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Russell Jones Brooke

THE STAFF CONTROL COMPUTER: A PRELIMINARY INVESTIGATION OF THE FEASIBILITY OF HIGH SPEED ELECTRONIC CORRELATION OF MESSAGES WITH MISSIONS AND OTHER INFORMATION IN THE FILES OF AN ARMY STAFF

A THESIS

Presented to

the Faculty of the Graduate Division

by

Russell Jones Brooke

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Industrial Engineering

Georgia Institute of Technology

June 1958

THE STAFF CONTROL COMPUTER:
A PRELIMINARY INVESTIGATION OF THE FEASIBILITY OF HIGH SPEED ELECTRONIC CORRELATION OF MESSAGES WITH MISSIONS AND OTHER INFORMATION IN THE FILES OF AN ARMY STAFF

Approved: [illegible]

Date Approved by Chairman: May 20, 1958

PREFACE

The report of this study has been difficult to write and may be difficult to read, not because it is particularly abstract, but because the nature of its abstractness is apt to escape the reader at times. The computer was discussed primarily as processing words from everyday language. These words are symbols--symbols for abstract concepts. However, a reader subconsciously calls to mind the connotations of the words he sees and often forgets the symbolic nature of language.

The numbers, signs, and XYZ's of mathematics are readily recognized as symbols. The flash of a green or red light is also recognized as a symbol. However, if a computer types out CONSISTENT or INCONSISTENT, the reader is apt to forget that the word also is simply a symbol. To help emphasize the symbolic nature of such words, upper case letters have been used throughout the report to denote the words that are being processed by the computer. For example:

a. CONSISTENT & INCONSISTENT as computer output symbols,
b. GREEN & RED as signal light symbols, and
c. X & Y as mathematical symbols.

ACKNOWLEDGEMENTS

The statements and opinions expressed in this thesis are solely the responsibility of the author and are in no way indorsed by the U. S. Army, the U. S. Navy, or any other organization with which he may be or have been associated.

This study was initiated under the guidance of Professor Robert M. Eastman and concluded under Dr. Rocker T. Staton, Jr., of the School of Industrial Engineering of Georgia Institute of Technology. It has involved several years during which time it has been influenced by the remarks and writings of so many people that it would be impractical to list them all.

Most helpful have been the author's day-to-day experiences with Army staff work as a civilian employee at the Headquarters of a Major Army and with Navy communications as a commander of a division of destroyers during World War II.

Primarily the author is indebted to Dr. Irwin E. Perlin, Professor of Mathematics, and Professor Edward Foster, Associate Professor of English, Georgia Institute of Technology, who were his special mentors.

TABLE OF CONTENTS

LIST OF FIGURES

SUMMARY

The Army has already started installation of high speed electronic computers to process numerical data. It is now time to consider the feasibility of using this type of equipment as a fast, accurate means of correlating messages with Army missions, estimates of the situation, decisions, plans, etc. This study explores the problems involved in electronically processing such staff information.

The inventory control of Army personnel is facilitated by the identification and classification of personnel by serial numbers and military occupational specialty numbers. It was assumed that inventory control techniques could also be adapted to the problems of control of an inventory of information provided the items can be classified and identified. A method that might be used was demonstrated. It is based on "the situation" which included all the information relevant to the decisions that must be made as to actions to be taken. It is an extremely flexible concept that sometimes includes a great deal and sometimes very little. At one extreme is the formal "estimate of the situation" prepared by the commander and his staff as a basis for decisions on fighting a campaign. At the other extreme is a memo on a request for special leave by a certain private. Each situation has

characteristics, factors, or dimensions which are termed "elemental concepts." These are the units that would be controlled in an inventory of information.

This system of classification was demonstrated for a typical peacetime staff action consisting of a request for approval of air conditioning of a certain building, the regulations covering such requests, and the three possible replies in accordance with the regulations. The standard form for such requests and replies, together with the lists of the possible entries for each blank space in the form, make a "class of situations." The particular request constitutes a "specific situation" within the class. The "entries" used to fill the different spaces in the standard form are "elemental concepts" and give the dimensions of the specific situation.

Although the complexities of language were studied as part of this project, the problems and methods of processing normal unrestricted language were placed beyond its limits in the belief that experience must first be gained in the processing of what is termed "conventionalized language." In such language, all messages are written in prescribed form using customary expressions.

A method was demonstrated that might be used in processing conventionalized language. Each message would be tested by the computer for consistency with missions and plans

contained in the automatic file: (a) by determining the nature of the specific situation involved, (b) by determining from the file which customary expressions entered in the different spaces of the appropriate standard form would be consistent, (c) by noting any elemental concepts or entries in the message that are inconsistent, and (d) by printing out the inconsistent information for reconsideration by the staff officers. The technique would consist of using information from the message to locate information in the automatic file. This information, in conjunction with additional information from the message, would be used by the computer to locate additional information from the file. This procedure would be repeated until all the file's pertinent information is brought to bear on the message and tested for consistency.

From the demonstrations it was concluded that the Staff Control Computer could correlate information from messages provided they are in conventionalized language.

It should be emphasized that the study merely breaks ground for a great deal of work that must be done before the Staff Control Computer becomes a practical tool of Army command. Extensive work by a team of staff officers, linguists, and computer men working together will be required. One of the most practical results of this study is its definition of the nature of the team work and proving ground that will be needed. The final recommendation is that a pilot installation

be set up as soon as possible by the staff of an Army division or larger unit.

CHAPTER I

INTRODUCTION

The decade of 1960 will see a fundamental change in the staff work of the United States Army. Each staff of a division or larger Army unit will be equipped with a high speed general purpose digital computer. As staff officers develop skill in the use of this electronic data-processing equipment, Army staff work will be revolutionized.

Computers are beginning to be used for the inventory control of personnel and logistics. In addition to these problems of men and materials, there is the broader more basic problem of correlation of messages and other staff actions with Army missions, plans, directives, and other information available to the staff. Can the digital computer help with this problem? Staff officers, harassed by slow staff work and inconsistent staff information, have dreamed of a "Staff Control Computer" ever since automatic computers were developed during World War II. This thesis is an introduction to this problem.

Staff Control.--Although army staffs are probably as old as armies themselves, the theory and techniques of modern staff control germinated in the Napoleonic era when it was

demonstrated by both positive and negative examples that staff information is indispensable to the successful conduct of war. Since the days of Napoleon the detail problems of warfare have increased astronomically. Not only are armies larger and disposition of forces world-wide, but war has become amphibious and three dimensional. Speeds now vary from the slow plod of the foot soldier to the supersonic speeds of guided missiles. The implements of war have increased from a few score until now the military catalog contains millions upon millions of items. New weapons and equipment have increased combat capabilities enormously which in turn have increased staff problems to a fantastic degree.

Even more complicated are the problems of control of a military organization in a free state. For Napoleon the army and the state were one and the same. To a degree this is also true of our potential enemy, but no such simplification exists for the staffs in the United States Army. A glance at Figure 1, which follows, will indicate some of the problems. There is a direct line of authority and command from the Congress and the President at the top down to the division commander and his staff. However, there are many other lines of influence and semi-authority. These lines come from other services, government agencies, sections of the armed forces organization and the like. During battle these extra lines of semi-authority can be disregarded by the division commander

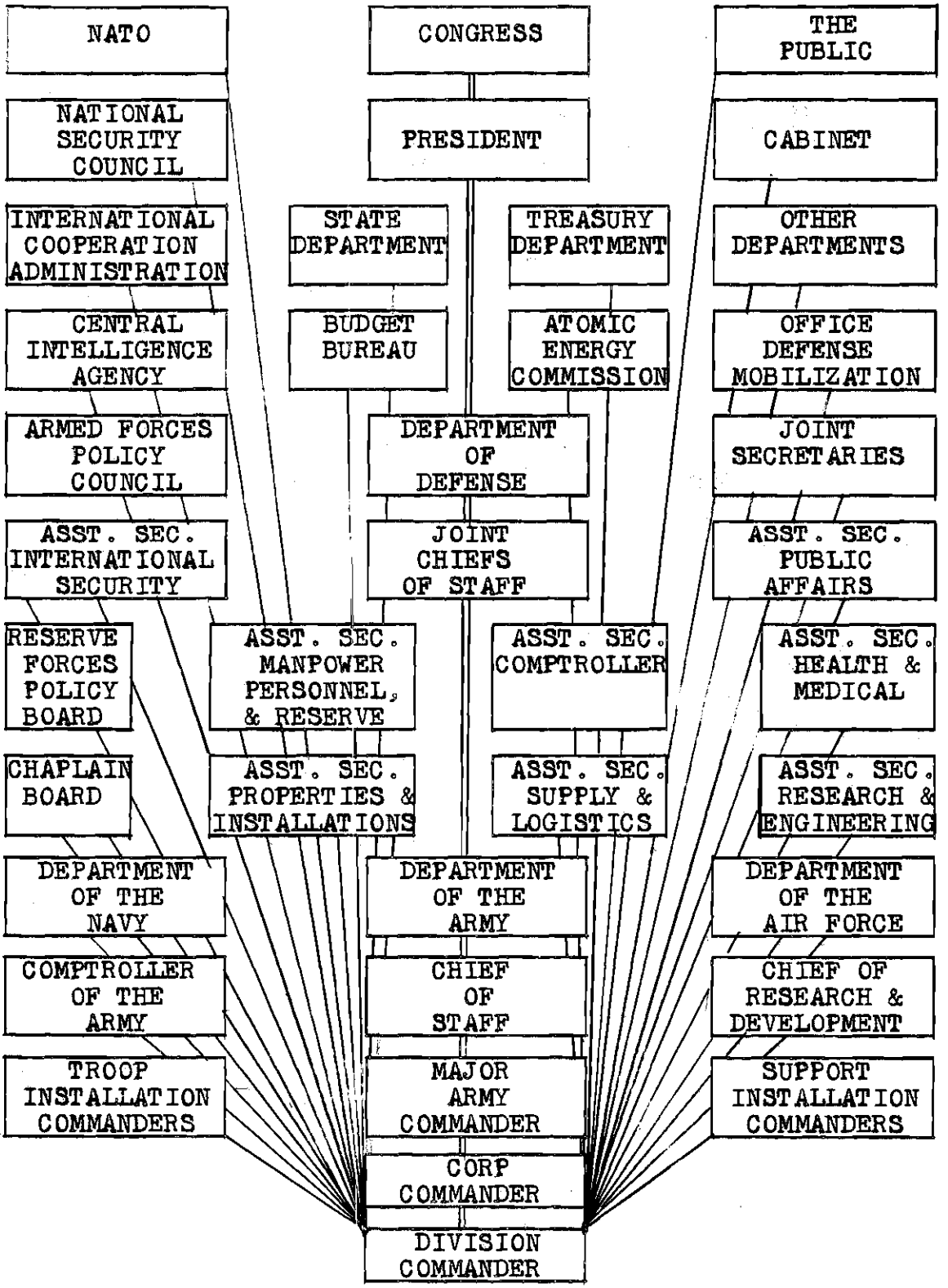


Figure 1. Position of an Army Division in the Organization of the Armed Forces

and his staff. However, during peacetime and at higher command levels in varying degrees at all times, statutory limitations, congressional interests, high level policies, and the like, come to the staffs both directly and along the lines of semi-authority. These must be considered by the staff and complicate the problems of staff control. A letter from a congressman's constituent sometimes can cause more staff work than an Army regulation direct from the Chief of Staff. Thus it is no simple task for an Army staff to determine all the details of its missions in the first place and to keep all staff actions consistent with these missions, the plans, the numerous policies and the like in the second place.

Manual Staff Work.--Staff work at its best requires the skillful use of many minds, so referring to staff work as manual work is incongruous, except in so far as "manual" is used as an antonym for "automatic" or "electronic." A common sight in this age of automatic controls is three push-buttons marked "Manual," "Off," and "Automatic." Pushing the "Manual" button starts the process, but the process once started must be controlled, usually with considerable skill, by the hands and minds of the operators. Within the memory of the senior officers of our armed forces, fire-control was manual. In like manner, staff control is manual; that is, little of it is automatic or electronic at present.

Complete staff study and coordination are always desired, but in battle there is seldom time for complete staff work. The commander, particularly at the division level, must depend upon the individual memories and judgments of the few staff officers present at quick staff meetings. As a result it is not uncommon to have inconsistencies between detail actions and the overall plans.

When time permits, staff coordination is accomplished, but it usually takes days and sometimes months. In large staffs there is much passing of papers from person to person in order that the minds, memories, and files of information in the different sections of the staff can be brought to bear on the different staff actions. The process is slow and cumbersome.

At one time in the ill-fated Gallipoli campaign of World War I, a brave British force fought to the top of Hill Q and gained control of this vitally needed high point on Sari Bair Ridge. Later these men had to fall back under devastating bombardment by their own Navy. Obviously the report that Hill Q was occupied by British forces was not received and coordinated by the staff with the information that directed the bombardment of Hill Q.

The Secretary of Defense issued an administrative instruction No. 4270.7 on 1 August 1956. This piece of paper began the process of staff coordination in the general staff of the Department of the Army, and nearly six months later,

29 January 1957, Army Regulation 420-54 was published. Next a letter was prepared at the headquarters of a major Army commander to implement the regulation. After the process of staff coordination, the letter was finally dispatched 22 July 1957, nearly a year after the original instruction was issued. This example, of course, is extreme, but it shows the danger of depending on slow manual staff control. Slow speed staff work and inconsistencies in staff information could paralyze our armed forces in a high speed electronic atomic war.

Problems of Using Computers.--The obvious answer to slow inconsistent staff work is high speed electronic data-processing equipment. But before these remarkable machines can be put to full use, considerable rethinking of the basic problems of staff control is necessary. The mechanization of present staff procedures by the use of electronic data-processing equipment would not materially improve overall staff effectiveness. The staff of any Army already has more information than it can use. To install equipment to produce still more information at a faster rate would further complicate staff work. What is needed is not more information but better information, that is, information with fewer inconsistencies.

Improving the quality of staff information will require considerable thinking and planning together by staff officers, computer men, and linguists. Thus the purpose of this study was to reduce the problem to its elemental aspects for ready

comprehension by the three types of readers with their different backgrounds.

Each type of reader will read this thesis for a different purpose. For example, the staff officer will be interested in the linguistic and computer aspects of the problem but will not be surprised to find that the staff work problems have been handled in an overly simplified manner. Likewise the linguists, who understand the infinite complexity of language, may expect more than the study provides. However, he will notice that it does force upon us a recognition of the symbolic nature of language, and he should gain insight into the workings of a staff and a digital computer. The computer man may be surprised to find so little consideration given to the powerful computational abilities of electronic computers. However, in a study of limited scope much must be omitted. What was included on computers was intended for the linguists and staff men.

The study made no pretense to dealing with the entire scope of the problem. Instead, it reduced the problem to its elemental aspects and, by analysis of typical example of staff action, attempted to show the nature of the problem and the feasibility of its solution.

CHAPTER II

ELEMENTS OF THE PROBLEM

Staff Information

Army Staff Work.--A staff is literally an organization of minds. It is necessary because the problems of modern war are much too complex for a single human mind. It is similar to the "front office" of an industrial organization.

