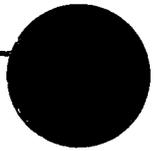


NMF



BY THE COMPTROLLER GENERAL

**Report To The Chairman, Committee On Appropriations**

**United States Senate**

OF THE UNITED STATES

x

**The Senate Should Explore Other Word Processing Alternatives To Improve Cost Effectiveness And Productivity**

Word processing systems are essential to the offices of U.S. Senators who respond annually to over 11 million letters from their constituents. The annual cost for equipment and personnel to develop and process responses is estimated at over \$28 million.

The word processing systems now used by the Senate may not be the best to meet this workload. In the past 5 years, significant technological developments have produced powerful and flexible new systems. These systems have the potential to help meet its growing correspondence while at the same time reduce its processing costs.

The Senate should delay its planned purchase of a new computer-based word processing system until it thoroughly analyzes available alternatives.

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COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON, D.C. 20548

B-199292

The Honorable Warren G. Magnuson  
Chairman, Committee on Appropriations  
United States Senate

Dear Mr. Chairman:

This report is submitted in response to your May 3, 1979, letter, jointly endorsed by Senators Sasser and Stevens, requesting us to perform a comprehensive review of the Senate's word processing needs and the methods currently employed to meet those needs, and to recommend improvements.

Your request for a review was a consequence of the May 1, 1979, hearing by the Legislative Branch Subcommittee of your Committee to review the Senate's computer services. During that hearing, Senators Long and Cranston expressed serious concern about the costs and effectiveness of the Correspondence Management System (CMS) which the Senate uses to respond to constituent mail. They proposed that we be assigned to review the word processing systems that are used in the Senate.

In recognition of those concerns we addressed three objectives in our review. We set out to:

- Determine the cost effectiveness of the Senate CMS as compared with the recently approved standalone video-display systems.
- Assess (1) the word processing needs of senatorial offices and (2) the staffs' satisfaction with their current word processing systems.
- Determine whether other word processing approaches are feasible.

In addition to these objectives, we also assessed the planning, management, and cost effectiveness of the communications network that is being developed to link Senators' State field offices with the CMS computer.

The recommendations proposed in this report are intended to assist the Senate in improving its management of current word processing capabilities, and in planning for the future

NCJRS

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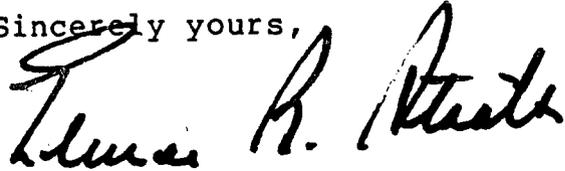
ACQUISITIONS

B-199292

needs of Member offices, particularly in view of the rapidly changing state of the art of office automation technology.

As arranged with your office we did not obtain comments on this report outside the Committee. Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from its date. At that time we will send copies to interested parties and others who request them.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Thomas R. Stauber". The signature is written in a cursive style with a large initial 'T'.

Comptroller General  
of the United States

**REPORT TO THE CHAIRMAN,  
SENATE COMMITTEE ON  
APPROPRIATIONS**

**THE SENATE SHOULD EXPLORE  
OTHER WORD PROCESSING ALTERNATIVES  
TO IMPROVE COST EFFECTIVENESS  
AND PRODUCTIVITY**

**D I G E S T**

By taking advantage of the rapidly changing state of the art of word processing, the Senate can improve its ability to respond to constituent mail at substantial savings.

Each year Senators receive more than 11 million letters from their constituents. Almost 40 percent of the Senate's personnel costs—\$24 million—is for staff who handle constituent mail. An additional \$4 million is spent on equipment, supplies, and support services.

It would be impossible for Senate offices to keep up with the flood of mail without automated word processing systems, which are used to respond to about 75 percent of Senate mail. Three types of systems are available:

- Correspondence Management System. A centralized, time-shared, computer based system used by 75 offices. The system is maintained and operated by a vendor of computer services. The Senate is expected to extend the vendor's contract for another year when the present contract expires on September 30, 1980.
- Standalone word processors. Two different video-display word processors and two different removable-memory word processors used by six offices.
- "Other" word processing equipment. Five different types of paper-display word processors used by 19 offices. These older, somewhat antiquated, word processing machines were acquired by the Senate over the past 10 years. (Throughout the report the word "other" will be used to refer to this third category of primary word processing systems used in the Senate.)

GAO surveyed and interviewed all 100 senatorial offices to determine their current and future word processing needs as well as to obtain workload and cost data to compare the Senate's three groups of systems. In addition, surveys were conducted with private and public sector organizations using word processing systems currently not available to Senators.

## STANDALONE SYSTEMS WERE LEAST COSTLY IN LETTER PRODUCTION

GAO found that correspondence production on the standalone system cost 34 percent less than on the Correspondence Management System (CMS) and 38 percent less than on the other systems. The variance in letter costs between CMS and the standalone offices was due to differences in the cost of equipment, supplies, and support. For offices using the other systems, this cost difference was due to a combination of both higher personnel and equipment costs.

## CMS HAS ADDITIONAL CAPABILITIES WHICH MAY JUSTIFY ITS HIGHER COST

CMS offers features which go beyond simply producing correspondence, features which were developed specifically to improve the overall efficiency of senatorial offices in managing their correspondence workload. These capabilities—available only to CMS offices—include management reporting, casework management, mailing list maintenance, high-speed production printing, and indexing and filing of correspondence. GAO found that the special features CMS offers have become an essential part of most of these offices' correspondence systems. Although it costs 34 percent more to produce a letter on CMS than on the standalone systems, the additional CMS capabilities appear to justify the added cost.

## THE CURRENT APPROACH TO NETWORK COMMUNICATIONS HAS BEEN POORLY DEVELOPED

A rapidly growing use of CMS involves workstations installed in Senators' State offices which tie into the Senate computer center via a data communications network. At the time of GAO's audit, 19 Senators with 24 field offices were using this network. A total of 55 field locations are scheduled to be in operation by the end of fiscal 1980.

GAO found that there had been inadequate planning for the development of the Senate network even though funds were specifically allocated for this purpose. Without an analysis of data communication requirements and a rigorous evaluation of the tradeoffs of feasible alternative network structures, there can be no assurance that the Senate's current network development is taking the most effective approach. GAO compared the cost of the Senate's current network structure with cost estimates from commercial network services and found the commercial services cost over 20 percent less than the Senate's approach.

## AN ALTERNATIVE FOR THE FUTURE

Significant technological developments in distributed-logic word processing systems have rapidly advanced the state of the art in word processing

over the past 5 years.<sup>1</sup> These systems have grown in power and flexibility, have become simpler to operate, and are cheaper to acquire.

GAO surveyed seven organizations which use distributed-logic systems to process correspondence workloads similar to that of a Senator. These systems offer the same letter assembly and production capability as CMS, but even greater text editing power and flexibility. In addition, they can operate as autonomous standalone word processors in an individual office; however, they can also communicate via a telephone network with other offices as well as with a large central computer when it is necessary to generate mailing lists, indexes, and management reports.

Compared to the current configuration of CMS in the Senate, distributed-logic systems offer significant cost savings. GAO's analysis indicates that the Senate could save over \$1 million per year over the next 5 years if it were to replace CMS with a distributed-logic system. Serious consideration should be given to testing and designing an implementation plan for such a system to help the Senate meet its future word processing needs.

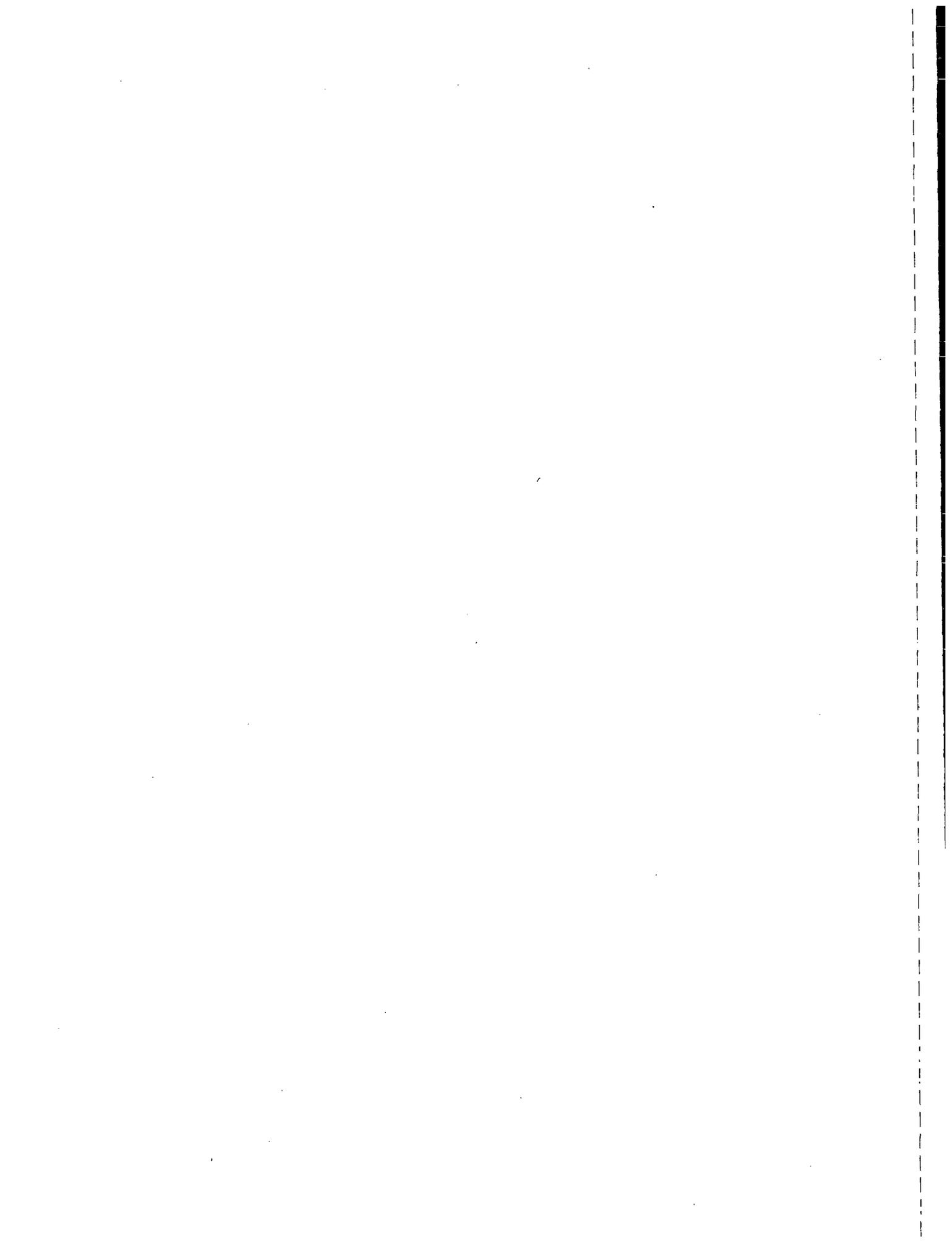
## RECOMMENDATIONS

GAO recommends that the Senate consider the following:

- Test alternative word processing systems in Senators' offices. The Senate should fully explore and evaluate an alternative word processing approach based on the use of distributed-logic systems.
- Defer its consideration of purchase of the Correspondence Management System until the design study is completed. The Senate needs time to explore the distributed-logic system alternative before deciding whether to purchase the CMS.
- Evaluate alternative commercial data communications network structures to determine potential benefits and costs.
- Replace older, other word processing systems as quickly as possible to improve the productivity of offices where these systems are used to process correspondence.

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<sup>1</sup> Distributed-logic word processing systems are multiterminal systems which share peripherals (e.g., printers) and sometimes storage, but disperse computing power among individual workstations or system components.



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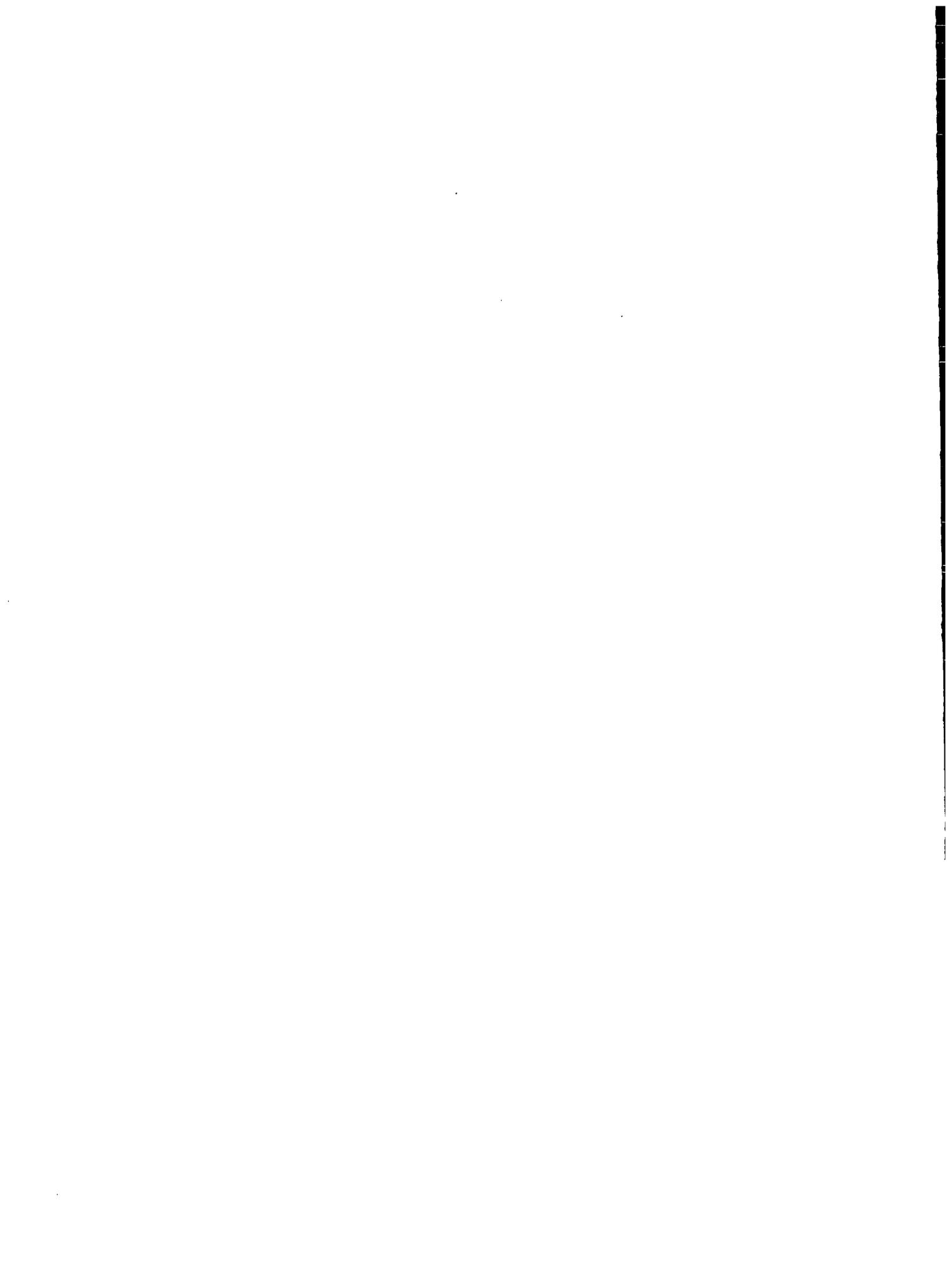
ABBREVIATIONS

CMS	Correspondence Management System
GAO	General Accounting Office
GSA	General Services Administration

## GLOSSARY

Automatic typewriter	The simplest form of word processor. Used for straight, repetitive output requiring little or no text editing.
Baud	In communications, a unit of transmission speed; generally a Baud will equate to a bit (of data) per second.
Data communications	The transmission and reception of encoded information over telephone lines between terminals or between terminals and computers.
Disk	A high-capacity magnetic storage medium which enables data to be stored randomly and retrieved by an address location. Disks may be nonremovable or removable, allowing replacement for text file changes or additional text storage. Capacities range from 500 to 1,000 pages of text per disk.
Diskette or floppy disk	A magnetic storage medium constructed as a flexible disk of magnetic coated mylar enclosed in a protective envelope, ranging in size from 5.5" to 7.8" in diameter, and capable of storing approximately 60 pages of text.
Distributed-logic word processing system (sometimes referred to as distributive system)	A multi-terminal system which shares peripherals and sometimes storage, but disperses computer power (logic) among individual stations or system components.
Intelligent terminal	A terminal with logical capability; a remote device which is capable of performing processing functions upon input or output data.
Mag card	A magnetic storage medium constructed as a tab-sized card coated with magnetic material, holding about 50 to 100 lines of text and codes.
MCST	The Mag Card Selectric Typewriter, an IBM paper-display word processing typewriter that employs a reusable, recording mag card medium.
Memory typewriter	A typewriter that is capable of storing material as typed and playing it back automatically. Memory typewriters generally have some text input features, and compete in the low end of the word processing market (see app. I).
Microprocessor	An integrated circuit which contains the logic elements for manipulating text/data and performing processing operations on it.

