operate in order to be truly effective.

Summary

The information submitted from two of the three active Army C&C Companies and other personnel knowledgeable in C&C Company operations may be briefly summarized as follows:

1. A special production control system is required for a C&C Company's materiel processing operation.
2. The system should provide a visual means of controlling the flow of materiel and facilitate identifying

the position of the items in the materiel processing cycle.

3. The system should facilitate accountability for all items received and processed by the company.
4. The system should utilize forms currently available in TAMMS.
5. The system should be simple and easily operated and contain minimum personnel requirements.

The information obtained in the survey provides a keen insight of the requirements for controlling the production of a C&C Company. Chapter V will present a proposed system of production control for a C&C Company. Conclusions concerning the proposed system's capacity to satisfy the C&C Company's production control needs that were identified by the survey, and other research of this thesis, will be developed in Chapter VI.

CHAPTER V

A TYPE PC SYSTEM FOR A C&C COMPANY

Introduction

To direct and control the mission operations of a C&C Company, a production control system needs to be developed that is specifically oriented to handle the type materiel processing operation conducted by the company. This chapter will present such a system.

This presentation will address the control tools specifically designed to fit the mission requirements of a C&C Company and explain the procedures to be followed in using these tools to operate this system. After outlining the simulated processing of a 1/4 ton truck, an analysis of the system in terms of the basic functions of production control and other evaluation characteristics will be presented.

Proposed Control Tools

The analysis of the C&C Company presented in Chapter III revealed that the basic materiel processing functions performed by the company were as follows:

1. Collect or receive the materiel
2. Inspect and classify the items received
3. Dispose of materiel in accordance with MMC instructions
   a. Disassemble and salvage selected parts and components

b. Ship to a maintenance facility for repair

Visual production control tools such as a production control board can be effectively used to provide reliable, timely information from which to plan and schedule the work. Conforming to the procedures for utilizing these control tools as explained in Appendix D, a control board and supporting tub file can be designed to accommodate the basic materiel processing functions performed by a C&C Company.

The columns of the board, representing the steps through which an item of equipment might be processed, would conform to the materiel processing functions performed by the company and be titled as

Awaiting Inspection

Awaiting Disposition

Awaiting Disassembly

In-Process Disassembly

Awaiting Shipment

The items to be shipped to maintenance facilities for repair or property disposal as scrap will usually be reported to the local Transportation Movements Officer (TMO) for movement. Due to the time lapse between the time an item is committed for shipment and the time it is actually picked up and moved, an additional column, titled Transportation Information, would prove useful for recording pertinent information such as the Transportation Control and Movement Document (TCMD) number and pick-up date. If used, this column should be a poster board covered with acetate rather than the hooks used for hanging control tags.

Shipment dates and TCMD numbers could then be recorded on the appropriate line for the items being shipped.

An example of this type control board listing four major categories of equipment, each sub-divided into specific items is provided in Figure 3. Additional categories of equipment and their specific item sub-division would be listed similar to the ones shown in the example.

The tub file for this production control system would be similar to a conventional tub file as explained in Appendix D with the different sections titled to match the columns of the control board.

Although the control board and tub file are the principal tools used to control the materiel processing operation, they are by no means the only control tools utilized. A Maintenance Request Register, DA Form 2405, a visible index file and such other TAMMS forms as DA Form 2404, Equipment Inspection and Maintenance Worksheet, will be used during the processing of an item of equipment.

The Maintenance Request Register, DA Form 2405, is used to record the items received by the company. Such information as the date received, company control number, nomenclature and serial number of the item of equipment and the unit turning in the item is recorded in this register. The company control number is the combination of the Julian date and a document serial number.

A DA Form 1296, Stock Accounting Record or Stock Record Card (SRC) will be maintained for the National Stock Number (NSN) of each item received by the company. Accountability will be

Equipment		Awaiting Inspection	Awaiting Disposition	Awaiting Disassembly	In-Process Disassembly	Awaiting Shipment	Shipment Information
AUTOMOTIVE	1/4 Ton Trks.						
	1 1/4 Ton Trks.						
	2 1/2 Ton Trks.						
	5 Ton & Over						
	Trailers						
	Tanks						
	How's						
	APC						
	Misc.						
ENGINEER	Gen. 1.5KW						
	Gen. 2-5KW						
	Gen. 10KW & Over						
	Construction						
	Misc.						
COMMEL	Radars						
	Radios						
	Telephones & TT						
	Misc.						
WEAPONS	Pistols						
	Rifles						
	MG's						
	Misc.						

Figure 3

C&C Company Production Control Board

assumed by posting a gain to the SRC of the NSN of each item received. Because a large number of the items received by a C&C Company will be disassembled and eliminated from the Army inventory, the importance of close equipment accountability and control is increased.

An inspection to determine general condition of the equipment, i.e., presence and completeness of components, parts, and logbook should be conducted when receiving the equipment. The more important — and much more complex and time consuming — classification inspection may be accomplished after receipt of an item and posting its gain to the SRC. A DA Form 2404, Equipment Inspection and Maintenance Worksheet, is prepared to be used in directing this classification inspection and any other processing, such as disassembly and/or preparation for shipment, that the item might undergo. The results of the inspection and the appropriate condition classification code are recorded on the form applicable to that commodity of equipment. DA Form 461-5, Vehicle Classification Inspection, is used for all automotive items; DA Form 3590, Repair Eligibility Data Sheet, is used for engineer items, and DA Form 2404 Equipment Inspection and Maintenance Worksheet is used for all other commodities.

System Procedures

To illustrate the use and interrelationship of the control tools used in this system, an outline of the sequential procedures to be followed in operating this system is presented.

I. Item received by the company

A. Recorded in the Maintenance Request Register

B. Posted to the stock record card

C. Control board tag hung under Awaiting Inspection

D. DA Form 2408-9, Maintenance Control Record, completed

E. DA Form 2765-1, Request for Issue or Turn-In, that is received with an item of equipment is processed

F. DA Form 2404 made up in two copies

1. One copy filed with the logbook and related paperwork in the tub file

2. One copy sent to Inspection Section

II. Item inspected and condition classification code determined

A. DA Form 461-5, Vehicle Classification Inspection, completed

B. Inspection results returned to Control Section

III. Disposition instructions requested from MMC

A. Classification forms forwarded to MMC

B. Control board tag moved to Awaiting Disposition

C. Items for which automatic disposition instructions have been published will be processed accordingly

IV. When disposition instructions are received, the item is processed according to instructions

A. Disassembled

1. DA Form 2404 sent to the Disassembly Platoon directing the disassembly of the truck

2. Designated repair parts and components recovered

a. Recovered items forwarded with the DA Form 2404 to the Storage and Shipping Platoon who cleans, tests, and prepares the items for shipment. Items beyond the C&C Company's capacity to test are prepared for shipment to a maintenance facility for testing and repair

b. DA Form 2404 returned to the Control Platoon listing the stock number and quantity of items prepared for shipment

c. Recovered item posted to SRC; SRC adjusted when the items are shipped to another facility to be repaired and/or reissued

3. Remaining scrap metal sent to property disposal

4. DA Form 2408-9 completed

B. Shipped to a maintenance or supply facility for repair and/or reissue

1. Coordination initiated with the local Transportation Movement Office for shipment to the gaining facility; TCMD initiated

2. DA Form 2404 sent to the Heavy Lift and Evacuation Section directing that assistance be provided in loading and preparing an item for shipment. The 2404 is returned to the Control Section when the item is actually shipped out

3. DA Form 2408-9 completed

4. DD Form 1348-1 completed

5. SRC adjusted to show loss of the item when it is received by the gaining maintenance facility

C. Shipped direct to property disposal as excess

1. Coordination initiated with the local Transportation Movement Office for shipment to the gaining facility; TCMD initiated

2. DA Form 2404 sent to the Heavy Lift and Evacuation Section directing that assistance be provided in loading and preparing an item for shipment. The 2404 is returned to the Control Section when the item is actually shipped out

3. DA Form 2408-9 completed

4. DD Form 1348-1 completed

5. SRC adjusted to show loss of the item when it is received by the property disposal facility

D. Control board tag is moved to the appropriate column — Awaiting Disassembly, In-Process Disassembly, or Awaiting Shipment. If the item is to be shipped, the pertinent transportation information is recorded in the Transportation Information column