The Army's field manual for staff officers defines a general staff and its functions as follows:

> The staff of a unit consists of the officers who assist the commander in his exercise of command. The commander and his staff should be considered as a single entity. The staff secures such information and furnishes such estimates and advice as may be required by the commander, prepares the details of his plans, translates his decisions and plans into orders, and causes such orders to be transmitted to the troops. It brings to the commander's attention matters which require his action or about which he should be informed, makes a continuous study of the situation, and prepares tentative plans for possible future contingencies for the consideration of the commander. It assists the commander in coordinating the efforts of the command. To the extent authorized by the commander, it supervises the execution of plans and orders, and takes such other action as is necessary to carry out the commander's intentions.

There are two types of general staffs: one is the staff of a commanding general in the field; the other is The General Staff of a nation which is responsible for the direction of the nation's army, prepares the plans for carrying out

the national military policy, and determines how the field forces will be utilized. Staffs of intermediate echelons of command have characteristics of both these types.

The staff of a division commander in the field consists of no more than a dozen officers with their clerks. Staff coordination is accomplished by quick staff meetings. Instead of large files of information, the commander must depend upon the memories and intuitions of the staff officers based on their training and experience. The problem is one of speed in processing items of detail information.

In staffs of higher levels of command, hundreds, thousands, and even tens of thousands of staff officers, assistants, and clerks are needed to think through, to remember, and to locate in the files all the complex details of modern warfare. The problem is one of a maze of information. When a new plan, directive, or other important message is to be issued, it must be coordinated with many specialists and sections to make certain that no important detail is overlooked. The staff is the organization of minds that makes this coordination possible.

Staff information is not produced by a single mind with a single purpose but by thousands of different individuals with different backgrounds. It is not surprising that the directives for the many Army activities are full of inconsistencies, that much of the information reflects the views

of certain staff sections and serves their particular purposes better than those of the Army as a whole or of the nation, that much staff work is actually at variance with the missions and decisions of the commander. What is surprising is that any organization of human minds as complex as the combined Army staff sections at different echelons of commands works at all. Considering the difficulties, Army staffs do a remarkable job. However, the purpose of this thesis is not to praise past accomplishments, but to look towards future improvements.

Inventory Control of Information.--It would be ideal if all pertinent information from the vast experience of the Army could be brought to bear on each detailed staff and command decision. At present this is impossible because the volume of information is so large and the manual processes of bringing the different sections of information to bear are so slow and cumbersome. As a result every staff action is based on incomplete information. There is always the serious danger that an essential detail has been overlooked.

The essential details are usually available in the memories and files of the staff. The problem is to find the information and to make it available when and where it is needed, and in a form that will make it recognizable as pertinent to the staff action being considered. It is a problem of inventory control, the control of an information

inventory.

Most of the techniques for stock inventory control could be adapted to the control of an information inventory. "In stock" and "out of stock" in stock inventory control would correspond to "consistent" and "inconsistent" in information inventory control. Stock levels are provided in anticipation of requisitions in stock inventory control just as directives and regulations would be filed in anticipation of requests for instructions or approval of proposed actions. Serial numbers and catalog numbers are used in stock inventory control just as code numbers for items of information and classification numbers would be used in information inventory control. Data on location, substitute items, sources of supply are helpful in stock inventory control and would be helpful in information inventory control.

However, before inventory control techniques can be put to use, we must deal with identification, classification, and organization of information. In other words, we must deal with the problem of language.

Language

In this study, two forms of Army language were recognized. First is the language of standard forms and customary expressions that we term "conventionalized language." Second is normal, unrestricted language.

Conventionalized Language.--The problem of the mechanization

of Army staff work will be greatly simplified by the fact that the majority of the information written and transmitted in the Army is already on printed forms or in letters or messages written in a prescribed manner. For example, the staff of a major Army makes use of over five thousand printed forms. Form 285 is an accident report form; Form 726 is the installation construction program; Form 5-40 is the inspection and service record for air conditioning; Form 5-2 is the fire report form.

Most letters and messages also follow a standard form. Thus the form of an operation order is set forth in detail in Field Manual FM 101-5. It prescribes that paragraph 1 will give the situation and paragraph 2 the mission, e. g.

1. ENEMY FORCES OCCUPY HILL Q AND BLOCK OUR ADVANCE INLAND.
2. THIS FORCE WILL BOMBARD HILL Q AT 05:45 ON 9 AUGUST TO ASSIST IN THE CAPTURE OF HILL Q BY GROUND FORCE GROUP 463.

Each blank in the printed form or each space in the standard message is usually filled from a list of a limited number of customary expressions or "entries." Each of these different entries for a given space in a given form would represent a different "elemental concept." In conventionalized language, each elemental concept is always symbolized by one and only one distinctive group of words.

For the unaided human mind, the process of writing in

conventionalized language involves remembering the customary expression for each concept. Staff personnel must use the Army dictionary, guides, signal books, and examples of approved communications. Even though the process is tedious, armies have fought complicated, far-flung battles in which every message had to be looked up in the signal book before it was sent and again before it was read and understood.

Thus the Army with its conventionalized language has a means of expression adapted to clear cut yes-no answers. Now, it is just this sort of language which is also adapted to the operations of high speed computers which are based upon the presence (yes) or the absence (no) of an indicator, such as a hole in a specific location in a punched card or perforated tape.

Normal Unrestricted Language.--Although most Army correspondence is in conventionalized language, an appreciable part is not. Part of it is in normal unrestricted language. Thus it was necessary in this study to give consideration to the nature of normal language.

Language is an aggregation of symbols and customs by which we express our thoughts or concepts. It has developed after much trial and error over thousands upon thousands of years. It is a most highly developed, subtle, and complicated form of symbolism. Not only do we use language to convey our thoughts to one another, but we also use language in the process

of thinking. Words are vehicles for our thoughts in mental excursions and flights of fancy. Language is the framework within which we do our thinking. It is beyond a doubt our most valuable heritage.

However, language is far from perfect. Normal unrestricted language lacks the logical precision of mathematics. The same group of words often convey different thoughts to different readers. Similarly, the same thoughts or concepts can be expressed in many different ways. In addition, the meaning of a written passage comes not from just the words used in the passage but also from implication, often subtle implication. This makes it difficult for ordinary language to be handled by machines which are primarily adding and sorting devices. Before the full potentialities of electronic data-processing can be exploited, considerable "language engineering" is required.

Electronic Data-Processing

Digital Computers.--Staff information and language have been discussed. The third element of the problem is the electronic processing of information by a digital computer with its associated automatic file.

Even though a digital computer is complex, has many parts, and works at phenomenal speeds, it is still a counting machine. As such, it is related to the primitive abacus and the everyday office adding machine. The abacus has beads

which are either moved or not moved into the counting position. The adding machine has teeth on counting wheels that are either indexed or not indexed. The digital computer has a generator that makes even continuous pulses that are either passed or not passed by the radio-like circuits of the computer. This is illustrated in Figure 2.

The abacus uses a five-bead quinary system. The adding machine uses a ten-key decimal system. A computer works in a two-position system of pulse and no-pulse, which are usually represented by the binary digits of 1 and 0. A series of a fixed number of these binary digits, or "bits" as they are called, forms a "word" in computer nomenclature. These "words" have meaning depending upon the code and number system used. Some number and code systems are shown in Figure 3.

The difference between the office adding machine and a modern digital computer is more than size, speed, and number system. First, a computer can compare two numbers and shift from one sequence of instructions to another in accordance with the result of the comparison. Second, once instructed a computer can control itself to follow lengthy instructions in carrying out involved calculations including deductions based on comparisons.

Comparison of two numbers or "words" is a subtraction process. One number is subtracted from the other. If there

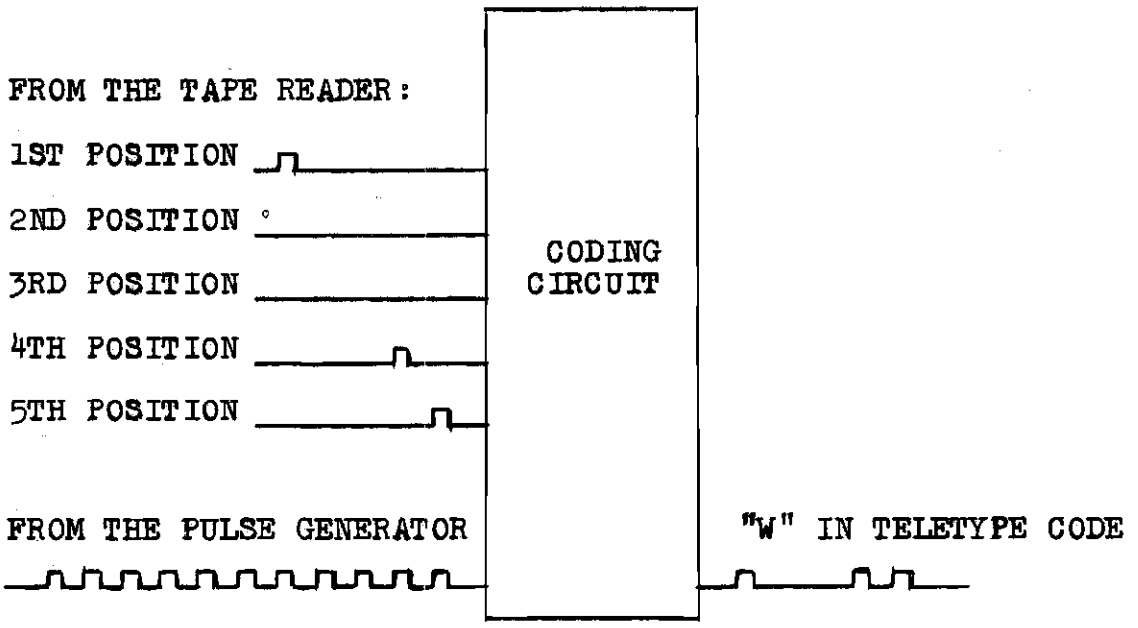


Figure 2. Illustration of Coding by Passing or Not Passing Pulses

BINARY NUMBER SYSTEM (Addition)

1	1	1	1	1	1	1	1	1	1	1	1	
2048	1024	512	256	128	64	32	16	8	4	2	1	
0	1	0	1	0	0	0	0	1	0	0	0	
	1024		256					8				= 1288

MODIFIED BINARY SYSTEM (Addition)

1	1/	1	1	1	1	1	1	1	1	1	1	
2000	1000	500	250	125/	64	32	16	8	4	2	1	
0	1	0	1	0	0	0	0	0	1	1	1	
	1000		250						4	2	1	= 1257

2421 SYSTEM (Addition)

1	1	1	1/	1	1	1	1/	1	1	1	1	
200	400	200	100	20	40	20	10	2	4	2	1	
0	1	1	0/	0	1	1	0/	0	1	1	0	
	400	200			40	20			4	2		= 666

TELETYPE LETTER CODES

0	1	1	0	0/	1	1	0	0	0/	1	0	0	1	1
		"N"					"O"					"W"		

ALPHABETIC ORDER LETTER CODES

0	0	0	1	1/	0	0	0	0	1/	1	0	1	0	0
			2	1					1	16		4		
		"3"					"1"					"20"		
		"C"					"A"					"T"		

Figure 3. Examples of Number and Code Systems

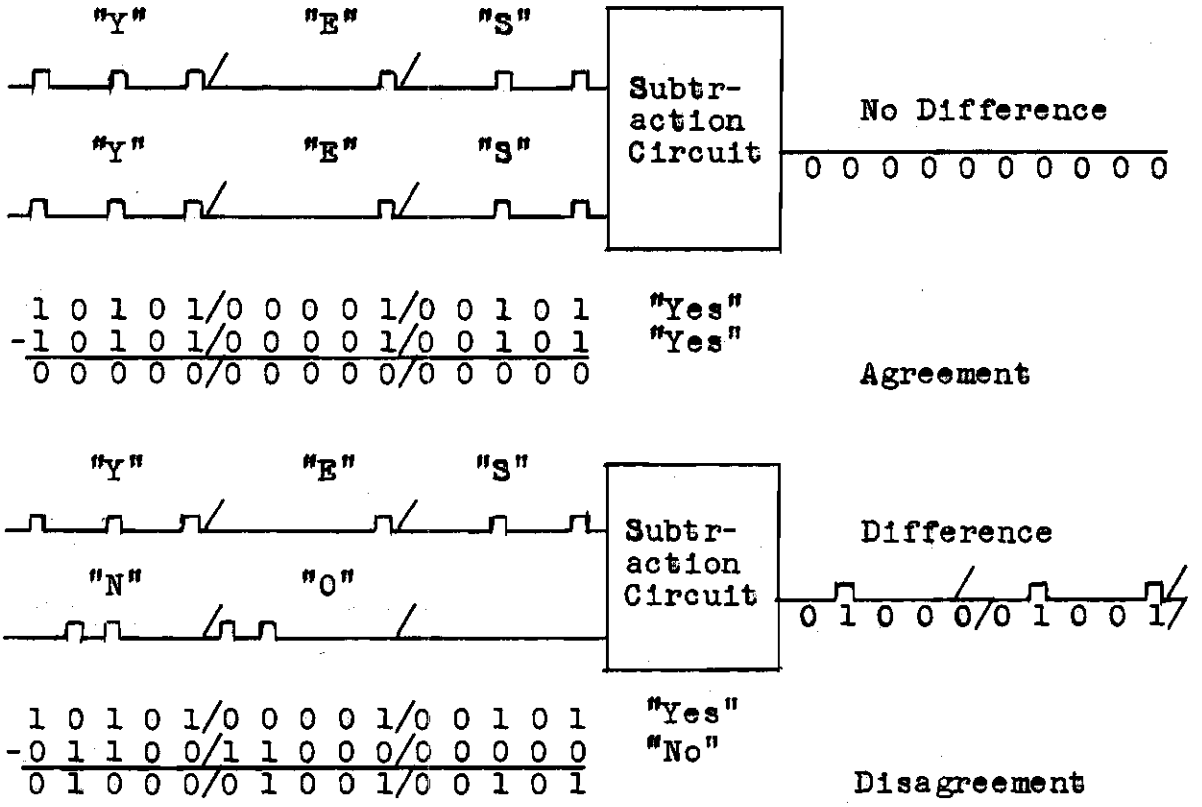
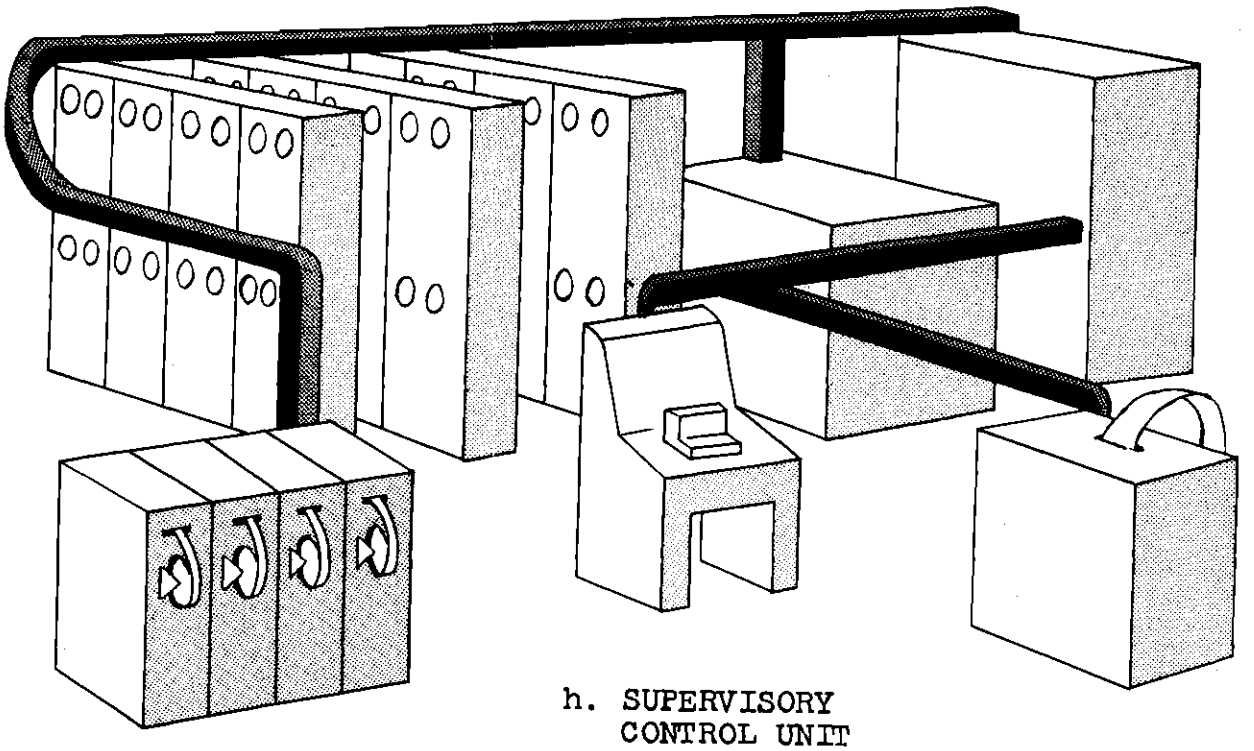