MTST	The Magnetic Tape Selectric Typewriter, an IBM paper-display word processing typewriter that employs as its medium a magnetic tape loaded into a cartridge.
Modem	Contraction of "modulator-demodulator," a device which modulates and demodulates signals transmitted over communications facilities; that is, converts digital signals into voice-like (analog) signals for transmission over a telephone line. At the other end of the line, another modem converts the analog signals back into digital form.
Paper-display system	Mechanical word processing system in which the "display" is entirely paper. As the operator keys in the information, the text is printed directly on paper.
Peripheral equipment	Devices (such as printers, optical character readers, and communications equipment) which may be configured with word processing systems as options, extending their capabilities.
Processing unit	A computer or part of a computer capable of receiving data, manipulating it, and supplying results.
Repetitive typewriter	Synonymous with automatic typewriter.
Standalone word processor	The classic, single-station word processor such as a paper-display or video-display system which does not share the processing power of a central computer.
Telecommunications	The transmission/reception between terminals, or between terminals and computers, of digitized information over telephone lines.
Terminal	In general, a device equipped with a keyboard that is connected to a computer or word processor for the input of text or data.
Video-display system	An electronic keyboard, usually with a separate printer, an internal memory, magnetic recording capability, and a visual display screen.
Word processing system	Specific hardware, software, and peripheral devices to record, store, or display text in order to facilitate its manipulation, revision, and transformation into a readable form.



## CHAPTER 1

### INTRODUCTION

The function of receiving, routing, and responding to mail is one of the most vital and staff-intensive operations of a senatorial office. The Senate annually spends an estimated \$28 million in personnel, equipment, supplies, and maintenance for approximately 9 million responses to over 11 million letters from constituents. The topics of constituent mail cover the entire spectrum of activity in a Senator's office, including legislation, casework, national and State politics, grants, invitations to speak, petitions, and special requests. Through this stream of correspondence which flows into a Member's office, constituents not only command access to their Senators, but they expect prompt and even personal attention to their correspondence. Although the mail does oblige Senators to respond directly to their constituents, it also furnishes them with useful information with which to gauge their constituency's views on various topics and legislative issues.

#### AUTOMATION IS ESSENTIAL FOR HANDLING INCREASING VOLUMES OF SENATE MAIL

The annual growth in the volume of mail for the entire Congress has been dramatic, increasing from 14.6 million letters in 1970 to 53 million letters in 1976—an increase of more than 300 percent.<sup>1</sup> In our review, we found that senatorial offices expect an average increase in incoming mail of 8 percent per year for the next 5 years.

In the Senate, mail is not merely answered; it is processed. It must be received, logged, and indexed; sorted and reviewed; analyzed and researched; and eventually answered and filed. The product of this process—the Senator's reply itself—must undergo a process of drafting or assembly, production, and review before it is signed and mailed.

Senatorial responses to the huge volume of incoming mail are impossible to handle unless mail processing and paperwork management are streamlined. In search of more efficiency, the Senate installed a variety of automated equipment and systems in the Members' offices, including a centralized computer-based system to ease its mail burden.

#### EACH SENATE OFFICE HAS A PROCESSING SYSTEM FOR LEGISLATIVE AND CASEWORK MAIL

Procedures for receiving, routing, and responding to constituent mail vary from office to office, and each office has its own system for processing mail. For purposes of this study, incoming constituent mail may be categorized into two broad classes, both of which generate high-volume repetitive letter production and require the highest priority: legislative mail and casework mail.

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<sup>1</sup> Cited in the Congressional Management Foundation seminar, "The Ebb and Flow of Mail," Nov. 9, 1979.

Legislative mail deals with substantive issues such as the Panama Canal treaty, the SALT agreements, the energy crisis, and the like. Responses to legislative mail are generally the products of a letter "assembly" operation. Standardized paragraphs (or, in some cases, entire letters) are selected from a repertoire of previously prepared responses and then assembled into a context suitable to the issue.

A generalized description of the most common legislative mail processing functions is illustrated in the flow chart in figure 1. The chart depicts the mail flow from the time a letter is received in the office's mailroom until a reply is signed, stuffed, sealed, and posted to the constituent.<sup>1</sup>

The second category of mail—casework mail—generally comes from constituents who need the Senator to act as a middleman on their behalf, particularly to resolve abuses or to cut through red tape in the Federal bureaucracy. Casework mail deals with such constituent problems as obtaining immigration visas, recovering lost social security checks, appealing rejected Veteran Administration loans, and the like.

Casework mail is usually answered by caseworkers assigned to a particular subject area. The caseworkers generally send a copy of the constituent's letter to the appropriate agency, with a personally prepared or standardized cover letter requesting the agency's assistance in expediting the matter. A separate letter signed by the Senator is also sent to the constituent, to show that the Senator is looking into the matter. If no action occurs, interim follow-up letters are sent every few weeks until the matter is resolved. Finally, a closeout letter with a copy of the agency's final reply is sent to the constituent. (See p. 12 for a detailed flow chart of the casework process.)

#### PRIMARY WORD PROCESSING CAPABILITY IN SENATORIAL OFFICES VARIES, DEPENDING ON THE TYPE OF SYSTEM UTILIZED

The terms "word processing," "text editing," or "text processing," are synonymously used by the office automation industry to define an activity in which a keyboard device is used to store or display text in order to facilitate the revision of the text and the eventual automatic "printing" (typing) of the revised text.<sup>2</sup>

In the Senate, the equipment used as the primary word processing capability varies from office to office.<sup>3</sup> This equipment produces on the average almost 75 percent of all mail in a Senator's office. Currently Member offices can choose to use one of three categories of word processing systems:

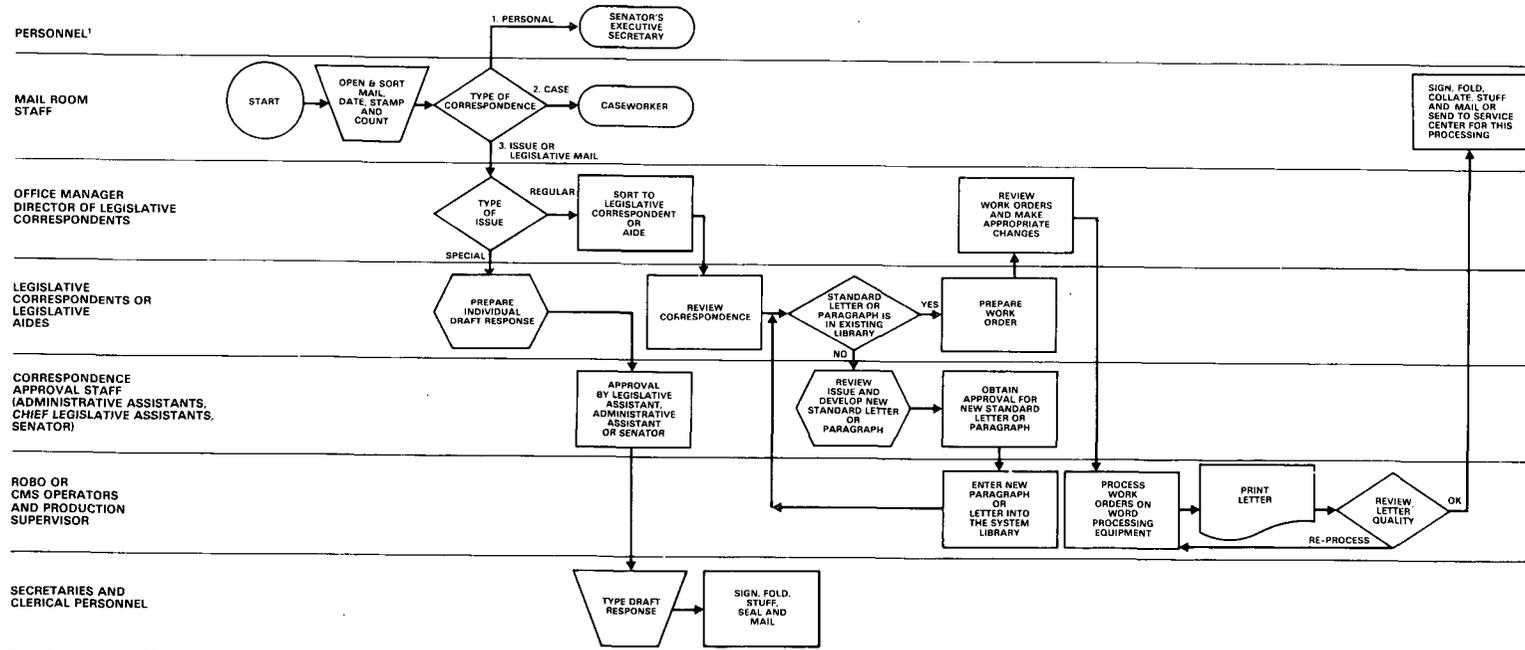
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<sup>1</sup> Many of the detailed review and approval procedures used by these offices are not shown because they vary from office to office. Also excluded from the chart are the processes for handling personal mail and casework.

<sup>2</sup> A glossary of word processing terms used in this report follows the table of contents.

<sup>3</sup> Primary system denotes the system the office relies on to produce the majority of its correspondence and is generally the most technologically advanced system in the office. A more comprehensive functional overview of the Senate's word processing capabilities is discussed in app. I.

FIGURE 1. PROCESSING LEGISLATIVE MAIL IN SENATORIAL OFFICES



NOTE: PERSONNEL TITLES ARE ONLY FOR EXAMPLE. THE SAME STAFF MAY BE INVOLVED IN SEVERAL OPERATIONS DESCRIBED ABOVE.

Correspondence Management System (CMS)	Centralized, timeshared, computer-based system used by 75 offices
Standalone word processors	Including two types of video-display word processors and two different removable memory word processors used by six offices <sup>1</sup>
Other word processing equipment	Five types of paper display word processing equipment used by 19 offices <sup>2</sup>

The approach to automating the correspondence function varies according to the volume of mail processed, the size and organization of the staff, and the particular management style of an office. Most senatorial offices use more than one class of equipment for letter production and word processing activities. For example, an office might use either the computer-based CMS or standalone equipment for their primary letter production capability, but use as a secondary system one of the paper-display units for text editing functions. The total word processing capability in senatorial offices, including backup (secondary) systems and primary systems, is illustrated in figure 2 on page 5. (The introduction to app. II elaborates further on the distinctions between primary and secondary word processing systems being used in Member offices.)

#### THE SENATE HAS DEVELOPED A CENTRALIZED APPROACH TO AUTOMATING CORRESPONDENCE MANAGEMENT

Senate efforts to develop a centralized automated correspondence management capability officially began in August 1975 with a test authorized by the Chairman of the Senate Rules Committee. The test, conducted in one Senator's office by the Committee's Computer Services Staff, was to determine whether computers could be used economically to handle constituent correspondence.

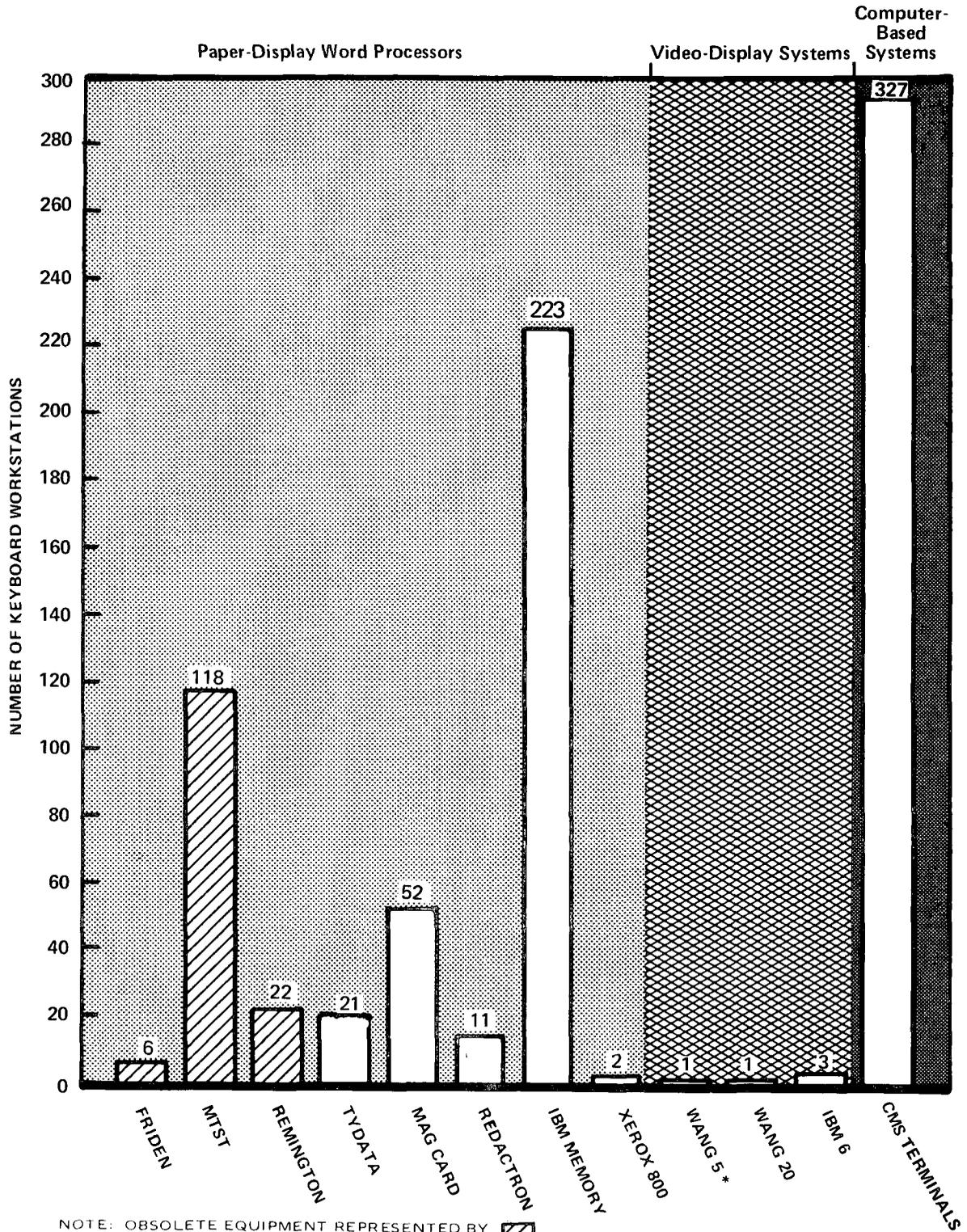
The results were encouraging enough to warrant a full scale operational test in October 1975 of two commercially available computer-based systems in four other senatorial offices. Eight months later, the pilot test was officially recognized as a Senate project, and funds were allocated for the acquisition of the Senate Correspondence Management System.

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<sup>1</sup> At the completion of our audit work 13 offices were using the standalone systems and 8 offices were still using the other equipment.

<sup>2</sup> This equipment is older, and in some cases somewhat antiquated. word processing equipment acquired by the Senate over the past 10 years. Throughout this report, "other offices" and "other equipment" refers to this third category of primary word processing system used in the Senate.

FIGURE 2  
OVERALL SENATE WORD PROCESSING CAPABILITY



NOTE: OBSOLETE EQUIPMENT REPRESENTED BY 

\*During our survey this Wang 5 was replaced by the Wang 20.

In keeping with the guidelines for computer services adopted by the Senate Rules Committee (July 21, 1971), the Computer Services Staff was given responsibility for procuring services and supervising the implementation of the CMS until it was ready to be turned over to the Sergeant at Arms for operation. In July 1976, a request for proposal was issued to 70 prospective bidders and a contract was awarded in May 1977 to On-Line Systems, Inc., to implement and maintain the CMS.

From the standpoint of functional utility and management control, the CMS was conceived by the Senate from the beginning as more than a letter production system. It was required to perform centralized indexing, filing, and retrieval functions and maintain central indexes and mailing lists in accordance with Senate rules.<sup>1</sup> As an office management tool, the CMS was designed to produce reports on various correspondence management functions in senatorial offices. These reports were developed to help office managers and supervisors interpret the issues of incoming mail, assess the efficiency and effectiveness of office staff in responding to mail, and update office mailing lists and topical indexes.

The CMS is in its third year of operation in the Senate and, as stated earlier, three-fourths of the Members have chosen to use the system. The current contract with the vendor will expire on September 30, 1980, and the Senate is expected to extend the contract for another year.

#### RECENT SENATE EXPERIMENTS WITH DECENTRALIZATION HAVE BEEN LIMITED TO TESTS OF STANDALONE EQUIPMENT

During July 1978 hearings held by the Senate Rules Committee, proponents of a decentralized word processing concept asked the Committee to change the rules and permit Senators to lease word processing equipment with funds from their regular office allowances. They argued that advances in technology have made newer types of standalone systems more cost effective and more user oriented than the CMS computer-based approach. Their testimony also indicated that the managerial style and correspondence procedures of some senatorial offices were not easily accommodated by the CMS letter-assembly type of operation. To these Senators, the CMS features of management reporting, high-speed printing, and mass storage are secondary to the quality of output, a more individualized response to constituent mail, and greater control over correspondence operations.

Although the Committee did not change the rules, it did authorize a test of selected standalone word processing systems. In July 1978, Committee staff reported on 10 different configurations that were tested and rated against 11 functions associated with high-volume correspondence production.

On the basis of this report, the Rules Committee, on August 2, 1978, directed its staff to test four new standalone word processing systems: IBM System 6, IBM 6640, Wang WP-5,

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<sup>1</sup> Senate rules prohibit Senators from using Senate computer facilities to store, maintain, or process any mailing lists, labels, or computer tapes for political campaign purposes.

and Xerox 800, for a period not to exceed 6 months. The Committee planned to wait until after the test period to decide on new word processing equipment to replace the old automatic typing equipment for those Senators who did not want to utilize CMS.