Simulated Equipment Processing

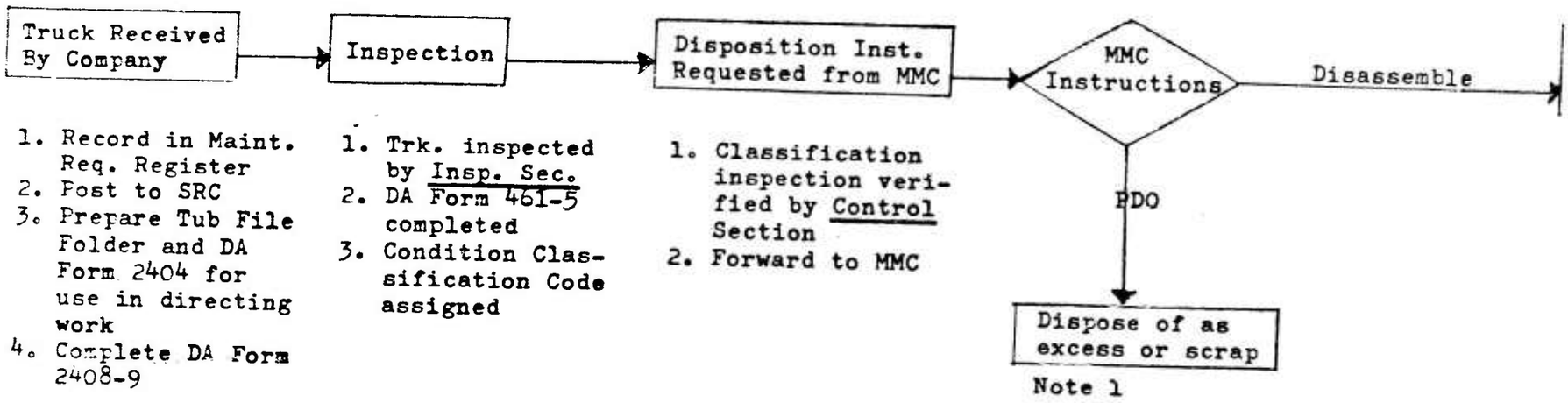
To demonstrate the functional feasibility of the proposed system, the simulated processing of a 1/4 ton truck is presented in a modified flow chart format in Figures 4, 5, and 6. Appendix E is an extract from AR 725-50, Requisitioning, Receipt and Issue System, that lists the condition classification codes which an item of equipment may be classified. These codes may be categorically summarized as follows:

Group	Codes	Basic Condition
1	A-D	Serviceable
2	E-G	Unserviceable, Economically Repairable
3	H & P	Unserviceable, Uneconomically Repairable
4	J-M	Suspended

Processing of group 3, condition code H and P is outlined in Figure 4 and is more complex than the processing of materiel in the other condition codes. It is the author's experience that the greatest percentage of a C&C Company's workload will be involved with processing condition code H equipment.

Figure 5 depicts the processing of materiel in group 1, and Figure 6 outlines the processing of groups 2 and 4. Additional details of materiel processing that address the specific requirements, company element involved and use of the control tools are presented in Appendix F.

Equipment disassembly, parts and components recovery, cleaning, testing, preservation, packing and return of items to the supply system represent the major service rendered by a C&C Company. The C&C Company's production control system must



NOTE 1: Initiate TCMD and DD Form 1348-1; complete DA Form 2408-9; adjust SRC when received by gaining facility.

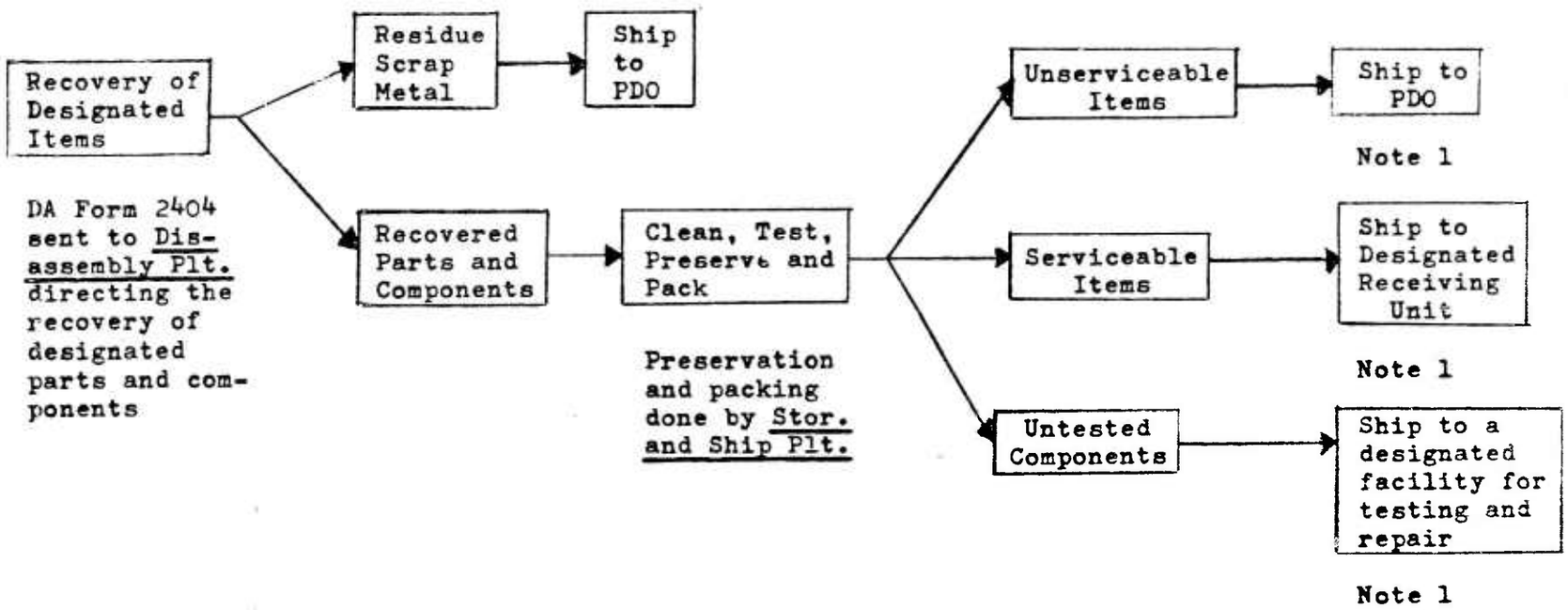
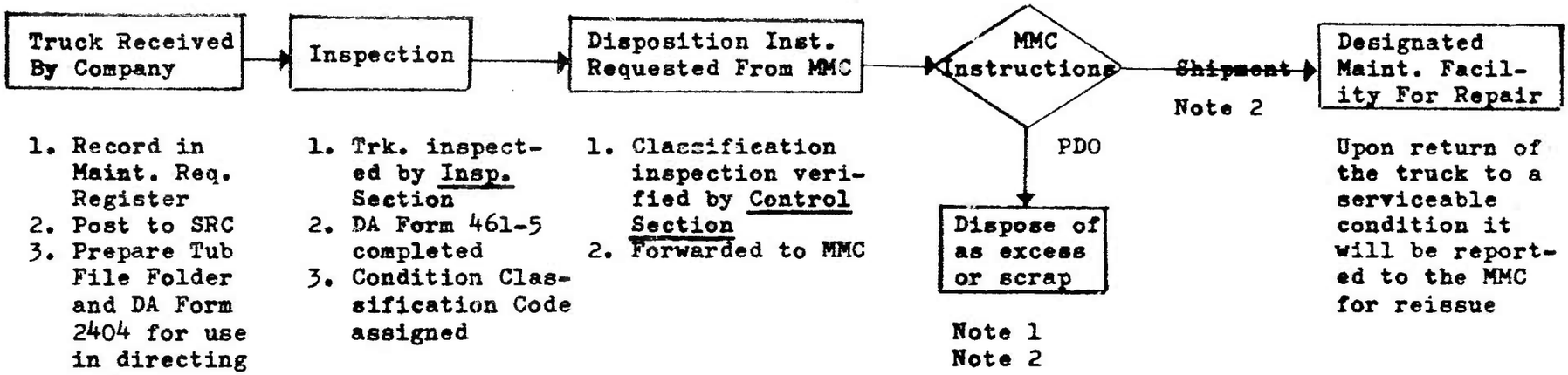


Figure 4

Flow Processing of a Truck 1/4 Ton
Group 3 — Unserviceable, Uneconomically Repairable
Condition Codes H & P