Figure 4. Illustration of Comparison by Subtraction

b'. AUTOMATIC FILE

b. HIGH SPEED INTERNAL MEMORY including
f. Buffer Storage

COMPUTER UNIT including
c. Pulse Generator
d. Coding Circuits
e'. Control Circuits
e". Arithmetic Circuits



h. SUPERVISORY CONTROL UNIT

a. PERFORATED TAPE RECEIVERS

g. HIGH SPEED PRINTER

Figure 5. Typical Digital Computer Installation with Automatic File

is no difference, there is agreement. If there is a difference, there is disagreement. Figure 4 illustrates this operation.

The elements of the digital computer, as shown in Figure 5, may now be listed in greater detail.

a. In-put mechanisms, such as perforated tape receivers, by which data and instructions are put into the automatic file and internal memory.

b. Internal memory in which numbers, words, and instructions are stored.

b'. Automatic file to store information waiting to be processed by the computer and reference information too voluminous for the internal memory.

c. Pulse generator which makes pulses to be counted.

d. Coding circuits which make numbers or words by counting or not counting pulses in accordance with information received from the memory.

e'. Control circuits to control the arithmetic circuits in accordance with instructions received from the memory.

e". Arithmetic circuits for manipulating the numbers received from the memory to accomplish the basic operations such as addition, subtraction, multiplication,

division, comparison, and shift in instructions.

f. Buffer storage to receive information from the computer until it can be handled by the out-put mechanisms.

g. Out-put mechanisms such as the high speed printer to disclose the results of computer processes.

h. Supervisory control unit to start and stop the computer, check its operation for failure of component parts, and supervise problems in process.

A computer has limitations. The principal limitation comes from the intricacy of the instructions required. In spite of the reputation of being a "giant brain," a computer is "simple minded." It must be instructed in every step it takes. If it encounters an unforeseen situation for which no instructions have been given, it cannot devise its own instructions, no matter how simple or obvious the alternative may be. Thus instead of thinking of a computer as a giant brain that can solve our problems for us at the punch of a button, it is better to think of it as a high speed mechanical clerk. When properly instructed, this clerk can do volumes of mathematical and clerical work that otherwise would be left undone for lack of time.

High speed digital computers were first put to work solving complicated mathematical problems in ballistics, aerodynamics, nuclear physics, and the like. In this field

the term "computer" is usually employed since the emphasis is on lengthy computations. More recently, digital computers have taken on the less complicated but more numerous problems of business and industry such as insurance statistics, pay rolls, billing, inventory control, and cost accounting. In this field the term "electronic data-processing system" is more commonly used since the emphasis is on "data reduction."

Automatic Files.--The automatic file that forms a part of most electronic data-processing machine installations is usually a collection of magnetic tape units. These units do not differ much in appearance and operation from home tape recorders used to "file" music. It is also similar to the telephone time-of-day service that is available in most cities. An automatic file keeps continuously on file the current time of day, and the information is available by dialing a certain number, for example:

JA 2 8550: PROTECT YOUR VALUABLES WITH A SAFETY DEPOSIT BOX. 12:45.

Usually a person dialing the number has a clock and desires to correlate his time with the information in the file as follows:

CLOCK: 12:47

JA 2 8550: 12:45

02 IS THE DISCREPANCY

Just as punched card sorting machines can sort out a given card from a file of cards by matching the holes in certain positions, a digital computer can read a long number, refer to the proper magnetic tape unit, search the tape for the number that corresponds and copy the associated information from the file. In other words, a digital computer can look up a policy number in the automatic file of an insurance company and print the insured's name, address, age, and other information.

Since a number can serve as a code for a word or group of words, a digital computer can read a group of words, compare it with groups of words in an automatic file and print a message. Using this principle, certain libraries have developed special purpose machines to search, select, and copy data from special coded files.

Computer Programs.--Before a digital computer can be put to work on a problem, a "program" must be prepared. The uninitiated is usually surprised at the amount of detailed instructions required. Being "simple minded," a computer must be told what to do at every step. Every possible situation that might occur in the process of the solution must be anticipated and a specific instruction given. "Programming" is tedious, time-consuming work requiring complete accuracy. Since human errors are inevitable, after a program has been devised, it must be "debugged." This process takes more time.

A small part of a program of computer instructions is given here for illustration. The program is one that might be used by a computer in locating a word in a code book in order to assign the appropriate code number. A flow diagram (Figure 6) is also shown to illustrate the memory cells filled with the necessary instructions and data, and the process in the operation of subtracting two numbers to determine whether they agree or disagree.

Some of the numbers stored in the memory serve as instructions to the computer while others serve as data to be processed, such as quantities and code numbers for words. Each number is stored in a numbered cell in the memory called an "address."

A computer instruction is a number like any other number in the memory cells except in the manner in which it is used by the computer. If, in accordance with a previous instruction, a number is routed into the control circuits, it becomes an order to be executed by the computer. The same number routed into the arithmetic circuits becomes data to be processed. By proper instructions an order can be routed into the arithmetic circuits and changed. This device enables the computer to alter its own instructions automatically.

There are three ways of locating information in a computer memory or automatic file. With a "random access memory," the computer acts as a telephone exchange and connects

directly with the memory unit desired.

With a "series access memory," an item of data is located by scanning: all addresses pass by an inspection point and are examined in turn. This process is comparable to running your finger down a list of names until the eye spots the name in question.

With an "indexed random access memory," the third way of locating information, the computer first refers to the index to determine the address and then makes the correct connection. This process is comparable with playing a game of ten questions, each answered yes or no. This process is illustrated in the following computer instructions for locating a word in a code list. The computer refers to the middle word in the list of code numbers to determine if the word in question is in the first half or second half of the list. More specifically the computer determines by subtraction whether the alphabetic order code number of the word in question is equal to or more than the alphabetic order code number of a certain word from the list. The computer determines, for example, the answer, yes or no, to the question, "Is the number equal to or more than the number for the 512th word? Yes.; 768th? No.; 640th? No.; 576th? No.; 544th? Yes.; 560th? Yes.; 568th? No.; 564th? No.; . . . . " wherein the numbers differ by 256, 128, 64, 32, 16, 8, 4, etc.

An order, #001, in a program of computer instructions

might read, "564 111 002 112" which, translated, is as follows:

#001

564 -- ADDRESS OF 1ST NUMBER -- 08 15 18 14 00 00 -- HORN

111 -- ADDRESS OF 2ND NUMBER -- 08 15 15 12 00 00 -- HOOK

002 -- INSTRUCTION TO SUBTRACT 2ND NUMBER FROM THE 1ST

112 -- ADDRESS OF THE RESULT -- 00 00 03 02 00 00

The computer, by this instruction, compares the word being looked up in the list, "HOOK," with the 564th word in the list, "HORN." The next step is to determine whether the numbers for the two words agree; in other words, to ask if the result of the subtraction is zero.

#002

112 -- ADDRESS OF 1ST NUMBER -- 00 00 03 02 00 00

000 -- BLANK

011 -- (TEST FOR ZERO. IF YES, SHIFT TO INSTRUCTION

021 (SHOWN AS 3RD ADDRESS

The answer is "NO," so another word must be selected from the list for test. The second word selected was separated from the first word by 256 words, which is approximately one-fourth of the total number of words in the list. This number was halved to become 128 for the next selection, then 64, then 32, and so on for the successive selections. It is possible for the process to continue until the number of words between each selection becomes 1, which would indicate that the two words nearest in alphabetic order to the word in

question had been tested. No agreement on the different tests to this point would indicate that the word in question was not in the list. The computer would then shift to the series of instructions, beginning with #031, for the operation when the word in question is not contained in the list. Instructions #003 and #004 would test for this situation.

```
      #003
113 -- 1ST ADDRESS -- 000000000004 -- (NUMBER OF WORDS AWAY
                                      (FROM LAST SELECTION
114 -- 2ND ADDRESS -- 000000000001
002 -- SUBTRACT 2ND NUMBER FROM 1ST
115 --   RESULT    -- 000000000003
      #004
115 -- ADDRESS OF 1ST NUMBER -- 000000000003
000
011 -- (TEST FOR ZERO.  IF YES, SHIFT TO INSTRUCTION
031     (SHOWN AS 3RD ADDRESS
```

Since the answer to this last test was no, the next step is to halve the number of words between words selected from the list.

```
      #005
113 -- ADDRESS OF 1ST NUMBER -- 000000000004 -- (NUMBER OF
                                                (WORDS AWAY
116 -- ADDRESS OF 2ND NUMBER -- 000000000002    (FROM LAST
                                                (SELECTION
004 -- DIVIDE 1ST NUMBER BY 2ND
113 --   ADDRESS OF RESULT   -- 000000000002
```

Before making the next selection from the list, it must be determined whether the word in question, "HOOK," is ahead or behind the last word selected from the list, "HORN." Determining whether the result of the subtraction was positive or negative will determine in which direction on the list the computer should move in making its next selection.

```
      #006
112 -- ADDRESS OF 1ST NUMBER -- 00 00 03 02 00 00 -- (RESULT
                                                     (OF #001
000
012 -- (TEST FOR NEGATIVE SIGN.  IF YES, SHIFT TO
009    (INSTRUCTION SHOWN AS THIRD ADDRESS
      #007
001 -- ADDRESS OF 1ST NUMBER -- 564 111 002 112 -- 1ST ORDER
113 -- ADDRESS OF 2ND NUMBER -- 002 -- NUMBER OF WORDS AWAY
102 -- SUBTRACT 2ND NUMBER FROM 1ST PART OF 1ST NUMBER
001 -- ADDRESS OF RESULT     -- 562 111 002 112
      #008
000
000
010 -- SHIFT TO INSTRUCTION INDICATED BY 3RD ADDRESS
001
```

The computer now starts another cycle to test another word, "HOOK," selected from the list with the word in question, "HOOK."

```
      #001
562 -- ADDRESS OF 1ST NUMBER -- 08 15 15 12 00 00 -- HOOK
111 -- ADDRESS OF 2ND NUMBER -- 08 15 15 12 00 00 -- HOOK
002 -- SUBTRACT 2ND NUMBER FROM 1ST
112 --   ADDRESS OF RESULT   -- 00 00 00 00 00 00
      #002
112 -- ADDRESS OF 1ST NUMBER -- 00 00 00 00 00 00
000
011 -- (TEST FOR ZERO.  IF YES, SHIFT TO INSTRUCTION
021     (SHOWN AS 3RD ADDRESS
      #021
```

THIS IS THE FIRST ORDER IN A SERIES OF INSTRUCTIONS TO BE FOLLOWED AFTER THE WORD IN QUESTION, "HOOK," HAS BEEN LOCATED IN THE LIST OF CODE NUMBERS AS THE 562TH WORD.

The ten orders shown in the flow diagram as stored in cells #001 through #010 are only a small part of a complete program, but they are sufficient for the purpose of illustration (see Figure 6).

Limits of the Study

Stages in Complete Electronic Processing of Army Staff Actions.-- Complete electronic processing of Army staff actions will logically develop in three stages. The first stage, which is now getting underway and will be completed in the next decade, consists of processing the numerical data of accounting and inventory control of personnel and logistics. The

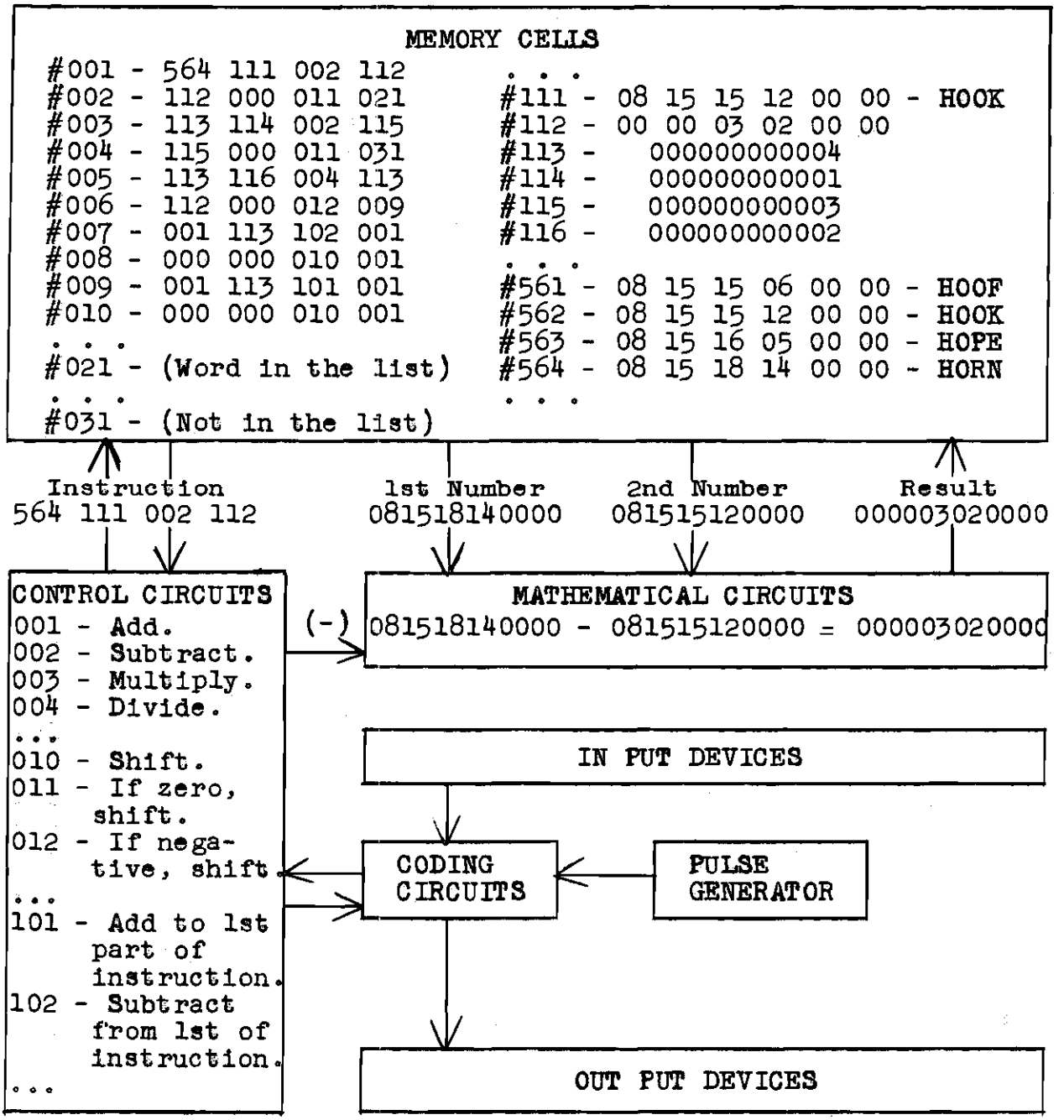


Figure 6. Computer Programmed to Locate a Word in a List of Words

next stage will be the processing of language data contained in forms, letters, and messages written with customary expressions and the standard forms of conventionalized language. This thesis was written as an introduction to this stage. The final stage will be the processing of normal unrestricted language.

