

## DOCUMENT RESUME

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Problems Found with Government Acquisition and Use of Computers from November 1965 to December 1976. B-115369; PGHSD-77-14. March 15, 1977. 46 pp.+ appendices (27 pp.).

Report to the Congress; by Robert F. Keller, Acting Comptroller General.

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Contact: Financial and General Management Studies Div.

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Organization Concerned: Department of Commerce; Department of Defense; General Services Administration; Office of Management and Budget.

Congressional Relevance: Congress; House Committee on Armed Services; Senate Committee on Armed Services.

Authority: Brooks Act of 1965 (P.L. 89-306). Executive Order 11717.

During the 11 years since enactment of the Brooks Act, GAO has issued 175 reports relating to the management and use of automatic data processing systems in Federal programs. GAO summarizes the information from these reports to assist the Congress, Federal managers, and other groups interested in data processing problems. Findings/Conclusions: Problems in Automatic Processing (ADP) management include: acquisition of data processing equipment without adequate determination of needs; lack of adequate studies of work to be done or alternatives; acquisition of computer equipment sooner than necessary; poor design and planning; prescribed procurement practices not followed; problems in acquisitions of computers under Federal grant programs; a complicated procurement system for minicomputers; the expense of short term equipment leases; not enough use of alternate equipment supply sources; not enough evaluation of software requirements and sharing opportunities; and not enough standardization of data elements and codes. Recommendations: Improvements in ADP management will require action by central agencies as well as by the operating agency concerned. Action to make possible multiyear leases and to increase usage of the ADP Fund would be of value in reducing the Government's data processing costs. More managerial attention is needed in computer operations, and agencies need to police their own activities. Inquiry into the adequacy of laws concerned with computer crimes is needed. (QH)

00054

# *REPORT TO THE CONGRESS*



*BY THE COMPTROLLER GENERAL  
OF THE UNITED STATES*

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## **Problems Found With Government Acquisition And Use Of Computers From November 1965 To December 1976**

During the 11 years since enactment of the Brooks Act, GAO has issued 175 reports relating to the management and use of automatic data processing systems in Federal programs. This report summarizes the information reported in these 175 reports to assist the Congress, Federal managers, and other groups interested in data processing problems and Government efforts to solve them.



COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON, D.C. 20549

B-115369

To the President of the Senate and the  
Speaker of the House of Representatives

The invention of the electronic computer has profoundly changed the way business and government operate. It has done much to increase productivity and has made significant contributions in financial management, scientific research, medical research, education, and other important fields of national interest, as well as in the administrative activities of the Federal Government.

The growth in the development and use of computers has been rapid and is related in great measure to efforts by Government managers to increase Federal productivity and to contribute to more efficient, less costly Government. The widespread use of computers has been accompanied by a host of new problems, many relating to the rapid technological changes in the field. Because of these changes, effective management has required continual updating of knowledge.

For more than two decades, GAO has been studying and reporting on problems arising from the expanding use of computer technology and its growing impact on Government operations.

Public Law 89-306, commonly called the Brooks Act, which became law on October 31, 1965, was directed at dealing with many of these problems. It fixed responsibilities within the Government for coordinating purchase, lease, and maintenance of computers; establishment of standards; and development of policy. Much has been accomplished as a result of the Brooks Act--savings reported by GSA are over \$2 billion--but vigilance is needed to see that Government policy and practices are consistently followed and that agency practices to keep abreast of technological changes carry out the act's intent.


In the 11 years since enactment of Public Law 89-306, GAO has issued 175 reports dealing with problems in the data processing field. In 1976, we were called upon twice to present testimony on

- major areas of automatic data processing management in which more improvement is still needed since passage of Public Law 89-306 on October 31, 1965, and
- computer-related crimes, physical security, and issues related to the use of computers in the administration of Federal programs.

The statements prepared for this testimony provided a rather comprehensive summary of our work in this area during the 11 years. Also, additional information on these subjects is available in the following congressional documents:

- House Report No. 94-1746, and Hearings before a Subcommittee of the House Committee on Government Operations on the Administration of Public Law 89-306, Procurement of ADP Resources by the Federal Government, on June 28 and 29 and July 1, 1976.
- Staff Study of Computer Security in Federal Programs by the Senate Committee on Government Operations, dated February 1977.

We are issuing this report, which includes these two statements and a list of the reports issued and the major issues dealt with in each report, for those interested in data processing problems and Government efforts to solve them.

  
ACTING Comptroller General  
of the United States

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#### ABBREVIATIONS

ADP	automatic data processing
GAO	General Accounting Office
GSA	General Services Administration
NBS	National Bureau of Standards
OMB	Office of Management and Budget

## INTRODUCTION

In the early 1950s, Federal agency practices for procuring and using calculators, punched card machines, and other office equipment were simply applied to ADP systems as well. Generally, agencies acquired computers by leasing them from computer equipment manufacturers and by trading in used or excess equipment to the same suppliers. Most agencies making such decisions considered only their own needs. Purchasing or acquiring computers in other ways or taking into account the needs of other agencies when exchanging equipment were usually not considered.

The automatic data processing (ADP) field in the Federal Government was in an early stage of development, and no single Government agency was responsible for directing and coordinating developments in this field. Likewise, no Government policy required an agency, before trading in equipment no longer suitable for its needs, to examine the possibility of transferring the used equipment to other Government organizations.

Under the system in use during the 1950s, each agency made its own decisions about how to acquire and use ADP equipment. No effective coordinating machinery was at work to see that such decisions considered the Government's overall needs.

The Congress and GAO were very much interested in the development and use of ADP technology in the Federal Government during the early years. About 100 GAO reports were sent to the Congress from 1955 to 1965. The results of these studies generally called for more Government-wide coordination in ADP management and recommended the establishment of a strong central management office in the executive branch.

Executive branch concern over ADP management in the fifties was usually limited to the annual budget review processes. However, in 1959 the Office of Management and Budget (OMB) instituted a program for better overall management of this new technology. The program recognized a need for central leadership in the executive branch and called for specialized management of ADP, Government coordination, and accurate up-to-date information on the number and cost of electronic computers in use throughout the Federal Government.

A small ADP staff was organized in OMB to carry out this responsibility. Its major duties included

--formulating and promulgating policy, criteria, and planning guidance for the Government ADP program;



- reviewing and assessing progress of ADP programs in selected agencies and for the Government as a whole;
- promoting desirable standardization in ADP systems that are common to all agencies; and
- using existing organizational relationships to guarantee effective internal and Government-wide coordination of the ADP program with related programs and activities.

From 1960 to 1965, OMB exercised its policymaking responsibilities by issuing many bulletins and circulars prescribing guidance, policies, and practices on selection, administration, management, and use of ADP equipment and systems.

A major milestone in the ADP area was the passage of Public Law 89-306 in October 1965. The Subcommittee of the Committee on Government Operations, under Chairman Jack Brooks, held hearings in 1963 and 1965 and prepared a bill (now known as the Brooks Act) which mandated changes in the overall Government ADP management practices.

Public Law 89-306 provides for the economical and efficient purchase, lease, maintenance, operation, and use of ADP equipment. The General Services Administration (GSA) was made responsible for the acquisition, use, and maintenance of ADP equipment; OMB was made responsible for policy and fiscal control aspects of ADP management. The law also gives the Department of Commerce responsibility for developing technical standards and providing technical advisory services to Federal agencies.

In May 1966 OMB issued policy guidelines to direct GSA's efforts under the act. GSA was to extend and intensify its program of distributing excess equipment and to

- review and improve the processes of obtaining and circularizing information about equipment availability,
- seek and evaluate reasons why excess equipment was not claimed by agencies, and
- help agencies arrange for the use of excess equipment.

In May 1968 OMB authorized GSA to acquire excess Government-owned equipment and rent the equipment to agencies through the ADP Fund at rates high enough to guarantee the

continued solvency of the fund but lower than the rates charged by suppliers.

OMB continued to exercise its policymaking responsibilities after passage of the act from 1965 through 1973. Guidelines, policies, and information were issued to Federal agencies on ways to better acquire, manage, and use ADP resources. OMB also sponsored conferences on the management of Government computer systems to review trends and developments of computer technology.

In May 1973, Executive Order 11717 transferred certain functions to GSA and the Department of Commerce. GSA received the policy control responsibility, and Commerce received OMB's standards responsibility, including the function of approving standards on behalf of the President. General oversight responsibilities remained in OMB. Executive Order 11893, issued on December 31, 1975, called for the policy formulation function to be OMB's responsibility and left the standards responsibilities in Commerce.

The statements presented on the following pages summarize much of our work during the 11 years since passage of the Brooks Act. A summary of the reports issued starts on page 47.

United States General Accounting Office  
Washington, D. C. 20548

FOR RELEASE ON DELIVERY  
Expected at 10:00 a.m. EST  
Monday, June 28, 1976

Statement of  
Donald L. Scantlebury  
Director  
Financial and General Management Studies Division  
Before the  
Subcommittee on Legislation and National Security  
Committee on Government Operations  
House of Representatives  
on  
Public Law 89-306

Mr. Chairman and Members of the Committee:

We are pleased to meet with you today to discuss the Federal Government's procurement and utilization of Automatic Data Processing (ADP) resources. We believe that P. L. 89-306, the Brooks Act, has accomplished a great deal over the past ten years, but pursuant to your request we have concentrated our comments primarily on those areas of management of ADP in which further improvements can be made.

Under this Act, major responsibilities are assigned to executive branch agencies:

- the Administrator, General Services Administration (GSA), coordinates and provides for the purchase, lease, and maintenance of automatic data processing equipment by Federal agencies;
- the Secretary of Commerce, working primarily through the National Bureau of Standards (NBS), provides scientific and technological advisory services, performs standards work, and does research in the area; and
- these activities are subject to direction by the President, and to fiscal and policy control by the Office of Management and Budget (OMB).

According to GSA statistics there were over 9,000 installed computers in the Federal Government inventory in January of this year and all indications are that the number of computers will continue to increase, with a corresponding increase in the Government's investment.

We know that Congress is concerned about the costs of ADP programs. On a number of occasions, we attempted to determine comprehensive and precise costs for the Government's ADP programs but found it impossible without an inordinate expenditure of effort and resources due to:

- the sizeable automatic data processing operations financed by the Government but not required to be reported to GSA; and
- differences among Federal agencies in recording, summarizing, and reporting on cost data on automatic data processing activities.

In May of 1975 we developed an estimate of the Government's automatic data processing for fiscal year 1974. At that time, we estimated the total expenditures were in excess of \$10 billion annually. We know that costs are continuing to grow and in our opinion consider \$10 billion annually to be a conservative estimate.

To get into this subject in more detail, we will start by outlining results of GAO studies of agency procurements of data processing equipment during the past few years. These studies point out the problem areas quite clearly.

ACQUISITION OF DATA PROCESSING  
EQUIPMENT WITHOUT ADEQUATE  
DETERMINATION OF NEEDS

In a number of our reports, we have cited instances in which data processing equipment was acquired or replaced without adequate determinations being made of what the agencies' needs were. The result often was that more capacity was acquired than was needed, and the Government incurred greater cost than was necessary to do the agencies' work.