On April 4, 1979, the Technical Services staff reported to the Rules Committee the results of the pilot test of these standalone systems. On the basis of that report, the Rules Committee, in July 1979, authorized a change in the regulation governing acquisition of office equipment. New offices were given a choice of systems. Equipment was to be provided according to a schedule based on constituent population and the rated production capacity of the equipment. In addition, the four tested systems were added to the list of approved equipment.

#### PURPOSE AND SCOPE OF THE REVIEW

During May 1, 1979, hearings before the Appropriations Committee's Legislative Branch Subcommittee two issues were raised—(1) the cost effectiveness of the word processing systems currently being used in the Senate and (2) whether the CMS should be purchased and brought in-house during fiscal 1981. Consequently, Committee Chairman Magnuson, together with Subcommittee Chairman Sasser and Ranking Minority Member Stevens, requested the General Accounting Office to evaluate these issues in a review of correspondence management in the Senate. Chairman Pell and Ranking Minority Member Hatfield, of the Senate Rules and Administration Committee, requested the results of the review. Based on these requests and subsequent discussions with the staff of these committees, GAO planned a review to answer the following four questions:

- How effective is the CMS compared to alternative standalone systems being used in the Senate? (See ch. 2.)
- What are the word processing needs of Member offices and how satisfied are they with their current word processing systems? (See ch. 4 and app. III.)
- Are there alternative systems that are more cost effective than the Senate's current approach to word processing? (See ch. 4.)
- Should the CMS be purchased by the Senate?

In addition to responding to these questions we sought to assess the planning, management, and cost effectiveness of the Senate's communication network that is being developed to link State field offices with the CMS. (See ch. 3.)

Our review included (1) a detailed audit of 12 Senators' offices using either the Correspondence Management System or the recently approved standalone systems, (2) a survey administered in all 100 Senators' offices, (3) interviews with 47 private and public sector organizations to identify word processing applications handling correspondence workloads similar to those in senatorial offices, and mail surveys of seven of these organizations, (4) guidance provided by an advisory panel composed of office managers and executive assistants from senatorial offices, and experts from Federal and private sector organizations, and (5) numerous interviews with the technical and professional staff of the Rules and Administration Committee, the Senate computer center, the office of the the Sergeant at Arms, and other personnel in the Senate.

## CHAPTER 2

### COST ANALYSIS OF THE CMS VERSUS THE STANDALONE SYSTEMS AND OTHER WORD PROCESSING EQUIPMENT

Our analysis indicated that of the three categories of word processing systems, the stand-alone systems produced letters at the least cost. However, the higher CMS costs may be justifiable to those users who require the additional CMS capabilities that are currently not available on the other systems. These capabilities include management reporting, case-work management, and automatic updating of an office's mailing list.

#### CMS IS MORE COSTLY

The cost analysis shows that the average cost per letter is higher for the CMS than for the stand-alone systems but slightly less than for the other systems. (See app. II.) The average cost per letter was calculated by dividing the total costs of resources used by the total number of letters produced on each office's primary word processing system.

The resources used to produce correspondence on each of the systems included personnel costs, equipment costs (or share of the CMS contract costs), supplies, and the office's share of Senate support staff costs.

Using letter production data collected during our interviews, we estimated each office's annual mail volume. We then attempted to verify our estimates by using available internal office management reports and by followup discussions with the office production staff.<sup>1</sup>

The results of our cost analysis, shown in table 1, indicate that the average letter cost for stand-alone offices is 61 cents, or 34 percent less than that for the CMS offices. However, the average letter cost for the 19 offices using the other systems is 10 cents, or 6 percent higher than that for CMS offices. In addition, we found that the range of average letter costs varied significantly for the three primary word processing systems.

**Table 1**

#### **Average Letter Cost by Primary Word Processing System**

<u>System/number of offices</u>	<u>Average letter cost</u>	<u>Range</u>
CMS/73 <sup>a</sup>	\$ 1.77	\$ .49 to \$ 5.51
Standalone/6	1.16	.43 to 2.19
Other/19	1.87	.12 to 7.88

<sup>a</sup> The personnel cost data in two offices was unobtainable so their average letter cost could not be included.

<sup>1</sup> In the case of CMS offices the letter production data is produced by computer.

The differences in average letter costs between CMS, standalone, and other systems can best be explained by table 2, which shows those costs based on two major components—(1) equipment, support, and material costs and (2) personnel costs.

**Table 2**  
**Components of Average Letter Cost**

<u>System/number of offices</u>	<u>Equipment support and material costs</u>	<u>Personnel costs</u>	<u>Total costs</u>
CMS/73 <sup>a</sup>	\$ .99	\$ .78	\$ 1.77
Standalone/6	.31	.86	1.17
Other/19	.60	1.27	1.87

<sup>a</sup> The personnel cost data in two offices was unobtainable so their average letter cost could not be included.

The difference in average letter costs between the standalone and CMS offices is not due to personnel cost but to a 60-cent difference in the cost per letter for equipment, material, and support. However, the difference in average letter costs between the standalone and other offices is a combination of higher personnel cost (41 cents per letter) and equipment, material, and support cost (29 cents per letter).

In addition to the differences between the average letter costs for the three primary word processing systems, table 1 shows a wide range between these costs for individual Member offices. Table 3 shows the distribution of these costs.

**Table 3**  
**Distribution of Average Letter Costs**

<u>Range</u>	<u>CMS offices</u>		<u>Standalone offices</u>		<u>Other offices</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
\$ .12 - 1.00	17	23.3	4	66.6	8	42.1
1.01 - 1.25	14	19.1	-	-	2	10.5
1.26 - 2.00	17	23.3	1	16.7	5	26.3
2.01 - 3.00	17	23.3	1	16.7	-	-
3.00 - 8.00	8	11.0	-	-	4	21.1
Total	73	100.0	6	100.0	19	100.0
<b>Average Letter cost</b>	\$ 1.77		\$ 1.16		\$ 1.87	

A primary reason for the wide range in average letter costs between Member offices is the variation in volume of outgoing letters. The greater the volume the lower the average cost. This was true for all three categories of systems. For example, the 11 CMS offices whose monthly mail volume ranged from 10,000 to 20,000 letters had an average letter cost of \$1.11 as compared to \$2.07 for the 15 offices that produce only 3,000 to 5,000 letters per month on the system.

Although we found the unit cost differences between CMS and the standalone system to be significant, the additional capabilities offered by CMS were not incorporated into this cost analysis.

### **CMS HAS ADDITIONAL CAPABILITIES WHICH MAY JUSTIFY ITS HIGHER COST**

Unlike the standalone and other systems, the CMS provides capabilities which go beyond simply producing letters. These include management reporting, casework management, high-speed/production printing, mailing list maintenance, and indexing and filing of correspondence. The designers of the CMS extended its capabilities to enhance the efficiency of Member offices. These capabilities are available to all offices using the CMS. The acceptance and satisfaction of the 75 Member offices using the CMS indicate that for these offices the Senate has done an adequate job of meeting their needs. The additional capabilities have become an established part of the offices' correspondence function. Although we found the average letter cost for CMS to be 34 percent higher than for the standalone systems, its additional capabilities appear to justify this cost differential. The other systems were judged to be inferior to both CMS and the standalone systems.

We discuss the additional capabilities of the CMS in the following sections. We sought to determine how important these capabilities were to the offices using them, as well as how the user offices rated them. In addition, we sought to determine what additional clerical work, if any, was required of the offices whose systems do not currently provide these capabilities.

#### **Management reporting**

A key feature of the Correspondence Management System is its ability to generate management reports designed to assist a Senator's staff with its correspondence. They provide daily, weekly, and monthly data on various correspondence activities in senatorial offices, including workload and issue reports, mailing list management reports, reports on the office's library of standard paragraphs, as well as reports indicating when followup of correspondence is required.

We surveyed the senatorial offices receiving these management reports, and found that 88 percent of the offices considered the reports useful in their mail operations.

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<sup>1</sup> This comparison was based on an effectiveness index which consists of two qualitative ratings of each system's capabilities; (1) office ratings of satisfaction and (2) the Advisory Panel's ratings of importance. (See p. 39 for a fuller discussion of this analysis.)

Lacking the CMS capability, the Member offices who use standalone or other word processing systems manually prepare a limited number of reports which can generally be categorized as (1) workload reports, which summarize correspondence received and sent out and (2) issue reports, which statistically highlight the topics most frequently addressed in correspondence. By comparison, the management reports provided by the CMS offer much more information.

### Casework management

Another added feature of the CMS is the casework management system. It is designed to assist caseworkers in effectively managing, controlling, tracking, and following up on constituent cases, a process which can span several months. (See fig. 3 on p. 12 for a flow chart on casework processing.) The casework management system automatically tracks the status and final disposition of cases, and by means of a tickler report prompts appropriate follow-up.

At the beginning of our audit, only 10 of the 75 Senators with the CMS were also using the casework management feature in Washington. However, at the end of our audit, we were informed that this number had grown to 25 offices. The results of our survey indicate that most of the 10 offices using the casework management system rated this feature as good or very good.

By comparison, senatorial offices that use standalone or other word processing systems must manually prepare case letter responses, case history and management reports, and agency names and addresses. The staff must manually type individual letters for each case and each agency contact. In some CMS offices they have modified the system to develop their own casework system. In other offices they use their secondary word processing systems to process casework.

### Production printing

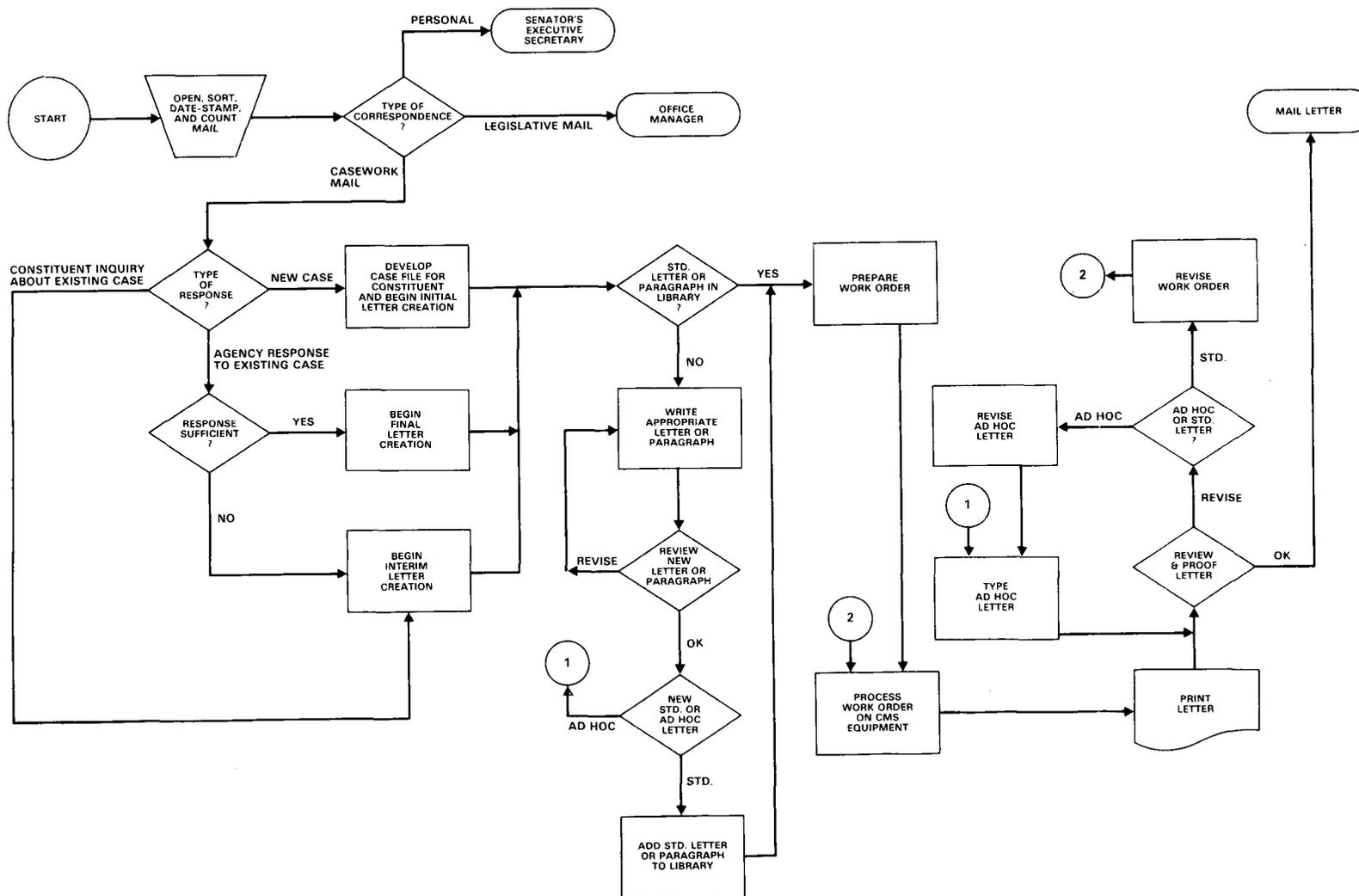
High-speed or production printing offered by the CMS can provide copies of correspondence in seconds. During our review, this printing was done by the CMS contractor, using three IBM high-speed line printers; however, the Senate computer center has recently purchased and installed a Xerox laser printer. It is one of the most advanced printers available, capable of formatting and printing collated sets of documents at the rate of two pages per second.<sup>1</sup> The offices using the CMS can also elect to use the comparatively slower character printers included in their CMS workstations to print smaller volumes of letters. Over 90 percent of a CMS office's mail is printed on these high-speed printers.

Sixty percent of CMS users rated the quality of the character printers as good or very good while 61 percent of them rated the high-speed line printer as fair or less, indicating a significant problem with the quality of letter production in these offices.

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<sup>1</sup> The Xerox laser printer was not being used to produce correspondence at the time of our survey. We did, however, conduct a telephone survey with a sample of offices that are now using it to produce letters. Overall they felt the quality was better than that of the IBM printer, but could still be improved.

FIGURE 3. PROCESSING CASEWORK MAIL IN SENATORIAL OFFICES USING THE CASEWORK SYSTEM (CWS)



By comparison, standalone and other system users do not have access to such high-speed production printing. Standalone offices use the character printers which come with the systems in their offices, while some of the other word processing equipment users produce their letters on the slower memory typewriters or even slower regular typewriters.

The amount of time needed to produce 5,000 one-page letters on the CMS high-speed printer is approximately 2.2 hours as compared to 23.6 hours for the fastest standalone unit. (See app. II for printing speeds by equipment type.) Consequently, the offices which have the CMS printer can respond to high volumes of issue mail in a short time without burdening their correspondence staffs.

#### Automatic updating of the mailing list

An important additional feature of the CMS is the ability to automatically add new names and delete other names in order to keep a Senator's mailing list current. Some senatorial offices maintain lists of constituent names and addresses for newsletters, followup letters, and other mail file functions. These lists are stored in the Senate computer and may contain several million four-line names and addresses, salutations, and identification codes.

By comparison, Senators using standalone or other word processing systems cannot automatically add names to their mailing list but must first enter their updated mailing list onto the tape of a secondary word processor that is compatible with the Senate computer (i.e., IBM MTST). These tapes or cartridges must then be delivered to the Senate computer center for merging with the master mailing list.<sup>1</sup>

The CMS mailing list function can save time for many senatorial offices, particularly those with large mailing lists. Of the 71 senatorial offices we asked to rate this capability, 66 believed it was either good or very good.

#### Indexing and filing of correspondence

The CMS provides an automatic indexing capability similar to its mailing list updating function. The index is a computerized listing of topics and subtopics arranged according to constituent names and addresses. It indicates those constituents who have expressed interest in a particular topic (e.g., energy regulation). This index information is automatically captured as a byproduct of letter production. For letters produced by CMS offices on their secondary word processing equipment (MTST, memory, or regular typewriters), the CMS "data function" is employed to include this information in the index. This automatic indexing capability significantly reduces an office's filing and storage space requirement. In some cases CMS users were also microfilming their CMS index listings to further reduce storage space and to speed access to the information.

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<sup>1</sup> The computer center staff is developing software that will permit the tapes from standalone and other systems users to be directly compatible with the Senate computer, thereby eliminating the need to create update tapes on secondary word processors. However, these offices would still have to deliver their own tapes to the computer center for merging with the master list.

Our survey of the Senators who were using the automatic indexing capability showed that a large majority of the offices rated this capability as either good or very good.

Standalone and other word processing system users do not have this automatic indexing capability for their correspondence. They use multiple paper files which can be bulky and difficult to store and cross-reference. Also, selecting data by multiple topics is almost impossible with paper files. Depending on the volume of correspondence, considerable storage space may be required to retain these files, and access to them can be difficult and time consuming.

### CHAPTER 3

#### THE CURRENT NETWORK APPROACH TO DATA COMMUNICATIONS HAS BEEN POORLY DEVELOPED

Our evaluation of the Senate's rapidly expanding data communications network which supports CMS in senatorial field offices indicates that the planning for this network has been inadequate even though funds were specifically allocated for a network study. In addition, the costs to provide this network may be unnecessarily high, given the availability of commercial network services.

The number of CMS installations in field offices has been rapidly growing. A prerequisite for these installations is an operational data communications network to support them. Approval for a nationwide data communications network for all Senators choosing CMS field installations was given by the Rules and Administration Committee in September 1979. Currently the network serves 19 Senators in 24 field offices. We evaluated the planning, development, and costs that have gone into installing this system.

Current projections of the Senate computer center indicate that 55 field offices will be linked to the CMS computer by October 1980. Our survey showed that 46 senatorial offices want access to the CMS from field locations. Allowing two CMS field installations for each Senator, this indicates a potential need of up to 92 CMS field sites.