Language as Symbolic Logic.--Considerable thought and study were given to the problems of processing normal unrestricted language. These works were studied:

Basic vocabulary such as C. K. Ogden's Basic English.

Systems of classification of words such as P. M. Roger's Thesaurus.

The sentence as understood by structural linguists such as Charles C. Fries, Donald J. Lloyd, and Harold Whitehall.

Techniques of machine translation such as those of Dr. Leon Dostert at Georgetown University.

It seems that language, both conventionalized and unrestricted, is a subtle, complicated form of symbolic logic. Words, expressions, sentences, paragraphs, and compositions are all symbols for concepts ranging from simple elemental concepts to involved complex concepts. These symbols for concepts have meaning through their relationship to symbols for other concepts and, as such, form points or areas in what was visualized as "planes of understanding."

It was concluded that the development of the problem of electronic processing of normal unrestricted language will require enormous work by skillful linguists and is beyond the scope of this thesis. Accordingly this thesis was limited to the consideration of processing conventionalized language.

Demonstration.--The techniques of inventory control of items of material have been highly developed and are being adapted to Army problems. These techniques are also being adapted to the problems of Army personnel accounting facilitated by the identification and classification of Army personnel by serial numbers and military occupational speciality numbers. It was assumed, for the purpose of this thesis, that inventory control techniques could also be adapted to the problems of control of an inventory of information provided the items of information can be identified and classified.

This thesis demonstrates a method that might be used for identification and classification of items of Army information contained in missions, studies, decisions, plans, directives, and reports. The method is based on "situations." The Army deals with situations, which with negligible exceptions, are expressed in written form. The situations range from the formal "estimate of the situation" prepared by the commander and his staff as a basis for decisions on fighting a campaign down to the memo on the personal request

of Private G. I. Joe. In between these two extremes are the scheduled bombardment of a certain hill and the request to air condition a certain building. There are general classes of situations and specific situations within a class. Situations are made up of what might be termed "characteristics," "factors," or "dimensions." In like manner, there are general classes of dimensions and specific dimensions. These specific dimensions are the "elemental concepts" or units of information that would be controlled in an inventory of information.

This somewhat abstract classification of information may be better visualized by thinking in terms of printed forms. A class of situations would be comparable to a printed form with its identifying form number. A specific situation within a class would be comparable to a completed form with the various blank spaces filled in. A factor or class of dimensions would be comparable to the title of a blank space on the form, such as in the case of our G. I. Joe, height and sex. A specific dimension or elemental concept would be one of the "customary entries" for the blank space such as "71 inches" and "male."

In addition to the demonstration of a method of identifying and classifying information, the thesis demonstrates in outline form the procedure that might be followed in processing information expressed in conventionalized language. From these demonstrations it was concluded that

the Staff Control Computer could correlate information in messages with the missions and other information in the files of the staff, provided the information is expressed in conventionalized language.

CHAPTER III

ELECTRONIC CORRELATION

Comparisons

Manual Staff Work vs. Staff Work with a Staff Control Computer.--First let us compare the essential difference between present day staff work and staff work as it might be with a Staff Control Computer. In both cases, judgments and decisions would be by the commander and his staff officers--by human minds. However, the commander and his staff officers must have available pertinent information upon which to pass judgment in making decisions. The difference between the two methods of staff work would be in the manner in which the information is stored and brought out for consideration.

In present day manual staff work, the information needed is either in the memories of the staff officers and the current orders or in books and files, depending upon whether the staff is for a division or a larger army unit and whether the staff action is in battle or in peacetime. The staff officers of a division in battle depend upon the operation order with its many annexes, the situation reports, and their memories. The problem comes not from a mass of information but from the need for utmost speed and accuracy in every detail. A single item in a lengthy bombardment schedule

and the change in position of a single battalion could spell disaster if not immediately correlated.

In the staff of a larger Army unit, particularly in peacetime, the problem is a maze of information stored in voluminous central files including books of regulations, guides, standards of procedure, and the like; in numerous convenience files; and in the memories of staff officers and their clerks. The information is brought out for consideration in relation to a particular staff action by coordinating the staff action with the different sections and divisions of the staff. In all but exceptional cases, this means passing the piece of paper, which spells out the staff action, from person to person. As has already been said, this process usually takes days and sometimes takes months. It is a cumbersome process but necessary if a staff is to avoid the danger of overlooking an essential detail.

With a Staff Control Computer all essential information, including the overall plans and the decisions from previous staff thinking, would be filed on magnetic tapes or other means of automatic filing. Instead of depending on human memories in passing a piece of paper from person to person, a piece of perforated tape from the tape perforating attachment on a typewriter would be passed to the reading mechanism of the Staff Control Computer. The computer would then extract the pertinent information from the automatic

file. The particular staff action would then be compared with the pertinent information and inconsistencies noted. Most staff actions, of course, would be in accordance with missions and previous staff decisions and thus would be passed as consistent with the pertinent information from the file. When inconsistencies are encountered, the nature of the inconsistency, together with the staff action in which it is contained, would be typed out by the computer.

Mechanical Thinking vs. Reflective Thinking.--Since the automatic file would contain all the pertinent information and all the command decisions previously made, it is natural to ask, "Why not let the Staff Control Computer write the message and dispatch it without bothering the staff officer?" Such a procedure, however, would be equivalent to letting the Staff Control Computer do the thinking for the staff.

The computer is quite adequate for mechanical thinking, and much of the mental activity of thousands of staff officers and clerks in staff work today is robot-like mechanical thinking. This includes such things as looking up the regulations, following the standard guide, implementing orders by disseminating the same information received, adding two and two to get four, and the like. Mechanical thinking can be performed faster and more accurately by a computer.

Of course, mechanical thinking is not the only kind of thinking needed by the Army; reflective thinking is also

required. This is a twofold process; the human mind analyzes its experiences and knowledge, discerning similarities and differences and evaluating their significances. In reflective thinking on a problem, a possible solution is envisioned and tested for logical concord with the mind's evaluation of past experience and knowledge. No mechanical-minded computer can do keen, versatile reflective thinking.

Although the thinker's discernment and evaluation ability, in reflective thinking, is of primary importance, the amount of experience and knowledge of the problem is also important. Other things being equal, the thinker with the greater amount of knowledge of the problem should obtain the better solution. The vast experience of the Army could be evaluated and filed in the automatic file. The Staff Control Computer could then make the experience of the whole Army available to broaden the background of knowledge for the reflective thinking by each staff officer. Thus, though a computer cannot do reflective thinking, it could greatly improve the reflective thinking of staff officers.

Procedure

Example of Typical Staff Work.--An example of a typical staff action was selected for study of the problems of testing the information in a communication for consistency with policies and command decisions stored in the automatic file. In the example, which is shown in full in Appendix A, an action is

planned by the commander and staff of a military camp, and a request for approval of the action is submitted to higher command. Appendix A gives the request, which is for the approval of air conditioning of a certain building together with the regulations covering such requests. In addition, an example is given of each of the three types of replies applicable to such requests: (1) the request is forwarded for approval by the Department of the Army; (2) the request is returned for additional information in justification of the request; and (3) the request is approved. The example is typical of most routine staff work, particularly in peacetime.

It is natural to think of the Army as fighting big battles and accomplishing great missions. The big mission usually captures our attention so that we lose sight of the fact that wars are won by many little actions. A rifle must be aimed and the trigger pulled. The wind direction and velocity must be determined and set in the fire-control computer. The proper size ball bearings must be available when needed. In the Korean war, at one time, the problem of dry socks became paramount: soldiers' feet were freezing for the lack of them. The control of many small actions is as vital a part of good staff work as formulating the overall plan.

Whether a proposed action is to bombard a certain hill, atom-bomb a certain rail center, ship a load of socks, or air

condition a specific building, the mechanical process within the staff is much the same. An action is proposed and then evaluated by the staff in terms of information available to the staff either in files or the memories of the staff officers from their past studies and experience.

General Description.--Now let us visualize how a staff equipped with a Staff Control Computer might handle correspondence written in conventionalized language wherein each item follows the standard form for its particular subject and all the expressions used are the customary expressions.

Assume that a request for approval of air conditioning a certain building is submitted and that such a request can be forwarded to the Department of the Army only when some ten items of information are furnished in justification. If an item of information is omitted, the request should be returned for additional justification in accordance with predetermined policy. Assume, however, that the staff officer handling the request prepares an indorsement to forward the request to the Department of the Army. In other words, assume the staff action proposed is inconsistent with predetermined policy.

Typewriters equipped with tape perforating attachments would be used. The perforated tapes corresponding to the request and the reply, which constitute the staff action, would be fed into the tape reading mechanism of the computer. In

most cases, of course, staff actions would be in accordance with plans so that the computer after testing the proposed staff action would indicate that it is "CONSISTENT." In the example, however, the computer would determine that the staff action proposed was to forward the request when the correct action would be to return the request for additional justification. Thus, in the example, the computer would have to indicate that the proposed action is "INCONSISTENT." Also, the nature of the inconsistency would be typed out by the computer on the high speed printer.

Five steps would be required in the process.

a. The class of situation to which the staff action pertains would be determined.

b. The proper standard form for the class of situation would be determined.

c. The elemental concepts of the staff action as indicated by the expressions used in the correspondence would be identified.

d. The concepts used would be tested for consistency and inconsistency with command decisions, plans, and policies as expressed by information in the files.

e. Inconsistent concepts, if any, would be identified and printed out by the computer. Otherwise the computer would indicate that the proposed staff action is "CONSISTENT."

These computer operations, shown in Figure 7, will be described in general at this point and in more detail in the five sections that follow. First, the situation would be identified by a code number such as 673.11. The first part, 673, is the gross file number of the correspondence. The subject of the correspondence, "Installation of air conditioning equipment," is No. 11 on the list of subjects under the file number of 673.

The standard staff action in this situation, 673.11, is shown in Figure 7 as a request from a camp together with one of three possible replies: (1) an indorsement forwarding the request, (2) an indorsement returning the request for additional information, and (3) an indorsement approving the request. The standard form in which such requests and replies are written would be secured from the automatic file. The standard form in the example has 24 spaces for units of information: (01) the fort or camp submitting the request, (02) the date of the request, (03) the number of the room or rooms to be air conditioned, (04) the number of the building, (05) the character of the building, (06) the size of the space, (07) the number of occupants, (08) the use of the space, and so forth.

The specific entries for the different blank spaces of the standard form as contained in the staff action would next be determined. The computer would call up in turn each of

the possible entries for each of the 24 spaces and compare these with the entry for each space in the staff action. When they match, the elemental concept would be identified. For example, the possible entries for the first space (01), the addresser of the request, would be Ft. Alpha (01:1001), Ft. Baker (01:1002), Cp. Gamma (01:1003), etc., which when compared with the entry in the staff action would match with Cp. Gamma, thus identifying 01:1003 as one of the elemental concepts that distinguishes the specific situation of the staff action.

When all the blank spaces of the standard form have been determined, the computer would have a chain of elemental concepts which completely identify the specific situation, i.e. 01:1003 (Cp. Gamma), 02:531110 (10 November 1953), 03: 9999 (room numbers not given), 04:38424 (Building 38424), 05:3 (temporary building), 06:40 (between 2500 and 3000 sq. ft. of space), 07:18 (from 50 to 60 occupants), 08:213 (a classroom) ... 14:99 (activity requiring air conditioning mission is not given) ... 20:1 (indorsement forwarding the request for approval by higher command), etc.

The regulations and command decisions would be contained within the automatic file as statements of consistent or inconsistent relationships between elemental concepts. For example, if the space 08 had been filled with an elemental concept identified by numbers 08:100 to 08:199 (including

such elemental concepts as 08:111 a dental clinic, 08:151 an operating room, etc.), the request for air conditioning could be approved under existing policy. In this case an indorsement including the elemental concept 20:3, "is approved," would be consistent with policy, and either of the other two possible indorsements, 20:1 or 20:2, would be inconsistent.

The specific situation shown in the example, however, contains the elemental concept 08:213, a classroom. Thus the request cannot be approved, but it can be forwarded to the next higher command for approval provided ten items of information, 05 through 14, are given in the request as justification. In the illustration, the last item of information was omitted as indicated by the elemental concept code number 14:99. In such a case, the request should be returned for the missing information by an indorsement containing the elemental concept 20:2, "is returned for additional justification." Either of the other two possible actions 20:1 or 20:3 would be inconsistent. Since the indorsement of the illustration contains the elemental concept 20:1, the staff action is inconsistent, as shown in Figure 7. The sections that follow give a more detailed description of this process of determining inconsistency.

Identification of Class of Situation.--One of the prime missions of an Army commander and his staff is to anticipate future situations and to plan for possible future contingencies.