These unnecessary acquisitions usually were attributable to:

1. Not adequately determining the scope of the work the computer system was to perform.

2. Failing to make cost/benefit analyses of alternative methods of meeting needs.
3. Not assessing utilization of equipment currently in use to see whether additional work could be performed without acquiring additional capacity.

The cases we have reported in the past few years include the following.

LACK OF ADEQUATE STUDIES OF WORK  
TO BE DONE OR ALTERNATIVES

In our report 1/ on the planning for a Departmental-wide automatic data processing system within the Department of Agriculture, we stated that the Department had not adequately determined requirements in that:

- the Department-wide needs were primarily developed from a workload analysis of only one of its 29 agencies and users,
- the users' locations and communications needs had not been identified, and
- an analysis of the security requirements for sensitive and personal data had not been performed.

Additionally, Agriculture had not made economic studies for evaluating the proposed project's benefits or the cost implications of alternative designs.

The total estimated cost for this program, including \$106 million for equipment and software, and for operating costs over an 8-year period, was \$398 million. Our report recommended the cancellation of the planned procurement. Subsequently, 2/ Agriculture terminated the procurement.

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1/LCD-75-108: Improved Planning--A Must Before A Department-wide Automatic Data Processing System Is Acquired For The Department of Agriculture, June 3, 1975.

2/October 1975.

In another case, we reported 1/ that the Social Security Administration leased two systems at an annual rental cost of \$2.8 million. These were leased without adequately evaluating the need for them or considering the relative costs of alternative methods of acquiring the desired computer capability. In response to our report, the Social Security Administration advised us it would improve its procurement practices.

In another instance, we reported 2/ that the Veterans Administration leased a computer for three years for about \$3.8 million, without determining whether a less costly system might satisfy their needs.

We suggested that VA restudy this matter and return this equipment if it was in fact larger than needed. (Their contract would permit such a return.) VA officials promised to make such a study.

We also have found instances in which procurements were made without being preceded by adequate utilization studies, which might establish that additional equipment is not needed or that less costly alternatives are available. Two such instances were the Department of Agriculture's proposed procurements for its Washington and St. Louis computer centers.

In our report on the Washington Computer Center 3/, we stated that Agriculture had not made a study justifying the need for expansion of its computer storage systems. In January 1976 we discussed our findings with Department officials and suggested that their request for proposals be cancelled, which they did. We also suggested an alternative lower cost way of satisfying their requirements, which would reduce their annual rental costs by about \$300,000.

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1/B-164031(4): Improving the Acquisition of Computer Systems; January 24, 1974.

2/MWD-76-132; Letter report to Congressmen John E. Moss and Charles Rose, House of Representatives; June 1, 1976.

3/LCD-76-120 letter report issued 4/16/76.

In a current review of the St. Louis Computer Center, 1/ we found inefficient use of data processing facilities which, if corrected, would eliminate any present need for additional equipment and could even result in a reduction in annual operating costs. We believe that other improvements to the existing system or use of commercial facilities, will preclude the need for a computer upgrade until it can be co-located with Agriculture's Kansas City Computer Center, planned for July 1977.

As disclosed in a current report, 2/ three Defense Supply Agency computer centers have disk drives which make up a substantial portion of the total hardware costs of these systems. We computed the utilization of disk space at these computer centers, which showed that, of 283 disk drives on line, space equivalent to 83 disk drives, or 30 percent, was not required to support the current levels of operations. Thus, unneeded disk equipment, which represented an investment of \$808,000, could be used at other Government activities to avoid new procurements or to replace rented equipment.

Also, we found that DSA had a disk drive replacement program underway which, if followed as originally planned, would have resulted in about 70 percent of the storage space on the new disk drives not being used. This happened because in arriving at its computation of needs, DSA had made no evaluation of the relationship between equipment performance and storage capacity, which they subsequently agreed to do.

On May 18, 1976, a DSA official told us that the study has resulted in DSA taking action to reduce the number of disk drives presently installed at one center and the number of drives to be installed at other centers will also be reduced. As a result of these actions annual costs under the replacement program will be reduced by about \$497,000 or 38 percent.

Our January 1974 report 3/ on acquisition of computer systems by the Social Security Administration (SSA), is another instance in which we discussed problems arising

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1/Report issued 12/30/76.

2/LCD-76-121.

3/B-164031(4), Improving the Acquisition of Computer Systems, January 24, 1974.

from the lack of studies required by Executive branch policies--studies that are intended to insure that additional ADP resources are obtained only after adequate evaluations of the requirements are made. In that report, we pointed out that the mere deferral of major systems acquisition through improving existing facilities can also result in substantial savings. This was demonstrated by SSA's action in March 1973 to defer the proposed leasing of a new IBM 370/165 system for about 3 months through the modification of an existing system, which resulted in a savings of about \$543,000.

### Inadequate Assessments of Utilization

In August 1975 we reported 1/ that the Federal Aviation Administration (FAA) had purchased and installed two computer systems at a cost of about \$3.1 million to support data systems that were being developed. FAA's justification was that existing computers could not handle the expected workload. We found that FAA did not review the workload and that the two computers were not effectively used months after installation. For a 6 month period that utilization amounted to only 7.3 percent.

At the time of the procurement the Office of Management and Budget (OMB) required a readiness review before acquisition to insure that a reasonable amount of productive work could be processed when the computers were installed. FAA did not make such a review.

In a March 1975 report 2/ we discussed opportunities for improving computer use in the Bureau of the Mint. That report discusses Federal regulations which require agencies to select computers on the basis of detailed determinations of an agency's data processing requirements so that only needed computing capacity is acquired. Before selecting the IBM 370/155, however, the Mint did not meet this requirement for the applications that were to be run on the computer. Nearly a year after installing its

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1/LCD-74-118, Improved Planning And Management of Information Systems Development Needed, Federal Aviation Administration, August 18, 1975.

2/FGMSD-75-19, Opportunities for Improving Computer Use in the Bureau of the Mint, Department of the Treasury, March 20, 1975.



computer, the Mint was using only one-third of the system's productive capacity. Only one major computer application had been designed and put into service.

We recommended that the Treasury direct the Mint to seek ways to use the excess capacity. In a letter commenting on the recommendation in our reports, the Treasury reply stated that:

"the current and planned customs workload will use a significant portion of this capacity."

After we issue a report, we make routine followups to see if our recommendations are being implemented. During one of these followups, we learned that instead of diverting more Customs work to the Mint computer, the Treasury permitted Customs to acquire a computer of its own.

#### ACQUISITION OF COMPUTER EQUIPMENT SOONER THAN NECESSARY

A closely related problem is acquiring equipment, in quantity, before adequate software design, testing, and debugging have been performed. This can lead to substantial unnecessary costs.

In a recent report <sup>1/</sup> concerning the Air Force's Advanced Logistics System we stated that the Air Force acquired and installed computer systems at all five air logistics centers and Headquarters before successful testing and with the knowledge that there were serious problems with computer equipment and software. This occurred even though in February 1971 we endorsed a recommendation by an Air Force Scientific Advisory Board panel that no additional computer systems be acquired by the Air Force until the prototype system was completely tested and evaluated under operational loads. That endorsement was contained in an earlier report to the Chairman, House Committee on Appropriations, dated February 4, 1971.

In December 1975, the Congress instructed the Air Force to terminate the Advanced Logistics System after

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<sup>1/</sup>LCD-75-101, Problems in Developing The Advanced Logistics System, dated June 16, 1976.

9 years of work and the expenditure of about \$250 million. The cost to the Government could have been much less if the Air Force had not acquired the hardware prematurely.

### POOR DESIGN AND PLANNING

In a number of our reviews, we have found that initial poor design and planning continues to plague ADP operations years later. In 1975 we issued a report <sup>1/</sup> on the Navy's automatic data processing. This program is costing about \$300 million annually. We found that the Navy has the necessary guidance for system development but was having difficulty achieving its major objectives for such systems, particularly in developing standard systems on a command and functional basis. Instead of timely, standardized, and cost-effective systems, there have been costly and prolonged systems development cycles. This has resulted in the Government spending millions of dollars each year to sustain system development efforts and to operate and maintain computers acquired for those systems without fully achieving expected benefits. In addition, it has acquired late-model computers for some of those systems in an effort to upgrade them, even though they are not fully standardized and are not designed to use the latest computer technology.

We found that a major contributing factor is command prerogative, which allows local commanders to influence unduly the design of standard systems, to modify standard systems, and to develop systems to suit local needs without regard to the ADP program objectives. We recommended that the commands be required to adhere to the fundamental requirements for systems development and management through more stringent control by Navy's top data processing managers. The specific areas where improvements are needed, in both development and management, are system studies, redesign of systems, justification of system projects, and standardization.

The Assistant Secretary of the Navy (Financial Management) acknowledged that improvements could and should be made in the Automatic Data Processing Program and essentially agreed with GAO's proposals. In July 1975 he advised us that he had initiated numerous actions to strengthen the Navy's data processing program. These are essentially in consonance with our recommendations.

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<sup>1/</sup>LCD-74-110, Ways to Improve Management of Automated Data Processing Resources, Department of the Navy, April 16, 1975.

PRESCRIBED PROCUREMENT PRACTICES  
NOT FOLLOWED

We have also reported a number of instances in which prescribed procurement practices were not followed. The results of such actions are not always ascertainable, but the usual result is additional cost to the Government for the items purchased.

The deviations from prescribed procedures disclosed by our reviews are:

1. Agencies avoided obtaining GSA delegations of authority for procurement
2. Failure to obtain competition or make cost determinations.
3. Sole source procurements authorized without adequate consideration of alternative methods of meeting needs.
4. Little use of ADP Fund.

Avoidance of GSA Authority  
to Delegate Procurement

In our reviews we found some evidence of avoidance of obtaining delegations of procurement authority from GSA. In one report 1/ we disclosed that the Social Security Administration (SSA) ordered only 10 of 64 tape drives required for a new IBM 370/165 system, thus staying within the maximum order limitations; and thereby avoiding having to obtain a procurement delegation from GSA. The other 54 tape drives were diverted from other SSA systems. These were supposed to have been returned to IBM and replaced with drives obtained competitively. GSA had not approved the diversion. Also, SSA acquired a UNIVAC 1108 system, without obtaining a delegation of authority, by amending a contract made under an earlier delegation.

In another case, 2/ to acquire three computers the Army modified an existing contract, without seeking a

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1/B-164031(4), Improving The Acquisition Of Computer Systems, January 24, 1974.

2/Comdisco, Inc., 54 Comp. Gen. 196 (1974).

delegation of procurement authority from GSA. In response to a bid protest, we found this procurement to be unauthorized and advised the Army to get such a delegation before proceeding with the procurement. The Army eventually purchased the remaining systems on the open market and modified the arrangement on the installed systems to reduce significantly the cost to the Government.

In two cases, 1/ GSA and the procuring agencies involved did not justify and review proposed procurements in accordance with Federal Management Circular 74-5 and Federal Property Regulation, part 101-32.4, (the detailed procedures governing Government acquisition of computer equipment) even though under the proposed procurements contractors could acquire equipment for the account of the Government. GSA's rationale was that these were not procurements of equipment but were procurements of facilities management services. After GAO raised objections with regard to these procedures, GSA reinterpreted its responsibilities so that in the future, it will increase its review role in such procurements.