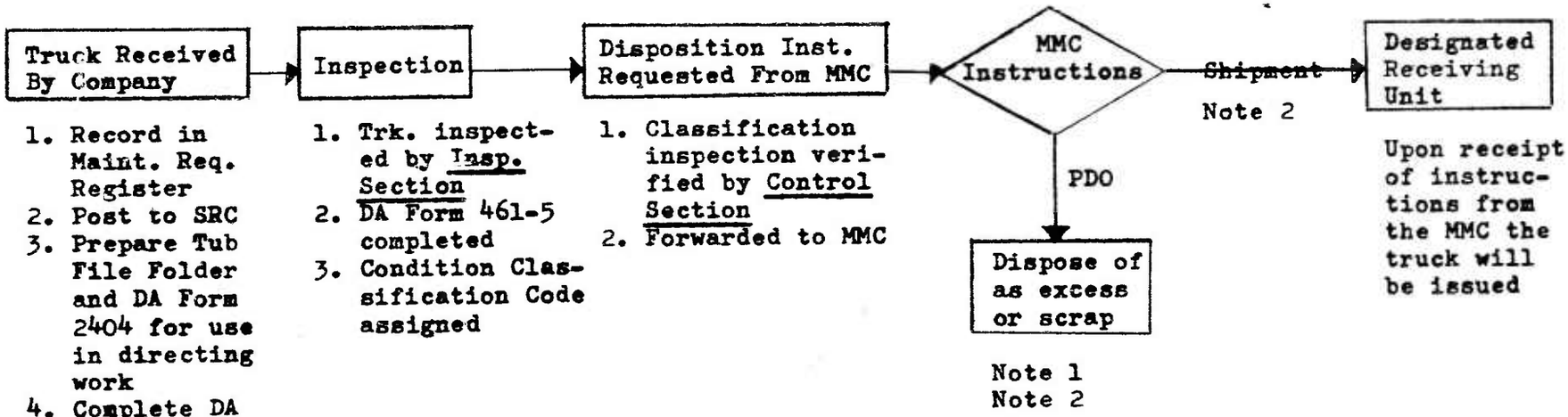


NOTE 1: The MMC could direct that the truck be salvaged. However, this is unlikely to occur because the truck is economically repairable.

NOTE 2: Initiate TCMD and DD 1348-1; complete DA Form 2408-9; adjust SRC when received by the gaining facility.

Figure 5

Flow Processing of a Truck 1/4 Ton
Group 2 — Unserviceable, Economically Repairable
Group 4 — Suspended
Condition Codes E-G and J-M



NOTE 1: The MMC could direct that the truck be salvaged. However, this is unlikely to occur because the truck is serviceable.

NOTE 2: Initiate TCMD and DD 1348-1; complete DA Form 2408-9; adjust SRC when received by gaining facility.

Figure 6

Flow Processing of a Truck 1/4 Ton
Group 1 — Serviceable
Condition Codes A-D

accommodate the complex processing of unserviceable, uneconomically repairable equipment while providing the status visibility and item accountability needed to completely control and account for all items received by the company.

Analysis of the System

The objective of a production control system is to provide the organization with the essential procedures and paperwork for coordinating the men, materials, and machinery of production. Analysis of the five field systems, graphically summarized in Table 1, page 33, used the following evaluation characteristics.

Brief description of system procedures

Control tools

- PC board
- Tub file
- Forms

System contributes to

- Planning
- Scheduling
- Dispatching
- Follow-up
- Equipment accountability

Except for the brief description of system procedures, these same evaluation characteristics will be used to analyze the proposed system. Because a detailed explanation of the proposed system has already been presented, further description of the system procedures is omitted here.

The deficiencies outlined for the field systems are overcome in the proposed system mainly by the use of a production control board specifically oriented for a materiel processing operation. The control board graphically displays the quantities and specific types of equipment in the major categories which equipment will be grouped as it passes through the materiel processing operation. It will show the total number of a particular item of equipment on hand in any category and also the total amount of equipment for a specific category. For example, the number of 1/4 ton trucks on hand by major category as well as the total number of all items of equipment on hand in a category, such as Awaiting Disposition or In-Process Disassembly, is obtained by a glance at the production control board. The tub file supports the control board alignment and is used to file the logbook and related paperwork for each item of equipment.

The proposed system's use of TAMMS forms is more cost effective because of their availability in publication channels and using the standard forms eases the training requirements that accompany personnel turnover. Both the field systems that used TAMMS forms and the proposed system promote the use of the same forms with the exception of DA Form 2407, Maintenance Request. The proposed system does not use this form because the form's recommended use is for "requesting maintenance support from supporting maintenance activities,"[3] and is used when an item of equipment is turned in for repair and returned to user. Equipment

---

[3]U.S. Department of the Army, TM 38-750, The Army Maintenance Management System (TAMMS), (Washington, D.C.: Government Printing Office, 1971), p. 3-19.

turned in to a C&C Company will not be repaired and returned to the user and is turned in using the appropriate supply form, not a DA Form 2407. Processing and disposition of DA Form 2407 used in a C&C operation is not explained in TM 38-750, the Army Maintenance Management System (TAMMS), further attesting to the form not being applicable for use in this type operation. The proposed system recommends the use of DA Form 2404, Equipment Inspection and Maintenance Worksheet, a multi-purpose and simpler form suitable for use in a C&C materiel processing operation.

The proposed system encompasses the fundamental elements of production control — planning, scheduling, dispatching and follow-up — in the following manner.

1. Planning

An estimation of the immediate workload is readily available in the Awaiting Inspection and Awaiting Disassembly columns of the control board. These two categories represent equipment that is waiting to be processed by the company. This part of the company workload will be handled by the Inspection Section and the Disassembly Platoon.

Items in an Awaiting Shipment status represent equipment that has already been processed by the company and only waiting to be shipped to its next destination. Planning for handling this workload involves notifying the Heavy Lift and Evacuation Section to assist in the loading and moving of these items.

2. Scheduling

After considering the shop capacity, present workload,

and personnel available, the Control Section determines the "when" of production. A plan or schedule of items to be inspected, disassembled, or shipped will be developed. The schedule can cover any designated time period; however, it is the author's recommendation that a weekly schedule be used to facilitate control and accountability of equipment and to minimize disruptions in the schedule.

The In-Process Disassembly column of the control board shows the equipment that is currently scheduled for disassembly and comprises the largest portion of the existing workload.

3. Dispatching

The transition from a planning phase to an action phase is accomplished when the Control Section issues the authority or direction to initiate production. In the C&C Company, the production that is initiated would depend on the section or platoon involved. Receipt of the DA Form 2404, Equipment Inspection and Maintenance Worksheet, on each item to be processed would be the authority or direction to begin work on that item of equipment. The DA Form 2404 would outline the specialized instructions concerning that item of equipment. The company element that might receive a DA Form 2404 directing production and what they might accomplish are outlined below.

Company Element	Production Accomplished
Inspection Section	Inspection and classification of the item of equipment
Disassembly Platoon	Disassembly of the piece of equipment; recovery of certain designated parts and components

Heavy Lift and Evacuation Section	Assist in loading and moving the equipment
Storage and Shipping Platoon	Temporary storage of the equipment and completion of any preservation and packing required

4. Follow-up

Checking the status of work orders after they are released to the shop and taking any necessary action to insure the smooth flow of work would be accomplished by the Control Section. Follow-up involves a close monitoring of the on-going workload, with particular attention to items Awaiting Inspection and In-Process Disassembly, to insure its completion according to the designated schedule. When production problems occur that threaten the successful and timely completion of work orders, the Control Section can initiate the required corrective action.

Equipment accountability is greatly enhanced by the proposed system's use of stock record cards to account, by stock number, for all equipment received by the company. A more complete accounting of all items processed, to include the repair parts and components that are recovered, expedites inventories, audit trails, and other means of quality control.

Summary

The system presented here was developed after first analyzing the principles and tools of production control, and secondly, examining the C&C Company mission and materiel processing requirements. It utilizes standard control tools, modified and realigned, to fit the mission requirements of a C&C Company. The system's procedures outlined the sequential steps to be

followed when employing this system and were further illustrated in the flow charts presented in Figures 4, 5, and 6.

To be effective, a production control system must expedite the accomplishment of the basic elements of production control. The analysis of this production control system substantiates the system's capability to enhance the completion of the fundamental functions of production control — planning, scheduling, dispatching, and follow-up.

CHAPTER VI

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Production control facilitates the planning, directing, and controlling of work flow and provides immediate, accurate information needed to conduct managerial tasks in a timely manner. For the C&C Company, a unit assigned the mission of materiel reclamation and salvage, the Army has not established doctrinal guidelines for controlling its materiel processing or production operations.