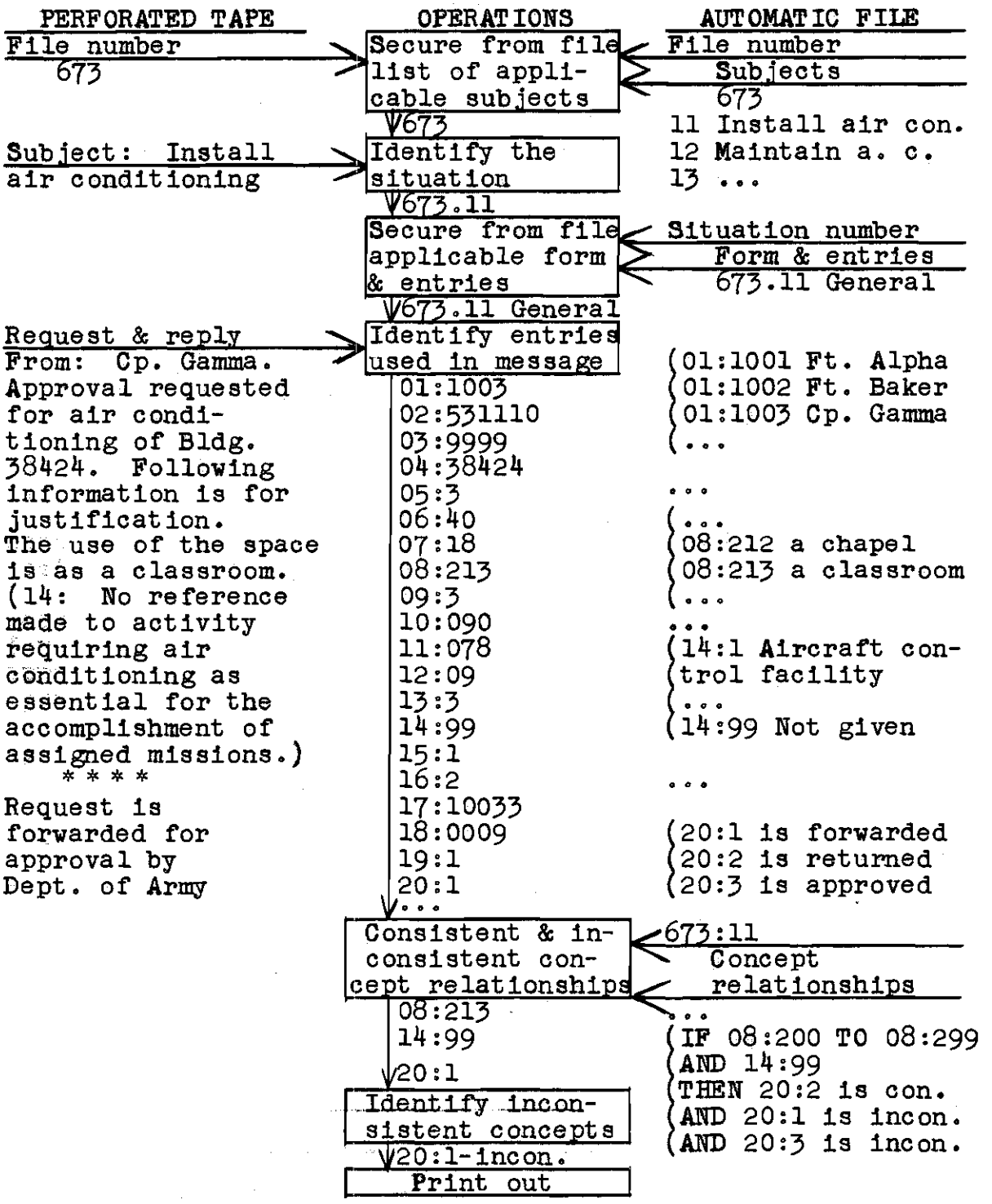


Figure 7. Flow Diagram of Computer Operations

Thus with negligible exceptions, any message and its reply would pertain to a class of anticipated situations. The first step for the computer, then, would be to read the perforated tape corresponding to the message and its reply and to identify the class of situation to which the particular staff action applies. If the correspondence is on printed forms, the situation would be identified by reading the form numbers. If not on printed forms but in the standard form of conventionalized language, the situation would be identified from the gross file number and the subject of the correspondence.

Feeding the perforated tape into the tape reading mechanism would place the staff action, written out in binary code numbers, into the internal storage of the computer. The first operation would be to locate the file number. This could be done by comparing the coded expression (see Appendix B), 111.11 011.01 001.10 100.10 000.01 001.00 011.00 001.11 111.00 110.01 000.01 010.10 001.00 110.11, "file number," with the coded staff action until the codes for "file number" are located in the staff action. The file number would then be indicated as the next coded group, 101.01 001.11 000.01, "673." This process is shown in Figure 8.

The computer would then use the file number as an address in the automatic file to locate the list of subjects covered by the file number. The list of subjects in the example is as follows:

COMPUTER INSTRUCTION		STAFF ACTION STORED IN MEMORY OF COMPUTER	
Search staff action for:			
		...	...
		110.00	O
		010.10	R
		110.10	G
		001.10	I
		000.11	A
		110.11	(Figures)
		111.00	.
		010.00	(Carriage Return)
		000.10	(Line Feed)
		000.10	(Line Feed)
111.11	*	111.11	(Letters)
011.01	*	011.01	F
001.10	*	001.10	I
100.10	*	100.10	L
000.01	*	000.01	E
001.00	*	001.00	(Space)
011.00	*	011.00	N
001.11	*	001.11	U
111.00	*	111.00	M
110.01	*	110.01	B
000.01	*	000.01	E
010.10	*	010.10	R
001.00	*	001.00	(Space)
110.11	*	110.11	(Figures)
		101.01	6
		001.11	7
		000.01	3
		001.00	(Space)
		001.00	(Space)
		...	...

* Indicates agreement

Figure 8. Illustration of Locating Words in Message by Matching Numbers

673 SUBJECT:

INSTALLATION OF AIR CONDITIONING EQUIPMENT	- 673.11
OPERATION OF AIR CONDITIONING EQUIPMENT	- 673.12
MAINTENANCE OF AIR CONDITIONING EQUIPMENT	- 673.13
CONSTRUCTION OF COLD STORAGE PLANTS	- 673.21
OPERATION OF COLD STORAGE PLANTS	- 673.22
MAINTENANCE OF COLD STORAGE PLANTS	- 673.23
CONSTRUCTION OF ICE PLANTS	- 673.31
OPERATION OF ICE PLANTS	- 673.32
MAINTENANCE OF ICE PLANTS	- 673.33
INSTALLATION OF REFRIGERATION SYSTEMS	- 673.41
OPERATION OF REFRIGERATION SYSTEMS	- 673.42
MAINTENANCE OF REFRIGERATION SYSTEMS	- 673.43
INSTALLATION OF VENTILATION SYSTEMS	- 673.51
OPERATION OF VENTILATION SYSTEMS	- 673.52
MAINTENANCE OF VENTILATION SYSTEMS	- 673.53

This list would be transferred from the automatic file to the internal memory of the computer. Next the subject of the correspondence would be identified in the same manner as the file number was identified. This is shown in Figure 9.

Reading the number corresponding to the subject from the list which agrees with the subject of the correspondence would identify the situation number, i.e.

101.01	001.11	000.01	111.00	101.11	101.11
6	7	3	.	1	1

STAFF ACTION			673 SUBJECTS		SITUATION NUMBERS	
I	001.10	*	001.10	I		
N	011.00	*	011.00	N		
S	001.01	*	001.01	S		
T	100.00	*	100.00	T		
A	000.11	*	000.11	A		
L	100.10	*	100.10	L		
L	100.10	*	100.10	L		
A	000.11	*	000.11	A		
T	100.00	*	100.00	T		
I	001.10	*	001.10	I		
O	110.00	*	110.00	O		
N	011.00	*	011.00	N		
(Space)	001.00	*	001.00	(Space)		
O	110.00	*	110.00	O		
F	011.01	*	011.01	F		
(Space)	001.00	*	001.00	(Space)		
A	000.11	*	000.11	A		
I	001.10	*	001.10	I		
R	010.10	*	010.10	R	101.01	6
(Space)	001.00	*	001.00	(Space)	001.11	7
C	011.10	*	011.10	C	000.01	3
O	110.00	*	110.00	O	111.00	.
N	011.00	*	011.00	N	101.11	1
D	010.01	*	010.01	D	101.11	1
...	...	...	...	...		
			110.00	O		
			101.10	P		
			000.01	E		
			010.10	R		
			000.11	A		
			100.00	T		
			001.10	I	101.01	6
			110.00	O	001.11	7
			011.00	N	000.01	3
			001.00	(Space)	111.00	.
			110.00	O	101.11	1
			011.01	F	100.11	2
			...	...		

* Indicates agreement

Figure 9. Illustration of Method of Identifying Code Numbers by Matching Information from Message with Information from Automatic File

Determination of Standard Form.--The automatic file would contain the standard form for use with each class of situation, including that indicated by Situation Number 673.11. The file would also contain a list of elemental concepts, which is to say the expressions customarily used to fill each blank space in the standard form. Using the situation number, the computer would locate the standard form and lists of customary entries in the automatic file and transfer the information, as shown below, to the internal memory of the computer. The information would be in binary code numbers of 0 and 1, but is shown here in the English alphabet and Arabic numbers for ease in reading.

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
HEADQUARTERS	FT. ALPHA, N. C.	01:1001
	FT. BAKER, FLA.	01:1002
	CP. GAMMA, GA.	01:1003
	FT. DELTA, MISS.	01:1004
	CP. ETA, S. C.	01:1005
	CP. THETA, ALA.	01:1006
	FT. IOTA, TENN.	01:1007
	FT. KAPPA, ALA.	01:1008
	FT. MU, GA.	01:1009
FILE NUMBER 673	. . .	. . .
	8 NOVEMBER 1953	02:531108
	9 NOVEMBER 1953	02:531109

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	10 NOVEMBER 1953	02:531110
	11 NOVEMBER 1953	02:531111
	. . .	. . .
SUBJECT: INSTALLA - TION OF AIR CONDI - TIONING EQUIPMENT.		
TO: COMMANDING GENE- RAL, X ARMY, FT. MU, GA.		
1. APPROVAL IS RE- QUESTED FOR INSTALLA- TION OF AIR CONDITION- ING EQUIPMENT	FOR ROOM 1	03:0001
	FOR ROOM 2	03:0002
	. . .	. . .
	(BLANK)	03:9999
	IN BUILDING 1	04:00001
	IN BUILDING 2	04:00002
	. . .	. . .
	IN BUILDING 38424	04:38424
	. . .	. . .
	(NOT GIVEN)	04:99999
THE FOLLOWING INFOR- MATION IS FURNISHED		

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
AS SUPPORTING JUSTI-		
FICATION FOR AIR		
CONDITIONING:		
A. CHARACTER OF THE		
SPACE IS	PERMANENT BUILDING	05:1
	SEMI-PERMANENT BUILDING	05:2
	TEMPORARY BUILDING	05:3
	(NOT GIVEN)	05:9
B. SIZE OF THE SPACE		
IS FROM	0 TO 100 SQ. FT.	06:21
	100 TO 125 SQ. FT.	06:22
	125 TO 150 SQ. FT.	06:23
	150 TO 175 SQ. FT.	06:24
	175 TO 200 SQ. FT.	06:25
	. . .	. . .
	2000 TO 2500 SQ. FT.	06:39
	2500 TO 3000 SQ. FT.	06:40
	3000 TO 3500 SQ. FT.	06:41
	. . .	. . .
	(NOT GIVEN)	06:99
C. THE NUMBER OF		
OCCUPANTS IS FROM	1 TO 2 PERSONS	07:01
	2 TO 3 PERSONS	07:02
	3 TO 4 PERSONS	07:03

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	4 TO 5 PERSONS	07:04
	. . .	. . .
	30 TO 35 PERSONS	07:15
	35 TO 40 PERSONS	07:16
	40 TO 50 PERSONS	07:17
	50 TO 60 PERSONS	07:18
	60 TO 70 PERSONS	07:19
	. . .	. . .
	(NOT GIVEN)	07:99
D. THE USE OF THE SPACE IS AS	A SPACE AUTHORIZED AIR CONDITIONING UNDER THE PROVISIONS OF SR 420-430 - 1	08:100
	A DENTAL CLINIC	08:101
	AN E.E.N. & T. CLINIC	08:102
	. . .	. . .
	A PHOTOGRAPHIC LABORATORY	08:132
	. . .	. . .
	A SPACE IN EXCESS OF THAT PERMITTED AIR CONDITIONING UNDER THE PROVISIONS OF SR 420-430-1	08:200

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	. . .	. . .
	A CLASSROOM	08:213
	. . .	. . .
	(NOT GIVEN)	08:999
E. THE AVERAGE OUTSIDE DRY BULB TEMPERATURE BETWEEN 09:00 AND 17:00 HOURS FOR THE THREE WARMEST MONTHS		
IS	BELOW 70° F.	09:1
	FROM 70° TO 80° F.	09:2
	FROM 80° TO 90° F.	09:3
	ABOVE 90° F.	09:4
	(NOT GIVEN)	09:9
F. THE AVERAGE INSIDE DRY BULB TEMPERATURE FOR THE PERIOD OF TIME COVERED IN (E)		
ABOVE IS	70° F.	10:070
	71° F.	10:071
	72° F.	10:072
	. . .	. . .
	89° F.	10:089
	90° F.	10:090

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	91° F.	10:091
	. . .	. . .
	(NOT GIVEN)	10:999
G. THE AVERAGE OUTSIDE WET BULB TEMPERATURE FOR THE PERIOD OF TIME COVERED IN (E) ABOVE IS	60° F.	11:060
	61° F.	11:061
	62° F.	11:062
	. . .	. . .
	77° F.	11:077
	78° F.	11:078
	79° F.	11:079
	. . .	. . .
	(NOT GIVEN)	11:999
H. A	1/2 H.P.	12:01
	3/4 H.P.	12:02
	1 H.P.	12:03
	1 1/2 H.P.	12:04
	2 H.P.	12:05
	3 TON	12:06
	5 TON	12:07
	7 1/2 TON	12:08

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	10 TON	12:09
	. . .	. . .
	(NOT GIVEN)	12:99
	WINDOW AIR CONDITION-	
	ING UNIT	13:1
	AIR COOLED PACKAGE	
	AIR CONDITIONED UNIT	13:2
	PACKAGE AIR CONDITION-	
	ING UNIT COMPLETE WITH	
	AIR DISTRIBUTION SYSTEM	
	AND COOLING TOWER	13:3
	. . .	. . .
WILL BE USED.		
I. AIR CONDITIONING		
IS ESSENTIAL FOR THE		
ACCOMPLISHMENT OF THE		
ASSIGNED MISSIONS OF		
THIS	AIR CRAFT CONTROL	
	FACILITY	14:01
	ELECTRONIC COMPUTING	
	CENTER	14:02
	FIRE CONTROL CENTER	14:03
	. . .	. . .
	(NOT GIVEN)	14:99

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
2. FUNDS FOR THE ACCOMPLISHMENT OF THIS WORK ARE	AVAILABLE LOCALLY	15:1
	REQUESTED IN THE AMOUNT OF:	
	$5,000.00	15:45
	$6,000.00	15:46
	$7,000.00	15:47
	$8,500.00	15:48
	$10,000.00	15:49
	. . .	. . .
	(NOT GIVEN)	15:99
	BY ORDER OF THE COMMANDING GENERAL	16:1
	FOR THE COMMANDING GENERAL	16:2
	. . .	. . .
	WM. R. OMICRON, COLONEL, A. G. C. ADJUTANT GENERAL	17:10031
	D. K. NU, LIEUT. COLONEL, A. G. C. ASSISTANT ADJUTANT GENERAL	17:10032

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	L. F. ETA, MAJOR,	
	A. G. C.	
	ASSISTANT ADJUTANT	
	GENERAL	17:100033
	. . .	. . .
INCLOSURE NO. 1:		
DRAWING OF PROPOSED		
AIR CONDITIONING.		
AJEUD 673 14 DECEMBER		
1953.		
1ST INDORSEMENT.		
SUBJECT: INSTALLATION		
OF AIR CONDITIONING		
EQUIPMENT.		
HEADQUARTERS X ARMY,		
FT. MU, GA.		
TO:	CHIEF OF ENGINEERS,	
	DEPARTMENT OF ARMY,	
	WASHINGTON 25, D. C.	18:0009
	COMMANDING GENERAL,	
	FT. ALPHA, N. C.	18:1001
	FT. BAKER, FLA.	18:1002
	CP. GAMMA, GA.	18:1003
	. . .	. . .