Failure to Obtain Competition  
or Make Cost Determinations

Mr. Chairman, your Committee has, for a long time, insisted upon an environment of full and free competition for Federal procurements of automatic data processing equipment.

Our report on competition, dated May 1974, 2/ disclosed that, while there has been a decline in recent years of schedule contract procurements, in fiscal year 1973 (the latest year for which reports were available at the time) it was still 60 percent of the total for automatic data processing equipment contract costs.

Federal Property Management Regulations require that agencies seek competition before acquiring equipment under schedule contracts, except when a determination of lowest overall cost to the Government, price and other factors

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1/RED-76-59, Contract Award by the Federal Power Commission for Developing and Installing a Regulatory Information System, April 2, 1976, and PRC Computer Center, Inc., 55 Comp. Gen. 60 (1975).

2/B-115369, More Competition Needed in the Federal Procurement of Automatic Data Processing Equipment, May 7, 1974.

considered, can be made and documented without further solicitation or negotiation. GAO identified and described instances where agencies competitively acquired equipment. In so doing, they effected substantial savings to the Government, as much as 65 percent of the schedule contract price. In many instances, however, agencies ordered from schedule contracts without either seeking competition or making the requisite cost determinations. In such cases, there is no assurance that the equipment was acquired at the lowest cost. One of the problems at the time was that the maximum order limitations--those quantities or amounts that an agency cannot exceed without a delegation of authority from GSA--did not apply to installed, leased equipment. Thus, any cost reductions that the use of such limitations could provide were not obtained for a major portion of annual equipment expenditures, and savings, which could be in the hundreds of millions of dollars over the lives of those systems, were being lost. We recommended that the Administrator of General Services: (1) extend the use of maximum order limitations to contracts for the renewal of leases or purchases of installed, leased equipment, (2) remind agencies of the Federal Property Management Regulation Requirement to obtain full and complete competition in all ADP equipment acquisitions, and (3) emphasize to Federal agencies the significant savings resulting from competition in the acquisition of ADP equipment. The Administrator took the recommended actions. <sup>1/</sup> GAO has not yet conducted a follow-up review to see how much the procurement process has improved, but we plan to do so.

### Questionable Sole Source Procurements

Another procurement area that has caused concern are sole source procurements. Justifications of sole source or restrictive specification procurements on the basis of emergency needs have been numerous. We have found instances where such procurements have been initiated without adequate consideration of alternate resources. For example, a few years ago we reported <sup>2/</sup> this situation on the leasing of computers for automating communications, message processing and information-handling processes in the Executive Office of the President, Office of Management and Budget (OMB), National Security Council and Domestic Council.

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<sup>1/</sup> FPMR Temporary Regulation E-39, June 24, 1975 (Superseded E-32, June 28, 1974).

<sup>2/</sup> B-174830; Letter report to the Chairman, Joint Economic Committee; September 7, 1972.

Three computers 1/ were leased under schedule contracts with the manufacturers, at an annual rental of \$1,371,000, after OMB waived its prescribed procedures 2/ for competitively selecting computers. Thus, other vendors were not offered an opportunity to compete. Plans were to lease a fourth computer 3/ in a similar manner.

Inquiry was made into the justification for sole-source acquisition of one 4/ of the three leased computers. The primary justification was the need to install the system by a specified date to insure the processing of the President's next budget. In our opinion, this justification was questionable because OMB could have used computer resources of other agencies or commercial firms, as it had for prior budgets.

Another instance 5/ involves the leasing of a specific brand computer on an interim basis. The Agriculture Department considered this an emergency action due to its cancellation of a Department wide computer procurement and its increasing workload. However, the Department had not adequately considered other alternatives, such as using commercial services and making various improvements in existing systems.

#### Use of ADP Fund

In an October 1975 report, 6/ we found that additional savings could be realized by full implementation of the Brooks Act as intended by the Congress. The legislative

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1/Two RCA 70/45s and one IBM 370/155.

2/OMB Circular A-54 (superceded by Federal Management Circular 74-5).

3/One IBM 370/145.

4/IBM 370/155.

5/ACD-76-126, New Computer Not Needed for the St. Louis Computer Center, Department of Agriculture, DRAFT.

6/LCD-74-115, Further Actions Needed to Centralize Procurement of Automatic Data Processing Equipment to Comply with Objectives of Public Law 89-306, October 1, 1975.

history of the Act indicates an intention that GSA eventually become the single purchaser of data processing equipment for the Government. GSA would delegate its procurement authority to the using agencies only in exceptional circumstances. Also, the revolving fund, specially created by the Brooks Act to facilitate the financing of the acquisition of automatic data processing equipment by the Government, should eventually be fully utilized for such purchases and leases and operation of Federal computer centers. Although 10 years have passed, neither of these objectives has been achieved. Over 80 percent of the 1974 data processing procurements were made by the using agencies rather than by GSA. Only 1 percent of the procurement utilized the revolving fund.

GAO found that the full implementation of the original intent of the Brooks Act had been hampered because OMB: (1) neither approved nor disapproved GSA's plans for full capitalization of the ADP fund; (2) denied GSA's requests for resources to carry out its functions; and (3) placed limitations on capital expenditures out of the ADP fund.

We found that significant savings, indicated to be in the hundreds of millions of dollars, could be realized if GSA were allowed to achieve this "single purchaser" status and the Fund were adequately capitalized. Acquisitions of automatic data processing equipment could then be more efficient and economical since GSA: (1) would have a greater ability to make volume purchases (and take advantage of accompanying discounts); (2) could better utilize the information it has collected regarding the Government's ADP resources, e.g., by having the knowledge and ability to make "opportunity (lease-purchase) buys" of automatic data processing equipment; (3) would be in a position to influence buy vs. lease decisions; and (4) could better promote a competitive environment in Federal ADP procurements.

On the basis of our reviews of numerous agency procurements, it is our view that a strong central procurement capability should be maintained to insure that the Government's interests are protected--that, generally, the high level of expertise that is necessary should reside in a central agency, with the requisite authorities. GAO recommended that Congress require the Director of OMB and the Administrator of General Services to (1) prepare and submit a financial plan to accomplish the major objectives of Public Law 89-306 (including alternative ways of capitalizing the automatic data processing fund), and (2) advise the Congress periodically of progress or problems in accomplishing the plan.

PROBLEMS IN ACQUISITIONS OF COMPUTERS  
UNDER FEDERAL GRANT PROGRAMS

These same types of problems also affect Federal grant programs. Federal policies and legislation have approved and encouraged using automatic data processing in grant programs. During the last several years, grant funds spent for developing, acquiring, and operating ADP systems have increased. The amount of Federal expenditures is unknown; however, we know that the amount is large and increasing.

In our recent report 1/ on opportunity for savings of large sums in acquiring computers systems under Federal grant programs, we noted that grantees were allowed to:

- Obtain new computer systems or add to existing systems without thoroughly evaluating their needs. Better evaluations would show, for example, if more efficient use of existing computers could make it possible to do the work planned without a new computer.
- Obtain their own computer systems without fully exploring opportunities for joint use of existing computer facilities.
- Lease equipment for short periods without fully considering the savings from purchasing or long-term leasing.
- Exclude certain sources of equipment supply, even though price reductions can normally be obtained from these sources.

In summary, we concluded that OMB, GSA, and Federal grantor agencies should work together to establish consistent guidelines so that grantees obtain necessary automatic data processing equipment economically. Grantor agencies should adopt procedures to insure grantee compliance with these guidelines.

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1/FGMSD-75-34, Opportunity for Savings of Large Sums in Acquiring Computers Systems Under Federal Grant Programs, July 24, 1975.



In this report, we recommended several specific procedures that would strengthen Federal policies to insure that grantee agencies follow business-like practices when acquiring future computer equipment. We plan to start follow-up work in the area during fiscal year 1977.

### IMPROVING ADP OPERATIONS

GAO has also looked into methods for reducing the operating costs of automatic data processing installations. After a review of 43 computer installations in industry and Government, GAO issued a report to the Congress. <sup>1/</sup> The report describes methods which some companies and agencies used to improve computer operations in six major categories.

1. Making sure computer products are needed and properly designed.
2. Increasing efficiency of application programs.
3. Increasing efficiency of operating system software.
4. Improving operations of computer systems.
5. Improving scheduling of computer systems.
6. Improving productivity of computer hardware.

We found that use of these methods saved large amounts of money in places where they were used. However, these methods were either not known or not used in many of the Government's data processing operations. We found that Federal agencies needed further and more specific guidance on how to maximize the efficiency of these resources. We stated that OMB, GSA, and the National Bureau of Standards (NBS) should provide strong leadership in this area.

Subsequently, GSA reported to GAO that it issued Federal Management Circular 74-5, dated July 24, 1974, requiring that as a prior condition to initiating a new procurement action, the agency must establish that:

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<sup>1/</sup>B-115369, Tools and Techniques for Improving the Efficiency of Federal Automatic Data Processing Operations, June 3, 1974.

- the functions or processes for which the computer is to be used are essential and readily adaptable to automation,
- workload and data processing requirements were revalidated,
- consideration had been given to upgrading the existing installations,
- nonmission-type work was eliminated, and
- proposed new systems had been designed for effectiveness and operational economy.

GSA has proposed requiring a certification of evaluation and improvement of existing systems to be provided with the submitting of a new system procurement request. To the best of our knowledge, this certification requirement has not been issued in either the applicable Federal Procurement Regulation or Federal Property Management Regulations.

While these actions indicated activity and progress, some major procurements have come to our attention in which GSA's requirements and guidance were not complied with, or were not adequate. For example, four additional major computer systems are being acquired by Social Security Administration to augment or replace computers which we think are being substantially underutilized even on the busiest days of a 2-year period.

PROCUREMENT SYSTEM FOR MINICOMPUTERS  
IS TOO COMPLICATED

Another problem often raised by agency personnel is the aspect of red tape involved in preparing for a procurement of automatic data processing equipment. This arose in our minicomputer study. 1/

Agency personnel told us that intolerable procurement delays were resulting from their own internal documentation requirements as well as from GSA's documentation requirements. Most of these requirements were developed before

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1/FGMSD-75-53, Uses of Minicomputers in the Federal Government: Trends, Benefits, and Problems, April 22, 1976.

minicomputers appeared on the scene. In a survey of 149 installations, 39 percent said they experienced unreasonable delays in acquiring and/or implementing the minicomputers. We recommended that GSA simplify procurement requirements for minicomputers with low-aggregate-dollar value, and GSA agreed.

### MULTIYEAR LEASES

On the basis of a review of automatic data processing equipment installed under short-term leases, we reported 1/ in 1971 that the Government was spending amounts substantially greater than it would under firm-term multiyear leases. We concluded that the use of multiyear leases had become essential if the Government is to make maximum use of the limited funds for acquiring ADP equipment.

We recommended, therefore, that the Congress consider legislation authorizing the GSA, through the ADP Fund, to contract on a multiyear basis without the necessity of obligating the total anticipated payments at the time of entering into the leases.

In the 93rd Congress Senate bill S. 2785 was introduced to provide the authority GAO recommended, but it was not passed.