The purpose of this thesis was to analyze production control principles, functions, and control tools and the mission requirements of a C&C Company and develop a type production control system for use by the C&C Company. This system must accommodate the managerial and informational requirements of the C&C Company as it performs its support mission in a theater of operations.

As a production control system accomplishes its objective of coordinating men, material, and machinery, the planning, scheduling and dispatching of production operations are also completed. Corrective action, if required, of any aspect of the production operation is achieved when management performs the follow-up function. The soundness of any production control system has a direct relationship to the system's:

1. Capacity to furnish timely, accurate information

2. Flexibility
3. Simplicity
4. Being economical to operate
5. Adeptness to force prior-planning and corrective action
6. Facilitating management by exception

These factors provide a guide to developing a functional production control system and enhance the continuous evaluation of that system.

The C&C Company is organized to perform a materiel collection and classification mission. The major elements of the company are functionally organized to store, disassemble, and evacuate materiel in accordance with instructions provided by the MMC. The company returns designated repair parts and components to the supply system, ships equipment to a maintenance facility for repair, or disposes of the equipment as scrap metal. Guidance concerning management and control of internal mission operations for the C&C Company are not contained in current doctrinal publications and regulations.

Utilizing such standard control tools as a production control board and tub file, which were modified and realigned to fit the mission requirements of the C&C Company, a type system for use by the company was presented in Chapter V. The procedures for this system support the completion of the necessary planning, scheduling, dispatching, and follow-up of the production operation and conform to the six factors outlined earlier as guides for developing a functional production control system.

A survey of active Army C&C Companies and other personnel knowledgeable in C&C Company operations was conducted to provide "field input" to this thesis in terms of production control requirements for a C&C Company. Table 3 outlines the major requirements submitted by the survey respondents and an indication if the requirement is provided for by the proposed system.

In addition to the requirements listed in Table 3, the survey analysis revealed that the forms provided by The Army Maintenance Management System (TAMMS) are suitable for use by the C&C Company in controlling its materiel processing operation. The proposed system also recommends the use of TAMMS forms; however, the number of different forms used by the proposed system is slightly less than the number reported by some survey respondents, an indication of the simplicity of the proposed system and its lessening of administrative requirements.

One other significant finding of the survey is that no respondent attempted to use the maintenance production control system. Eighty percent of the respondents reported the use of a special system. This finding serves to attest to the need for a production control system specifically oriented to the needs of a C&C Company. This special system may use standard forms and control tools, but the forms and control tools must be modified to conform to the materiel processing requirements of the C&C Company. The system's specific procedures must also be aligned to support an operation that disassembles and eliminates equipment from the Army inventory rather than an operation that repairs equipment.

Table 3

Production Control Requirements
and the Proposed System

	Production Control Requirements	Provided by the Proposed System
1.	Visual means of controlling flow of materiel through cycle of operation	Yes
2.	Identify position of the items in the cycle	Yes
3.	Account for every action taken concerning the item	Yes
4.	Generate accurate data on component parts returned to supply system	Yes
5.	Provide item identification and location accuracy	Yes
6.	Control items moving in and out of disassembly and equipment moving to PDO	Yes
7.	Timely disposition instructions	No
8.	Accurate listing of mandatory recoverable items	No
9.	Provide for equipment accountability	Yes
10.	Simple system with minimum personnel requirements	Yes

From a very broad viewpoint, this thesis examined the theory and tools of production control, analyzed the mission requirements of a C&C Company and developed a production control system for use by the company. The proposed system was then compared to the results of a field survey of C&C units and knowledgeable personnel, thereby highlighting its advantages over existing systems and its ability to satisfy the production control requirements identified by the survey.

Conclusions

From this study of production control and its application by a C&C Company, the following conclusions may be reached.

1. The proposed production control system can be used to effectively control a C&C Company's mission operations.
2. The system presented in this thesis assists in the accomplishment of the fundamental elements of production control — planning, scheduling, dispatching, and follow-up — and promotes the characteristics of a sound functional production control system.
3. The production control requirements for a C&C Company are different from the production control requirements of a maintenance or supply company.
4. Current doctrinal publications do not contain adequate guidance on the internal management and operations of a C&C Company's assigned mission.

Recommendations

1. It is recommended that the production control system presented in this thesis be provided through TRADOC, through the Log Center to the Ordnance Center and School for consideration and inclusion in a field manual on the Collection and Classification Company.
2. It is recommended that additional doctrinal guidelines concerning internal C&C Company operations, specifically in the area of production control, be published.

APPENDICES

APPENDIX A

DEFINITIONS

Providing a precise, comprehensive definition of terminology for Army-wide application is difficult. Because of the confusion about the meaning of the word reclamation, the Army Service Forces, in a circular dated 6 December 1943, defined it as "the process of restoring to usefulness condemned, discarded, abandoned, or damaged property, or parts, or components thereof, by repair, refabrication or renovation."[1] For simplicity and to facilitate future discussions, the following derived definitions will be used.

Production Control (PC) — the process of directing and controlling the work in a maintenance shop in a manner that will result in a maximum output of quality work, utilizing such tools of control as the production control board, job order register, and tub file.

Management Information — facts or data organized and utilized to be meaningful knowledge and which enables a manager to take a broader view of the operation for which he is responsible.

---

[1]U.S. Department of the Army, The Ordnance Department: Procurement and Supply, by Harry C. Thomson and Lida Mayo (Washington, D.C.: Government Printing Office, 1965), p. 461.

Collection and Classification (C&C) Company — the unit organized under TOE 29-139H. The C&C Company's mission, organization, and concept of operation are explained in Chapter III.

Materiel Processing — the receipt, inspection, segregation, disassembly, preservation, and disposition of serviceable and unserviceable materiel.

: Auth: CG Sixth Army
: Init: [illegible]
: Date: 30 Nov 44

HEADQUARTERS SIXTH ARMY
A. P. O. 442
2300/30 November 1944

APPENDIX B

SALVAGE COLLECTING PLAN

1. Responsibility:

a. Salvage collection is a command responsibility.

b. Zones of Responsibility:

Army	Army Service Area (when constituted)
ASCOM	Army Base Area (when constituted)
Corps	Area forward of Corps rear boundary
158th RCT	Area occupied

2. Salvage Plan:

a. During First Phase:

(1) Corps Commanders will institute a plan to collect and evacuate salvage within their respective areas to Corps Salvage Collecting Dumps. Salvage collecting units attached to Corps will process salvaged material promptly for the purpose of separating serviceable supplies which will be returned to the issuing agency as soon as possible. Salvage will be evacuated from Corps Dumps to ASCOM Salvage Collecting Dumps by ASCOM.

(2) Army units will collect salvage within their respective areas and evacuate in accordance with instructions to be issued later.

(3) Major items which cannot be moved with the means available will be reported to the Army Quartermaster through supply channels.

b. During Second Phase:

(1) Commanders of Corps, 158th RCT, Army and ASCOM units are charged with the responsibility for collecting salvage within their respective areas and its evacuation to the truckheads or other supply points serving their units.

(2) Commanding General, ASCOM, is charged with:

(a) Evacuation of salvage from truckheads or other supply points

(b) Prompt return of salvaged supplies to issuing agencies.

(c) Conservation of repairable supply for subsequent reclamation or issue to civilian population.

3. General:

a. In collecting salvage, the following practices will be observed:

(1) Unexploded artillery projectiles, bombs, mortar shells, grenades or rockets will not be touched or disturbed. Their location will be reported to the nearest Ordnance Officer.

(2) Clothing, shoes and individual equipment will be sorted by article and stacked.

(3) All ammunition must be removed from clothing, belts, and other items of equipage.

(4) Personal property and papers will be removed from clothing and equipment and disposed of as follows:

(a) Papers, correspondence or other documents removed from enemy equipment will be forwarded to the unit intelligence officer or G-2.

(b) Personal property removed from equipment of friendly troops will be sealed in an envelope and turned over to the officer in charge of Salvage Collection. All possible means of identification will be recorded on the envelope, for example, individual clothing markings or unit code markings.

(c) Personal property which can be identified will be forwarded to the unit commander when the unit can be identified.

(d) Unidentified personal property will be evacuated through salvage channels.

(e) A record will be retained by salvage officers showing disposition of each item received.

(5) Salvaged enemy material will be segregated in the salvage dumps. It will be disposed of as prescribed in letter Hq Sixth Army, AG 386.3 D-5, 27 Sept 44, subject: Disposition of Captured Enemy Equipment.