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	REQUEST FOR APPROVAL	
	OF	19:1
	(BLANK)	19:9
THE INSTALLATION OF AIR CONDITIONING EQUIPMENT AS PROPOSED IN BASIC LETTER	IS FORWARDED FOR APPROVAL AS AN EXCEPTION TO DEPARTMENT OF ARMY POLICY AS SET FORTH IN SR 420-430-1	20:1
	IS RETURNED FOR ADDITIONAL JUSTIFICATION	20:2
	IS APPROVED	20:3
	THE CHARACTER OF THE SPACE IS NOT GIVEN	21:01
	THE SIZE OF THE SPACE IS NOT GIVEN	21:02
	THE NUMBER OF THE OCCUPANTS OF THE SPACE IS NOT GIVEN	21:03
	THE USE OF THE SPACE IS NOT GIVEN	21:04

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	THE AVERAGE OUTSIDE DRY BULB TEMPERATURE IS NOT GIVEN	21:05
	THE AVERAGE INSIDE DRY BULB TEMPERATURE IS NOT GIVEN	21:06
	THE AVERAGE OUTSIDE WET BULB TEMPERATURE IS NOT GIVEN	21:07
	THE CAPACITY OF THE EQUIPMENT TO BE USED IS NOT GIVEN	21:08
	THE TYPE OF EQUIPMENT TO BE USED IS NOT GIVEN	21:09
	TASK REQUIRING AIR CONDITIONING FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS IS NOT GIVEN. UNDER THE PROVISIONS OF SECTION V OF DA CIRCULAR 113, 16 NOVEMBER 1953, REQUESTS WILL BE FORWARDED ONLY WHERE THE INSTALLATION CAN BE	

STANDARD FORM	CUSTOMARY ENTRIES	ELEMENTAL CONCEPTS
	JUSTIFIED AS ESSENTIAL	
	FOR THE ACCOMPLISHMENT	
	OF ASSIGNED MISSIONS.	21:10
	(BLANK)	21:99
	BY ORDER OF THE COM-	
	MANDING GENERAL	22:1
	FOR THE COMMANDING	
	GENERAL	22:2
	D. I. SIGMA, COLONEL,	
	A. G. C.	
	ADJUTANT GENERAL	23:10001
	C. O. KAPPA, MAJOR,	
	A. G. C.	
	ASSISTANT ADJUTANT	
	GENERAL	23:10002
	INCLOSURE NO. 2, ADDED:	
	FUNDS ALLOTMENT	
	DOCUMENT	24:1
	(BLANK)	24:9

Identification of Specific Entries.--The next operation that would be performed by the computer is comparable to taking the dimensions of a particular situation. The standard form with its lists of entries for the different blank spaces would

serve as the measuring stick, which is marked, for most dimensions, with words instead of numbers.

The process would be to compare the correspondence on the one hand with the standard on the other hand. This process is shown as follows with the astericks (*) indicating agreement.

CORRESPONDENCE	STANDARD FORM	ELEMENTAL CONCEPTS
HEADQUARTERS	HEADQUARTERS	
	FT. ALPHA, N. C.	01:1001
	FT. BAKER, FLA.	01:1002
CP. GAMMA, GA.	*CP. GAMMA, GA.	*01:1003
	FT. DELTA, MISS.	01:1004
	. . .	. . .
FILE NUMBER 673	FILE NUMBER 673	
	. . .	. . .
	8 NOVEMBER 1953	02:531108
	9 NOVEMBER 1953	02:531109
10 NOVEMBER 1953	*10 NOVEMBER 1953	*02:531110
	11 NOVEMBER 1953	02:531111
	. . .	. . .
SUBJECT: INSTALLATION OF AIR CONDITIONING EQUIPMENT.	SUBJECT: INSTALLATION OF AIR CONDITIONING EQUIPMENT.	
TO: COMMANDING GENERAL, X ARMY,	TO: COMMANDING GENERAL, X ARMY,	

CORRESPONDENCE	STANDARD FORM	ELEMENTAL CONCEPTS
FT. MU, GA.	FT. MU, GA.	
1. APPROVAL IS REQUESTED FOR INSTALLATION OF AIR CONDITIONING EQUIPMENT	1. APPROVAL IS REQUESTED FOR INSTALLATION OF AIR CONDITIONING EQUIPMENT	
	FOR ROOM 1	03:0001
	FOR ROOM 2	03:0002
	. . .	. . .
	*(BLANK)	*03:9999
	IN BUILDING 1	04:00001
	IN BUILDING 2	04:00002
	. . .	. . .
IN BUILDING 38424	*IN BUILDING 38424	*04:38424
	. . .	. . .
	(NOT GIVEN)	04:99999
THE FOLLOWING INFORMATION IS FURNISHED AS SUPPORTING JUSTIFICATION FOR AIR CONDITIONING:	THE FOLLOWING INFORMATION IS FURNISHED AS SUPPORTING JUSTIFICATION FOR AIR CONDITIONING:	
A. CHARACTER OF THE SPACE IS	A. CHARACTER OF THE SPACE IS	
	PERMANENT BUILDING	05:1
	SEMI-PERMANENT BUILDING	05:2

CORRESPONDENCE	STANDARD FORM	ELEMENTAL CONCEPTS
TEMPORARY BUILDING	*TEMPORARY BUILDING	*05:3
	(NOT GIVEN)	05:9
B. SIZE OF THE	B. SIZE OF THE	
SPACE IS FROM	SPACE IS FROM	
	. . .	. . .
	2000 TO 2500 SQ. FT.	06:39
2500 TO 3000 SQ. FT.	*2500 TO 3000 SQ. FT.	*06:40
	3000 TO 3500 SQ. FT.	06:41
	. . .	. . .
ETC.	ETC.	ETC.

Through this process the staff action represented by the message and its reply would be reduced to a series of numbers representing the elemental concepts that go to make up a specific situation, as follows:

XYZ -- IDENTIFICATION NUMBER

673.11 -- INSTALLATION OF AIR CONDITIONING EQUIPMENT

THE REQUEST:

01:1003 -- CP. GAMMA, GA.

02:561110 -- 10 NOVEMBER 1953

03:9999 -- (BLANK)

04:38424 -- IN BUILDING 38424

05:3 -- TEMPORARY BUILDING

06:40 -- 2500 TO 3000 SQ.FT.

07:18 -- 50 TO 60 PERSONS

08:213 -- A CLASSROOM

09:3 -- FROM 80° TO 90° F.

10:090 -- 90° F.

11:078 -- 78° F.

12:09 -- 10 TON

13:3 -- PACKAGE AIR CONDITIONING UNIT COMPLETE WITH AIR DISTRIBUTION SYSTEM AND COOLING TOWER

14:99 -- (NOT GIVEN)

15:01 -- AVAILABLE LOCALLY

16:2 -- FOR THE COMMANDING GENERAL

17:10033 -- L. F. ETA, MAJOR, A. G. C. ASSISTANT ADJUTANT GENERAL

THE REPLY:

18:0009 -- CHIEF OF ENGINEERS, DEPARTMENT OF ARMY, WASHINGTON 25, D. C.

19:1 -- REQUEST FOR APPROVAL OF

20:1 -- IS FORWARDED FOR APPROVAL AS AN EXCEPTION TO DEPARTMENT OF ARMY POLICY AS SET FORTH IN SR 420-430-1

21:99 -- (BLANK)

22:2 -- FOR THE COMMANDING GENERAL

23:10002 -- C. O. KAPPA, MAJOR, A. G. C. ASSISTANT ADJUTANT GENERAL

24:9 -- (BLANK)

Determination of Consistent Relationships.--The next process would be to determine whether the relationships of the various elemental concepts in the staff action are consistent with the relationships as conceived by the commander and his staff in their estimates of the situation, decisions, plans, regulations, physical laws, economic and engineering factors, etc. For this purpose, the automatic file would contain lists of relationships between elemental concepts and groups of concepts, showing which are consistent and which are inconsistent.

For example, the Special Regulation SR 420-430-1 lists certain spaces that are authorized air conditioning. These spaces are elemental concepts that would be assigned identifying numbers such as 08:100 through 08:199. The regulation reads in part "MECHANICAL COOLING EQUIPMENT MAY BE INSTALLED FOR THE TYPES OF ACTIVITIES AND INSTALLATIONS INDICATED BELOW:

A. CLINICS--DENTAL (08:101), E. E. N. & T. (08:102) AND SPECIAL TREATMENT (08:103),

B. FORTIFICATIONS--UNDERGROUND (08:111),

C. HOSPITAL CENTRAL SERVICE FACILITY (08:121),

D. LABORATORIES--ANIMAL HOUSE (08:131), PHOTOGRAPHIC (08:132), X-RAY (08:133), DENTAL (08:134), AND MEDICAL (08:135),

E. . . . "

This relation between THE USE OF THE SPACE to be air conditioned and the staff action of APPROVAL of the request might be shown in the automatic file as follows:

20:3 IS CONSISTENT WITH 08:100 TO 08:199

or stated another way,

IF: 08:100 TO 08:199

THEN: 20:3 IS CONSISTENT.

Translated or "recoded," this relationship would mean that in the situation (673:11) of a REQUEST FOR APPROVAL OF THE INSTALLATION OF AIR CONDITIONING EQUIPMENT, the concept (20:3) IS APPROVED is consistent with the class of concepts (08:100 TO 08:199) the USE OF THE SPACE is as a SPACE PERMITTED AIR CONDITIONING by the policy.

Special Regulation SR 420-430-1 also states that requests for air conditioning of SPACES NOT AUTHORIZED AIR CONDITIONING may be submitted to the Department of the Army, provided certain specific information is submitted as supporting justification. These items of information are also elemental concepts. The regulation reads: "... INSTALLATION OF EQUIPMENT IN EXCESS OF THAT PERMITTED BY THIS POLICY (08:200 TO 08:299) WILL REQUIRE SPECIFIC APPROVAL OF THE DEPARTMENT OF THE ARMY. SUCH PROJECTS WILL INCLUDE, AS SUPPORTING JUSTIFICATION FOR EXCEPTION TO DEPARTMENT POLICY, THE FOLLOWING SPECIFIC INFORMATION:

A. CHARACTER (05:1, 05:2, OR 05:3), SIZE (06:21 TO 06:70),

AND USE (08:100 TO 08:299) OF SPACE, AND NUMBER OF OCCUPANTS (07:01 TO 07:54).

B. AVERAGE OUTSIDE (09:1, 09:2, 09:3, OR 09:4) AND AVERAGE INSIDE (10:070 TO 10:130) DRY BULB TEMPERATURES BETWEEN 09:00 AND 17:00 HOURS FOR THE THREE WARMEST MONTHS.

C. AVERAGE OUTSIDE WET BULB TEMPERATURE FOR THE PERIOD OF TIME COVERED IN (B) ABOVE (11;060 TO 11:110).

D. CAPACITY (12:01 TO 12:40) AND TYPE (13:1 TO 13:7) OF THE EQUIPMENT TO BE USED.

In addition to the regulation, there was a Circular that required an additional item of information. It read, "... REQUESTS ... WILL BE FORWARDED FOR CONSIDERATION ONLY WHERE SUCH INSTALLATION CAN BE JUSTIFIED AS ESSENTIAL FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS (14:01 TO 14:60)." Further, the staff of Headquarters X Army had ruled that a request would either state that funds were available locally (15:01) or ask sufficient funds to accomplish the air conditioning (15:45 to 15:70). Thus there were eleven items of information (05:_ THROUGH 15:_) required. The omission of any of these eleven items of information could be shown by 9's in the last part of the code numbers, i.e. 05:9, 06:99, 07:99, 08:999, 09:9, 10:999, 11:999, 12:99, 13:9, 14:99, AND 15:99. Then a statement "NOT 05:9" would means that the item of information 05:_ was not omitted. "NOT 05:9, NOT 06:99, NOT 07:99, NOT

08:999, NOT 09:9, NOT 10:999, NOT 11:999, NOT 12:99, NOT 13:9, NOT 14:99, AND NOT 15:99" would indicate that all items of required information were contained in the request, so that the request could be forwarded (20:1) to the Department of the Army for approval. This relationship might be shown in the automatic file as follows:

IF: 08:200 TO 08:299
AND: NOT 05:9 AND
NOT 06:99 AND
NOT 07:99 AND
NOT 09:9 AND
NOT 10:999 AND
NOT 11:999 AND
NOT 12:99 AND
NOT 13:9 AND
NOT 14:99 AND
NOT 15:99
THEN: 20:1 IS CONSISTENT

If one or more of the required items of information are missing, the request would be returned (20:2). This relationship might be shown as follows:

IF: 08:200 TO 08:299 OR 08:999
AND: 05:9 OR
06:99 OR
07:99 OR

08:999 OR

09:9 OR

10:999 OR

11:999 OR

12:99 OR

13:9 OR

14:99 OR

15:99

THEN: 20:2 IS CONSISTENT

Since the blank space 20:_ can have only one of three entries (20:1 IS FORWARDED, 20:2 IS RETURNED, or 20:3 IS APPROVED), there are two inconsistent relationships for each of the consistent relationships shown in the foregoing. Each relationship could thus be extended to show both consistent and inconsistent relationships as follows:

IF: ...

THEN: 20:1 IS INCONSISTENT

20:2 IS INCONSISTENT

20:3 IS CONSISTENT

IF: ...

THEN: 20:1 IS CONSISTENT

20:2 IS INCONSISTENT

20:3 IS INCONSISTENT

IF: ...

THEN: 20:1 IS INCONSISTENT

20:2 IS CONSISTENT

20:3 IS INCONSISTENT

With this example we see how the relationships necessary for testing an item of information are developed from regulations, decisions, etc. The automatic file would contain the relationships needed to test each of the twenty-four items of information in the staff action, including not only those relationships based on Army regulations but also relationships based on engineering factors, economics, and the like. The size of the air conditioning unit, 12:09 10 TON, for example, would depend for consistency on: the location of the building, 01:1003 CP. GAMMA, GA.; the type of construction, 05:3 TEMPORARY BUILDING; the size of the space, 06:40 2500 TO 3000 SQ. FT.; the number of occupants, 07:18 50 TO 60 PERSONS; the use of the space, 08:213 A CLASSROOM; the average outside dry bulb temperature, 09:3 FROM 80° TO 90° F.; the average inside dry bulb temperature, 10:090 90° F.; the average outside wet bulb temperature, 11:078 78° F.; and the type of equipment, 13:3 PACKAGE AIR CONDITIONING UNIT COMPLETE WITH AIR DISTRIBUTION SYSTEM AND COOLING TOWER.