The responsibility for developing, installing, and managing the CMS State office network belongs to the Senate computer center staff. In 1977 the first State office was linked with the CMS. The terminal operator in the field office (which was in Salem, Oregon) would connect to the CMS computer system by making a long-distance phone call over a GSA phone line. The cost of this arrangement for one year was \$12,000.

With the expansion of the State office program to include more field locations, the Senate telecommunications staff devised the current network structure, which utilizes leased high-speed phone lines and communications switching equipment. There are currently eight clusters of State offices in the network, each cluster consisting of 2 to 4 offices, comprising the total 24 State offices currently in the network. The switching equipment allows the clustered State offices to share the leased lines, thereby affording some cost savings. We were told the monthly cost of this network arrangement for 24 State offices is \$20,252. In addition, there was a one-time installation cost of \$2,443.

These costs represent only the charges incurred by the Senate for leasing the lines and the network communications equipment. There are costs for other equipment that supports the network, including terminals for the field offices and communications equipment used by the Senate computer center to route communications traffic to the CMS computer. Other costs include Senate computer center staff and support services required to install, maintain, and operate the CMS State office network. We were unable to obtain an estimate of the staff costs involved in operating the network. From our discussion with the Senate telecommunications staff, it appears that one or two full-time personnel and an indeter-

minate number of part-time personnel are involved with the network. No records or documents were available to support a reasonable cost estimate for these personnel.

#### Alternative network structures have not been seriously considered

We asked the telecommunications staff to give us copies of any studies and analyses that were performed before the current network structure was established. They felt it was not feasible to estimate network traffic volume and related workload parameters, so had not developed such data. Without such data, however, we feel it is not possible to conduct a meaningful and serious analysis of alternative network structures.

The Senate computer center chose to respond to the decision of the Rules and Administration Committee by installing a leased-line network to fulfill the rapidly expanding communication needs of the Senate. Alternative networks which might have cost less should have received more attention and study.

We were told that the current network is performing well, is efficient, and is the most cost-effective alternative. Further, we were told by staff of the Senate computer center that a study contract would be awarded during 1980 to provide an overall analysis of the CMS network structure. They also said a computer model was being used to help determine the best locations and configurations of equipment for the current network structure.

Although the use of commercial telecommunication networks has not been attempted by the Senate, it is a possibility worthy of consideration. In this approach, the Senate computer system (or the CMS computer system) would be established as a node within the vendor's network. To gain access to the CMS, a field office would simply use a local phone to call the nearest point on the vendor's network, which would in turn connect the field office to the Senate computer system (or, for that matter, to any desired computer system on the vendor's network). This network approach would thus enable senatorial offices to gain access to other non-Senate-operated computer centers, should that be desired. The process of connecting a field office to the network would be very similar to the procedure now used by senatorial offices in Washington, D.C., where a phone call connects them to the CMS computer center located at 400 North Capital Street, N.W.. Some of the major advantages of using a commercial network are as follows:

- Leasing expensive dedicated lines would not be necessary.
- Leasing communications equipment would not be necessary (with the exception of modems which would be required in any network option chosen).
- Leasing or acquiring space and facilities across the country to support the equipment needed for a private (leased-line) network would not be necessary.
- Fewer technical staff would be required to oversee the operation of the network. The vendor would arrange for maintenance when line problems occur.

- It would be easy to add field offices, or change field office locations, because clustering would not be necessary.
- Backup lines would be automatically provided (unlike the current network arrangement, whereby if a dedicated line goes down a number of field offices may be off the network for an extended period).
- Added services are or will soon be available that might be of value. Examples are compatibility services which allow the use of virtually any type of terminal device, as well as electronic mail, image, support, and other services.

#### Commercial network structure is less costly

To compare the Senate network with commercial networks, we developed estimated workload data for the 24 State offices now using the CMS network. Using data obtained from the CMS computer system, and an assumed ratio of work performed in Washington offices versus State offices, a network model input was developed which consisted of connect time and characters transmitted. This network model input was then analyzed by a commercial network vendor's computer model and the vendor provided us with a cost estimate to support the indicated workload. The cost schedules used by the vendor are those currently established with the General Services Administration. The results show that it would cost the Senate an estimated \$16,668.00 per month for commercial data communications versus \$20,252.00 per month for the current in-house network—a difference of over 20 percent.

After two years of operational experience, it is still opportune for the Senate computer center to consider alternatives to its leased-line approach. Commercial network services are currently undergoing growth and expansion of services and facilities. Use of a commercial network should also lower cost because users benefit from the economies associated with shared facilities. Users of a leased-line network, on the other hand, must pay the entire cost associated with acquiring, managing, and maintaining the network.

## CHAPTER 4

### THE SENATE SHOULD CONSIDER A THIRD ALTERNATIVE TO THE USE OF CMS OR STANDALONE WORD PROCESSORS

Senatorial offices are currently limited to two approaches to primary word processing. They may either (1) share the use of the centralized computer-based CMS or (2) acquire and operate one of the four approved standalone word processors. While the users who have chosen either of these approaches are generally satisfied with their systems, they have indicated that both approaches have certain functional and operational disadvantages in terms of their current needs and future requirements. Based on our evaluation we believe the Senate should seriously consider a possible third alternative. This alternative offers the combined advantages of the first two at lower cost, as well as providing additional capability and flexibility to meet future word processing needs of the Senate.

#### MEMBER OFFICES ARE GENERALLY SATISFIED BUT WANT IMPROVEMENTS

Our survey of 100 Member offices (summarized in app. III) indicated that senatorial offices are generally satisfied with the primary word processing systems they are using and depend on these systems to promptly produce large volumes of letters at an acceptable level of quality. Specifically, most offices are generally satisfied with system response times, system capacities for handling volumes of mail, and system print quality.<sup>1</sup> However, the level of satisfaction differs with the type of system being used. The CMS and standalone users are more satisfied with their system's response times and ability to handle the mail volume, but the standalone and other system users are more satisfied with the print quality of their letters. Some offices would like their systems to provide management reports and mass storage for text, mailing lists, and index files. As discussed in chapter 2, however, only the CMS can now provide these capabilities.

Although most offices believe their systems meet current letter production needs, they want improvements and additional word processing capabilities, particularly as they consider their future needs. They want the capability to produce larger volumes of better quality letters, process and produce correspondence at any location, communicate between Washington and field offices, and streamline office organization and mail flow.

#### AN ALTERNATIVE SYSTEM IS AVAILABLE TO SATISFY CURRENT AS WELL AS FUTURE NEEDS

Although we considered the relative satisfaction and needs of Member offices, a major objective of our review was to identify more cost-effective word processing systems than those now used in the Senate. After considering the alternatives, we felt the Senate can take three possible approaches in the future:

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<sup>1</sup> "Response time" is the time from receipt of a letter in an office's mailroom to the dispatch of a response letter to the constituent.

- (1) Continue using a centralized computer-based time sharing system.
- (2) Allow greater decentralization by approving a wider range of standalone equipment.
- (3) Provide a combination of local and centralized processing capability.<sup>1</sup>

Since our objective was to identify alternatives to the systems now being used in the Senate, we concentrated on the third approach—systems that could provide local processing as well as communicate with, and use the processing power of, a central, large-scale computer.

The spectrum of available systems which could satisfy the Senate's correspondence management needs has greatly broadened in the last few years. Many types of systems now offered were not available 5 years ago when decisions were made to acquire the CMS. The market now offers a number of systems that rely heavily on the use of microprocessors and low-cost magnetic disk storage devices. Available in a variety of configurations, these devices offer economies of scale—a strong incentive for considering them.

Accordingly, through contacts with a group of word processing experts and equipment manufacturers and with information gathered from industry reference publications, we developed a list of 47 organizations using word processing systems other than those the Senate uses. After initial discussions with these organizations we chose seven that have high-volume letter assembly operations and workloads similar to a Member's office. By surveying these seven organizations and comparing our findings with those of the Senate survey, we identified a type of system which we believe would

- be substantially less expensive than CMS;
- provide all of the features of CMS, standalone, and other word processing systems now in use in Senate offices; and
- have the capability to permit integration of all primary and secondary processing systems equipment in Senate offices.

The type of system we identified employs the concept of "distributed intelligence"—each terminal or workstation has its own logic and memory to perform local word processing functions as well as communicate with remote printers or computers when necessary to exchange information. It is a multiterminal or "clustered" system, that is, it includes a combination of "dumb" terminals, "intelligent" terminals, and various peripheral equipment connected to a processor unit.<sup>2</sup>

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<sup>1</sup> Local processing means that which is physically performed in the Senator's office rather than at a central location such as the Senate computer center.

<sup>2</sup> A "dumb" terminal is functionally equivalent to a CMS terminal.

## DISTRIBUTIVE SYSTEMS ARE THE MOST FLEXIBLE AND COST- EFFECTIVE ALTERNATIVE

We believe that the distributive system offers the most flexible and cost-effective alternative for meeting the Senate's future correspondence management needs. Distributive systems, the latest trend in the word processing industry, combine some of the best features of other recent developments in the field. (See app. I.) They generally include some or all of the following components:

- A local processing unit (minicomputer) which houses the system's memory, control logic, and one or two diskette drives. This unit can communicate with a large computer, with local intelligent and dumb terminals, and with other peripheral equipment included in the cluster.
- Magnetic disk storage units which range in storage capacity from under a million characters to over 100 million characters.
- Intelligent (standalone) terminals which have their own logic and disk drives and all the program capability of the local processing unit. Although connected to the processing unit to access its data base, intelligent terminals can operate independently and communicate directly with other peripheral equipment in the cluster as well as with a remote mainframe computer. These terminals could retain their standalone status and continue to operate even if the local processing unit in the cluster were to malfunction.
- Typing stations (dumb terminals) which have no intelligence of their own and are driven by the local processing unit. They not only share the logic of the local processor, but can also simultaneously access its on-line memory and storage capacity to perform many data entry and text-editing operations such as letter assembly and mailing list updates. Because these terminals are relatively inexpensive compared to intelligent terminals, they are cost effective for handling large-volume correspondence management functions.
- Printers, which are either character printers or higher speed, lower quality line printers. Although each typing station and each intelligent terminal could support its own printer, printers are generally shared between stations or terminals. The number of printers included depends on the volume of output.

As mentioned earlier, we conducted a parallel survey of organizations with letter assembly operations similar to the correspondence function in the Senate. We sent out questionnaires like the ones used in the 100 Senate offices to gather data on the operational characteristics of the word processing systems these organizations were using, their applicability to the Senate's needs, and their overall costs and benefits.

We examined the results of the Senate survey to identify features that are desirable but currently unavailable, as well as problems associated with current systems. We analyzed the following areas in depth to assure that a distributed-logic system could provide the desired capabilities and that external survey users were satisfied with present performance:

- Printing quality and capability.
- Text editing capability and file maintenance.

We also examined the environmental, personnel, and economic impact of choosing the distributive system approach.

#### Printing quality and capability

Over 60 percent of CMS users expressed some dissatisfaction with print quality, while all standalone users were very satisfied, and 73 percent of other users were satisfied or very satisfied. When we examined this in more detail, we found that those CMS offices using their in-house printers were generally more satisfied than those using the offsite printer.

During the interviews, CMS respondents complained about the computerized appearance of letters printed offsite and about the time delays caused by having to reprint letters which were smudged, had faint printing, or had parts of lines missing. Others commented on the time delays and inefficiencies caused by having to transport letters back and forth between their offices, the Senate computer center, and the service department.

Primarily because of complaints about print quality, several offices have recently dropped CMS and switched to one of the approved standalone systems. Several other offices indicated to us that they were considering this.

The distributive system, on the other hand, not only offers high-quality impact printing on character printers, but could include ink jet printing as a feature. For those offices willing to sacrifice speed for enhanced appearance, proportional spacing is also available. Other options are a variety of type fonts including large type which can be used for speeches.

Printers are also available with dual cartridge sheet feeders which will hold letterhead paper in one cartridge and plain bond for second sheets in the second cartridge. The feeders can be programmed to print all page 1's of a multiple address letter, then all page 2's, to facilitate use of the signing machine, or they can print pages 1 and 2 in succession. Other equipment offers automatic envelope feed to the printer.

Because these feeders use single-sheet paper, an office would no longer have to cut, trim, or separate letters or take them to the service department to have this done. Single-sheet paper costs about one-fourth as much as continuous-form paper. Therefore, the sheet feeders would pay for themselves in those offices which switch from continuous-form paper to single-sheet paper.

The distributive system has other printing options which can benefit Member offices with large mail volumes. A medium speed line printer can be used for proofing and quality control in place of the character printers now used for this in most offices. The line printer is more than 10 times faster than the character printers for this function.

Because such printing would be done locally in a Senator's office, it would enhance an office's ability to exercise local quality control on finished products, another feature desired

by many offices. For those offices willing to sacrifice typewriter-quality printing for speed, the distributive system still gives them the option to communicate with the Senate's central computer to print letters offsite. However, this option would raise communications costs and entail extra processing steps.

The users of these systems we contacted in our survey were generally very satisfied with the print quality of the material produced on their systems. They used their character printers to print not only correspondence, but reports and other documents as well.

One user was exceptionally pleased with the optional 15-pitch print wheel which enabled production of wide documents in a reduced size for use in manuals and other binders without print shop reduction.

#### Text editing and file maintenance capabilities

A number of Senate respondents expressed a preference for additional text editing capabilities, including being able to make more personalized changes in formats and letter structures. Other offices said they needed more flexibility in updating their mailing lists and sending out specialized letters. They said that they cannot selectively add names to their master mailing lists as a byproduct of letter generation without rekeying the names and addresses; that is, they can add every name and address from a group mailing to the mailing list, but have no way of singling out and adding only some of the names.

Similarly, several offices said they cannot selectively send letters to only some members of a group mailing list. For example, if a Senator's office wants to send a letter to 40 Senators, they have two choices: they can individually type the names and addresses of the 40 Senators designated as recipients or they can use their system to automatically generate letters to all 100 Senators and throw away the extra 60 letters.

The distributive systems we reviewed offer much more text editing capability than is offered by CMS. In addition to performing essential functions such as letter assembly from stored paragraphs, mailing list creation and maintenance, and merges of mailing lists and repetitive letters, a distributed-logic system can selectively create mailing lists as a byproduct of letter generation and can selectively send letters to only certain names on a group mailing list.

Features such as automatic paragraph indentation, tabulation, underlining, centering, margin adjustment, and backspace correction are standard features of distributed-logic systems. All of these features and others can be performed by an operator while the text is displayed on the terminal, thus satisfying another need identified during the Senate survey.

Other text editing features available in distributive systems include global search and replace, automatic repagination, and hyphenation. File security and maintenance features are also available.

## SEVERAL FACTORS MUST BE CONSIDERED WHEN EVALUATING DISTRIBUTIVE SYSTEMS

If the Senate were to consider adopting the distributive system approach, the following issues must be addressed.

The environmental impact of these systems, while a possible matter of concern, should not be a major obstacle. Components of these systems are generally contained in a desk pedestal or in an equipment cabinet equivalent in size to a four-drawer file cabinet. Terminals are approximately typewriter size. Printers are separate units about the size of a two-drawer file. Heat generated by these units is minimal and can be offset easily in the summer by an effective air conditioning system. The noise of the printers is also minimal and can be further suppressed through the use of acoustical covers. If the Senate integrates all word processing functions, the space required for the distributive system equipment would be made available in part by removal of the paper display equipment.

Since Member offices using standalones and other equipment now perform all functions locally, the personnel impact on these offices of switching to distributive systems should be minimal. For CMS offices, the impact should be offset by eliminating (1) the time delays caused when letters printed centrally at the computer center must be sent back and forth between the service department and the originating offices for cutting, trimming, and separating and (2) the labor involved in having office staff perform these functions. If it wishes, an office could still use the Senate service department to fold, stuff, and mail outgoing letters.

Selection of a single brand of equipment would be likely to yield substantial benefits if Senate offices could agree on one manufacturer's line of equipment (selected through competitive procurement). The large-quantity purchase could mean substantial savings and lead to the most favorable purchasing conditions for software and maintenance. It also would minimize the need for conversion and training, that would now be fulfilled by one vendor.

When considering a distributive system, the potential impact of file conversion and retraining must also be taken into account. If the Senate were to adopt a single brand of equipment as discussed above, then software essential to conversion could be procured with the hardware. A retraining package, perhaps with instruction equivalents between the old and new systems, could be developed by the vendor in conjunction with the computer center staff. Since most text handling concepts are similar between systems, retraining, while not a trivial function, should be well within the capability of the computer center.

## DISTRIBUTIVE SYSTEMS OFFER SUBSTANTIAL SAVINGS

In summary, we found that the distributive system, when compared to CMS, offers substantial equipment savings. For a clustered configuration which is directly comparable in capability to the CMS, the estimated cost savings would be approximately 44 percent of present CMS contract and terminal costs, a savings of over \$1.3 million per year. Even if

the distributive system were to be enhanced through the addition of intelligent terminals, the projected annual savings would still be over \$1 million or 34 percent of present CMS contract and terminal costs. Further details of our cost analysis are provided in appendix II.