S. 1260 was introduced in the 94th Congress with the same language as the previous bill; it was passed by the Senate and referred to the House Committee on Government Operations for consideration. In September 1975, we reported to the Chairman that we favored enactment of that bill. We think that congressional control can be retained since the bill provides that the unfunded portion of the Government's obligation under the multiyear leases shall not exceed the amount specified in the annual appropriation act.

In the absence of the kind of authority recommended, GSA recently proposed a plan to implement multiyear leasing under various arrangements which do not require obligating funds for more than one year at a time. In April 1976, the Comptroller General gave tentative and conditional approval

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1/B-115369, Multiyear Leasing and Government-wide Purchasing of Automatic Data Processing Equipment Should Result in Significant Savings, April 30, 1971.

to "Third Party Leaseback" arrangements. 1/ Conditions were that GSA should continue to seek adequate capitalization for its automatic data processing fund to finance purchases; each proposed leaseback should be approved by GSA (no blanket delegation to agencies should be made), and lease or purchase determinations should be made and documented before leasebacks are used. Also, we said these procedures should be instituted on a trial basis because of problems which may arise.

#### ACQUIRING EQUIPMENT FROM ALTERNATE SOURCES OF SUPPLY

A computer system is made up of a combination of various pieces of electronic and other types of equipment designed to function as a whole. Generally, each individual component is not functional until it is joined to other components, and the proper software is on hand to make the equipment perform.

Before 1970, both the Federal Government and private industry generally relied on computer system manufacturers to assemble a series of components or "peripherals" into a workable system, even though the components may have been made by several different manufacturers. Computer system manufacturers perform the necessary interfaces and connecting operations and develop the operating system software.

The price of computer equipment obtained from a system manufacturer necessarily includes the cost of many of the services described above. On the other hand, some independent manufacturers of components do not normally provide these services, specializing instead in the marketing of a particular component or group of components at lower prices.

In selecting a computer, one cannot simply select components or peripherals from various manufacturers with the assurance that, when all this equipment is put together, it will operate as a system. Electronic interfaces may be needed or additional software may be required. Although the concept of purchasing components from various manufacturers is a complex one, it is generally recognized in the industry that, by so doing, the sophisticated user can obtain the best available equipment for a particular application and save large sums.

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1/B-115369, April 23, 1976.

## GAO Report on Peripherals

In a 1969 report, 1/ we stated that Federal agencies can achieve large savings through the use of more economical sources of supply for peripheral equipment and components.

The report identified:

- Selected peripherals which were directly interchangeable (plug-to-plug compatible) with certain systems manufacturers' peripherals which, if replaced by lower cost peripherals, could save Federal agencies about \$28 million annually.
- Other non-plug-to-plug components which could replace similar system components which would save Federal agencies about \$100 million. However, before such savings could be realized, standards must be developed to solve interface problems.
- Additional savings in rental cost were noted by using third-party leasing companies.

In July 1970, the Joint Economic Committee held hearings on this subject. We reported that slow progress was being made by the computer industry on development of interface standards to solve the problems identified in the 1969 GAO report. We suggested that if an industry-wide standard cannot be established, then NBS should be directed to develop a Federal standard interface program.

In March 1973, NBS prepared a report entitled, "Means of Achieving Interchangeability on Computer Peripherals." The findings and recommendations in that report called for development of interface standards along with other suggestions for improvement in the peripheral area.

Bureau officials told us that the Bureau had not developed an input and output interface standard because it lacked the necessary funds to do the job. Emphasis on solving the standard interface problem was increased early in January 1975 when NBS received additional funds to help develop interface standards.

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1/B-115369, Acquisition of Peripheral Equipment for Use with ADP Systems, June 24, 1969.

Progress in the development of interface standards for non-plug-to-plug components has been slow while many millions of dollars have been saved in the plug-to-plug compatible area. Over six years have passed without development of an input and output interface standard for ADP components, which is where large savings potential is known to exist.

SOFTWARE REQUIREMENTS AND SHARING  
OPPORTUNITIES NOT FULLY EVALUATED

Since passage of the Brooks Act of 1965, many changes in the marketing of computer software have taken place. The Federal Government has not had a centrally guided or unified approach for dealing with these changes. By the early 70's, Federal agencies were spending over \$2 billion a year on computer software and experts believe that today such expenditures exceed \$5 billion yearly. The complexities of programming and related problems have increased costs in recent years to the point that software has surpassed the cost of computer equipment.

During our study of the acquisition and use of software for Federal computer systems; 1/ we found that Federal agencies generally did not have a coordinated approach on acquiring and developing software products. We found that the Federal Government:

- developed similar software at many agencies to perform the same function,
- procured computer programs that were already available within the Federal Government,
- bought software with restrictive limitations for use,
- contracted for like software at varying prices within a relatively short time period,
- used widely varying criteria for purchase, selection, and evaluation of software which resulted in buying many variations of the same product, and

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1/B-115369, Acquisition and Use of Software Products for Automatic Data Processing Systems in the Federal Government, June 30, 1971.

--deprived the Government of the opportunity to benefit from bulk procurements.

These acquisition practices were followed by Federal agencies because of limited activity by central management agencies of the Government in providing policy guidance for acquiring and utilizing computer software. Among other things, we noted in our report a need for:

- More positive central guidance and more effective procurement regulations specifically directed to software acquisitions.
- A catalog, inventory, or central reference index of computer programs that have been developed, tested, or in use by the Government.
- Software standards which would promote greater interchangeability of computer programs among Federal data processing installations.
- Better quality of software documentation which would facilitate reuse of computer programs.

Our 1971 report suggested that GSA should make use of the revolving fund (set up by the Brooks Act) to acquire generalized software for Government-wide use. Other suggestions to GSA included: (1) bulk buying of generally used software, (2) using formally advertised procurement contracts, (3) striving to obtain nonrestrictive or license-free contractual arrangements for software with rentals based on use, (4) considering the outright purchase of software products that would be widely used throughout the Government, and (5) maintaining an inventory of generally used computer software for sharing purposes.

We recommended that the Government establish and maintain a reference index of computer programs, make detailed technical evaluations of all programs intended for use by the Government and promulgate Federal standards for computer languages and program documentation.

#### Action Taken by Central Management Agencies on GAO's Software Findings

Little overall progress has been made in this area during the past five years on the problems identified in our 1971 report on software. However, in February 1976, GSA set up a Federal Software Exchange Program. Under this program, agencies will be required to report to GSA commonly used software

developed within the past three years. After the data is reported, GSA plans to provide a software catalog to all agencies for selecting software programs to meet their needs. Agencies will be required to screen existing Federal software resources before they procure software from commercial sources.

Also under development is a Federal guide to help Federal managers make better software buys. NBS officials told us that this guide would help managers in buying software products--in terms of better specifications, cost-estimating methods, technical review steps, and quality assurance requirements--to get dependable, on-schedule products in today's software marketplace at the best price to the Government.

### Better Documentation is Needed to Improve Software Sharing Opportunities

Preparing readable documents and records is very important for sharing of ADP software. Usually, it is the only visible means of communicating both the essential elements of the system and the logic followed by a computer program.

As used in the ADP field, the term "documentation" refers to the information recorded during the design, development, and maintenance of computer applications to explain pertinent aspects of a data processing system--including purposes, methods, logic relationships, capabilities, and limitations.

During the past decade, GAO has issued both Government-wide and agency-wide reports pointing out the many problems involved in documenting ADP systems. Our reports showed that inadequate documentation has:

- limited the potential for sharing computer systems, programs, and mathematical models;
- increased the cost of Federal operations;
- weakened management controls in some systems; and
- contributed to loss of funds and assets.

Typical problems cited in the GAO reports are:



--An entire ADP system involving several programs had to be redesigned when minor modifications could have achieved the same results, had adequate documentation been available. The difference in time required to redesign the system instead of modifying it was about six staff months.

--Inadequate documentation was cited as the reason for not sharing hundreds of general-use computerized models for which the Federal Government had paid development costs.

Generally, our studies reported that good documentation prevents waste and unnecessary costs in many ways--by making program modifications feasible, by making redesigns easier, by making internal controls work better, by facilitating the work of auditors, and in a host of other ways, including making programs usable by others.

We recommended in 1974 <sup>1/</sup> that GSA issue guidance to agencies in this area when NBS standards became available.

In February 1976, NBS issued Guidelines for Documentation of Computer Programs and Automated Data Systems. These guidelines are intended to provide a basis for determining the extent of documentation that is needed for Federal computer programs and automated data systems.

While some work has been started on solving some of the problems in the software area, we have not observed much software sharing among Federal agencies, in this, the largest ADP expenditure area.

It has been widely recognized, and our past studies have shown, that large benefits can be obtained by sharing computer systems, programs, models, etc. However, before large savings in the sharing of software resources can be accomplished, four important steps must be placed into operation. They are:

1. An inventory of existing software programs must be prepared to identify programs that are currently available for sharing purposes.

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<sup>1/</sup>B-115369, Improvement Needed in Documenting Computer Systems, October 8, 1974.

2. When computer programs are developed, they must be designed with sharing in mind, i.e., the computer program must be universal in design in order to meet varied possible users' requirements and in accordance with Federal processing standards.

3. They must be properly documented in order that possible users can acquire shared programs with a minimum amount of technical support.

4. An enforcement mechanism must be created.

We are currently involved in a follow-up study on software sharing problems.

#### MORE STANDARDIZATION OF DATA ELEMENTS AND CODES WILL HELP REDUCE HIGH COSTS

Although Federal agencies need current and accurate information, collecting raw data and converting it into machine-readable form is expensive and time consuming when done manually. A few years ago, the National Archives and Records Service of GSA had estimated the cost of Federal data collection activities to exceed \$5 billion annually. Today, it is many billions more.

Data is sometimes transferred by automatic means between Federal computer systems. However, more data can be transferred automatically if originally collected and recorded in a standardized, agreed-upon fashion.

When more than one agency needs the same data, that which is already collected and recorded in one Federal computer system can be transferred to another, eliminating the need to duplicate the collection and conversion process. Once the data has been converted to machine-readable form by the original collector, this data can be exchanged automatically in the form of magnetic tapes, punched cards, disks, and so on. Such exchanges are especially desirable when data can be put directly into another computer-base data system.

#### Federal Standards Program

Since 1965 the Federal Government has had a Federal Standards Program. The objectives of this program are to achieve the greatest practicable degree of uniformity of information used among and within Federal data systems.

Prior to 1973, the Office of Management and Budget retained responsibility for supporting the development and use of standards for data common to the executive department.

Executive Order 11717, dated May 9, 1973, transferred to the Secretary of Commerce all OMB functions related to establishing Government-wide standards for automatic data processing systems, including approving standards on behalf of the President. In effect, this order transfers overall leadership for standardizing data elements and codes to Commerce.

### GAO Reports on Standards

In a report 1/ on this subject, we pointed out that the Federal program in this area has been slow and not very successful. Only a few Federal general standards have been issued since 1965, and many agencies do not use some of the standards developed.

Also, we noted that although some agencies have developed and adopted standards, the overall effort has been hampered by major obstacles in policy direction, approach, and guidelines. Our report also stated that GAO did not foresee a significant amount of automated exchange taking place until the Government standardizes data elements and codes and incorporates them into its computer systems as they are designed or redesigned.