In this study, however, it was assumed that all the elemental concepts in the basic request, 01:_ through 17:_, were tested by the Staff Control Computer at Camp Gamma. Therefore, it would be necessary for the computer at

Headquarters X Army to test only the elemental concepts in the reply, 19:_ through 24:_. The nature of the reply, 20:_, would be tested for consistency with the use of the space, 08:_, and the eleven items of information, 05:_ through 15:_, needed in justification of a request for an exception to the Army policy. The statements requesting that certain information be submitted, 21:_, would be tested for consistency with the staff action of returning the basic request for additional information, 20:2, and the item or items of missing information, 05:_ through 15:_. The addressee of the reply, 18:_, would be tested for consistency with the nature of the reply, 20:_. The words, "REQUEST FOR APPROVAL OF," would be used, 19:1, or omitted, 19:9, depending on the nature of the reply, 20:_. The command line of the reply, 22:_, would be tested for consistency with the addressee, 18:_. The signer of the reply, 23:_, would be tested for consistency with the list of those authorized to sign and release messages. The allocation of funds document, if any, 24:_, would be tested for consistency with the request for funds, 15:_. The process of this testing for consistency might be as follows:

a. Read from the automatic file the set of relationships pertaining to elemental concepts being tested, 20:_.

   RELATIONSHIP 673:11 -1 (between 08: or use of space entries and 20: or the entries of approving the

request, forwarding the request, and returning the request for additional information).

IF: 08:100 TO 08:199 (A space authorized air conditioning)

THEN: 20:1 (forwarding the request) IS INCONSISTENT

20:2 (returning the request) IS INCONSISTENT

20:3 (approving the request) IS CONSISTENT

IF: 08:200 TO 08:299 (A space not authorized air conditioning)

AND: NOT 05:9 AND (The entry 05:9 is the
NOT 06:99 AND indication that the
NOT 07:99 AND space 05: is not filled.
NOT 09:9 AND NOT 05:9, NOT 06:99, etc.
NOT 10:999 AND would indicate all the
NOT 11:999 AND spaces were filled with
NOT 12:99 AND the required informa-
NOT 13:9 AND tion.)
NOT 14:99 AND
NOT 15:99

THEN: 20:1 IS CONSISTENT (forwarding request)

20:2 IS INCONSISTENT

20:3 IS INCONSISTENT

IF: 08:200 TO 08:299 OR 08:999

AND: 05:9 OR (Indicating that a required
06:99 OR item of information is
07:99 OR not given)
08:999 OR
09:9 OR
10:999 OR
11:999 OR
12:99 OR
13:9 OR
14:99 OR
15:99

THEN: 20:1 IS INCONSISTENT
20:2 IS CONSISTENT (returning the request)
20:3 IS INCONSISTENT

b. Compare the relationships with the elemental concepts in the staff action.

RELATIONSHIPS		TEST	STAFF ACTION
IF:	08:100 TO 08:199	no	08:213 (classroom)

(Since the test is negative, the computer at this point will shift to the next relationship.)

SHIFT

IF:	08:200 TO 08:299	yes	08:213
AND:	NOT 05:9 AND	yes	05:3 (temporary building)

RELATIONSHIPS		TEST	STAFF ACTION
NOT 06:99	AND	yes	06:40 (2500-3000 sq.ft.)
NOT 07:99	AND	yes	07:18 (50-60 persons)
NOT 09:9	AND	yes	09:3 (80° - 90° F.)
NOT 10:999	AND	yes	10:090 (90° F.)
NOT 11:999	AND	yes	11:078 (78° F.)
NOT 12:99	AND	yes	12:09 (10 tons)
NOT 13:9	AND	yes	13:3 (package unit)
NOT 14:99	AND	no	14:99 (not given)

(With this negative test, the computer will shift.)

	SHIFT		
IF: 08:200 TO			
08:299	OR	yes	08:213
08:999			
AND: 05:9	OR		05:3
06:99	OR		06:40
07:99	OR		07:18
08:999	OR		08:213
09:9	OR		09:3
10:999	OR		10:090
11:999	OR		11:078
12:99	OR		12:09
13:9	OR		13:3
14:99	OR	yes	14:99 (not given)
15:9			15:1

RELATIONSHIPS	TEST	STAFF ACTION
THEN:	20:1 IS INCONSISTENT	20:1 (is forwarded)
	20:2 IS CONSISTENT	
	20:3 IS INCONSISTENT	
	END	

c. Note the inconsistency, if any, if the staff action.

20:1 IS INCONSISTENT

d. If there is an inconsistency, search the relationship for the entry that would be consistent.

20:2 IS CONSISTENT

e. Rewrite the reply using the consistent elemental concepts.

ORIGINAL	REWRITE
18:0009	18:0009
19:1	19:1
20:1 (IS FORWARDED)	20:2 (IS RETURNED)
21:99	21:99
22:2	22:2
23:10002	23:10002
24:9	24:9

From this step on, the rewritten rather than the original reply would be tested.

f. Read from the automatic file the set of relationships pertaining to the next elemental concept to be tested, 21:_.

RELATIONSHIP 673:11 -2 (between 20:2 returning the request, 05: to 15: the information required, and 21: entries asking that the missing information be submitted).

IF: 20:2 (request is returned)

AND: 05:9 (character of building not given)

THEN: 21:1 IS CONSISTENT (submit information on character of the building)

IF: 20:2

AND: 06:99 (size not given)

THEN: 21:2 IS CONSISTENT (submit this information)

IF: 20:2

AND: 07:99 (number of occupants not given)

THEN: 21:3 IS CONSISTENT (submit this information)

IF: 20:2

AND: 08:999 (use of the space not given)

THEN: 21:4 IS CONSISTENT (submit this information)

IF: 20:2

AND: 09:9 (outside dry bulb temperature not given)

THEN: 21:5 IS CONSISTENT (submit this information)

IF: 20:2

AND: 10:999 (inside dry bulb temperature not given)

THEN: 21:6 IS CONSISTENT (submit this information)

IF: 20:2

AND: 11:999 (inside wet bulb temperature not given)

THEN: 21:7 IS CONSISTENT (submit this information)

IF: 20:2

AND: 12:99 (capacity of equipment not given)

THEN: 21:8 IS CONSISTENT (submit this information)

IF: 20:2

AND: 13:9 (type of system not given)

THEN: 21:9 IS CONSISTENT (submit this information)

IF: 20:2

AND: 14:99 (mission requiring air conditioning not given)

THEN: 21:10 IS CONSISTENT (submit this information)

IF: 20:2

AND: 15:9 (source of funds to be used not given)

THEN: 21:11 IS CONSISTENT (submit this information)

g. Compare the relationships with the entries in the re-written message.

RELATIONSHIPS		TEST	STAFF ACTION
IF:	20:2	yes	20:2
AND:	05:9	no	05:3
		SHIFT	
IF:	20:2	yes	20:2
AND:	06:99	no	06:40
		SHIFT	
IF:	20:2	yes	20:2
AND:	07:99	no	07:18

RELATIONSHIPS		TEST	STAFF ACTION
		SHIFT	
IF:	20:2	yes	20:2
AND:	08:999	no	08:213
		SHIFT	
IF:	20:2	yes	20:2
AND:	09:9	no	09:3
		SHIFT	
IF:	20:2	yes	20:2
AND:	10:999	no	10:090
		SHIFT	
IF:	20:2	yes	20:2
AND:	11:999	no	11:078
		SHIFT	
IF:	20:2	yes	20:2
AND:	12:99	no	12:09
		SHIFT	
IF:	20:2	yes	20:2
AND:	13:9	no	13:3
		SHIFT	
IF:	20:2	yes	20:2
AND:	14:99	yes	14:99
THEN:	21:10 IS CONSISTENT		
	(21:99) IS INCONSISTENT		21:99
		CONTINUE	

RELATIONSHIPS		TEST	STAFF ACTION
IF:	21:2	yes	20:2
AND:	15:9	no	15:1
		END	

h. Note the inconsistencies, if any, in the staff action.

21:99 IS INCONSISTENT

i. Determine the elemental concepts that would be consistent.

21:10 IS CONSISTENT

j. Rewrite the reply using the consistent elemental concepts.

ORIGINAL	REWRITE
18:0009	18:0009
19:1	19:1
20:1 (IS FORWARDED)	20:2 (IS RETURNED)
21:99 (BLANK)	21:10 (TASK REQUIRING AIR CONDITIONING AS ESSENTIAL FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS IS NOT GIVEN. UNDER THE PROVISIONS OF SECTION V OF DEPARTMENT OF ARMY CIRCULAR 113, 16 NOVEMBER 1953,

ORIGINAL	REWRITE
	REQUESTS WILL BE FORWARDED ONLY WHERE THE INSTALLATION CAN BE JUSTIFIED AS ESSENTIAL FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS.)
22:2	22:2
23:10002	23:10002
24:9	24:9

The other elemental concepts in the reply would also be tested. In our example, however, no further inconsistencies would be detected, so the additional tests are omitted for simplicity.

Print Out of Inconsistencies.--After the tests for consistency, the final process would be either to indicate that the staff action is free of inconsistencies or collect the inconsistencies together with the information as to what elemental concepts would be required for consistency and print out the information for reconsideration by the staff officer. These final steps might be as follows:

x. Pass the staff action as consistent.

STAFF ACTION XYZ:

NO INCONSISTENT CONCEPTS.

This step is not applicable to the example.

y. Collect the inconsistencies with related information.

STAFF ACTION XYZ:

ORIGINAL

18:0009

19:1

20:1 IS INCONSISTENT WITH 08:213 AND 14:99

21:99 IS INCONSISTENT WITH 20:2 AND 14:99

22:2

23:10002

24:9

REWRITE

18:0009

19:1

20:2

21:10

22:2

23:10002

24:9

z. Translate and print out the information.

STAFF ACTION XYZ:

... IS FORWARDED ..., 20:1, IS INCONSISTENT WITH THE USE OF THE SPACE AS A CLASSROOM, 08:213, AND THE TASK REQUIRING AIR CONDITIONING FOR ACCOMPLISHMENT OF MISSION NOT BEING GIVEN, 14:99. ALSO, REQUEST FOR ADDITIONAL INFORMATION BEING

BLANK, 21:99, IS INCONSISTENT WITH RETURNING THE REQUEST FOR ADDITIONAL INFORMATION, 20:2, AND THE ITEM OF MISSING INFORMATION, 14:99.

REWRITE TO ELIMINATE INCONSISTENCIES IS AS FOLLOWS:

... IS RETURNED FOR ADDITIONAL JUSTIFICATION, 20:2. TASK REQUIRING AIR CONDITIONING AS ESSENTIAL FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS IS NOT GIVEN. UNDER THE PROVISIONS OF SECTION V OF DA CIRCULAR 113, 16 NOVEMBER 1953, REQUESTS WILL BE FORWARDED ONLY WHERE THE INSTALLATION CAN BE JUSTIFIED AS ESSENTIAL FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS. ,..

With this information before the staff officer, he would have no difficulty in writing a reply that would be passed by the computer as consistent.

Standardization of Concepts.--Each customary entry for each space in each standard form is a symbol for an elemental concept. Standard forms, of course, include not only printed forms but also letters and messages written in prescribed form. Since there are tens of thousands of such forms, with up to hundreds of blank spaces that can be filled with two or three to many hundred customary entries, there would be billions of elemental concepts. Filing information on a billion concepts would be nearly impossible. This number, however, would be greatly reduced by standardization.

For example, "classroom" used in space 8 of the standard form used in our example would have the same meaning as "classroom" used in space 9 of the Fire Report Form, space 14 of the Real Property Record Form, space 3 of the Individual Project Estimate Form, space 2 of the Inspection and Service Record for Air Conditioning, space 2 of Building Electrical Inspector's Record, column 3 of the Analysis of Custodial Services Requirements Form, and the like. Therefore, instead of a different list of customary entries for each space of each form, standardized lists would be prepared that would serve for many forms. Thus billions of concept symbols would be reduced to hundreds of thousands of symbols. The necessity of this standardization is obvious.

Summary

Army staffs do a remarkable job of control of their armies considering the complexities of modern warfare and the quantities of detailed staff work required. However, present-day manual staff work would be too slow and would involve too much inconsistency of information for the electronic-atomic warfare of today.

Like the need of a horseshoe nail that caused the loss of the classical kingdom, a detailed staff action can have far-reaching results. Thus as much of the pertinent information available to the Army as possible should be brought to bear on each detailed decision. This would require considerable

information in the automatic files of an Army division staff and good inventory control of a mass of information in the staffs of larger Army units. Modern high speed electronic data-processing equipment is available for inventory control and processing of data. These machines require a system of language or code numbers with the exactness of mathematics -- a language as precise as the presence or absence of a hole in a given space on perforated tape. It was recognized that in the use of printed forms, of standard methods of correspondence and procedure, and of standard titles and abbreviations, the Army has a conventionalized language suitable for processing by computers.

All messages in conventionalized language could be compared with the information in the automatic file by a procedure like that outlined in this thesis. Information would be standardized and organized for storage in the automatic file so as to dovetail with customary expressions and standard forms of the Army conventionalized language. Command decisions and the overall plans would be indicated in the automatic file as lists showing which elemental concepts are consistent with decisions and plans and which under different situations are inconsistent.

Each message would be tested by the computer for consistency (a) by determining the nature of the specific situation involved, (b) by determining from the file which

customary expressions entered in the different spaces of the appropriate standard form would be consistent, (c) by noting any elemental concepts or entries in the message that are inconsistent, and (d) then by printing out inconsistent information for reconsideration by the staff officers. Messages with no inconsistent concepts would be indicated as "consistent" by the computer and dispatched by the staff. The technique would consist of using information from the message to locate information in the automatic file. This information in conjunction with additional information from the message would be used by the computer to locate additional information from the file. This procedure would be repeated until all the pertinent information on the situation from the file is brought to bear on the message and tested for consistency.

It is suggested that this is a practical method for high speed electronic correlation of messages with missions and other information in the files of an Army staff.

CHAPTER IV

CONCLUSION

The Staff Control Computer, in the present stage of development, would be unsuccessful in processing information if the messages to be handled are written in normal unrestricted language in which all types of variation occur. However, Army messages, far from being unregulated, are required to be written in a customary style using customary words and expressions. This is particularly true of operational messages. Army staff personnel could be trained to hold variations from conventionalized language to a minimum. The Staff Control Computer could then process the mass of Army staff information. Messages could be correlated with missions and other information in the files of the staff. Information received by the staff, put out by the staff, and circulated within the staff could be kept consistent with itself, the mission, the estimates of the situation, the command decisions, the plans, and the directives.