To explain the basis of our cost findings, it is essential to briefly describe the assumed equipment configuration and mode of operation of the proposed alternative system approach. For purposes of cost comparison, we have developed the following conceptual model of the alternative system:

- In the terminology used throughout this report, the distributed-logic systems would be installed locally in each Senator's office to function as the office's primary system. As with present Senate systems, centralized computer support (provided by the Senate computer center) would be required only for certain functions such as updating and maintaining the master (newsletter) mailing list and generating the management reports now in use. Transmission of data to maintain these central files would be feasible on a periodic batch basis using commercial dial-up communications to minimize connect time and cost.
- The alternative conceptual model also includes a distributive system installation at every CMS site that was operational on December 31, 1979, with the same or a slightly higher number of terminals than were installed at that time. The total number of sites in the model is 102 and the total number of terminals is 327. Each site is provided with a local processor that can communicate with a remote, central, large-scale computer.
- Printing is assumed to be performed entirely on site; each Senate office is provided with sufficient capacity to produce its 1979 letter output in a standard work week; all printers have automatic sheet feed and noise suppression equipment.
- The processor of each local distributive system would be equipped with a magnetic disk storage unit. The required capacity of each storage unit is based on the amount of working storage reported by On-Line Systems for each CMS office during October 1979.

Comparing price with performance, we feel that adopting this alternative system approach would enable the Senate to take advantage of the rapidly advancing technology in word processing.

#### Possible approach in evaluating a distributed-logic system in Senators' offices

The potential equipment savings identified in our evaluation seem large enough to justify immediate investment in a systems design effort to test our findings. The systems design effort would yield sufficient data to be used as the basis for deciding whether to acquire an alternative system. If the Senate should decide to proceed with a request for proposals, we suggest they undertake a single competitive procurement which would allow the Senate to request single proposals combining an initial test with the ultimate system implementation. In this way manufacturers would understand at the outset the scope of the total system development cycle. Prices for the test phase might reflect the economies associated with the large volume of purchases expected in the implementation phase, while retaining the benefit of a reasonable test to assure full compliance with the system specifications.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### CONCLUSIONS

On the basis of our findings, we have concluded that the Senate can achieve significant cost savings by improving its management of automated correspondence production activities. The Senate currently expends almost 40 percent, or more than \$24 million, of its personnel budget to respond to over 11 million pieces of constituent mail. In addition, almost \$4 million is expended for the equipment and supplies that support these personnel. Each Senator's office decides which correspondence should be answered and by what means; but the responsibility for providing these offices with the most effective and efficient systems belongs to the Rules and Administration Committee.

#### CMS is more costly than the standalone systems

Our cost evaluation of the Correspondence Management System and the alternative standalone word processing systems indicated that on solely a letter production basis the standalone systems were estimated to be less costly than comparable CMS systems, and the older, other equipment was found to be slightly more costly than the CMS. However, this assessment must be qualified by the importance placed by CMS users on its other capabilities which go beyond letter production. These additional capabilities seem to justify the CMS's higher costs.

#### Data communications network has not been adequately planned

The Senate computer center is currently developing and installing a nationwide leased-line network without having first performed a detailed assessment of the Senate's long-term communication needs. It is our view that this network development may not be the best approach. Lacking an appropriate analysis of requirements and a rigorous evaluation of the tradeoffs among possible alternative network structures, there can be no assurance that the Senate's current network development is the most cost-effective approach.

#### Distributive systems offer a viable alternative approach for the future

Significant new developments in distributive-logic systems are rapidly changing the state of the art of word processing technology to the benefit of the clerical nontechnical user. These systems have improved in power and flexibility, and become simpler to operate and cheaper to acquire. They offer the same letter assembly and production capability as the CMS, but with even greater text-editing power and flexibility. Moreover, they can operate as autonomous standalone processors in an individual office or they can communicate with a large central computer—as do the CMS terminals—when it becomes necessary to generate indexes, mailing lists, and management reports, or produce correspondence on a

high-speed printer. This type of system is continually experiencing reductions in cost and improvements in functional utility. We believe that adopting this type of system would allow the Senate to take continuing advantage of the state of the art in word processing technology and that distributed-logic word processing systems offer a better package of features and capabilities than the systems now used by the Senate. A distributed-logic system would also save at least \$1 million or 34 percent of the CMS cost.

In view of these findings, it is our opinion that these systems promise an operationally viable, technologically superior, and less expensive way for the Senate to meet its future word processing needs. A systems design study of this alternative would provide the Senate with information necessary to decide on the continued use or procurement of the CMS.

## RECOMMENDATIONS

We offer the following recommendations for the Senate's consideration:

- Alternative word processing systems should be tested in senatorial offices. More specifically, we recommend that the Senate fully explore and evaluate an alternative word processing approach based on the use of distributed-logic systems. To fully understand the operational implications and costs of this alternative system approach, it is essential that a comprehensive system design study be completed by the Senate. The design study would yield sufficient information to decide whether to acquire these systems.
- The Senate should defer its consideration of purchase of the CMS until the design study is completed. The distributed-logic system alternative should be explored before a decision is made about whether to purchase the CMS.
- Alternative commercial data communications network structures should be evaluated to determine potential benefits and costs. We recommend that the Senate review its current network approach as expeditiously as possible. More specifically, the Senate should have a long-range data communications plan that assesses the cost effectiveness of various alternative commercial approaches. The plan should also provide an implementation schedule for an alternative approach which accommodates current and projected network requirements quickly and economically.
- The older, other word processing systems now operating in Member offices should be replaced as quickly as possible to improve the productivity of these offices in processing their correspondence. These offices were the least satisfied with their word processors and had the highest unit cost per letter of all systems. These offices could be used to test the distributed-logic system model.

## REPORT COMMENTS

As requested by the Senate Appropriations Committee, we did not obtain official comments on the report from outside the Committee.

## COMPARISON OF SENATE WORD PROCESSING CAPABILITY WITH THE STATE OF THE ART

To better understand the relative capabilities of the various Senate word processing equipment and systems, it would be helpful to understand the distinguishing features which broadly define the current state of the art of word processing technology. At the low end of the price range are the comparatively inexpensive, repetitive typewriters and paper-display text editors; at the high end are the more expensive and sophisticated electronic-display, shared-logic, distributed-logic, and time-shared text editing systems.

In the Senate, repetitive typewriters are popularly called "Robo machines." These machines can automatically repeat text, but they are limited in their ability to conveniently manipulate text (add, delete, change). They generally use paper tape or paper rolls as the memory storage medium. Although they are outmoded and no longer in production, six of the machines (Friden) are still used by six senatorial offices as secondary or backup word processing resources.

### PAPER-DISPLAY (OR "BLIND") WORD PROCESSORS

Paper-display word processors are distinguished chiefly by their inability to display electronically what is recorded in memory. For this reason, they are often referred to as "mechanical" or "blind" processors. In other words, as text is keyed into the machine's memory, the words are simultaneously typed ("displayed") on paper in the manner of an ordinary typewriter. The printer on these machines is used to display text for editing operations as well as for final output. This type of word processor is typically a single station machine in which the keyboard is integral with the printer (as in a typewriter) and which contains its own edit and control logic and internal memory.

Within this class of machines are two specific categories: at one end of the spectrum are the electronic typewriters (also known as intelligent typewriters) and at the other end, the removable-memory word processors.

#### Electronic typewriters

Electronic typewriters look like traditional typewriters but they contain an internal electronic memory. These machines are a relatively new phenomenon in the marketplace, and generally cost below \$2,000. Owing to their rather small internal memories (generally 1,000 characters or less), the intelligent typewriters offer very limited text entry and editing capability but usually provide such features as automatic centering, decimal tabulation, and error correction. Accordingly, they fit somewhere between ordinary single-element electric typewriters and word processors. Also in this category is the somewhat atypical IBM memory typewriter, which contains 50 to 100 pages of memory and costs \$4,900 to \$5,500, depending on the model. The Senate has 223 memory typewriters in use, 69 of which are in State field offices.

### Removable memory word processors

Removable memory word processors, in addition to having internal memory and control logic, also feature a removable magnetic recording medium. The Senate machines in this class use a variety of recording media, including tape cassettes (Xerox 800, Tydata, Redactron, Remington); tape cartridges (IBM MTST); magnetic cards (IBM MCST, Mag Card II, and Mag Card A). This class of machines represents the most widely used word processing equipment in the Senate, with 170 units in Washington and 64 in the field offices. However, 146 of these units are models which have been discontinued by the manufacturers (e.g., Friden, IBM MTST, Remington). These machines range in cost from \$7,400 (Redactron) to almost \$13,000 (MTST IV).

### VIDEO-DISPLAY WORD PROCESSORS

Instead of a mechanical keyboard printer, this class of equipment characteristically has an electronic keyboard, a video-display screen, and a separate printer. The memory in these machines is usually a combination of internal memory and magnetic recording media (floppy disk, hard disk, tape, or card). As text is keyed into the memory, it is electronically displayed on either a screen or a "thin window." The operator can key in new text for display while the printer is simultaneously engaged in printing previously stored textual material.

Machines in this class of word processors are sometimes subdivided according to size of display, ranging from thin window units, which display up to two lines of text, and half page units, which display up to 28 lines; to full-page units which display 56 to 66 lines of text. Other differentiations may include additional logic to enhance overall word processing power, arithmetic or data processing capabilities, or programmable software. Video-display word processors can be components of shared-logic, distributive, or clustered systems.

#### Standalone systems

Of the standalone group, comparatively few units had been approved and installed in the Senate at the time of our review. These were the Wang 5 unit in one office, the IBM 6640 Ink Jet Printer in one office, and the IBM System 6/450 in three offices.<sup>1</sup> These units range in purchase price from \$5,700 (Wang 5) to over \$27,000 (IBM 6/450).

#### Shared-logic systems

With the exception of one Wang 20 system which was recently installed, shared-logic systems have not been used in the Senate. Shared-logic systems typically include a central processor (usually a minicomputer) which provides the logic and memory to drive up to 12 keyboard display terminals, although some systems may support more. However, the more

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<sup>1</sup> Although one office was using Wang 5 at the beginning of our audit, it upgraded its system to Wang 20 during our review.

terminals added and the more complex the application, the slower the system. The central processor simultaneously allows several operations at different workstations to interactively share software, peripheral devices (e.g., printers), or information stored in a common data base. Shared-logic systems offer more powerful control logic to enhance such editing functions as page forming, line justification, scrolling, searching, and sorting; and larger on-line memory and storage capacity.

Shared-logic systems are most suited to processing lengthy documents which are subject to numerous and complex author revisions; however, there is one drawback—if a system malfunction occurs in the central processor the entire production shuts down. Prices for shared-logic systems range from under \$25,000 to over \$150,000. Recent market research indicates that shared-logic system architecture is being overshadowed by the growing trend toward distributive word processing systems.

### DISTRIBUTIVE SYSTEMS

Distributed-intelligence systems take advantage of low cost, large scale, integrated microprocessors and the rapidly decreasing cost of semiconductor memory. Though outwardly similar to shared-logic systems, distributed logic systems disperse intelligence to the workstations. In other words, each terminal has its own intelligence (logic and memory) to perform local functions and communicate with other terminals and with peripheral devices (printers, disc drives, OCR readers) as necessary to exchange information.

Distributive systems are inherently more flexible than shared-logic systems because they provide processing autonomy as well as shared resources. Many terminals can be used for different functions without depending entirely on the central processor and without affecting others in the network, and the software in each terminal or peripheral device can be modified without slowing down or adversely affecting other terminals in the network. Prices for distributive systems are in the same range as for shared-logic systems.

### TIME-SHARED SYSTEMS

With 75 senatorial offices now using CMS, most of the Senate's primary word processing capability is provided through a centralized, computer-based, time-shared system. This type of system allows multiple terminal workstations at various locations to communicate with a remote central computer by network and utilize the computer to provide word processing capability.

Computer-based systems such as the CMS typically afford the user massive on-line storage and high-speed printing at savings. The startup costs for a centralized computer-based system are generally high; however, these costs conceivably can be spread across all the offices using the system so that the cost per workstation decreases as additional workstations are added. The costs for accessing the central computer are usually billed to each user on a monthly basis and are proportional to the duration of connection to the computer, amount of storage capacity used, special peripheral equipment (e.g., high-speed line printers) used, telephone use charges, and costs for local workstation terminals.

**COST ANALYSIS OF WORD PROCESSING  
IN THE SENATE—PRESENT AND FUTURE**

Numerous pieces of word processing equipment are used by Senators to produce constituent and casework mail. Most Member offices use more than one system to answer mail and it was necessary to examine all these systems. In our analysis we have segmented the equipment in a Senator's office into two categories: a primary system and a secondary system.

**PRIMARY AND SECONDARY SYSTEMS DEFINED**

A primary system is the principal system the office relies on to produce the majority of the mail and it is usually the most technologically advanced system in the office. The primary systems operating in the Senate at the time of our review were:

<u>System</u>	<u>Number of offices</u>
Correspondence Management System (CMS)	75
Standalone word processor	6
Xerox 800                   (1)	
Wang System 5           (1)	
IBM System 6           (3)	
IBM 6640               (1)	
Other	19
IBM MTST               (7)	
Tydata                   (5)	
Remington              (4)	
Memory typewriters   (1)	
Regular typewriters   (2)	
Total	<u>100</u>

Secondary systems are the backup systems used in some Senate offices to produce casework mail, personal mail responses to invitations, as well as other replies not prepared on the primary system. The secondary systems have much less storage capacity, slower printing capabilities, and are usually less technologically advanced than the primary systems. Secondary systems include the following types of equipment: IBM MTST, IBM Mag Cards, Tydata, Remington, Redactron, memory typewriters and regular typewriters.<sup>1</sup>

However, the 19 offices using the other equipment have not procured the more advanced standalone systems or the CMS. Thus the same equipment used by these offices as the primary system could also serve the CMS or standalone office as a secondary system.

<sup>1</sup> See figure 2, p. 5, for distribution of equipment used as secondary systems.

In our analysis we reviewed data for fiscal 1979 and developed costs based on the primary and secondary systems used within the Senate offices. The following table lists the resources used by each system.

**Direct Resources Consumed in Letter Production**

	<b><u>Offices using CMS</u></b>	<b><u>Offices using standalone and other systems</u></b>
System resources	Office share of the CMS contract and support staff costs (including Senate computer center staff salaries, travel costs, communications and network costs, supplies, and estimated service department costs)	Annual equipment costs or annual depreciation for purchased equipment
Personnel resources	Salaries of CMS operators and system librarians	Salaries of Robo operators
Supplies	Additional supply costs	Personalized supplies. Estimated department costs

**TOTAL SYSTEM COSTS DEFINED**

Total system costs include costs associated with the primary and secondary systems as well as other costs affiliated with word processing that were not directly related to either system. Included in other word processing costs were miscellaneous pieces of equipment such as automatic signature machines, letter openers, sealers, and folders, as well as maintenance costs and salaries for correspondence personnel. It was our intent to include all costs associated with the production of correspondence in a Senator's office.

**OFFICE GROUPINGS DEFINED**

In our analysis we classified word processing needs as being accomplished either by the Correspondence Management System or by other non-CMS systems which included offices using the standalone word processing systems and offices using other systems. The Senate offices were thus categorized as CMS users or non-CMS users.

Within the CMS users category (75 offices) we divided offices into three groups, according to the population of the individual State. All Senate offices serving a State population of 3 million or less were assigned to Group 1, those serving a population between 3 and 7 million were assigned to Group 2, and those serving a population of over 7 million were assigned to Group 3. This breakdown was necessary to help us determine whether word processing needs and associated costs would vary according to the population of the individual State. However, we did not group remaining non-CMS users since they were few (25) and equipment costs could be determined on an individual office basis.

## COMMON CMS COST ALLOCATION

In order to determine individual office costs for the 75 offices using CMS we needed to allocate the primary common costs of the system. Annual primary common costs associated with CMS word processing include the following:

1. On-line Systems contract cost (\$2,435,493) for computer time sharing. This contract provides the Senate offices a means of generating letters and input to the Senate index and mail systems, and of receiving management information reports. The contractor provides computer and programming support with an on-line computer system and a software package offering text editing and data base management capabilities.
2. Senate computer center staff salaries (\$351,675) for 24 personnel who provide direct assistance to CMS. This staff is divided into two basic units—a support staff and a training staff. The support staff consists of Senate User Representatives who help familiarize new users with the CMS and resolve any questions regarding the system. The training staff provides continual classes for senatorial office personnel on the various functions of the CMS.
3. Travel expenditures (\$5,100) incurred by Senate computer center staff for training State office personnel, setting up new State offices and managing the CMS network.
4. Terminal costs (\$551,532) as reported by the Senate computer center. This includes the cost of leased terminals and a prorated cost for terminals purchased in fiscal 1978, based on a 5-year useful life. Maintenance costs for both the leased and purchased terminals are also included. Other charges included with terminal costs are printers, delivery and installation charges, line charges, and other costs associated with operation of the terminals.
5. Local communication charges (\$110,000) as reported by the Senate computer center, in support of CMS terminals in Washington.
6. Network costs (\$10,750) as set forth by the Senate computer center, based on additional network communications equipment necessary to provide support to the State offices. At the time of our review only 19 Senators operating 24 State offices were on the network.
7. Supplies (\$92,605) requested by the Senate computer center in support of the CMS. These include such items as standard continuous form paper, print wheels, ink, ribbons, and other miscellaneous charges to sustain CMS operations.
8. Estimated costs for service department support (\$7,592) in the printing and mail processing of correspondence. This support covers such costs as the printing of signatures, folding, collating, and inserting the letters into envelopes for mailing.
9. Continuous form paper (\$40,426) ordered from the Senate stationery room.

To determine the share of total common costs of the CMS (\$3,605,173) on an individual office basis, two methods of cost allocation were developed to best capture the actual resources being used by each office. The methods chosen base the allocation on available capability provided to the office and use of the system.