We pointed out that policy determinations are needed on:

- A uniform approach and coordination between departments.
- An across-the-board incorporation of approved Government-wide standards at the most economical time.
- The right of a standardization leader to initiate standards work with other Federal agencies.

The increasing need in Government for information, coupled with expanding Federal programs and operations, has highlighted the need for standardization.

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1/B-115369, Emphasis Needed in Government's Efforts to Standardize Data Elements and Codes for Computer Systems, May 16, 1974.

Automated techniques should be used more to exchange data and information collected by agencies where much sharing is appropriate. Data collected and converted to machine-readable form by one agency should be made available to others having a valid need for it.

We are currently studying NBS' standardization efforts, and we will report our findings to the Congress at a later date.

#### SUMMATION

Our testimony today has concentrated on results of reviews we have made during the past few years. In these reviews we made specific recommendations for changes or improvements. Some of these call for action by the central agencies and some can be accomplished by the operating agency concerned. During the testimony we also touched on some areas where your committee may wish to make further inquiries. We particularly believe that action to make possible multiyear leases and to increase usage of the Automatic Data Processing Fund would be of great value in reducing the Government's data processing costs.

Mr. Chairman, this concludes my prepared statement; we will be pleased to answer any questions or furnish additional information.

UNITED STATES GENERAL ACCOUNTING OFFICE  
Washington, D.C. 20548

Dated  
September 28, 1976

STATEMENT OF  
Donald L. Scantlebury  
Director  
Financial and General Management Studies Division  
Prepared for the  
Senate Committee on Government Operations  
on  
Issues Related to the Use of Computers  
in the Administration of Federal Programs

Mr. Chairman and Members of the Committee:

We are pleased to present information on our recently issued reports to the Congress calling attention to the need for protection against the many types of threats and conditions that can cause catastrophic losses to Federal computer systems. Each of these reports deals with a different facet of the subject, but all three are concerned with what we consider to be serious problems in providing proper protection to computer assets, valuable data, and automatic actions at reasonable costs.

The three reports were:

- Computer-Related Crimes in Federal Programs  
(FGMSD-76-27, April 27, 1976).
- Managers Need to Provide Better Protection for  
Federal Automatic Data Processing Facilities  
(FGMSD-76-40, May 10, 1976).
- Improvements Needed in Managing Automated  
Decisionmaking by Computers Throughout the  
Federal Government (FGMSD-76-5, April 23, 1976).

Before discussing these reports, it may be helpful to take a few minutes to discuss what a computer is, and where computers are used in Federal programs. My purpose is to show that computer systems have become an integral part of the Government process by performing many of the operations and applications that, in the past, were not done at all or were done manually. Some agencies would find it impractical, if not impossible, to accomplish their missions without computers.

## INCREASES IN FEDERAL ACTIVITIES

In 1950 the Federal Government had 2 computers, 2 million civilian employees and a \$40 billion budget. From that time to date we have witnessed huge increases in social programs, Government services, and computer systems. The cost of this increased service and workload is shown in the Federal budget which, for 1977, amounts to about \$400 billion. In a little less than three decades, the budget has increased tenfold. Strikingly absent, however, is a corresponding increase in personnel. The full-time civilian workforce for 1977 is budgeted at less than 2.5 million--only a 25 percent increase over 1950. However, it is expected that the workforce will use about 10,000 computers to help them run the Government, a 5,000-fold increase over 1950.

This is a very simple comparison I'm making, Mr. Chairman. Obviously I'm not saying that computers alone have kept the workforce more constant than the budget, but they have had a significant impact.

## WHAT IS A COMPUTER?

In its simplest terms, a computer is nothing more than a fast calculator. Its functions have been succinctly defined as INPUT-PROCESS-OUTPUT.

The INPUT is the process of amassing the raw data and preparing it for acceptance by the machine. This process is very personnel-oriented. Data comes from sundry sources and in various media. The preparation consists of converting the human intelligible data into machine-readable coded data.

The PROCESS is the manipulation of the data according to a set of pre-established instructions already imbedded in the machine. Alterations to these instructions will obviously alter the results.

The OUTPUT is the resulting intelligence from the processing of the raw data.

In the early use of computers, data was inserted in the computer, processed and a report was generated. Changing instructions was difficult. Technology has made great strides in improving the PROCESS part of the operation. Computers are much faster, smaller, and more economical. The introduction of financially viable mass storage has fostered the development of data banks wherein huge amounts of data can be concentrated in a readily accessible media. The development of English-like languages to write instructions for the computer simplified the process and put computers within the reach of more people and organizations.

Advances in communications and teleprocessing are putting the computer at the fingertips of all kinds of potential users--legitimate and otherwise. Today all one needs is access to a terminal and a telephone line.

### CONGRESSIONAL INTEREST IN COMPUTERS

Since computer systems are very costly and since they have become inseparable from the Federal programs, there is and has been continuing congressional interest in the trend of development and use of these systems for Federal programs.

GAO has responded to this interest and since the early 1950's has issued numerous reports detailing the need for better management of data processing activities. These reports have dealt with the acquisition, procurement, management and use of these systems.

In the early 1950's the House Appropriations Committee requested us to study and report back on the development and use of punch card equipment. In the latter part of 1950 and early 1960 the House Post Office and Civil Service Committee was interested in the effects of computer systems on Federal employment. The House Government Operations Committee during the past 15 years held many hearings on the acquisition and use of computer systems by Government agencies. The enactment of Public Law 89-306 resulted from these hearings. The Joint Economic Committee was interested in economy in the Government procurement of data processing equipment in the early 1970's. Also, many other Senate and House Appropriation Committees and Subcommittees have held hearings which have frequently dealt with the most efficient and effective way to acquire and use computer systems. Recently, the right to privacy has been the subject of many congressional hearings and legislation, and in 1976 the Senate Government Operations Committee began studying computer crimes and security.

### COMPUTER USE IN FEDERAL PROGRAMS

The Federal Government is the largest user of computers in the world. We estimate the Federal Government's annual cost in computer systems is over \$10 billion. However, this cost represents only a small part of the total value of these systems to the Federal Government. To help place our reliance on computers in proper perspective, I have included, as Attachment I of my statement, a chronology of major computer usage in Federal programs. You will see that year after year more programs and functions were computerized. From a modest start of two computers in 1950 we have now grown to an inventory of 9,500 in June 1976. To highlight

their importance, the National Aeronautics and Space Administration could not carry forth its space programs and the Federal Aviation Administration could not control aircraft effectively without computer assistance. Many computer systems are used by the Social Security Administration to create checks for Social Security payments of over \$84 billion annually. The Internal Revenue Service also uses computer systems to process about 125 million income tax returns each year. The agencies mentioned here, NASA, FAA, Social Security, and IRS--are only examples of agencies that are very dependent on computers to carry out their programs. There are many others that could continue to function but only at reduced levels of efficiency and effectiveness if computers were not used.

### WHY DO COMPUTER SYSTEMS NEED PROTECTION?

Of more importance than the concern over the cost of a computer facility is the value of the information and/or contents of computer systems. Because of the nature of computer technology as well as the tremendous capabilities of computers, agencies have tended to centralize their computer operations in just a few major computer centers. This centralization increases the potential for major thefts, frauds, misuses, or catastrophic losses. Let's consider the possibility of:

- Large amounts of government funds being paid out for fraudulent claims;
- Valuable information being stolen for monetary gain;
- Information or records being destroyed, altered, or misused; and
- Harm being done to individuals by improper use of personal information collected and maintained.

### WHAT ARE THE THREATS TO COMPUTER SYSTEMS?

Each Government computer center is usually unique. The threats the center faces usually relate directly to its purpose and use, location, workforce, physical facilities, and so forth. Furthermore, the relative risks of a center can change over time because of changes in Government policies, laws, conditions, or even changes in the environment or physical situations. Such changes might be due, for example, to war, changes in the attitude of the American people, or economic conditions of the country. In any event



changes in Government policy or even the environment of the land and its people can change the posture of a Government computer installation which could increase or decrease the threat against it.

We found that computer facilities must be protected against both natural threats (flood, earthquakes, windstorms, etc.) as well as hostile threats (fire, theft, bombings, etc.). Such threats include destruction by environmental forces as well as theft or destruction by individuals. Therefore, in order to have safe and reliable protection over computer systems at reasonable cost, it is necessary to have a good security program for protection against accidental or intentional destruction, and disclosure or modification of the data on these systems. In a computerized system where funds are disbursed and large quantities of data are centrally accumulated, stored, and integrated with communication facilities, appropriate administrative, technical and physical safeguards are more necessary than in a manual system.

#### WAYS TO HANDLE THREATS

Providing total protection against all possible threats could require unlimited funds or resources. However, there are ways and approaches available to help management secure computer systems at reasonable costs. One approach advocated by experts involves a concept of risk management which:

- Analyzes the risks involved,
- Summarizes risk findings for management use,
- Involves high level management in the decision-making process,
- Implements the most cost effective security practices to control unacceptable risks, and
- Reevaluates periodically the potential impacts of threats to assess values and mission accomplishments and decides on new or existing practices to handle the risks.

#### WHAT DID GAO FIND?

In our three reports we pointed out that Government computer systems and their applications and data were not being properly protected because many installations lacked

important security and control measures and/or recovery procedures for continuity of operation.

Some effects that have occurred because computer systems were not properly protected include:

- Dollar losses;
- Building, equipment, software, and data losses;
- Personnel injuries; and
- A loss of life.

Some of these losses were minimal, while others were catastrophic.

For your convenience, we have categorized our findings into the following broad fields.

#### Category 1--Criminal actions

This category includes such actions as crimes, espionage, mischief, sabotage, etc. Our report on computer crimes (FGMSD-76-27) addresses these illegal or unwanted acts.

#### Category 2--Inadequate physical security protection

Computerization tends to centralize Government assets and data, making them more vulnerable to destruction or alterations than ever before. We found a number of conditions at Government installations visited which led us to believe that physical security was not adequate and that action should be taken to protect against possible losses caused by fire, flood, fraud, theft, embezzlement and human errors. Our May 10, 1976, report on physical security (FGMSD-76-40) addresses this problem.

#### Category 3--Inadequate controls over automated transactions

Computers in the Government annually issue unreviewed payments and other actions involving billions of dollars in Government funds. These actions are sometimes wrong and, if not caught, can cost the taxpayers huge sums of money. Our April 23, 1976, report on automatic decisionmaking (FGMSD-76-5) covers this activity.

#### COMPUTER-RELATED CRIMES

Now, I will discuss some of the details of our three reports, starting with the computer-related crimes report.

We worked under a handicap in obtaining this information because Federal agency records do not classify computer crimes as a separate category. With some digging, however, we learned of 69 cases involving the Federal Government. We examined the cases to see if there were common patterns of criminal activity that might suggest means to better safeguard against it. We found that these crimes fell into four major classes. They are:

1. Introduction of fraudulent records into the computer system.
2. Unauthorized use of facilities.
3. Alteration or destruction of information or files.
4. Stealing checks, data, or information.