Since this thesis demonstrates a method that might be used, it was concluded that high speed electronic control, now used in weapons systems and being adapted for Army inventory control, could be adapted for staff control. It was concluded that high speed electronic staff control is feasible.

CHAPTER V

RECOMMENDATIONS

Much Needed Work.--It was obvious from the study that a great deal of work is necessary before the Staff Control Computer, though feasible, can be made a practical tool of Army command. What was done here is but preliminary to further study of the subject. One of the purposes of this study was to outline the common ground where those with computer know-how, linguists, and general staff officers can meet in common understanding of the task ahead in producing a machine to process Army staff information written in conventionalized language.

General Staff Officers.--For computer men and linguists we have discussed the Army technique of organizing information into "estimates of the situation," "decisions," "plans," "directives," and "reports." Also we have dealt with the problem of determining whether each additional item of information is consistent or not with previously received and organized information.

In this area the general staff officers have a task of improving the organization of the information available to the staff. Although procedures for organizing staff information are set forth in regulations and instruction manuals,

it is obvious, even to an outsider, that many Army actions are not taken in accordance with logically prepared "estimates of the situation," "decisions," and "directives." There are too many examples of actions being taken and then summarily reversed--of programs being started, stopped and started again on a different tack. This is reminiscent of the old method of fire control for guns where the first shot was fired at an assumed range without expectation of hitting the target. Then the range would be manually increased and decreased by intervals that were halved each time so that the shots would fall short of or over the target by lessening intervals until finally a shot was placed on the target. This method of fire control worked fairly well as long as the target moved slowly enough for the gunner to get the range before he ran out of ammunition or was himself put out of action.

However, in high speed modern warfare any manual, hit-and-miss method of fire control would be disastrous. A slow speed method of staff control might also be disastrous. Just as high speed electronic computers are needed for fire control, they are also needed for staff control. But before electronic computers, which are of necessity logical in their operation, can be fully exploited for staff control, all staff work must be performed more logically, even down to the elemental details. The major task of general staff officers, then, is to make all staff work more logical.

Computer Techniques.--For the linguists and the staff officers, we discussed the problems of computer programming. The mass of detail work that is necessary is usually comprehended with difficulty by those who habitually instruct human clerks instead of machines. So much of both language and staff work are handled intuitively by human clerks that supervisors usually give instructions in general terms expecting the clerks to use common sense to fill in the details.

Since computers have no built-in "common sense," they must be instructed in every detail. It is the task of the computer men to work out the intricate instructions or programs by which the computer would know what to do in every detail and with every exception to the common rules.

Linguists.--Brief references were made to the work of modern linguists in the mechanical translation from Russian and other languages into English, in the development of basic vocabularies and structural grammar. Language was considered here as a system of elemental symbols used to fill spaces in sentences, communications, and printed forms. This limited concept is sufficient for the great majority of Army language and is all that would be necessary for the initial installation of a Staff Control Computer, particularly at the Army division level for operational messages which already are highly standardized. Obviously, however, a more comprehensive concept of language would make the computer a much more

powerful tool of command.

In the final stage of development, the linguists have the principal task in dealing more comprehensively with the problems of language, together with the responsibility of devising vocabularies, definitions, lists of synonyms, and other information to be used by the Staff Control Computer in processing language information.

Pilot Installation.--The final recommendation of this thesis is that a pilot installation of a Staff Control Computer be set up by an Army unit to handle limited categories of staff information. This should be done as soon as practical. The handling of operational messages and reports at the Army division level is the logical first step. With the experience gained in this first step, further mechanization should be possible.

No amount of theorizing can serve the purpose of a practical demonstration. Before there could be an Air Force, the Wright Brothers had to take the first labored flight into the air. Before the high speed electronic weapon systems of today were possible, there were years of test installations for crude manual and mechanical range keeping. Before the full potentialities of the Staff Control Computer can be developed, a simple start must be made in mechanical processing of language in addition to numerical staff information.

Already rapid progress is being made in the machine

processing of numerical staff information. Inventory control systems have already been set up. Systems for the machine processing of cost accounting, operating data, and other categories of numerical staff information are being set up within the Army. The next step is to use high speed machine methods to process language staff information.

The processing of language as well as numerical staff information by Staff Control Computers is feasible. However, skill must be gained in the use of this tool of Army command, and the sooner a test installation can be made the better. World War III may not allow second guessing. When and if it comes, staff work must be fast and free of inconsistencies. Only with electronic machines skillfully used is such staff control possible.

APPENDIX

APPENDIX A

EXAMPLE OF STAFF ACTION USED FOR ILLUSTRATION

REQUEST

HEADQUARTERS CP. GAMMA, GA.

FILE NUMBER 673 10 NOVEMBER 1953

SUBJECT: INSTALLATION OF AIR CONDITIONING EQUIPMENT

TO: COMMANDING GENERAL X ARMY

FT. MU, GA.

1. APPROVAL IS REQUESTED FOR THE INSTALLATION OF AIR CONDITIONING EQUIPMENT IN BUILDING 38424. THE FOLLOWING INFORMATION IS FURNISHED AS SUPPORTING JUSTIFICATION FOR AIR CONDITIONING:

A. CHARACTER OF THE SPACE IS TEMPORARY BUILDING.

B. SIZE OF THE SPACE IS FROM 2500 TO 3000 SQ. FT.

C. THE NUMBER OF OCCUPANTS IS FROM 50 TO 60 PERSONS.

D. THE USE OF THE SPACE IS AS A CLASSROOM.

E. THE AVERAGE OUTSIDE DRY BULB TEMPERATURE BETWEEN 09:00 AND 17:00 HOURS FOR THE THREE WARMEST MONTHS IS BETWEEN 80° AND 90° F.

F. THE AVERAGE INSIDE DRY BULB TEMPERATURE FOR THE PERIOD OF TIME COVERED IN (E) ABOVE IS 90° F.

G. THE AVERAGE OUTSIDE WET BULB TEMPERATURE FOR THE

REQUEST (CONTINUED)

PERIOD OF TIME COVERED IN (E) ABOVE IS 78° F.

H. A 10 TON PACKAGE AIR CONDITIONING UNIT COMPLETE WITH AIR DISTRIBUTION SYSTEM AND COOLING TOWER WILL BE USED.

2. FUNDS FOR THE ACCOMPLISHMENT OF THIS WORK ARE AVAILABLE LOCALLY.

FOR THE COMMANDING GENERAL

L. F. ETA

MAJOR, A. G. C.

ASSISTANT ADJUTANT GENERAL

INCLOSURE NO. 1:

DRAWING OF PROPOSED AIR CONDITIONING

REGULATIONS

SPECIAL REGULATION
NO. SR 420-430-1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C.
12 DECEMBER 1950

MECHANICAL COOLING

1. THE POLICY PRESCRIBED IN THESE REGULATIONS IS APPLICABLE TO INSTALLATION OF MECHANICAL COOLING EQUIPMENT AND SYSTEMS IN EXISTING BUILDINGS AND IN NEW CONSTRUCTION PROJECTS WITHIN THE CONTINENTAL UNITED STATES AND OVERSEA COMMANDS.

2. MECHANICAL COOLING EQUIPMENT MAY BE INSTALLED FOR THE TYPES OF ACTIVITIES AND INSTALLATIONS INDICATED BELOW:

A. CLINICS--DENTAL, E.E.N.&T., AND SPECIALIZED TREATMENT.

B. FORTIFICATIONS--UNDERGROUND.

C. HOSPITAL CENTRAL SERVICE FACILITIES.

D. LABORATORIES--ANIMAL HOUSES, PHOTOGRAPHIC, X-RAY, DENTAL, E.E.N.&T., AND MEDICAL.

E. OPERATING ROOMS.

F. PROCESS SPACES--REQUIRING CONTROLLED ATMOSPHERIC CONDITIONS.

G. TELEPHONE SWITCHBOARD ROOMS--AUTOMATIC EQUIPMENT.

H. THEATERS--PERMANENT.

I. WARDS--FOR RECOVERY AND CRITICALLY ILL PATIENTS (NOT TO EXCEED 10 PER CENT OF HOSPITAL BED CAPACITY).

J. WARDS--SPECIAL TREATMENT FOR PARAPLEGICS, SPINAL

REGULATIONS (CONTINUED)

CORD INJURIES, BODY CAST, OBSTETRICS, NURSERIES.

3. EXCESS EQUIPMENT.--INSTALLATION OF EQUIPMENT IN EXCESS OF THAT PERMITTED BY THIS POLICY WILL REQUIRE SPECIFIC APPROVAL OF THE DEPARTMENT OF THE ARMY. SUCH PROJECTS WILL INCLUDE, AS SUPPORTING JUSTIFICATION FOR EXCEPTION TO DEPARTMENT OF ARMY POLICY, THE FOLLOWING SPECIFIC INFORMATION:

A. CHARACTER, SIZE, AND USE OF SPACE, AND NUMBER OF OCCUPANTS.

B. AVERAGE OUTSIDE AND AVERAGE INSIDE DRY BULB TEMPERATURES BETWEEN 09:00 AND 17:00 HOURS FOR THE THREE WARMEST MONTHS.

C. AVERAGE OUTSIDE WET BULB TEMPERATURE OR AVERAGE RELATIVE HUMIDITY FOR THE PERIOD OF TIME COVERED IN (B) ABOVE.

D. CAPACITY OF THE EQUIPMENT TO BE USED.

E. SKETCH INDICATING NUMBER, LOCATION AND SIZE OF EQUIPMENT, AND THE EXTENT OF THE ELECTRICAL AND DUCT WORK INVOLVED.

BY ORDER OF THE SECRETARY OF THE ARMY

JAMES L. ALPHA

CHIEF OF STAFF

UNITED STATES ARMY

REGULATIONS (CONTINUED)

OFFICIAL:

EDWARD F. NU

MAJOR GENERAL, U. S. A.

THE ADJUTANT GENERAL

DEPARTMENT OF THE ARMY

CIRCULAR NO. 113 WASHINGTON 25, D. C.

16 NOVEMBER 1953

. . .

SECTION V: RESTRICTION ON THE INSTALLATION OF AIR CONDITIONING EQUIPMENT

THE SECRETARY OF DEFENSE HAS DIRECTED THAT REQUESTS FOR INSTALLATION OF AIR CONDITIONING EQUIPMENT AS AN EXCEPTION TO POLICY SET FORTH IN SR 420-430-1, WILL BE APPROVED ONLY BY HIS OFFICE. REQUESTS FOR INSTALLATION OF AIR CONDITIONING EQUIPMENT, AS AN EXCEPTION TO POLICY UNDER THE PROVISIONS OF PARAGRAPH 3, SR 420-430-1, WILL BE FORWARDED FOR CONSIDERATION ONLY WHERE SUCH INSTALLATION CAN BE JUSTIFIED AS ESSENTIAL FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS.

BY ORDER OF THE SECRETARY OF THE ARMY

M. B. RHO

GENERAL, UNITED STATES ARMY

CHIEF OF STAFF

OFFICIAL:

J. MCC. PI

MAJOR GENERAL, UNITED STATES ARMY

THE ADJUTANT GENERAL

REPLIES

FIRST OF THREE POSSIBILITIES--FORWARDED

AJEUD 673 14 DECEMBER 1953

1ST INDORSEMENT

SUBJECT: INSTALLATION OF AIR CONDITIONING EQUIPMENT

HEADQUARTERS X ARMY, FORT MU, GEORGIA

TO: CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

WASHINGTON 25, D. C.

REQUEST FOR APPROVAL OF THE INSTALLATION OF AIR CONDITIONING EQUIPMENT IN BUILDING 38424 IS FORWARDED FOR APPROVAL AS AN EXCEPTION TO DEPARTMENT OF ARMY POLICY AS SET FORTH IN SR 420-430-1.

FOR THE COMMANDING GENERAL

C. O. KAPPA

MAJOR, A. G. C.

ASSISTANT ADJUTANT GENERAL

SECOND OF THREE POSSIBILITIES--RETURNED

AJEUD 673 14 DECEMBER 1953

1ST INDORSEMENT

SUBJECT: INSTALLATION OF AIR CONDITIONING EQUIPMENT

HEADQUARTERS X ARMY, FORT MU, GEORGIA

TO: COMMANDING GENERAL, CAMP GAMMA, GEORGIA

REQUEST FOR APPROVAL OF THE INSTALLATION OF AIR CONDITIONING EQUIPMENT IN BUILDING 38424 IS RETURNED FOR ADDITIONAL JUSTIFICATION. TASK REQUIRING AIR CONDITIONING AS ESSENTIAL

REPLIES (CONTINUED)

FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS IS NOT GIVEN. UNDER THE PROVISIONS OF SECTION V OF DA CIRCULAR 113, 16 NOVEMBER 1953, REQUESTS WILL BE FORWARDED ONLY WHERE THE INSTALLATION CAN BE JUSTIFIED AS ESSENTIAL FOR THE ACCOMPLISHMENT OF ASSIGNED MISSIONS.

BY COMMAND OF LIEUTENANT GENERAL BETA

C. O. KAPPA

MAJOR, A. G. C.

ASSISTANT ADJUTANT GENERAL

THIRD OF THREE POSSIBILITIES--APPROVED

AJEUD 673 14 DECEMBER 1953

1ST INDORSEMENT

SUBJECT: INSTALLATION OF AIR CONDITIONING EQUIPMENT

HEADQUARTERS X ARMY, FORT MU, GEORGIA

TO: COMMANDING GENERAL, CAMP GAMMA, GEORGIA

INSTALLATION OF AIR CONDITIONING EQUIPMENT IN BUILDING 38424 IS APPROVED. FUNDS FOR ACCOMPLISHMENT OF THE PROJECT ARE AVAILABLE LOCALLY.

BY COMMAND OF LIEUTENANT GENERAL BETA

C. O. KAPPA

MAJOR, A. G. C.

ASSISTANT ADJUTANT GENERAL

APPENDIX B

CODE FOR COMMUNICATION TYPE PERFORATED TAPE

WHEN PRECEDED BY:		111.11	110.11
		LETTERS	FIGURES
1.	000.01	E	3
2.	000.10	LINE FEED	LINE FEED
3.	000.11	A	-
4.	001.00	SPACE	SPACE
5.	001.01	S	/
6.	001.10	I	8
7.	001.11	U	7
8.	010.00	CARRIAGE RETURN	CARRIAGE RETURN
9.	010.01	D	$
10.	010.10	R	4
11.	010.11	J	?
12.	011.00	N	,
13.	011.01	F	:
14.	011.10	C	%
15.	011.11	K	(
16.	100.00	T	5
17.	100.01	Z	"
18.	100.10	L	)
19.	100.11	W	2

CODE FOR COMMUNICATION TYPE PERFORATED TAPE (CONTINUED)

WHEN PRECEDED BY:		111.11	110.11
		LETTERS	FIGURES
20.	101.00	H	#
21.	101.01	Y	6
22.	101.10	P	0
23.	101.11	Q	1
24.	110.00	O	9
25.	110.01	B	!
26.	110.10	G	&
27.	110.11	SHIFT TO FIGURES	NO SHIFT
28.	111.00	M	.
29.	111.01	X	*
30.	111.10	V	;
31.	111.11	NO SHIFT	SHIFT TO LETTERS

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