#### Method No. 1 - Available capability provided to the office

The first method bases the allocation of costs on the degree of service provided to the office. It uses the number of available channels or ports the office has been allotted to access the system. A single port enables a Member's office to communicate with the contractor's computer to enter data and generate letters on the CMS. A typical office could have three ports assigned and up to four pieces of equipment (e.g., three terminals and one printer). These four pieces of equipment would share utilization of the three assigned ports. Available ports would thus be the determining factor in providing system capability to the Member's office.

The total number of CMS computer ports allocated to the Senate is 393. Of these, 69 ports are used strictly by the staff of the Senate computer center for purposes of system development, training, testing and other CMS administrative purposes. Therefore we allocated these ports as overhead to be borne on a proportionate basis by each of the Senate offices. The remaining 324 ports are assigned to individual Senate offices with the number of ports assigned varying according to State population and the number of physical locations where CMS work is performed.

To prorate the above-listed primary common costs we determined how many ports were allocated to each office and how many months the office was on the CMS for fiscal 1979. The product of these factors resulted in the number of port months of utilization of CMS for each office during fiscal 1979. (See p. 38, example 1, step 1.) The total common costs were then divided by the total port months for all CMS offices to arrive at a cost per port month. (See example 1, step 2.) To determine the proportionate share of common CMS costs for each office, the cost per port month was then multiplied by the individual office's port months of utilization. (See example 1, step 3.) It is recognized that this method is a gross cost determination that takes into consideration a service rendered to the office but does not take into consideration the impact of individual transactions (production of letters and updating of files) undertaken by the office. We therefore developed a second cost allocation method that takes into consideration the transactions completed by the office during the year.

#### Method No. 2 - Utilization of the system

The second method bases the allocation of costs on the number of transactions accomplished by the Member office during the year.<sup>1</sup> Total transactions included single letters, group letters, case letters, and data functions done through CMS channels. (See p. 39, example 2, step 1.) Transactions were all weighted equally since it was shown that the amount

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<sup>1</sup> This second method was also developed to determine if the basis of transactions would greatly change the offices' average letter cost. We made comparisons and results are shown on page 38.

of computer resources required for each type of transaction was approximately the same. Once total individual office transactions were established, then total CMS transactions were calculated.

To arrive at the individual offices' share of common CMS costs, the ratio of each office's transactions to total CMS transactions was established. (See example 2, step 2.) This ratio was multiplied by the total common costs for CMS to arrive at each office's share of common costs. (See example 2, step 3.)

Since only relatively small differences were noted in office costs using this method as compared to method number one, we decided to rely on the first method for our analysis.

### INDIVIDUAL CMS OFFICE COSTS

After determining the individual office share of common CMS costs, we calculated a total cost for individual offices, based on three cost components:

1. Primary system office costs showing the expenditures for word processing on the principal system;
2. Washington, D.C., office costs including both primary and secondary system costs; and
3. Total office costs including all Washington and State field office costs associated with word processing.

#### Primary system office costs

The primary system cost was developed to show only the costs directly related to CMS letter production. We used this cost to calculate our average letter cost for the primary system. The primary system costs included the following items:

- Member office's share of common CMS costs.
- Salaries of the CMS operator(s) in Washington and State offices and the CMS librarian(s) directly involved in answering constituent mail. If 100 percent of a staff member's time was spent working on mail then the full salary was charged, but if only 50 percent of the time was spent on mail then only half the salary was charged.
- The cost of envelopes as reported by the printing clerk's office. These envelopes were charged against the Senator's stationery allotment.

Using the above method we were able to determine the individual office costs for word processing on the primary system for each of the Members' offices using the CMS.

### Washington, D.C., office costs

In addition to the average letter cost for the primary word processing system we also developed an index for all correspondence produced in the Washington office. The office costs used in this index included costs for both the primary and secondary word processing systems. Washington, D.C. costs included:

- All costs previously described in Primary system office costs for CMS. (See p 34.)
- Salaries of the Senator's Washington, D.C., correspondence staff who were involved in any function of answering constituent mail. Again the amount of time spent by the individual working with constituent mail determined the percentage of salary charged against word processing costs.
- Costs for Washington, D.C., offices of other word processing equipment such as MTST, Tydata, Redactron, Remington memory typewriters, letter openers, folders, inserters, sealers, and automatic signature machines. An annual cost for this equipment was calculated based on an expected life of 7 years. We also included an estimated maintenance cost for this equipment.

### Total office costs

In order to develop an average letter cost for all correspondence produced by the office we calculated a total office cost. Total office costs included:

- All costs previously described in Primary system office costs for CMS and Washington, D.C., office costs for CMS.
- Salaries of the field office personnel who were involved in any function of answering constituent mail. Here, too, the percentage of time working on constituent mail determined the amount of salary charged against word processing.
- Costs for the field offices' other word processing equipment such as MTST, Tydata, Redactron, Remington, memory typewriters, letter openers, folders, inserters, sealers, and automatic signature machines. An annual cost for this equipment was calculated using an expected life of 7 years. An estimated maintenance cost for the above equipment was also included.

### STANDALONE AND OTHER OFFICE COSTS

For these systems we calculated costs on the same basis as for the CMS and therefore developed three costs for word processing: (1) the primary system costs, (2) Washington, D.C., costs, and (3) total system costs based on fiscal 1979 data. This gave us comparable cost data to use in analyzing the various word processing systems. However, with the standalone and other systems there were no common costs to prorate, so all costs were charged directly to the Senator's office in which they were incurred.

### Primary system costs

Primary system costs were developed in the standalone and other offices to show the direct cost of the principal means of letter production within those offices. This cost was used in the calculation of our average letter cost for the primary system. The primary system costs for the standalone and other offices included the following items:

- Equipment costs for the primary system. The principal methods for these offices are shown on page 31. For the standalone systems this was the yearly lease cost for the equipment which includes maintenance. For the other systems we prorated the cost of the purchased equipment, using a useful life estimate of 7 years and a separately estimated maintenance cost.
- Salaries of Robo operator(s) and librarian(s) who were directly involved in answering constituent mail. If 100 percent of an individual's time was spent working on mail, then the full salary was charged to word processing; whereas if less than full time was spent on mail, only an equivalent percentage of the salary was charged.
- Cost of continuous-form stationery ordered from the Senate stationery room.
- Estimated cost of envelopes and single sheet stationery as reported by the printing clerk's office. These items are charged against the Senator's stationery allotment.
- Estimated cost of miscellaneous supplies such as print wheels, ink, and ribbons needed to support the primary word processing system.
- Estimated service department cost for support in the printing and mail processing of correspondence. This support included the printing of signatures, folding, collating, and inserting the letters into envelopes for mailing.

### Washington, D.C., costs

We also developed an average letter cost for correspondence produced in the Member's Washington, D.C., office. The costs in this index included all those associated with the primary and secondary word processing systems used in the Washington offices, as follows:

- All costs previously described in the Primary system costs for standalone and other systems.
- Salaries of the Senator's Washington, D.C., correspondence staff who were involved in any function of answering constituent mail. Again the amount of time spent by the individual working with constituent mail determined the percentage of salary charged against word processing costs.
- Costs for word processing equipment used in the Washington Office, other than that used for the primary word processing system, such as MTST, Tydata, Redac-tron, Remington, memory typewriters, letter openers, folders, inserters, sealers,

and automatic signature machines. The annual cost of this equipment was calculated based on a useful life of 7 years. A maintenance cost for the equipment was also estimated

### Total office costs

A total office average letter cost for standalone and other offices was also developed, using the following:

- All costs previously described in Primary system costs for standalone and other systems and Washington, D.C., costs for standalone and other systems.
- Salaries of field office personnel for the standalone and other offices who were involved in any function of answering constituent mail in the field office. Here, too, the amount of time spent on constituent mail determined the amount of salary charged against word processing.
- Costs for word processing equipment used in the field office, such as MTST, Tydata, Redactron, Remington, memory typewriters, letter openers, folders, inserters, sealers, and automatic signature machines. The annual cost of this equipment was calculated based on a useful life of 7 years. A maintenance cost for the above equipment was also included.

Thus, three word processing cost categories were developed for standalone and other offices in a method similar to that used for CMS offices. The analysis shown in chapter 2 of this report was based on this cost data.

### AVERAGE LETTER COSTS

The following chart shows the average letter costs based on the various cost allocation methods for Primary, Washington, D.C., and Total costs.

#### Average Letter Costs

<u>Primary Equipment</u>	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>
CMS <sup>a</sup>	\$ 1.77	\$ .49	\$ 5.51
Standalone	1.16	.43	2.19
Other	1.87	.12	7.88
<u>Washington, D.C.</u>			
CMS	5.00	.67	26.64
Standalone	5.03	1.89	10.77
Other	10.46	.70	31.10
<u>Total Office</u>			
CMS	5.05	1.40	18.19
Standalone	5.83	1.13	16.56
Other	7.33	.70	31.07

<sup>a</sup> The personnel cost data for two CMS offices was unobtainable so their average letter cost could not be included.

ALTERNATIVE COST ALLOCATION METHOD

To determine whether a cost allocation method using transactions would differ significantly from the method using available service or port months, we calculated the average letter cost for both methods. The following chart compares these methods.

**Average Letter Costs**

<u>Primary Equipment</u>	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>
Port Months	\$ 1.77	\$ .49	\$ 5.51
Transactions	1.57	.51	4.85
<b><u>Washington, D.C.</u></b>			
Port Months	5.00	.67	26.64
Transactions	4.84	.66	25.93
<b><u>Total Office</u></b>			
Port Months	5.05	.90	18.20
Transactions	4.76	.87	17.26

Since the average letter costs above showed only relatively small differences, we relied on the available service or port months method for our analysis in this report.

**Example 1**

**Senate Office "A" Share Common CMS Costs<sup>a</sup>**

**Step 1**

Ports allocated (4)	X	Months on system fiscal 1979 (8)
Equals		Port months office "A" (32)

**Step 2**

Total Common CMS Costs (\$3,500,000)	÷	Total CMS Port Months (\$3,500)
Equals		Common Cost Per Port Month (\$1,000)

**Step 3**

Common cost per port month (\$1,000)	X	Senate office "A" port months (32)
Equals		Senate office "A" share common costs (\$32,000)

<sup>a</sup> These numbers were generated for illustration only.

**Example 2**

**Senate Office "A" Share Common CMS Costs<sup>a</sup>**

Step 1

Single letters (2,750)	+	Group letters (18,500)	+	Case letters (0)	+	Data functions (32,000)
Equals Total transactions Senate office "A" (53,250)						

Step 2

Total transactions Senate office "A"	=	$\frac{(53,250)}{(5,850,000)}$
Total CMS transactions		
Equals Ratio Senate office "A" transactions to total CMS transactions (.009102564)		

Step 3

Ratio (.009102564)	X	Total common CMS costs (\$3,500,000)
Equals Senate office "A" share common costs (\$31,858.97)		

<sup>a</sup> These numbers were generated for illustration only.

**EFFECTIVENESS ANALYSIS METHODOLOGY**

To compare the effectiveness of the CMS and standalone systems we first prepared a list of 31 different capabilities afforded by the Senate's various word processing systems. We then developed an effectiveness index for each system based on these capabilities, using the following formula:

$$\text{Effectiveness index} = \text{Importance of the capability in managing and processing correspondence (Rating)} \times \text{Assessment of the capability (rating)}$$

The importance of each of the 31 capabilities was rated by our advisory panel on a scale of 0 to 8 in which the higher the rating the more essential the capability is to an office. Assessment of the capability was judged by the users on a scale of 1, very poor, to 5, very good.

The products of these two ratings gave us an average effectiveness index for each system. We then used the following formula to generate an overall effectiveness index for each system:

$$\text{Cost effectiveness index} = \frac{\text{Effectiveness index}}{\text{average letter cost}}$$

Here are the results of that analysis:

	<u>System</u>	
	<u>CMS</u>	<u>Standalone</u>
Effectiveness	713	516
Average letter cost	\$1.77	\$1.16
Cost effectiveness index	403	445

#### COMPARATIVE COSTS OF THE CMS STATE COMMUNICATIONS NETWORK VERSUS COMMERCIAL NETWORK SERVICES

We believe that the Senate computer center should consider using a commercial network as an alternative to the CMS State office network. To support this viewpoint, we developed communications traffic data estimates for the 24 State office locations that make up the current CMS State office network. These estimates included data for two planned additional State offices.

The estimates were then provided to a commercial network services vendor who processed them through a computer model to determine an estimated cost for the use of the commercial network. The results showed that the cost of using a commercial network for the CMS State office network is comparable to the cost of the current network, as follows:

<u>Current CMS State network</u>	\$20,252 per month plus one-time costs of \$2,443 (actual cost)
<u>Commercial network</u>	\$16,668 per month plus one-time costs of \$1,200 (estimated cost)

In addition to the \$20,252 per month operating costs, staffing costs must be considered. The CMS State office network requires the full-time services of two staff members with other staff members used part-time as needed. Additional staff members will be needed as the CMS network expands.

Commercial network services, on the other hand, require minimal staff. A single staff member could coordinate network service requests with the vendor as the network expands.

The workload estimates we provided to the vendor for a network services cost estimate included the number of on-line connect hours and number of data characters to be transmitted by State office location. The locations used were the same as those in the current CMS State office network plus two additional planned State office locations, Ogden and Provo, Utah.

Our workload estimates are based on connect time data obtained from the CMS contractor and CMS production statistics provided by the Senate computer center. We made two assumptions in developing our estimates: (1) 70 percent of a given Senator's CMS workload will be processed at the State office and (2) where a Senator has two field offices, the on-line connect hours and data workload have been divided equally between the two offices.

The following table shows the estimated monthly workload by office locations.

<u>Office location</u>	<u>On-line connect hours</u>	<u>Traffic data workload (no. of characters)</u>
Birmingham, Ala.	158.5	261,046
Montgomery, Ala.	158.5	261,046
Wilmington, Del.	72.2	65,828
Wilmington, Del.	86.0	360,212
Lakeland, Fla.	753.4	1,265,879
Tallahassee, Fla.	544.6	1,235,459
Atlanta, Ga.	432.1	778,953
Indianapolis, Ind.	403.3	3,992,056
Louisville, Ky.	175.3	992,440
Elizabethtown, Ky.	165.6	312,834
Jackson, Mo.	71.8	225,129
Kansas City, Mo.	83.0	226,191
St. Louis, Mo.	83.0	226,191
Kansas City, Mo.	146.5	1,099,603
St. Louis, Mo.	146.5	1,099,603
Columbus, Ohio	245.2	937,071
Salem, Oreg.	161.1	611,267
Portland, Oreg.	161.1	611,267
Portland, Oreg.	208.5	382,872
Austin, Tex.	450.5	1,703,569
Austin, Tex.	302.9	1,196,483
Dallas, Tex.	302.9	1,196,483
Ogden, Utah	52.9	269,753
Salt Lake City, Utah	52.9	269,753
Salt Lake City, Utah	79.9	384,368
Provo, Utah	79.9	384,368

The commercial vendor's cost estimate was based on the following assumptions: (1) 300 Baud service was required, (2) each connect is for 1 hour, and (3) the number of connects is equal to the number of monthly connect hours divided by 3.

A table summarizing the commercial network's estimated cost follows:

**Total Hours and Cost by Node Category<sup>a</sup>**

<u>Node type</u>	<u>Hours</u>	<u>Cost</u>
HI	-	\$ -
LO	888	4,857
FX	327	1,635
WATS	<u>636</u>	<u>10,176</u>
Total	<u>1,851</u>	<u>\$16,668</u>

<sup>a</sup> A node is a minicomputer that is interconnected to other minicomputers or nodes by communication lines (e.g., leased telephone line), so as to allow alternate paths in a network. Node categories are as follows:

- HI -- High density telephone traffic area node  
 LO -- Low density telephone traffic area node  
 FX -- Foreign exchange service; this service provides the equivalent of local telephone service even though the connection is made through a distant exchange.

WATS-- Wide area telephone service; this service allows the customer to make long-distance telephone calls from his premises to telephones anywhere within a specified service area at a flat monthly rate.

In addition to the \$16,668 for telephone line charges, there is a one-time charge of \$1,200 for installation of equipment.

The commercial network vendor asked us to stress that this is only an approximate cost, developed using estimates and assumptions. The vendor suggested that a better way to evaluate its services is to try them on a limited basis for a 60- or 90-day period. Such a trial period would provide some actual cost data which could be used for analyses and comparisons with the cost of alternative methods. We agree and believe this suggestion should be considered by the Senate computer center.

### Comparison of Printing Speeds

The following chart illustrates how the high-speed printers can effectively process large volumes of correspondence.

#### Analysis of Printing Speed by Equipment Types

<u>Printing speed</u>	<u>Manual typewriters</u>	<u>IBM 6640 &amp; System 6</u>	<u>Xerox 800</u>	<u>Wang 20</u>	<u>DTC</u>	<u>IBM 1403</u>	<u>Xerox 9700</u>
CPS <sup>a</sup>	10	92	30	40	30	950	3120
Seconds per one-page letter <sup>b</sup>	156	17	52	39	52	1.6	.5
Hours per 5,000 letters	216.7	23.6	72.2	54.2	72.2	2.2	.69

<sup>a</sup> CPS equals characters per second.

<sup>b</sup> Average Senate letter was estimated to be 26 lines with 60 characters per line.

### METHODOLOGY FOR DEVELOPING COSTS OF THE DISTRIBUTED-LOGIC SYSTEMS

Costs for the distributive system alternative discussed in chapter 4 were developed through a process of: (1) analyzing CMS production statistics and equipment configurations to determine needed capacity; (2) configuring a distributive systems model that would have the capacity for production equal to, or greater than, that of CMS; (3) configuring an enhanced capability, distributive system model, and (4) applying current actual costs to the equipment and software in the system models.