The most frequent type of crime concerned introducing fraudulent records into the system. There have been many cases discovered to date in which people have prepared fraudulent inputs to Government computer systems which resulted in direct payments to individuals who were not entitled to them. These cases include fraudulent payroll, social welfare, tax refunds, and compensation transactions as well as payments for nonexistent goods and services.

One case in our study involved a system user of a Federal social benefit program. He was able to introduce a series of fraudulent accounts into the computer system. This caused benefit payments to be paid to co-conspirators who were not entitled to them. Although the perpetrator conducted his illegal activity over a period of 2-1/2 years, the confirmed loss was only about \$3,680. However, in a similar case on the West Coast, losses were estimated at one-quarter of a million dollars. Losses in subsequent cases where similar methods were used are estimated by program officials to run as high as \$1 million in one metropolitan area alone. Of course the figures I have cited relate only to cases discovered. No one knows how many millions of dollars have actually been lost as a result of fraudulent claims to Government systems.

Another case noted during our study involved theft of Government funds at Kelly Air Force Base, San Antonio, Texas. The Government paid about \$100,000 to bogus fuel companies for aircraft fuel never delivered to the Air Force. These companies were established by a dishonest Government employee working at the air base who had indepth knowledge of the computerized fuel accounting system which he helped to develop

and install. An investigation was initiated when a bank contacted the Air Force regarding suspicious banking transactions involving Government checks. The employee was later arrested and sentenced to 10 years in jail for theft of Government funds.

In the cases we reviewed, controls--both automated and manual--should have been in place and working to minimize the possibility of criminal activity, but either they were not there to begin with or, if they had been provided, they were not functioning correctly. In our opinion, management has a specific responsibility to see that the assets and funds for which they are accountable are protected through a proper system of controls, and in these cases failed to provide them. This concept is not new; it is a basic tenet of management and is set forth in numerous authoritative documents. Management can meet these responsibilities by having:

- An organizational plan that segregates the duties of individuals to minimize their opportunity to misuse or misappropriate the entity's resources;
- A system of authorization and record procedures adequate to provide effective accounting control over assets, liabilities, revenues, and expenses;
- An established system of practices to be followed for each duty and function the organization performs; and
- An effective system of internal review. This includes an internal audit staff that has training adequate to review and evaluate computer-based system controls and makes such reviews both when the systems are being designed and after they have become operational.

We believe the guidance on internal controls, internal audit, and accounting methods provided in GAO's Policy and Procedures Manual for the Guidance of Federal Agencies, and in our audit standards, gives appropriate general criteria in this area; and our report's recommendations were basically a restatement of this guidance coupled with an urging that agencies review their situation and take appropriate steps to correct identified weaknesses.

If crimes do occur, they should be analyzed to pinpoint the weaknesses in management's control processes that made them possible. We believe that analyses of such crimes

should be made and the results provided to managers, designers, investigators, and auditors to help them strengthen their operations and procedures.

The agencies that commented on our draft report on computer-related crimes were in general agreement with our views and indicated that they would take appropriate corrective measures.

### INADEQUATE SECURITY

Next I would like to turn to our report on physical security.

As more and more of the daily work of Government agencies is put on computers, there is a trend toward centralization of assets and data to a much greater extent than ever before. An agency may have concentrated in its computer center all of its assets or key records and files which are the backbone and lifeblood of the agency's operations. Concentrations of this nature, while economically advantageous, pose potentially serious security problems. If the computer center should be put out of action for any reason, the effect on Government operations could be catastrophic. While acts of nature--such as windstorm, flood, and earthquakes--have put computer centers out of operation, acts by dissident groups or terrorists could be equally serious. The vulnerability of insufficiently safeguarded computer centers has already been convincingly demonstrated on too many occasions. Examples of such situations are detailed in our report.

During our security review, we found a number of hazardous conditions at 28 Government installations visited which led us to believe that the computer systems were not adequately protected. We also visited 23 additional Federal data processing installations--which we knew had experienced physical security problems--to identify impacts or effects from security weaknesses. I will now highlight a few of the conditions found along with some adverse effects of security weaknesses:

- Fourteen locations had combustible paper and magnetic tape files stored in computer rooms which exposed these systems to loss from fire. The \$6.5 million Pentagon fire loss which we discussed in our report is a classic example of what can happen when fire breaks out and combustible paper and magnetic tape files are stored in, or near computer facilities.

- Ten locations had computers in operation under overhead water pipes, which if broken, could dump water on these systems. Also, two locations had computers installed in basements below ground level. Extensive damage was done to a Post Office computer center when flood water overran the banks of the Susquehanna River in 1972 and flooded the computer facilities.
- At least seven locations were susceptible to sabotage because service personnel were not supervised while on the premises. Three computer locations were also possible targets for vandals. In 1970, a bomb exploded outside an Army computer facility and killed one employee, injured three others and resulted in damage to assets of \$2.4 million and a loss of 20 years' accumulated data valued at \$16 million.
- Fourteen locations were without contingency plans to insure continuity of operations if a security event occurred. About 16.8 million manual military personnel records were lost in a 1973 fire at the St. Louis Record Center. No contingency plans were in existence at the time of the fire.

Other Federal installations we reviewed were not adequately prepared to deal with other types of security situations, or to recover from them.

We believe these situations arose in part because few people in authority had recognized the need to consider the physical security of their computer installations as a subject deserving special attention, and no Government-wide direction has been provided. In our view, because of the concentration of vital information in data processing centers, specific steps are needed to assure that systematic management action is taken and appropriate security measures are implemented.

We recommended in our report that the Office of Management and Budget (OMB) direct that agencies having computer installations assign a high-level management official specific responsibility for physical security, and risk management techniques be used to determine the protection needed. We believe that pinpointing this responsibility and using risk management techniques will go a long way toward correcting the problem. Our report also contains guidelines which will be helpful to such officials, as well as referring them to other publications, including those of the National Bureau of Standards.

OMB has not been receptive to our recommendations, stating that agency heads are already responsible for protecting their installations. We believe that our report amply demonstrates that many agencies have not paid adequate attention to physical security needs in the past, and, therefore, hold to the position that special attention needs to be given the matter.

#### INADEQUATE CONTROL OVER AUTOMATED ACTIONS

Now I would like to move on to a discussion of the issues in our report on automated systems.

The power of the computer is particularly well suited to applications in which repetitive transactions based on pre-established criteria are needed. Literally millions of Federal actions take place daily based on such computer-generated operations without anyone checking them for correctness. For example, if issuance of material from inventory causes the balance of stock on hand to drop below the reordering point, a purchase order can be generated automatically by the computer. Again, based on information supplied to the computer, it can decide whether usable material turned in to supply by an organization should be scrapped or returned to inventory. Many such actions are taken without any manual review of the computer's calculations, and great volumes of workload can be processed in this manner, contributing to greater governmental effectiveness and efficiency. However:

- If the computer program processing the work has errors in it; or
- If there is incomplete or incorrect information input to the computer; or
- If data already in the computer is not accurate, complete, and current;

the transactions will still be turned out in great volume, but they may be wrong, and they probably will not be caught. Wrong transactions can cost money, and our report points out that hundreds of millions of dollars have been unnecessarily spent as a result of such operations. Therefore, the most important point made in our report is that poorly controlled systems have the potential for issuing unreviewed payments and other actions involving billions of dollars in Government assets.

Here are typical examples of bad computer transactions cited in our report:

- Army computers at several inventory control points automatically issued material to overseas customers from the wrong depots, and caused unnecessary cross-country shipments. The Army estimated that additional transportation costs of \$900,000 and added pipeline costs of \$1.3 million were incurred.
- A Veterans Administration computer did not properly schedule required reductions in benefit payments to veterans taking apprenticeship and other on-the-job training, setting up potential automatic overpayments projected at \$700,000.
- An Army computer allowed the automatic issue of radioactive material despite policy requirements calling for a manual review before such issuance.
- A Navy computer automatically--but incorrectly--initiated the overhaul of aircraft components, resulting in the unnecessary or premature expenditure of many millions of dollars.

Our report attributes these wrong operations to two basic types of errors: data errors and program errors. We recommended a variety of corrective actions to minimize the occurrence of such errors, including (1) management assurance that systems have been properly designed and tested before being placed in operation and (2) periodic testing of output for correctness after systems have been placed in operation.

Our recommendations have met with general acceptance from the agencies involved, and we are anticipating significant actions in these areas. The Office of Management and Budget, for example, issued on May 29, 1976, a strongly worded memorandum to all agencies directing them to take action to improve their controls in the area of automated operations and to report the results of such actions to OMB this fall.

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We believe that each of our three reports exemplify situations where there has been inadequate managerial attention paid to the potential for loss which may exist. Our recommendations for improvement run to the agencies themselves--to police their own activities--and to the Office of Management and Budget, the General Services Administration, and the Department of Commerce's National Bureau of Standards, all of which can and should provide leadership and guidance



toward resolving the problems. We have also suggested that the Civil Service Commission provide further emphasis in its training courses on those areas where we believe it would be most helpful.

We welcome this Committee's interest in the reports and are hopeful that, together, they will be beneficial in stimulating Federal agency managers to recognize the extent of their responsibilities in these areas and to participate actively in directing corrective actions to minimize future losses whether they may result from criminal activity, from inadequate physical security, or from bad decisionmaking by their computers.

The whole question of top-level management involvement and participation in computer activities has been a subject of considerable discussion within the computer profession itself. In the past, and even today, many key decisions are being made by technicians and by computer operations managers who lack the perspective that top management can bring to bear.

One important facet of this involvement is the need for management to stimulate and encourage its internal auditors to make more and better audits of computer systems. Internal auditors should be a major weapon in management's arsenal of controls, but in many cases auditors have avoided involvement with computers. Much needs to be done to train the auditors and develop sound approaches to this work.

Also, we understand that this Committee will raise the question of whether the laws of the land are adequate in the area of computer crimes. Our audits were not directed to answer questions in this area of inquiry. However, the Department of Justice has the responsibility for administration of the criminal justice system, and we understand that they are prepared to provide the expertise needed to handle any inquiry into this area.

## CHRONOLOGY OF COMPUTER USE

### IN FEDERAL PROGRAMS

#### THE 1950-1955 ERA

The first computers installed in the Federal Government were used primarily to support Department of Defense (DOD) research projects. In 1951 the Bureau of Census installed a computer to compile census data; this was considered the first business-type application.