By command of Lieutenant General KRUEGER:

G. H. DECKER,
Brigadier General, G. S. C.,
Chief of Staff.

OFFICIAL:

G-4

APPENDIX C

INDUSTRIAL PRODUCTION CONTROL TOOLS

There are many different types of commercial loading and scheduling devices available to the designer of a production control system. Each device has both advantages and disadvantages which must be carefully weighed before the final selection is made.

Of the numerous methods and devices that have been developed as control tools, few seem as well equipped to do the job as visual control boards. The following brief explanation of some of the more common control boards and other tools is presented to provide a better understanding of the tasks for which these production control tools may be used.

Produc-Trol Board — a device that usually depicts the relationship of the current status of an order to the planned schedule.

Sched-U-Graph — a board mounted Kardex system used for machine loading and scheduling.

Boardmaster — made by the Graphic Systems Company, this control tool is a series of boards used for the loading and scheduling of facilities.

Gantt Chart — a bar chart or line chart with time graduation shown along the horizontal axis and people, organizations, machines, tasks, or space shown along the vertical axis.

PERT Network – an integrated management control system that is divided into three aspects: time, cost, and performance. Use of a PERT Network requires that the planner indicate the intermediate goals or events to be accomplished on the way to the final objective.

APPENDIX D

U.S. ARMY PRODUCTION CONTROL TOOLS

The detailed explanation of the selected tools of production control set forth here was extracted primarily from FM 29-23, and is presented in order to provide an in-depth understanding of the design and use of these management tools. Detailed explanation of the tools of production control is limited to those tools that Army doctrine recommends for use by Army-in-the-Field TOE units. Information presented here illustrates the use of these production control tools in managing a direct support maintenance shop.

Production control board

The production control board is a device used to present visual, up-to-date information on the status of jobs within the maintenance shop, the location of these jobs, and the load conditions of the various shop sections. It presents an accurate picture of the distribution of work within the maintenance shop and is extremely useful in answering queries pertaining to specific jobs and in determining when jobs should enter the shop and how work should be routed or rerouted due to conditions existing in the various shop sections.

The board is divided horizontally into sections for the various types of material maintained, and vertically into sections

to indicate progress and location within the shop. A sample control board that might be used by the shop office of a direct support maintenance company is shown in Annex A.

The status of jobs, the progress of each item, and the load condition of the various shop sections are indicated by the use of small tags, representing job orders, which are moved from one section of the control board to another as the status and location of the jobs change. With simplified boards, this information may be merely a written or chalk entry. The status of jobs reflected by the control board should always coincide with the status noted in the tub file and each of these tools should be used as a check on the other to insure that both are up-to-date.

The proper use of the control board tag or entry enables the shop office to quickly check the status and location of work. Enough information should be included so that the job is readily identified. This information usually includes the job order number, designation of the unit initiating the maintenance request, and the date received. Different colors may be used to indicate job priority:

RED to indicate critical jobs [priority designator (PD) 01 through 03]

YELLOW for jobs with PD 04 through 10

GREEN for routine jobs with PD 11 through 15.

Priority is determined in accordance with priorities established by higher headquarters and priority designators indicated on the maintenance request.

Tub File

This file is used to house job order files (envelopes), which contain active maintenance requests (DA Form 2407) and pertinent records such as parts requests, continuation sheets, and inspection forms. Tub files are divided into sections and the job order files are moved from section to section as progress is made on a particular job. A type tub file is shown in Annex B.

The sample tub file is divided into six sections as described below. These sections correspond to the various sections of the production control board. This facilitates correlation of both devices to facilitate management of equipment on job order.

1. Initial inspection. This section is designated to hold job order files on jobs that are awaiting inspection or which are being inspected. The job order envelopes remain in this section until parts have been requested.

2. Awaiting parts. This section must be of sufficient size to accommodate the job orders to be accomplished for which parts are not yet available. The files are moved to the next section when parts are available for the job.

3. Awaiting shop. This section may be divided into compartments with job orders being moved up one compartment each day until they enter the shop. Although this separation is not essential, it is a rapid means of determining how long each job has been awaiting shop entry. The shop officer should, at all times, be kept informed as to the length of time jobs are awaiting shop. The tub file should be properly maintained to provide this

information. One method would be to mark each job order envelope with a notation as to the date parts became available. Job orders in this section then could be checked daily to determine unwarranted delays in shop entry.

4. In-process. This section is used to house job orders on which work is being performed. This section can also be divided, with job order files moving forward on a daily basis until jobs change status. Controls and daily checks similar to those exercised while jobs were in an "awaiting shop" status are necessary to assure that job orders are being completed on schedule and to focus attention on unanticipated delays so that corrective action may be taken. For items that are routed to a repair section immediately upon receipt, job order files will be established in this section concurrently with the routing of the unserviceable to the responsible repair section.

5. Final inspection. This section is used to house job order files on work which has been completed and is awaiting pickup or final inspection.

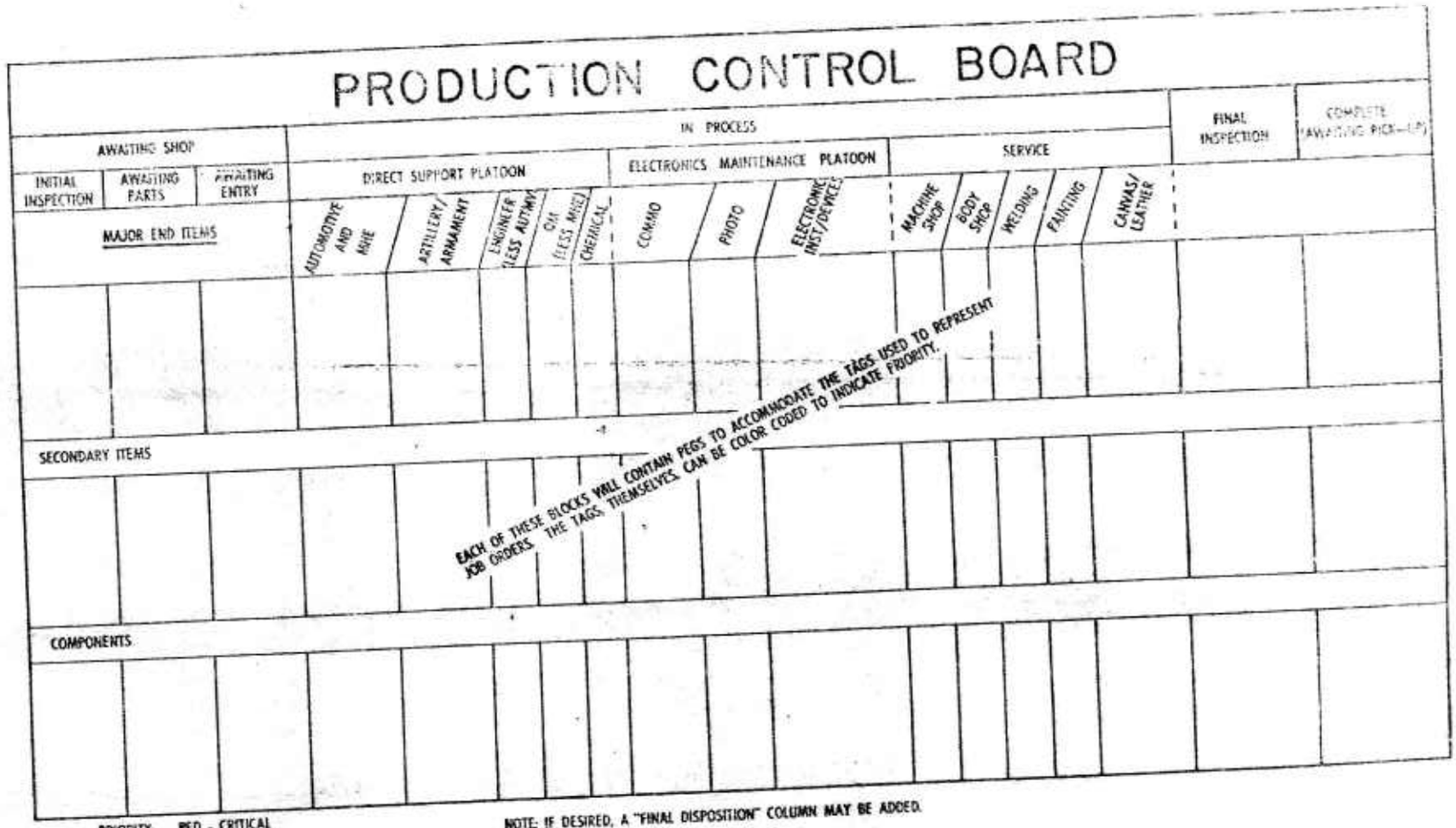
6. Awaiting pickup. This section is used to house job order files that have been completed and inspected jobs that have not yet been disposed of.