As specified in the body of the report, certain assumptions were made about the relationship of CMS production capacity and the distributed-logic system model. The table below summarizes the comparisons between the CMS and distributive-logic system models. The costs used were for one typical brand of distributive system equipment and were drawn from the GSA schedule purchase and maintenance prices. Equipment was assumed to have a 5-year life.

<u>System</u>	<u>Number (CMS)</u>	<u>Method of model development</u>	<u>Distributive system alternatives</u>	
			<u>Directly comparable to CMS</u>	<u>Enhanced capability</u>
Terminals	327	One-for-one replacement	327	355
Local processors	N/A	One per CMS site as of 12/31/79	102	102
Character printers	106	Sufficient capacity to print all letter production locally. At least one per site.	171	171
Magnetic disk storage units	N/A	Comparable in size to working storage reported in use for each office by On-Line Systems in Oct. 1979.	102 units, ranging in size from 12 million to 64 million characters	102 units, ranging in size from 12 million to 64 million characters

## COST COMPARISON

The cost analysis on p. 30 identified all cost elements associated with present Senate word processing systems and the amounts expended in each. Because the capabilities of the proposed alternative are closer to the CMS than to the other systems being used, in our analysis we compared the costs of the alternative with the costs of the CMS. All of the comparisons refer directly to the "common CMS costs" and "individual office costs" shown on page 32 and 34.

### On-Line Systems contract cost and terminal costs

The distributed-logic system relies on a combination of terminals and a local processor. The most accurate way to compare costs with the CMS is to compute the total cost of the distributive system and compare it with the combined cost of the On-Line Systems contract and the CMS terminals, which for fiscal 1979 was \$2,987,025. A distributed-logic system using dumb terminals, which would be directly comparable to CMS, would cost \$1,674,000 or 56 percent of CMS. This estimate is based on purchase and maintenance prices obtained

from the GSA schedule, with the equipment assumed to have a 5-year life. This estimate is very conservative because if the Senate could agree to select one brand of equipment, the resulting competitive procurement should result in substantially lower costs.

The above comparison, which is based on using only dumb terminals, does not take full advantage of the capability of distributive systems to provide enhanced reliability and capability when intelligent terminals are substituted. For comparison, therefore, we configured a second alternative in which nearly half of the terminals are intelligent terminals having full standalone processing capabilities. Each site would be provided with one such terminal that could communicate directly to the large central computer. The cost of this alternative is estimated at \$1,986,000 per year, and is 18 percent higher than the dumb-terminal alternative, or 66 percent of the CMS cost. Again, this estimate is conservative and could be expected to be lower if a competitive procurement were made.

#### Senate computer center staff and related travel expenditures

We would expect no difference in cost for Senate computer center staff or related travel if an alternative system were to replace the CMS. As with the CMS, the distributed-logic system alternative must be supported by a Senate staff of experts and trainers who can guide offices in using this sophisticated equipment.

#### Local communication charges and network costs

The distributed-logic system should reduce both local communication and network costs below those of the CMS. The possible savings are discussed in chapter 3 of this report. The cluster concept envisions all processing of correspondence being performed locally with no communications necessary, except that required to update the central indexing, mailing, and management information files on the Senate computer.

#### Supplies

The Senate computer center would probably use fewer supplies with the distributed-logic system because of the proposed local printing of correspondence. Continuous-form paper would be eliminated. All letter printing would be on sheet paper, which costs approximately one-fourth as much as continuous-form paper.

#### Service department support

Support from the service department may be as applicable under a distributive system as it is presently. No change in cost can be predicted.

#### Individual office personnel costs

For the purpose of this comparison, we cannot accurately predict possible differences in office personnel cost. Some operational changes within the office do imply cost reallocations.

For example, local responsibility for the equipment means that offices will have to arrange for maintenance services to be performed. However, based on the results of the external survey, we expect such efforts to be minimal.

Mail handling (printing of signatures, folding, collating, and inserting into envelopes) should be faster because of the substitution of sheet paper for the continuous-form paper now used in most offices. However, local responsibility for printing will mean attending to paper-feed system loading and operation and ribbon replacement.

An additional factor to consider when estimating overall operating costs is the potential savings possible through higher equipment usage. CMS terminal use averages just over 5 hours per day. If CMS terminals were replaced on a one-for-one basis by the word processor workstations of the proposed alternative, the idle time could be very effectively used for work now done on regular and memory typewriters. This would free personnel for other assignments, leading to higher individual productivity. Use of fewer types of office equipment would lead to lower total training costs.

## SURVEY OF SENATE WORD PROCESSING SYSTEMS

At the request of the Senate Appropriations Committee, we surveyed all 100 Senate offices. To help develop the survey and evaluate its results, we formed an advisory panel composed of Federal word processing experts, Senate office managers or executive assistants, and a private-sector word processing consultant. (See p. 63.) The survey was also designed to determine some characteristics of the Senate offices, collect workload and salary data necessary for analyzing the costs of the various word processing systems, and provide the opportunity for personal interviews with the Senate staff. Through an analysis of the survey responses, we were to determine what type of word processing system would be most cost effective for certain types of offices.

The survey was conducted through a two-part questionnaire hand delivered to each office in November-December of 1979. (The survey forms are presented at the end of this appendix.) The first part of the questionnaire, called Survey 1, was to obtain the Senators' opinions about their word processing systems. The second part, called Survey 2, was to obtain the opinions of the Senators' staffs. Executive and administrative assistants, office managers, and a few Senators completed Survey 1; and executive and administrative assistants, office managers, mail directors, and word processing operators completed Survey 2. We interviewed each Senator's staff and then collected the completed questionnaires. The response rate for completed questionnaires was 100 percent.

### SATISFACTION WITH THE PRIMARY WORD PROCESSING SYSTEMS

Our survey identified four areas of word processing needs and indicated that for most of these areas, Member offices are satisfied with their primary word processing systems. These areas are:

- Letter production, the process of generating mail in Senate offices. Letter production is a primary need because correspondence provides essential contact with the Senators' constituents.
- User and equipment support, the training of users and the maintenance of equipment. This support is vital to the implementation and daily operation of a word processing system.
- Equipment attributes, the ease of operation, security, and minimal impact of the equipment on the office's environment. These features are necessary for any word processing system.
- Other non-letter-production capabilities, management reporting, casework, and updating of mailing lists and indexes.<sup>1</sup> These capabilities can increase office efficiency by improving the ability to produce letters and freeing the staff from clerical tasks, thereby allowing more time for researching legislative issues and dealing with constituents.

#### Letter production

Individual senatorial offices produced approximately 500 to 45,000 letters per month in fiscal 1979 on their primary word processing systems. To do this, the offices used different

<sup>1</sup> We asked offices several questions to determine their level of satisfaction with the non-letter-production capabilities. The responses were discussed in ch. 2. (See pp. 10-14).

types of equipment with different letter production capabilities; but regardless of the type of primary equipment being used, most offices rated their equipment good at meeting letter production needs, as illustrated in the following chart::

Type of word processing equipment	Rating Categories					Total
	Very Good	Good	Fair	Poor	Very poor	
	------(percent)-----					
CMS	37	49	11	3	—	100
Standalone	100	—	—	—	—	100
Other	16	37	26	21	—	100

Although only six offices use standalone equipment, these six are more satisfied with their equipment than offices using the CMS or the other equipment. The offices using the other equipment are the least satisfied.

To meet an office's letter production needs, a word processing system must produce a large volume of letters at an acceptable level of print quality. Overall, Senate offices are satisfied with the capability of their systems to handle their mail volumes and are satisfied with their response times. Once again, the standalone offices are the most satisfied with the handling of the mail volumes and with the response times, while some CMS and other offices are dissatisfied. The CMS offices which are dissatisfied believe that file, or on-line storage, space is too small for the mail volumes. Because of this, the files require constant re-sorting to stay within storage limits. The remaining CMS offices which are dissatisfied have equipment that cannot print their letters fast enough.

Although most offices are satisfied with their response times, these times vary greatly from 1 to 42 days. Offices at both ends of this range are satisfied. Satisfaction depends, therefore, on both an office's priorities and its capabilities.

High print quality is extremely important to senatorial offices because the appearance of correspondence is usually the first impression a constituent receives of the Senator. All offices can print letters locally on their own character printers, but only CMS offices have the option to print letters on high-speed line printers located at the Senate computer center. As seen in the following chart, most offices rate the print quality of their own relatively slower character printers as good, while 61 percent of the CMS offices using the high-speed line printers rate print quality as fair or less than fair. Since most CMS offices use the offsite high-speed line printers for approximately 90 percent of their letters, low print quality is a major disadvantage of the CMS.

Type of equipment and printers	Rating of Print Quality			Total <sup>a,b</sup>
	Very good and good	Fair	Poor and very poor	
	----- (percent) -----			
CMS, local	60	24	16	100
CMS, offsite	39	34	27	100
Standalone	100	—	—	100
Other	74	16	11	100

a Although there are 75 CMS offices, all of them do not use both their own local printers and the offsite high-speed printers. One office does all its printing locally, while 13 do all their printing offsite.

b May not total 100 due to rounding.

During our review, the Senate computer center installed a new high-speed printer, a laser printer, to help improve print quality. We contacted a sample of the offices using the laser printer as of February 1980. The majority of these offices believe the print quality is improved and rate it good or very good. The offices, however, do not believe the laser printer is ideal primarily because the letter looks like a copy, not an original. The offices want typewriter quality, but now must trade quality for speed since the print quality of the equipment offered to them varies inversely with printing speed.

**User and equipment support**

To successfully implement a word processing system, Senate offices need both assistance to develop and manage their systems and training to operate their equipment. Also, once the system is implemented it must be maintained to effectively meet an office's needs. User and equipment support is therefore vital to senatorial offices and their word processing systems.

In our survey, we asked the offices how satisfied they were with the assistance received from either the Senate User Representatives or the vendors in developing their word processing systems. We also asked how satisfied they were with the training received to operate the equipment. The following chart summarizes the responses to these questions.

	Rating Category			Total <sup>a</sup>
	Very satisfied or satisfied	Neither satisfied nor dissatisfied	Dissatisfied or very dissatisfied	
	----- (percent of offices) -----			
<b>Technical assistance</b>				
CMS	83	7	11	100
Standalone	83	—	17	100
Other	80	20	—	100
<b>Training</b>				
CMS	85	5	9	100
Standalone	100	—	—	100
Other	75	13	13	100

<sup>a</sup> May not total 100 due to rounding.

We found no significant differences between the CMS offices' satisfaction with the Senate User Representatives and the standalone and other offices' satisfaction with technical assistance provided by the vendors and the service center to develop their systems. The majority of offices are satisfied; however, some CMS offices stated that the Senate User Representatives are inaccessible and do not always provide sufficient and accurate information. The chart also reveals that more than 75 percent of all senatorial offices are satisfied with the initial training received to operate their equipment, but the CMS and standalone offices tend to be the most satisfied.

The turnover of word processing operators can affect the need for additional training of a Senator's staff. The higher the turnover, the greater the need for training and therefore the greater the chance for problems in training new operators. We asked offices how much of a problem is created by the turnover of operators and the training of new operators. The results of those questions are shown in the following chart. Only CMS offices are experiencing moderate or serious problems with turnover. A greater percentage of the CMS offices, 51 percent, also experienced problems with the training of new operators. Perhaps the competition for operators causes these problems with turnover and training in the 75 CMS offices.

	Degree of Problem			Total <sup>a</sup>
	Very serious	Moderate or small	None	
------(percent)-----				
<u>Turnover</u>				
CMS	4	24	70	100
Standalone	—	17	83	100
Other	—	6	94	100
<u>Training</u>				
(Washington)				
CMS	8	43	49	100
Standalone	—	—	100	100
Other	11	16	74	100
(Field)				
CMS	25	25	50	100
Standalone	—	—	100	100
Other	20	40	40	100

<sup>a</sup> May not total 100 due to rounding.

Responsive and reliable maintenance is an important factor in supporting a Member office's word processing system. Without it, equipment failures can quickly cause a large backlog of mail. Eighty-eight percent of the offices are satisfied with the maintenance service they receive, but the "other" offices are the least satisfied. Several of the offices mentioned specific problems with obtaining adequate maintenance service, particularly for equipment in the field.

### Equipment attributes

Acceptable word processing equipment in the Senate should not disrupt an office's environment. We asked offices about two possible environmental impacts of their equipment, noise and heat. Most offices have only a small problem or no problem at all with the noise and heat produced by their equipment. We found, however, that 69 percent of the "other" offices have a moderate or serious problem with noise.

A word processing system should also provide sufficient security to prevent tampering, misuse, and theft of information stored in the system. We asked Senate offices about the physical and electronic security of their systems. Most offices, regardless of the type of equipment being used, are satisfied with both the physical and electronic security of their equipment, but they identified several potential security problems. These problems include:

- Lack of lockable rooms for equipment.
- Delivery of reports to the wrong Senator.
- Access by one office to another office's files after a power failure.

### NEEDS DICTATED BY FUTURE GROWTH OF SENATE CORRESPONDENCE

The volume of mail handled by word processing systems in the Senate in fiscal 1979 was estimated to be 9 million letters. The cost to the Senate for this workload is estimated to be over \$28 million in personnel, equipment, supplies, and support services.<sup>1</sup> Will this volume remain constant or will it change in the next 5 years? We asked that question about constituent and casework mail during our survey of all Member offices, and the table below shows their responses:

<u>Expected change</u>	Number of Offices	
	Constituent Mail	Casework Mail
Decrease	—	—
Remain the same	4	6
Increase 1-25%	49	47
Increase 26-50%	25	23
Increase 51-100%	12	14
Increase more than 100%	<u>3</u>	<u>3</u>
Total expected change	93	93
No response	<u>7</u>	<u>7</u>
Total	<u>100</u>	<u>100</u>

The responses indicate that the expected annual growth rate for both constituent and casework mail is approximately 8 percent, which translates into about one million additional pieces of mail to be answered each year. If we assumed the current unit cost for this additional correspondence, the added cost to Member offices and the Senate would be approximately \$2 million.

<sup>1</sup> This cost estimate excludes the personnel costs for two member offices that were unable to provide this information.

To determine the additional resources that offices would need to handle an increased workload we asked a sample of offices what they would need to handle a 10-percent increase in workload. The following chart shows their responses:

<u>Responses</u>	<u>Percent</u>
Additional staff	14
Additional staff and equipment	35
Additional equipment	11
Additional staff and space	5
Nothing	27
More efficient word-processing system	5
Additional staff, equipment and space	<u>3</u>
Total	<u>100</u>

These results indicate that additional resources in staff, equipment, and space will be required to handle the expected increase in workload for most offices. Presently offices are being "stretched" to keep up with the growth in correspondence. Two methods used by offices to keep up with growing workloads and to hold down rising costs are

- shifting workload from manual and secondary word processing systems to the office's primary system.
- processing more correspondence in field offices.

The first method—shifting workload to the office's primary system—helps the office keep up while holding down costs because primary systems can produce letters quicker and cheaper than manual and secondary systems. To shift the workload, an office's top management develops guidelines to reduce its personal mail and shift some individual responses to group responses that will be produced on the primary system. The following chart indicates the relative cost differences for the three systems between responding to mail with only the primary system and responding to mail with all the word processing systems in the office.

	<u>Average Letter Cost</u>	
	<u>Using primary system only</u>	<u>Using all systems in office (note a)</u>
CMS	\$1.77	\$5.05
Standalone	1.16	5.83
Other	1.87	7.33

<sup>a</sup> This cost includes all staff responsible for correspondence as well as all secondary word processing systems.

These figures indicate the sizable unit cost difference when the personnel and equipment used by the offices' secondary systems are added to the formula. Therefore, the offices can achieve a significant benefit by better controlling the personnel and systems employed in processing correspondence.

The second method—processing more correspondence in field offices—holds down correspondence costs because salaries in the field offices are generally lower than salaries in Washington, and personnel turnover in the field is lower. In addition, space is much more available in the field offices. A prerequisite for processing more correspondence in the field offices is to install the primary word processing system in the field offices, but so far only CMS offices have had this option. At the time of our audit, 19 Senators with 24 of their State offices were on the CMS network. Most of these offices have been brought onto the network in the past year so their experience is limited. We did, however, look at two senatorial offices that process, on the average, 80 percent of their correspondence in field offices. We found that their unit costs averaged 95 cents, which is 46 percent below the average for all CMS offices. It should be noted that these offices develop a high percentage of their work orders in Washington and then send them to the field for processing.

The demand for field locations of primary word processing systems is growing. We asked each office a series of questions to verify this need. The results showed that only 11 offices would choose to process all their mail in Washington. Most offices would like to have primary system capabilities in both Washington and the field. We also asked these offices if they needed a communications network between their Washington and field offices. This network would require a primary system in field offices. The following chart shows the response to that question:

<u>Type of system</u>	<u>Number of Offices</u>		
	<u>Yes</u>	<u>Undecided</u>	<u>No</u>
CMS	46	17	12
Standalone	2	—	4
Other	3	5	10
Total	<u>51</u>	<u>22</u>	<u>26</u>

These results reinforce the senatorial offices' need for primary systems and a communications network in the field.<sup>1</sup>

**OTHER FUTURE NEEDS**

The need for management training for word processing supervisors is of great concern to many office managers and administrative assistants. They feel that the training needs of operators are being met, but that the individuals managing the word processing system in an office have to learn to manage a correspondence operation with no outside training assistance. The results of our Senate-wide survey shown in the following chart validate this concern.