#### THE 1955-1960 ERA

In this period the number of computers in use in the Federal Government increased twelvefold from 45 to 531. In addition to scientific research, some additional applications were to:

- Pay old age and survivors benefits by the Social Security Administration
- Computerize pension payment accounting by the Veterans Administration
- Gather meteorological data by the Department of Commerce
- Manage materiel and supply inventories in the Department of Defense and the National Institutes of Health
- Provide personnel management information in DOD and the National Institutes of Health
- Generate labor statistics for the Department of Labor

#### THE 1960-1965 ERA

The Federal Government installed almost 1,900 additional computers in this period. This increase resulted from greater use of these machines in research and materiel management. Other applications introduced were to:

- Process Veterans Administration insurance program data

- Prepare bills of lading and Federal Telecommunications System billings by the General Services Administration
- Prepare insurance and loan interest notices by the Veterans Administration
- Control the functions of missile and air defense systems by DOD
- Process tax returns by Internal Revenue Service
- Process intelligence data by DOD
- Automate the patent search functions of the Patent Office
- Process purchase orders by DOD
- Evaluate petroleum bids by DOD
- Assist public building management by the General Services Administration
- Automate payrolls and personnel information systems in a number of agencies
- Control space missions by the National Aeronautics and Space Administration

#### THE 1965-1970 ERA

The number of computers in use by the Federal Government increased from 2,412 in 1965 to 5,277 in 1970. This increase is attributable to the expanded use of computers for previously developed systems in financial and administrative operations as well as expanded use in research and development. Computers were also used to:

- Maintain flight records and passenger reservations by DOD
- Process education benefit data by the Veterans Administration
- Automate clinical laboratory processing in Veterans hospitals
- Manage housing grants of the Department of Housing and Urban Development

- Analyze satellite weather data by DOD
- Store and retrieve criminal data by the Department of Justice
- Manage defense contracts by Defense Contract Administrative Support Regions
- Issue savings bonds by the Department of the Treasury
- Process postal money orders
- Predict crop levels by the Department of Agriculture
- Analyze housing market data by Department of Housing and Urban Development
- Manage inventories in the General Services Administration and Departments of Transportation, and Housing and Urban Development
- Standardize and integrate personnel and financial systems in DOD and some civil agencies
- Assist in assigning, training, etc. of personnel in DOD

#### THE 1970-1976 ERA

By 1976 the number of computers in use to support the operations of the Federal Government had increased to 9,500. Computers were now being used in almost every aspect of Federal activities. Additional use was made in program management and operations. For example, to:

- Generate monthly bills for loans by the Veterans Administration
- Report on Title I Home Improvement Loans by the Department of Housing and Urban Development
- Process freight waybilling by the Department of Transportation
- Automate air traffic control functions in Federal Aviation Administration
- Pay revenue sharing funds by the Department of the Treasury

- Forecast global weather by the Department of Commerce
- Assist in grant management by the Department of Justice
- Analyze satellite data for crop predictions by the Department of Agriculture
- Manage energy resources by the Department of the Interior and the General Services Administration
- Forecast home ownership assistance by the Department of Housing and Urban Development
- Computerize a medical information system by the Department of Health, Education, and Welfare
- Analyze accident data by the Department of Transportation
- Process case records by the Supreme Court
- Automate a legal information and retrieval system by the Department of Justice
- Coordinate broker/dealer examinations by the Securities and Exchange Commission
- Manage numismatics operations by the Department of the Treasury

SUMMARY OF REPORTS ISSUED

Both before and since passage of the Brooks Act (Public Law 89-306), we have done a lot of audit work in the ADP area. A complete list of the reports issued from November 1, 1965, to December 31, 1976, is provided in appendix II along with a code that identifies the issue areas covered by the report. Following is a list of the codes used, the issue areas reported on, and the number of reports listed in appendix II that treat the issue.

<u>Code</u>	<u>Issue area</u>	<u>Number of times reported</u>
A	GOVERNMENT-WIDE MANAGEMENT	27
B	ACQUISITION AND SHARING	
B-1	-Lease or buy	11
B-2	-Alternative acquisition procedures	9
B-3	-Alternative sources of supply	9
B-4	-Software requirements and sharing	8
C	UTILIZATION OF ADP RESOURCES	
C-1	-Full use and sharing	31
C-2	-Reuse of resources	8
C-3	-Computer evaluation techniques	7
C-4	-Maintenance	3
D	PLANNING AND CONTROLLING	
D-1	-Planning	88
D-2	-Controlling	56
D-3	-Documentation	11
D-4	-Standardization	11
D-5	-Grantees and Contractors	<u>18</u>
Total		<u>a/297</u>

a/Some reports cover more than one issue area. For example, the report on a proposed automated tax administration system for the Internal Revenue Service on page 73 (LCD-76-114, 11/23/76), has software (B-4), planning (D-1), and controlling (D-2) listed as issue areas discussed. Therefore, the total number of issues reported (297) exceeds the total number of reports (175).

IMPROVING GOVERNMENT-WIDE  
MANAGEMENT (CODE A)

GAO has submitted 27 reports suggesting improvements by the central managers; that is, the Office of Management and Budget, the General Services Administration, and the Department of Commerce. Mr. Scantlebury's statements in the early section of this report cover in detail most of the Government-wide management points covered in these reports. (See pp. 12 to 29.)

IMPROVING THE WAY COMPUTER RESOURCES  
ARE ACQUIRED AND SHARED (CODE B)

Equipment leased without fully  
considering cost savings available  
by purchase methods (Code B-1)

The Federal Government's practice of leasing data processing equipment originated before the development of electronic computers, at a time when mechanized data processing systems consisted primarily of electric accounting machines. Most of these machines were leased.

We submitted 11 reports illustrating that, when lease versus cost comparison studies were made, large sums could be saved by purchasing some components of the ADP systems.

In October 1961, after studying the various factors affecting lease-purchase decisions, the Office of Management and Budget issued Circular No. A-54 prescribing policies for Federal agencies to follow in acquiring ADP equipment. This circular requires that agencies make cost comparison studies using a 6-year life factor to ascertain whether leasing or purchasing is most economical. In other words, if the cost comparison showed that rental charges over a 6-year period would exceed purchase and related maintenance costs over the same period, the equipment should be purchased. Normally, most systems would have been purchased under this policy. However, the application of the policy depends upon the user's having a continued need for the equipment throughout the 6-year period. Many users anticipated changes in their ADP equipment and for this reason did not purchase many machines.

Hardware acquired under Federal  
contract procedures without  
considering other alternatives (Code B-2)

On nine occasions, we reported that large savings are possible by acquiring ADP systems by such means as increasing

competition, multiyear leasing, complying with the objectives of Public Law 89-306. (See pp. 13 to 16.) In summary our reports showed that

- the Government should use commercial leasing firms more often,
- the Government should seek more competition and use schedule contracts less often, and
- GSA should make greater use of its central procurement authority.

GSA data shows that during the past decade most computer equipment was still being acquired by noncompetitive procurement practices--sole source, make and model, brand name, or equal. In fiscal year 1975 only 36 percent of the equipment acquired by Federal agencies was procured in a fully competitive manner.

Computers acquired from equipment  
manufacturers without considering  
alternate sources of supply (Code B-3)

On nine occasions we reported that Federal agencies could save money by using more economical sources of supply for ADP peripherals and components. (See p. 21.)

Software requirements and sharing  
opportunities not fully evaluated (Code B-4)

We published eight reports involving the software requirements and sharing area. Software is a term that has come into use with ADP systems to identify computer programs, procedures, and related documentation and to distinguish such features from the systems hardware components. Pages 23 to 27 summarize the problem and action taken by Federal agencies on our software findings. Our reports generally suggested that the Government establish and maintain a reference index of computer programs, make detailed technical evaluations of all programs intended for use by the Government, and promulgate Federal standards for computer languages and program documentation.

No one knows how many thousands of computer systems and programs are now in operation within the Federal Government or how much it cost to design and program these systems. Likewise, no one knows the amount of Government funds spent to procure, design, and program similar systems at many Federal agencies.



IMPROVING THE USE OF ADP RESOURCES (Code C)Opportunity for savings by using  
computer facilities more (Code C-1)

Acquiring computer systems and the related software and other services required to make them run effectively is expensive. Because of this, specific and concentrated attention must be placed on using computer resources as fully as possible.

In 31 reports, we have cited examples in which large savings were possible through more use of Federal computer facilities. Pages 5 to 11 summarize the conditions found and action taken by Federal agencies on our major utilization findings.

Additional savings available  
by reuse of ADP resources (Code C-2)

Eight reports were sent to the Congress during the past 11 years relating to the reuse of ADP resources.

Reuse procedures

Federal Property Management Regulations require agencies to report excess ADP equipment to GSA. Upon receiving such a report, GSA reviews its files to determine whether any agency has indicated a need for the equipment. If no agency has indicated such a need, the equipment is then advertised in excess equipment bulletins. These bulletins are circulated to Federal agencies before the ADP equipment is declared as excess. The amount saved by reusing Government-owned equipment is not known because no reasonable basis for measurement can be determined. However, the redistribution of Government-owned excess ADP equipment at original acquisition costs has been estimated by GSA at over \$1 billion during the past 11 years.

Opportunity for greater efficiency  
by using computer evaluation  
techniques (Code C-3)

We have published seven reports that recognize the savings possible by using performance evaluation tools and techniques. In 1972 and 1974, we recommended that central management agencies encourage Federal agencies to use these techniques, especially before acquiring additional computer resources. Other specific recommendations concerned developing performance criteria, training, and designing

"built-in" techniques in future systems and controls. Our studies also noted that using computer measurement and evaluation tools and techniques required highly skilled technicians and that very little training was available in these areas.

The central management agencies acted to improve Federal computer operations by the use of computer evaluation techniques. 1/ Steps include:

--In August 1971 the National Bureau of Standards formed the Federal Information Processing Standards Task Group 10. The Group was responsible for identifying and recommending guidelines for (1) hardware and software component evaluation criteria, (2) measurement techniques, and (3) procedures that could be applied throughout the Federal Government to aid in installations operational improvements and computer system and component selections. Specific areas of investigation included the use of simulation, performance monitors, benchmarks, and analytic methods. In March 1973 the Group recommended a 2-year project to develop appropriate guidance in the use of these techniques.

--The Computer Performance Evaluation Users Group was formed in the Department of Defense and transferred to NBS sponsorship early in 1971. This Group provides a means of exchanging information between Federal agencies on performance evaluation techniques but has no responsibility for developing Government-wide guidance.

--GSA established a Federal Computer Performance Evaluation and Simulation Center to serve Federal agencies throughout the country. The Center's

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1/The term "computer evaluation techniques" is associated with tools (hardware and software monitors) and methods used to measure or evaluate the performance of computer systems. Hardware monitoring uses electronic devices to determine how much and when the various components of a computer system are being used. Software monitoring uses special computer programs to check other computer programs to see if these programs use computer capabilities efficiently. With this information, the workload can be distributed as evenly as possible among the components and they can be used more efficiently.

purpose is to provide economical computer evaluation services on a cost-reimbursable basis.

Obtaining adequate maintenance service at reasonable cost (Code C-4)

We issued three reports in the maintenance areas. We reported that agencies could realize cost savings and operating advantages in this area by

- performing in-house maintenance services at selected locations,
- contracting with other outside maintenance companies, and
- selecting the proper amount of maintenance coverage necessary to operate their computer facilities.

Operating advantages were greater management control over the maintenance work and lighter security controls at classified locations. We suggested that policies be developed in this area.

Action by central management agencies include development of a Federal policy (OMB Circular A-76) which calls for executive agencies to study all alternative ways of maintaining ADP equipment and to rely on private enterprise for maintenance services instead of establishing or continuing an in-house program.

IMPROVING THE PLANNING AND CONTROLLING OF ADP RESOURCES (Code D)

Since the introduction of the computer into Federal operations in the early 1950s, much has been discussed, written, and published about the need for better planning, developing, and controlling this new technology. (See p. 11 for an example on planning.)