Maintenance Request Register, DA Form 2405

The maintenance request register is a managerial tool which is used to record and control work received and processed as a result of maintenance requests (DA Form 2407). All requests are entered on this form, regardless of whether or not actual repair is accomplished locally. If, after inspection, evacuation

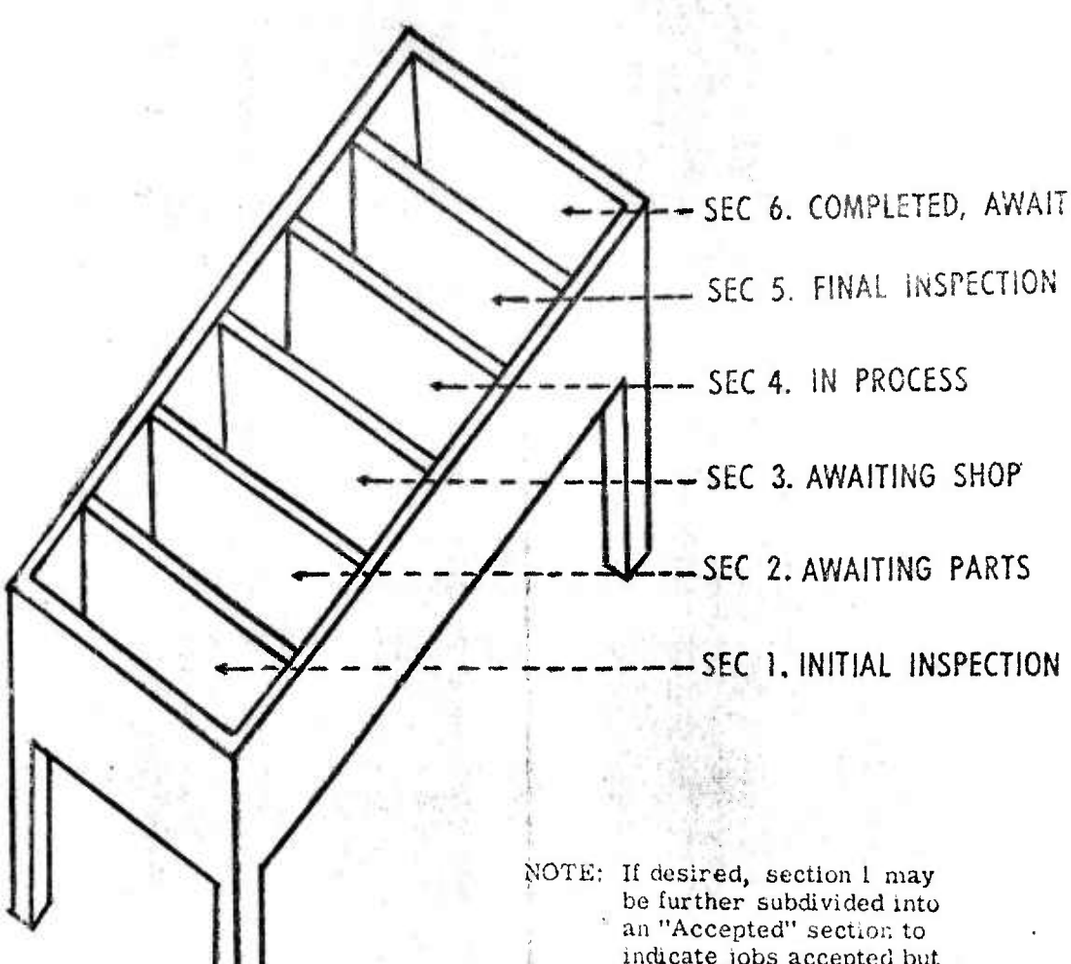
action is decided upon, such disposition may be recorded in the remarks column. The form identifies each maintenance request, and indicates nomenclature of the item(s) and the requesting unit. It indicates date of receipt and, when completed, indicates dates that repairs were started and completed and the man-hours expended. When completed, this form may be used as a source document for information required by all levels of command (e.g., backlog, jobs in process, man-hours expended).

The register is maintained by the shop office. Local policy may require that all maintenance requests be entered on the same form. However, for management and control purposes, and for easy reference, it may be preferable to use separate forms to record jobs of specific commodity groups. For example, one register may be used for mechanical repair, another for communications/electronic/electrical repair, and another for jobs assigned to the service section.



Annex A

Production Control Board



NOTE: If desired, section 1 may be further subdivided into an "Accepted" section to indicate jobs accepted but not yet inspected.

Annex B

Tub File

APPENDIX E

APPENDIX AB

CONDITION CODES

AB-1. These codes are one-position, alphabetic characters used to classify materiel to identify the degree of serviceability, condition, and completeness in terms of readiness for issue and use or to identify actions underway to change the status of materiel.

AB-2. Codes prescribed herein will be entered in card column 71 of all appropriate A- and D-series documents. These codes are also entered in block P of the DD Form 1348-1 for return of materiel to the supply system. (See para 4-58.)

Code	*Title*	*Explanation*
A	Serviceable (issuable without qualification).	New, used, repaired, or reconditioned materiel which is serviceable and issuable to all customers without limitation or restriction. (Normal requirements at time of issue for additional packaging or packing does not constitute a restriction.)
B	Serviceable (issuable with qualification).	New, used, repaired, or reconditioned materiel which is serviceable and issuable for its intended purpose but which is restricted from issue to specific units, activities, or geographical areas by reason of its limited usefulness or short service-life expectancy. (The item manager will prescribe the limits of usefulness or criteria for determining short shelf-life by specific commodity or by specific item for inclusion within this code.)
C	Serviceable (Priority issue)	Items which are serviceable and issuable to selected customers, but which must be issued before condition A and B materiel to avoid loss as a usable asset.
D	Serviceable (test modification)	Serviceable materiel which requires test, alteration, modification, conversion, or disassembly. (This does not include items which can be inspected or tested within normal outloading time immediately prior to issue.)
E	Unserviceable (limited restoration)	Materiel which involves only limited expense or effort to restore to serviceable condition and which is accomplished in the storage activity. (Limited expense or effort is defined as that which is allowable for expenditure by the care and preservation activity under current policies.)
F	Unserviceable (reparable)	Economically reparable materiel which requires repair, reconditioning, or overhaul. (Includes reparable items which are radioactively contaminated.)
G	Unserviceable (incomplete)	Materiel requiring additional parts or components to complete the end item prior to issue. (Applies to major/end items that are complete with all specified components and meet the prescribed serviceability standards, but lack BII.)
H	Unserviceable (condemned)	Materiel which has been determined to be unserviceable and does not meet repair criteria (includes condemned items which are radioactively contaminated).
I	(Not to be assigned.)	

Code	Title	Explanation
J	Suspended (in stock)	Materiel in stock which has been suspended from issue pending condition classification or analysis, where the true condition is not known. (Includes items not proof-accepted, ammunition items awaiting evaluation of test results, and the ammunition items that are overdue for test. Excludes returns unclassified as to condition (condition K).)
K	Suspended (returns)	Materiel returned from customers and users suspended from issue pending inspection and/or condition classification. (Includes items that have been identified by stock number and item name, but *not* examined for condition. Stocks in this condition code will be inspected and properly classified as to condition in accordance with allowable time standards as established in chapter 5. When more time is required as a result of receipts in large quantities, lack of facilities, non-availability of personnel, or other extenuating circumstances, an extension of time may be granted by the applicable accountable supply distribution activity.)
L	Suspended (litigation)	Includes assets received from procurement or other sources which contain shortages, overages, defects, or other conditions requiring negotiation or litigation with procurement sources or common carrier to determine responsibility or liability for corrective action. Includes assets held in a frozen status pending the result of a report of survey.
M	Suspended (in work)	Materiel identified on inventory control record but which has been delivered to and accepted by an Army or DOD maintenance facility or at a contractor's plant for processing.
N	(See para 3.)	
O	Not assigned	Reserved for future DOD assignment.
P	Unserviceable (reclamation)	Materiel determined to be unserviceable, uneconomically reparable as a result of physical inspection, tear down, or engineering decision. Item contains serviceable components or assemblies to be reclaimed.
Q thru Z	Not assigned	Reserved for future DOD assignment.
Ø thru 9	Not assigned	Reserved for future DOD assignment.