Is there a need for management training for word processing supervisors in your office?

<u>Type of system</u>	<u>Percentage of Offices Responding</u>			
	<u>Yes</u>	<u>Undecided</u>	<u>No</u>	<u>Total<sup>a</sup></u>
CMS	56	15	29	100
Standalone	50	—	50	100
Other	47	5	47	100

<sup>a</sup> May not total 100 due to rounding.

<sup>1</sup> The 22 undecided offices would significantly affect the cost of setting up such a network in the future. Based on our survey we know that an additional 27 CMS offices want to be added to our current 19 offices on the network.

We further substantiated the need for such training when we tabulated the unit costs for those offices responding to the question. The following chart shows these results:

<u>Type of system</u>	<u>Unit letter cost</u>	
	<u>Training needed</u>	<u>Training not needed</u>
CMS	\$2.08	\$1.26
Standalone	1.67	.66
Other	2.00	1.80

It can be seen, therefore, that those offices expressing a need for management training are those that truly have a problem—their unit costs are significantly higher than those offices not requesting such training.

A second need identified in our discussions was for access to the information systems SCORPIO and LEGIS in the field. We found that 65 offices would like to use SCORPIO, estimating their use of the system to average 5 hours per week. Similarly, 65 offices also expressed a need to access LEGIS in their field offices, requesting an average of 6 hours per week on the system.<sup>1</sup> For both systems the requested access ranged from 1 to 20 hours per week.

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<sup>1</sup> The 65 offices desiring use of SCORPIO were different offices from the 65 desiring use of LEGIS.

**U.S. GENERAL ACCOUNTING OFFICE  
SENATE WORD PROCESSING  
SURVEY 1**

1. Overall, how satisfied or dissatisfied are you with the correspondence produced on your word processing equipment?

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

Please explain: \_\_\_\_\_  
\_\_\_\_\_

2. Specifically, how satisfied or dissatisfied are you with the following capabilities or characteristics of your word processing system?

	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	Please Explain
Print quality					
Response time <sup>1/</sup>					
Capacity to handle your volume of mail					
Management reports					

3. Please rate the ability of your word processing system to collect and report statistical information on constituent views and concerns as expressed in your incoming mail.

- Very good
- Good
- Fair
- Poor
- Very poor

Please explain: \_\_\_\_\_  
\_\_\_\_\_

4. Have you requested CMS for your field offices?

- \_\_\_\_\_ Yes
- \_\_\_\_\_ No

Comments: \_\_\_\_\_  
\_\_\_\_\_

5. Based on your experience with your current word processing system, would you prefer to have this system:

- Operated and managed as a service by the Senate Computer Center staff  
(Your office would then be solely a user of the service)?
- Operated and managed by your office's own administrative staff?

<sup>1/</sup> "Response time" is the time from the receipt of a letter in your office's mailroom until a response letter is mailed to a constituent.



10. Currently what percent of your casework and constituent mail is handled in Washington and the field:

	Percent in Washington	Percent in Field	Total
Casework	/ / / / / % (43-45)	/ / / / / % (46-48)	= 100%
Constituent	/ / / / / % (49-51)	/ / / / / % (52-54)	= 100%

11. Approximately what percent of the mail you send out is one page or two or more pages (enclosures should not be counted in the page number)?

/ / / / / % = 1 page (55-57)  
 / / / / / % = 2 or more pages (58-60)

12. What equipment do you use most of the time to update your mailing list? (Check one.) (61)

- CMS
- Redaction
- MT/ST
- Other (please specify) \_\_\_\_\_

13. What is the average "turnaround time" for constituent mail in your office?

"Turnaround time" is the time from the receipt of a letter in your office's mail room until a response letter is mailed to the constituent.

/ / / / / days (62-63)

**Effectiveness Information**

Dupl (1-3) 2 (4)

14. Overall, how would you rate your current word processing equipment at meeting the letter producing needs of your office? (Check one.) (5)

- very good
- good
- fair (ok)
- poor
- very poor

Explain: \_\_\_\_\_

15. Overall, how would you rate the print quality of the letters produced on your primary word processing equipment (Both within and outside your office)? (Check one box for each row.)

Location of Printing	very good	good	fair (ok)	poor	very poor	Not Applicable	Explain
In your office							(6)
Outside your office							(7)

16. Overall, how would you rate the equipment you use to update your mailing list? (Check one.) (8)

- very good
- good
- fair (ok)
- poor
- very poor

Explain: \_\_\_\_\_

17. Which of the operations listed cause bottlenecks, if any, in responding to mail? (Check no more than three.)

- sorting mail (9)
- writing new standard responses (10)
- writing individual letters (11)
- filling out work orders (12)
- assembling paragraphs (13)
- proofing the letter (14)
- printing (15)
- typing (16)
- signing (17)
- cutting/flipping (18)
- folding/stuffing (19)
- sending letters from the field to Washington for processing (20)
- sending letters from Washington to the field for processing (21)
- Other (please specify) \_\_\_\_\_ (22)

**Correspondence Staff**

18. Please complete the charts below for your word processing personnel. This includes the personnel involved in receiving and sorting the mail; developing and approving responses; producing letters on the word processing equipment; and signing, folding, and sending the mail.

	No. of Personnel	Percent of Time on Word Processing	Average Annual Salary (In thousands of dollars)										
			Less Than 8	8-10	10-12	12-15	15-18	18-21	21-25	25-30	30-35	35-40	Greater Than 40
<b>Washington Staff</b>													
Supervisory Staff (Including office managers and production managers)													
Mail Room Personnel (Personnel opening and sorting the mail)													
Legislative Correspondents and Legislative Aides (Staff drafting constituent mail)													
Caseworkers (Only time spent preparing correspondence)													
Correspondence Approval Staff Administrative Assistants Chief Legislative Assistants													
Secretaries (Only time spent typing constituent and casework mail)													
CMS Operators Robo Operators													
Librarians (Maintains and updates standard correspondence)													
Other (please specify) includes interns, volunteers, etc.													
<b>Field Staff – Those personnel in your field offices developing and generating correspondence to constituents.</b>													
Supervisory Staff													
Mail Room Personnel													
Legislative Correspondents Legislative Aides (Only time spent developing responses)													
Caseworkers (Only time spent preparing correspondence)													
CMS Operators Robo Operators													
Secretaries (Only time spent typing correspondence)													
Other (please specify)													

**NOTE:** Staff members performing more than one correspondence function should be included in only ONE category above (i.e., even if the WP manager also opens and sorts mail, he/she should only be included in the WP manager category)

19. Listed below are capabilities that can be performed on various word processing equipment now being used in Member Offices. In Part I, please indicate whether your office needs the capability. (Answer Part I regardless of whether your system has the capability or not.) If your current word processing system has the capability, please indicate in Part II whether you use it. In Part III, please rate the performance of the capabilities you use.

Dupl (1-3)  
4 (4)

	PART I Need for this Capability					PART II Capability used on current W.P. system		PART III Rating of Capability					
	1. Very great need	2. Substantial need	3. Moderate need	4. Minor or small need	5. No need	1. Yes	2. No	1. Very good	2. Good	3. Fair	4. Poor	5. Very poor	
<b>Letter Production</b>													
- Generates identical letters with no retyping other than names and addresses													(5-7)
- Combines stored paragraphs for multi-issue letters													(8-10)
- Modifies pre-stored text for individual letters without altering original stored text													(11-13)
- Restricts pre-stored text to prohibit use pending revision													(14-16)
- Expands two-character state codes to full state name on letters and envelope													(17-19)
- Automatically repeats city, state, and zip code from previous address line for letter, envelope, mailing list, and index													(20-22)
<b>Printing</b>													
- Prints letters (after entry) with sufficient speed to meet workload													(23-25)
- Can run all "second" sheets to facilitate use of signing machine													(26-28)
- Can print page 1, page 2, and envelopes in succession													(29-31)
- Can print page 1 and 2 in succession													(32-34)
- Automatically prints envelopes from name and address information on the letter													(35-37)
- Automatically feeds envelopes (no operator necessary)													(38-40)
- Prints letters on both sides of the page													(41-43)
<b>Typing, Storing and Editing of Text</b>													
- Changes word(s) by retyping the correct word in place of the old word without retyping other parts of the letter													(44-46)
- Adds, moves or deletes words, phrases, sentences, or paragraphs without having to retype other parts of the letter													(47-49)
- With a single command, finds every occurrence of a word or phrase, and if desired changes every occurrence of that word or phrase without having to retype other parts of the letter.													(50-52)
- Creates text with prompts for fill-ins at time of letter setup													(56-58)

	PART I Need for this Capability					PART II Capability used on current W.P. system		PART III Rating of Capability					
	1. Very great need	2. Substantial need	3. Moderate need	4. Minor or small need	5. No need	1. Yes	2. No	1. Very good	2. Good	3. Fair	4. Poor	5. Very poor	
<b>Formatting</b>													
- Automatically analyzes letter for optimum line length, page makeup, and paragraph separation at the time of letter creation													(59-61)
- Allows operator to choose line length, page makeup, and paragraph separation at time of letter creation													(62-64)
- Adjusts formatting of letters for: - different paper sizes													(65-67)
- location of date													(68-70)
- location of signature block													(71-73)
- location of right and left margins													(74-76)
- justified right margins													(77-79)
<b>Casework</b>													Dupl (1-3) 5(4)
- Captures constituent and agency information for case tracking													(5-7)
- Captures opening, interim, and closing letters for case report													(8-10)
- Maintains agency address and contact table and automatically types name and address on transmittal letter													(11-13)
- Maintains tickler file by due date and aide													(14-16)
- Automatically retrieves name and address information for additional letters; no retyping necessary													(17-19)
<b>Indexing of Correspondence</b>													
- Updates Senate Computer's Index System with:													
- Automatic restructuring of data into proper format													(20-22)
- No re-keying of data													(23-25)
- Automatic submittal for update													(26-28)
- Automatically assigns a document number													(29-31)
<b>Update and Storage of Mailing Lists</b>													
- Automatically adds names, addresses, and interest codes to newsletter mailing list with no rekeying of data													(32-34)
- Selectively adds names, addresses, and interest codes to newsletter mailing list													(35-37)

**Word Processing Needs**

20. How important or unimportant is the ability to recall names and addresses entered into your system after 7 days? (38)  
 1.  very important  
 2.  important  
 3.  unimportant
21. How long does it take to retrieve this information (names and addresses) after 7 days have passed?     /    /     days (39-40)
22. Where would your office process constituent and casework mail, if given the option and the necessary equipment?

	Constituent	Casework
Washington only	1. <input type="checkbox"/>	1. <input type="checkbox"/>
Field only	2. <input type="checkbox"/>	2. <input type="checkbox"/>
Both Washington and the field	3. <input type="checkbox"/> (41)	3. <input type="checkbox"/> (42)

\*23. Currently what is the average weekly connect time (time you are actually using the system to alter text, produce letters, update your mailing list, etc.) on CMS per week.

Number of Terminals (Excluding your printer)     /    /     X Average connect time per terminal per week (hours)     /    /     = Average connect time per week (hours)     /    /      
 (43-44) (45-47) (48-52)

\*24. Given your current field office's workload, what would be your projected usage of CMS per field office terminal (Assume that you would be allocated two terminals in each of two field offices)?

Estimated connect time per terminal per week (hours)     /    /     Scorpio Legis  
 (53-55)

25. Currently how much time per week in hours are the two information systems "Scorpio" and "Legis" being used?     /    /     (56-58)     /    /     (59-61)

26. If these information systems were available in your field offices, estimate the time they would be used.

Estimated field office hours per week Scorpio Legis  
    /    /     (62-64)     /    /     (65-67)

27. Currently, the option exists to develop a communication network between the field and Washington. This option would allow, for example, your office to develop standard paragraphs or letters in Washington and then produce letters to constituents in the field office. Do you need this type of communications capability?

1.  Yes    2.  Undecided    3.  No (68)

28. By what percent will your constituent and casework mail increase or decrease over the next 5 years? Dupl (1-3)  
6 (4)

		Constituent			Casework
increase	<u>    </u> / <u>    </u> / <u>    </u> %	(6-8)	increase	<u>    </u> / <u>    </u> / <u>    </u> %	(9-11)
decrease	<u>    </u> / <u>    </u> / <u>    </u> %	(12-14)	decrease	<u>    </u> / <u>    </u> / <u>    </u> %	(15-17)

29. If your workload increases, what additional resources would you need to handle this workload? (Check all that apply?)

1.  additional personnel (18)  
 1.  additional equipment (19)  
 1.  Other (please specify) \_\_\_\_\_ (20)

**Management of the Word Processing System**

30. Is there a need for management training for your word processing supervisors?  
 1.  Yes    2.  Undecided    3.  No (21)
- \*31. If you receive reports from the Senate computer center, how important/unimportant are these reports in the management of your office's mail and personnel? (22)  
 1.  very important  
 2.  important  
 3.  unimportant

\* NOTE: These questions should be completed by CMS users only.

\* 32. If you receive CMS reports from the Senate computer center, how useful/useless are the reports in each of the following areas?

	Useful	Marginally Useful	Useless	
Workload and issue (for example, the statistic and issue breakdown reports)	1. <input type="checkbox"/>	2. <input type="checkbox"/>	3. <input type="checkbox"/>	(23)
Issue mail control (for example, the tickler report)	1. <input type="checkbox"/>	2. <input type="checkbox"/>	3. <input type="checkbox"/>	(24)
Case management (for example, the snapshot report)	1. <input type="checkbox"/>	2. <input type="checkbox"/>	3. <input type="checkbox"/>	(25)
Mailing list management (for example the Vague name/Zip list report)	1. <input type="checkbox"/>	2. <input type="checkbox"/>	3. <input type="checkbox"/>	(26)

33. If you are not on CMS or if you are on CMS and creating your own reports, list and describe the reports your office develops from the data in its word processing system?

Reports	Description
A. _____	_____
B. _____	_____
C. _____	_____
D. _____	_____
E. _____	_____

34. Overall how satisfied/dissatisfied are you with:

	1. Very Satisfied	2. Satisfied	3. Neither Satisfied nor Dissatisfied	4. Dissatisfied	5. Very Dissatisfied	Explain	
the assistance received from either the SURs (Senate User Representatives) or the vendor in developing your system?							(27)
the training your office staff received to operate the equipment?							(28)
the maintenance service provided for your equipment?							(29)
the security of your system: - Physical?							(30)
- Electronic?							(31)

35. How much of a problem, if any, is the:

	1. Very Serious	2. Serious problem	3. Moderate problem	4. Small problem	5. No problem	
noise produced by your equipment?						(32)
heat generated by your equipment?						(33)
readability of your screen?						(34)
turnover of your word processing/robo operators?						(35)
training of new operators to the point where they are proficient in using the equipment in: (a) Washington?						(36)
(b) Field?						(37)

**Other Comments**

36. If you have any other comments about your word processing system, future word processing needs, or overall word processing management in the Senate, please provide them in the space provided below.

\*Note: These questions should be completed by CMS users only.

## SENATE WORD PROCESSING ADVISORY PANELISTS

Ms. Anne Ainsworth, Office Manager  
Office of Senator Alan Cranston

Mr. Van Jones, Executive Assistant  
State Office of Senator Richard B. Stone

Dr. James Kasperzak, Acting Chief  
Administration Systems Division,  
Department of the Army

Mr. Al Mitchler, Office Manager  
Office of Senator Richard G. Lugar

Lt. Colonel Sharon Murry,  
Administrative System Manager  
Department of the Air Force

Mr. Mortimer Rogoff  
Director, Office Systems  
Booz-Allen and Hamilton, Inc.

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Office of Senator Patrick J. Leahy

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## United States Senate

COMMITTEE ON APPROPRIATIONS  
WASHINGTON, D.C. 20510

May 3, 1979

Mr. Elmer B. Staats  
Comptroller General of the  
United States  
General Accounting Office Building  
Washington, D.C. 20548

Dear Mr. Staats:

At a hearing conducted by the Legislative Branch Subcommittee on May 1, 1979, Senators Long, Cranston and others expressed serious concern about the current system the Senate has adopted to respond to constituent mail. For your information, we are sending you a copy of the hearing transcript and your attention is directed to the testimony of Senator Long in which he requested "a full and immediate investigation into the Senate's entire word processing system by the General Accounting Office (GAO), Congress' watchdog agency on Federal spending."

The concerns of Senator Long and Cranston have been shared by other Senators who feel the current system yields an inferior product at an excessive cost to the Senate.

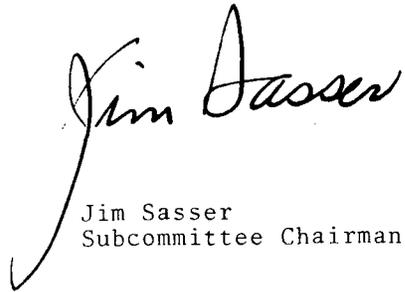
In view of these expressed concerns, it is our desire that you proceed with the request of Senators Long and Cranston for a comprehensive review of the word processing needs of the Senate along with the methods currently being used to meet these needs and any recommendations for improvement.

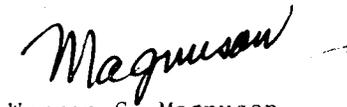
It will be appreciated if you would keep our staff informed in the conduct of this study, the results of which will hopefully be available for incorporation into the fiscal year 1981 budget cycle.

With best regards, we remain

Sincerely,

  
Ted Stevens  
Subcommittee Ranking  
Minority

  
Jim Sasser  
Subcommittee Chairman

  
Warren G. Magnuson  
Chairman



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