Better overall planning needed to improve system development and design efforts (Code D-1)

We have submitted 88 reports which illustrated that Federal agencies acquired computer systems without proper planning for the design and development of computer systems. Deficiencies included failure to

- define objectives clearly,

- quantify expected benefits adequately,
- determine requirements for use of the equipment, or
- determine cost of other alternatives.

These deficiencies resulted in

- prolonged system development cycles,
- cost overruns,
- premature acquisition of costly equipment, and
- system developments that were unable to satisfy the demands placed upon them.

We recommended that Federal agencies:

- Establish procedures for systematically evaluating the need for new system development projects.
- Establish procedures for validating estimated development costs of new systems and the value of expected benefits and for arriving at more realistic development costs.
- Reevaluate system development projects already underway and state the specific benefits expected.
- Identify and document how each project under development will help the agency, cost out alternatives so that the most economical means of meeting its information needs can be identified and pursued, and stop further development if the project no longer meets user needs.
- Reevaluate the need for computer equipment, even if this requires releasing some equipment.

In other reports we cited the need for a central planning group to help solve some of the Nation's problems by planning for integrated Government ADP systems. Integrated systems reduce paperwork and cut down on costs.

More guidance needed to  
improve management control  
over ADP resources (Code D-2)

During the past 11 years, as part of our audit function, we have made many reviews of the controls over ADP systems. Over 56 reports were issued pointing out the need for better controls. For instance, we found that:

- Determining how the system worked or what controls were built into it was difficult, because the flow charts and other documentation were out-of-date or had never been prepared.
- There was insufficient separation of duties; thus one person could alter or initiate unauthorized transactions--an unsuitable situation when checks are involved.
- Valuable records were lost or stolen because physical control over the computer tapes or other material was inadequate.
- Procedures were not adequate to reasonably make sure that all documents would be promptly processed.
- Changes in the computer programs were not adequately controlled; such controls are essential to prevent fraud, errors, and other irregularities.

Our review results were made available to the head of each location at which audits were made. They generally agreed with our findings and suggestions for improvement and acted to improve operations. Also, specific recommendations were made to the agencies to strengthen management control over the computer systems.

Perhaps our three most important reports on the need for better controls and protection for Federal computer systems were issued in 1976. These reports pointed out that many of the Government's 9,500 computers are inadequately controlled or protected against

- computer-related crimes;
- sabotage, crime, fire, water, or natural disasters;  
and
- automatically making wrong transactions or decisions.  
(See pp. 30 to 46.)

Better documentation is needed  
to improve operations and  
sharing opportunities (Code D-3)

On 11 occasions we reported that better documentation is needed to improve operations and sharing opportunities. In the ADP field the term "documentation" refers specifically to the information recorded during the design, development, and maintenance of computer applications to explain pertinent aspects of a data processing system (such as purposes, methods, logic, relationships, capabilities, and limitations). An example of one form of documentation--flow charting--is shown on the following page. Pages 25 to 27 summarize the findings, conclusions, and recommendations contained in these eight reports.

More standardization needed to  
help reduce high costs (Code D-4)

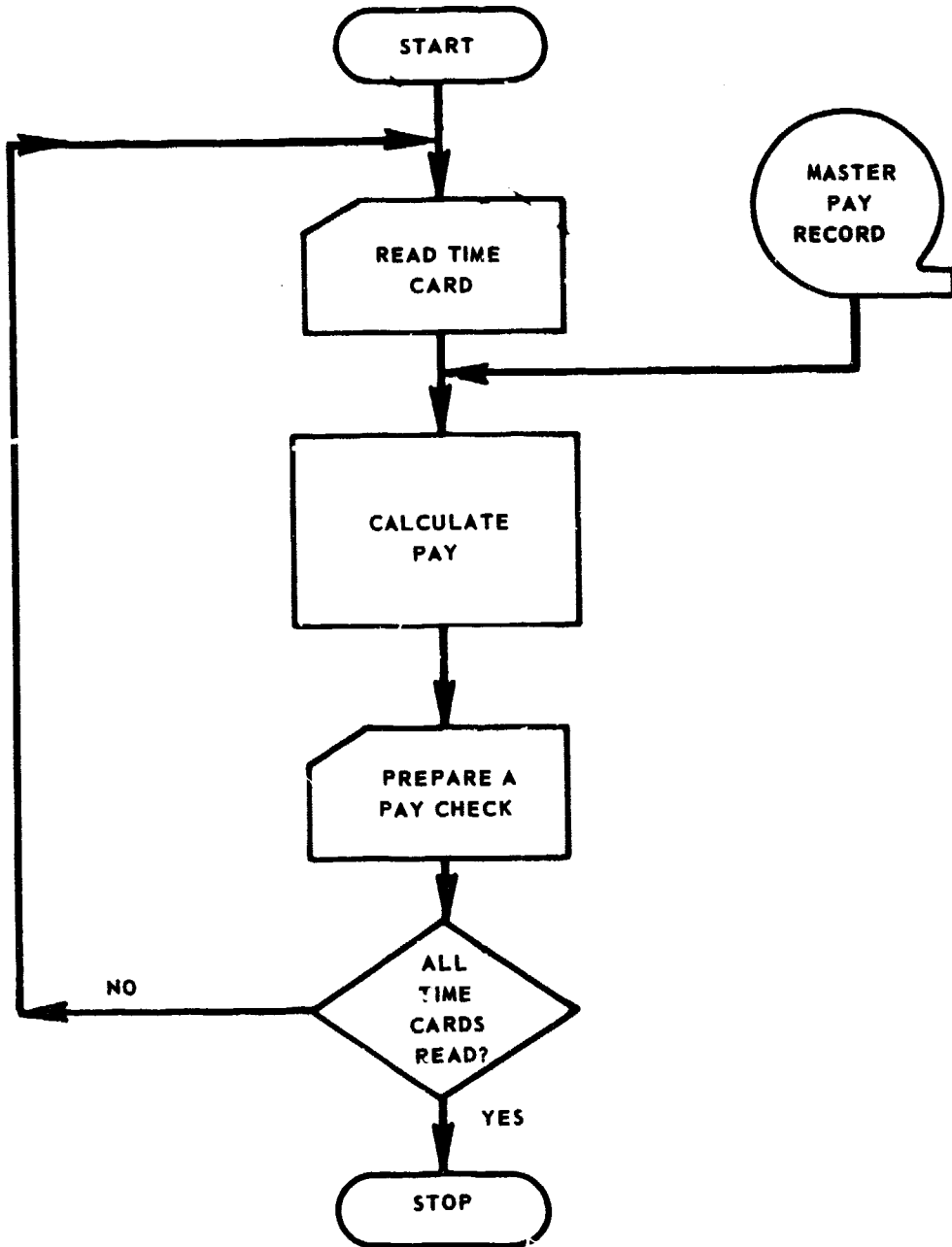
On 11 occasions we reported that the Federal standardization program has not been very successful and that we did not foresee much transferability of computer systems or increase in productivity until the Government improved its standardization efforts. (See pp. 27 to 29.)

Better management controls needed  
over grantee and Government  
contractors' ADP activities (Code D-5)

During the 11 year period, 18 reports were issued on grantee and Government contractors' ADP activities. In these reports, we evaluated the controls and procedures established by Federal agencies to make sure that the acquisition and use of computer equipment by grantees or contractors were as economical as possible. Generally, we found that although Federal policies and procedures were available, they did not specify some important analyses needed or some alternatives to be considered in keeping the cost of acquiring computer equipment low. As a result, grantees and contractors were allowed to:

- Obtain new computer systems or add to existing systems without thoroughly evaluating their needs.
- Keep certain benefits earned although the Government was absorbing most of the costs.
- Exclude certain sources of equipment supply that normally offered lower prices.

FLOWCHARTING-----IS ONE FORM OF DOCUMENTATION AND LOOKS LIKE THIS FOR PREPARING PAY CHECKS



In the above example, a time card containing the number of hours worked and a masterpay record containing information on rate of pay for an individual employee is read, his salary is calculated, and an appropriate pay check is prepared for disbursement.

In summary, we concluded that OMB, GSA, and other Federal agencies should work together to establish consistent guidelines to make certain that contractors and grantees obtain automatic data processing equipment more economically.



LIST OF ADP REPORTS ISSUED BY GAO  
FROM NOVEMBER 1965 TO DECEMBER 1976

	<u>Issues reported</u>
Procurement of Computer Systems by the Air Force (B-158121, 12/16/65)	B-1
Automatic Data Processing Activities at the Atomic Energy Commission's Sandia Laboratories (1/28/66)	D-1, D-5
General Electric Company's Leasing of Electronic Data Processing Systems (B-146732, 1/28/66)	C-1, D-5
Rental Charges for Data Processing Equipment at the Sperry Rand Corporation (B-157929, 2/18/66)	B-2, D-5
Management of Certain Equipment Purchased by the Federal Aviation Agency (3/24/66)	C-2
Planning for and Utilization of Automatic Data Processing Equipment (B-154068, 5/25/66)	C-1, D-1
Automatic Data Processing Activities of the Union Carbide Corporation (9/7/66)	B-1, D-2
Acquisition of Computers With Capacities in Excess of Immediate Needs (B-133182, 9/30/66)	C-1, D-1, D-5
Control Over the Procurement of Computer Work From Commercial Vendors (B-160095, 10/18/66)	C-1, D-5
Selective Review of Automatic Data Processing Capacity Available for Use by Public Works Centers (B-158837, 3/31/67)	C-1, C-2, D-1

## APPENDIX II

## APPENDIX II

	<u>Issues reported</u>
Review of the Acquisition and Installation of Computers by the United States Army, Pacific (B-160417, 4/28/67)	D-1, D-2
Utilization of Automatic Data Processing Equipment by the South Bend Community School Corporation (B-162080, 8/24/67)	C-1, D-5
Adequacy of the Department of Agriculture's Centralized Automatic Payrolling System (B-146951, 9/28/67)	D-2, D-3
Costs Charged to Government by Contractors Renting RCA-Manufactured Automatic Data Processing Equipment (B-146732, 10/12/67)	B-1, D-5
Report on Review of Accounting, Disbursing, and Automatic Data Processing Operations of Regional Finance and Data Processing Center at Paris, France (B-146703, 1/31/68)	D-2
Acquisition of Automatic Data Processing Equipment by the Peace Corps (B-163617, 2/27/68)	D-1
Inquiry Into Practices Followed by the Department of Defense Components in Acquiring and Installing New Automatic Data Processing Equipment for Use in Computerized Management Systems (B-163074, 3/13/68)	D-1
Maintenance of Automatic Data Processing Equipment in the Federal Government (B-115369, 4/3/68)	C-4
Review of Reliability of the Air Force Personnel Data System (B-164471, 7/25/68)	D-2
Examination Into the Control Over Procurement, Use, and Disposition of Magnetic Computer Tape in the Department of Defense (B-164392, 9/18/68)	C-2, D-1 D-2

## APPENDIX II

## APPENDIX II

	<u>Issues reported</u>
Utilization of a Computer by the Export-Import Bank of the United States (B-114823, 10/2/68)	C-1, D-1
Need for the Federal Communications Commission to Make Fuller Use of Its Automatic Data Processing Facilities (B-164987, 11/1/68)	C-1
Centralization of the Army's Supply Management Operations (COSMOS) System (B-163074, 1/16/69)	D-1
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