AB–3. These condition codes are applicable to US Army Armament Command (USAARMCOM). The explanations for each condition code contained in paragraph AB–2 apply to commodities managed by USAARMCOM. An extension of these explanations applicable to USAARMCOM commodities is established to further assist in the classification of USAARMCOM inventories. Supplemental explanations, where required, are as follows:

Code	Title	Explanation
A	(See para AB–2.)	
B	Serviceable (issuable with qualification)	Includes: *a.* All stocks of serviceable mission supplies on which the NICP has imposed limitations for issue or use; i.e., ammunition restricted for training use only. *b.* Serviceable nuclear weapons components received as field returns which have dual war reserve and training application, except those known to have been used on war reserve end items. Does not include components with exclusive test and handling equipment application. *c.* Base spares which have been used on a training item. *d.* Stocks of serviceable ammunition that were initially ac-

Code	Title	Explanation
		cepted on waiver for a specified issue outlet or items that are limited to issue within CONUS because of the preservation or packaging levels.
C	Serviceable (priority issue)	Includes: *a.* Blue Bag propellant charges without loss of tensile strength. *b.* Rockets with 1 year or less shelf life. *c.* Grade II ammunition. *d.* Items indicating deterioration but suitable for issue for training within country. *e.* Items directed by the NICP for priority of issue. *f.* Less than minimum lot size, for oversea issue, which is defined as: (1) HE and WP fixed, semifixed, mortar, separate-loading projectiles and separate-loading propelling charges: less than 100 rounds per lot. (2) All other conventional, special weapons, and guided missile ammunition: less than one standard exterior package (as listed in the appropriate supply manual).
D	Serviceable (test/modification)	Includes: *a.* Materiel of nonstandard design or condition; depot stocks requiring surveillance, laboratory or functional testing; and/or technical evaluation by higher authority as a condition to classification. *b.* Renovated lots awaiting ballistic test results, over-aged lots (lots that exceed shelf life), and lots overdue for trace or function test. *c.* New procurement receipts of nuclear weapons items pending initial receipt inspection (IRI) and nuclear weapons lot groups requiring 100-percent inspection due to sampling rejection. Items will be placed in the proper condition code upon completion of IRI or when the true condition code can be ascertained during the 48-hour tallying-in inspection. *d.* Nuclear weapons items selected for stockpile reliability tests.
E	Unserviceable (limited restoration)	Includes items requiring preparation and processing for issue; includes but not limited to dipping, cleaning, spraying, application of preservatives, painting, masking, packing, boxing, crating, packaging, wrapping, repacking, or reprocessing.
F	Unserviceable (reparable)	Includes items which are available; have been scheduled and not scheduled for work; require operations more hazardous or complex than care and preservation; normally, involve the replacement of components. Also includes items that have been determined unserviceable but economically reparable after nuclear weapons stockpile reliability test.
G	Unserviceable (incomplete)	Includes items that have been cannibalized by authorization of the NICP (excluding packaging) and are not authorized for demilitarization but can be restored to original configuration by replacing the components. Report under NSN that applied prior to cannibalization. Also includes items returned from nuclear weapons stockpile reliability test with missing components that were destructively tested.
H	Unserviceable (condemned)	Includes all items that are classified unserviceable, not economically reparable. Excludes serviceable surplus or obsolete ammunition authorized for demilitarization.

Code	Title	Explanation
		Serviceable items awaiting demilitarization will be reflected in their appropriate condition code.
J	Suspended (in stock)	Includes auspended ammunition. Items in this condition will be reclassified to the appropriate condition upon advice from the NICP.
K	Suspended (returns)	Includes items that have been identified by stock number and name, but not examined for condition. Stocks in this condition code will be inspected and classified as to proper condition within allowable time standards indicated in chapter 5. When more time is required due to receipts in large quantities, lack of facilities, nonavailability of personnel, or other extenuating circumstances, an extension of time may be granted by the appropriate NICP. Pertains to field returns and is not to be utilized for new procurement received from vendor. Does not include stocks suspended due to conditions requiring litigation or negotiation with vendor or carrier to determine responsibility or liability for corrective action.
L	Suspended (litigation)	See TB 750–94–2 for items pending unsatisfactory new materiel report (UNMR) finalization. Does not include "information only" UNMR or materiel reported on DD Form 6.
M	Suspended (In work)	Includes unserviceable, economically reparable items in condition code F that have been scheduled for repair and have been delivered to and accepted by a maintenance facility or contractor's plant.
N	Suspended (ammunition suitable for emergency combat use only).	Ammunition stocks suspended from issue except for emergency combat use.
P	Unserviceable (reclamation)	Materiel determined to be unserviceable, ineconomically reparable as a result of physical inspection, tear down, or engineering decision. Item contains serviceable components or assemblies to be reclaimed.

AB–4. The application of condition code changes to shelf-life items contained herein is for the purpose of assuring that condition codes reflect the remaining shelf-life time period, for interservicing, Army use, and to aid in classification of shelf-life inventories. The table relative to shelf-life items excludes the commodities applicable to USAARMCOM which are covered in paragraph AB–3.

Table for the Application of Condition Code Changes to Shelf-life Items

When Shelf-Life Remaining is—	*Assign Condition Code—*	*Indicating*
More than 6 months	A	Unrestricted Issue Interservicing
3 through 6 months (inclusive)	B	Restricted Issue Interservicing
Less than 3 months	C	Prior Issue No interservicing

APPENDIX F

SEQUENTIAL PROCESSING OF EQUIPMENT

The condition of equipment received by a C&C Company may range from completely serviceable or new items to items that are unserviceable and uneconomically repairable. The specific processing requirements for an item of equipment depend on the exact condition classification assigned and vary considerably among the many different classifications that are available. The specific processing requirements, the company element responsible for the processing and the position of the control board tag and tub file folder as an item proceeds through a processing cycle are shown in Tables 4, 5, and 6 for the major classification categories. These tables and the corresponding classification categories are

Table 4	Unserviceable, Uneconomically Repairable
Table 5	Unserviceable, Economically Repairable and Suspended
Table 6	Serviceable

Table 4

Sequential Processing of a Truck 1/4 Ton
Group 3 — Unserviceable, Uneconomically Repairable
Condition Codes H and P

Status	Receipt	Inspection		Disposition Requested	Disposition Received	Shipment
Requirements	1. Record in Maint. Req. Register 2. Post to SRC 3. Prepare Tub File and DA Form 2404 4. Complete DA Form 2408-9	1. Inspect truck 2. Complete DA Form 461-5 3. Assign Classification Code 4. Return to Control Sec.	1. Verify classification inspection forms	1. Forward request for disposition to MMC 2. Place truck in temporary storage	MMC directs A. Disassembly and recovery of designated components and repair parts or B. Shipment directly to PDO	1. Initiate TCMD 2. Request shipment 3. Initiate DD 1348-1 4. Complete DA Form 2408-9 5. Adjust SRC when item is received by gaining unit
Company Element Involved	Control Sec.	Inspection Sec.	Control Sec.	Control Sec. Stor.& Ship Plt. Heavy Lift & Evac. Sec.	Control Sec. Stor.& Ship Plt. Heavy Lift & Evac. Sec. Disassembly Plt.	Control Sec. Stor.& Ship Plt. Heavy Lift & Evac. Sec.
Position of Control Bd. Tag & Tub File Folder		Awaiting Inspection		Awaiting Disposition	In-Process Disassembly	Awaiting Shipment

Table 5

Sequential Processing of a Truck 1/4 Ton
Group 2 & 4 — Unserviceable, Economically Repairable & Suspended
Condition Codes E-G and J-M

Status	Receipt	Inspection		Disposition Requested	Disposition Received	Shipment
Requirements	1. Record in Maint. Req. Register 2. Post to SRC 3. Prepare Tub File and DA Form 2404 4. Complete DA Form 2408-9	1. Inspect truck 2. Complete DA Form 461-5 3. Assign Classification Code 4. Return to Control Sec.	1. Verify classification inspection forms	1. Forward request for disposition to MMC 2. Place truck in temporary storage	MMC directs shipment to: A. Maint. facility for minor repairs or B. See Note 1	1. Initiate TCMD 2. Request shipment 3. Initiate DD Form 1348-1 4. Complete DA Form 2408-9 5. Adjust SRC when item is received by gaining unit
Company Element Involved	Control Sec.	Inspection Sec.	Control Sec.	Control Sec. Stor.& Ship Plt. Heavy Lift & Evac. Sec.	Control Sec.	Control Sec. Stor.& Ship Plt. Heavy Lift & Evac. Sec.
Position of Control Bd. Tag & Tub File Folder		Awaiting Inspection		Awaiting Disposition		Awaiting Shipment

NOTE 1: Although this truck is economically repairable, the MMC could direct that it be disassembled and/or salvaged. However, this is unlikely and would probably only occur under unusual circumstances.

Table 6

Sequential Processing of a Truck 1/4 Ton
Group 1 — Serviceable
Condition Codes A through D

Status	Receipt	Inspection		Disposition Requested	Disposition Received	Shipment
Requirements	1. Record in Maint. Req. Register 2. Post to SRC 3. Prepare Tub File and DA Form 2404 4. Complete DA Form 2408-9	1. Inspect truck 2. Complete DA Form 461-5 3. Assign Classification Code 4. Return to Control Sec.	1. Verify classification inspection forms	1. Forward request for disposition to MMC 2. Place truck in temporary storage	MMC directs shipment to: A. Maint. facility for minor repairs or B. Hvy. Mat. Sup. Co. for reissue or C. See Note 1	1. Initiate TCMD 2. Request shipment 3. Initiate DD 1348-1 4. Complete DA Form 2408-9 5. Adjust SRC when item is received by gaining unit
Company Element Involved	Control Sec.	Inspection Sec.	Control Sec.	Control Sec. Stor.& Ship Plt. Heavy Lift & Evac. Sec.	Control Sec.	Control Sec. Stor.& Ship Plt. Heavy Lift & Evac. Sec.
Position of Control Bd. Tag & Tub File Folder		Awaiting Inspection		Awaiting Disposition		Awaiting Shipment

NOTE 1: The MMC could direct that the item be disassembled and/or salvaged. However, this is unlikely to occur because the item is serviceable.

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

Abramowitz, Irving. Production Management: Concepts and Analysis for Operations and Control. New York: Ronald Press Company, 1967.

Backstrom, Charles H. and Gerald D. Hursh. Survey Research. Evanston, Ill.: Northwestern University Press, 1963.

Barzun, Jacques, and Henry F. Graff. The Modern Researcher. New York: Harcourt, Brace and World, Inc., 1970.

Biegel, John E. Production Control, A Quantitative Approach. Englewood Cliffs, N.J.: Prentice-Hall, Inc. 1963.

Buffa, Elwood S. Basic Production Management. New York: Wiley and Sons, 1971.

_____. Modern Production Management. New York: Wiley and Sons, 1973.

Clark, Wallace. The Gantt Chart. New York: Ronald Press Company, 1922.

Greene, James H. Production Control: Systems and Decisions. Homewood, Ill.: Richard D. Irwin, Inc., 1965.

_____. Production and Inventory Control Handbook. New York: McGraw-Hill, 1970.

Hopeman, Richard J. Production Concepts — Analysis-Control. Columbus, Ohio: Charles E. Merrill Publishing Co., 1964.

McGarrah, Robert E. Production and Logistics Management. New York: Wiley and Sons, 1963.

Moore, Franklin G., and Ronald Jablonski. Production Control. New York: McGraw-Hill, 1969.

O'Donnell, Paul D. Production Control. New York: Prentice-Hall, Inc., 1952.

Parton, James A., and Chris P. Steres. Production Control Manual. Philadelphia: Chilton Company, 1955.

Pritzker, Robert A., and Robert A. Gring. Modern Approaches to Production Planning and Control. New York: American Management Association, Inc., 1960.

Reinfield, Nyles V. Production Control. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1959.

Rice, W. B. Control Charts. New York: Wiley and Sons, 1955.

Roberts, Arthur L. Production Management Workbook. New York: Wiley and Sons, 1962.

Rosove, Perry E. Developing Computer-Based Information Systems. New York: Wiley and Sons, 1968.

Scheele, Evan D., William L. Westerman, and Robert J. Wimmert. Principles and Design of Production Control Systems. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960.

Tooley, Desmond F. Production Control Systems and Records. Great Britain: Gower Press, 1972.

Van De Mark, Robert L. Production Control Techniques. Grand Rapids, Mich.: Gibson Press, 1964.

Voris, William. Production Control. Homewood, Ill.: Richard D. Irwin, Inc., 1966.

Wren, Daniel A. The Evolution of Management Thought. New York: Ronald Press Company, 1972.

Government Documents

U.S. Department of the Army. The Ordnance Department: Procurement and Supply. Washington, D.C.: Government Printing Office, 1965.

_____. The Quartermaster Corps: Operations in the War Against Germany. Washington, D.C.: Government Printing Office, 1965.

_____. The Quartermaster Corps: Operations in the War Against Japan. Washington, D.C.: Government Printing Office, 1956.

_____. Table of Organization and Equipment Number 29-139H. Washington, D.C.: Government Printing Office, 1974.

_____. AR 310-24, Dictionary of United States Army Terms. Washington, D.C.: Government Printing Office, 1971.

_____. AR 710-2, Materiel Management for Using Units, Support Units, and Installations. Washington, D.C.: Government Printing Office, 1971.

_____. AR 725-50, Requisitioning, Receipt and Issue System. Washington, D.C.: Government Printing Office, 1974.

_____. AR 750-1, Army Materiel Maintenance Concepts and Policies. Washington, D.C.: Government Printing Office, 1972.

_____. AR 755-1, Disposal of Supplies and Equipment. Washington, D.C.: Government Printing Office, 1967.

_____. AR 755-2, Disposal of Excess, Surplus, Foreign Excess, Captured and Unwanted Materiel. Washington, D.C.: Government Printing Office, 1970.

_____. AR 755-5, Collection, Classification, Consolidation, and Processing of Retrograde Materiel. Washington, D.C.: Government Printing Office, 1974.

_____. FM 29-20, Maintenance Management in the Theater of Operations. Washington, D.C.: Government Printing Office, 1968.

_____. FM 29-23, Direct Support Maintenance Operations. Washington, D.C.: Government Printing Office, 1971.

_____. FM 29-24, General Support Maintenance Operations. Washington, D.C.: Government Printing Office, 1974.

_____. FM 100-10, Combat Service Support. Washington, D.C.: Government Printing Office, 1973.

_____. TB 750-98-23, Repair Cost Estimating Procedures and Maintenance Expenditure Limits. Washington, D.C.: Government Printing Office, 1968.

_____. TM 38-750, The Army Maintenance Management System (TAMMS). Washington, D.C.: Government Printing Office, 1971.

_____. TM 750-134, Procedures for Rapid Deployment, Redeployment and Retrograde. Washington, D.C.: Government Printing Office, 1966.

U.S. Air Force Institute of Technology. Fundamentals of Logistics Research. Wright-Patterson Air Force Base, Ohio, 1969.

U.S. Army Command and General Staff College. RB 54-1, The Corps Support Command. Fort Leavenworth, Ks., 1974.

_____. RB 101-1, Organizational Data for the Army in the Field. Fort Leavenworth, Ks., 1974.

_____. Major Command Echelon (MCE) - 75 Study. Fort Leavenworth, Ks., 1968.

U.S. Army, Europe and Seventh Army. USAREUR Pam 38-750-4, Logistics Management. Frankfurt, Germany, 1972.

U.S. Army Management Engineering Training Agency. Work Planning and Control Systems Course Workbook. Rock Island Arsenal, Ill., 1972.

Periodicals and Articles

Buswell, Arthur T. "Disposal Operations — Vietnam," Army Logistician, May-June, 1973, pp. 28-31.

"Control Boards — From Pegs to PERT," Administrative Management, July, 1963, pp. 38-49.

Thurston, Philip H. "The Concept of a Production System," Harvard Business Review, November-December, 1963, pp. 70-75.

Williams, Lee W. "Managing Pacific Command Excess," Army Logistician, November-December, 1971, pp. 16-18.

Wilson, Gene F., and Winfield C. Frank. "Retrograding Army Materiel," Army Logistician, March-April, 1973, pp. 28-33.

Woolwine, Walter J. "Vietnam Redeployment and Materiel Retrograde," Army Logistician, July-August, 1971, pp. 8-42.

Unpublished Material

Wetzel, Robert E. "Management Engineering Techniques in the Army Maintenance Shop." Unpublished Air Command and Staff College Thesis, U.S. Air Force Command and Staff College, Maxwell Air Force Base, Alabama, 1966.