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# USE OF ELECTRONIC DATA PROCESSING EQUIPMENT

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## HEARINGS BEFORE THE SUBCOMMITTEE ON BUS AND GOVERNMENT STATISTICS OF THE COMMITTEE ON POST OFFICE AND CIVIL SERVICE HOUSE OF REPRESENTATIVES EIGHTY-SEVENTH CONGRESS SECOND SESSION

OCTOBER 2, 3, AND 5, 1962

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# USE OF ELECTRONIC DATA PROCESSING EQUIPMENT

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TUESDAY, OCTOBER 2, 1962

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON CENSUS AND  
GOVERNMENT STATISTICS OF THE  
POST OFFICE AND CIVIL SERVICE COMMITTEE,  
*Washington, D.C.*

The subcommittee met, pursuant to call, at 10 a.m. in room 215, Cannon Building, Hon. David N. Henderson (subcommittee chairman) presiding.

Mr. HENDERSON. The subcommittee will come to order.

This subcommittee has maintained a continuing interest in the use of electronic data processing equipment in the Federal Government. At earlier hearings, in June 1959, representatives from the General Accounting Office and the Bureau of the Budget testified regarding the trend of development and use of such equipment in the Federal Government. Portions of the Comptroller General's special report to the Congress, entitled "Survey of Progress and Trend of Development and Use of Automatic Data Processing in Business and Management Control Systems of the Federal Government as of December 1957," were included in an appendix to the hearings. Also included in the appendix were portions of the "Report of Survey of Personnel Problems of the U.S. Government in the Adoption and Use of Automatic Data Processing Systems" prepared for the Bureau of the Budget by Lester B. Knight & Associates in April 1959.

The subcommittee hearings in March 1960 stressed how the use of such equipment might affect employee job security. Testimony was given by representatives of various employee organizations who offered suggestions regarding planning ahead, retraining, reassignment, and definite placement programs. Representatives of the Veterans' Administration and the Treasury Department advised the subcommittee of the steps taken by their agencies in providing employee job security when electronic data processing procedures were being introduced.

The subcommittee report of August 1960 included a brief description of selected applications to indicate the various uses being made of electronic data processing equipment by Government departments and agencies, comments on the magnitude of the manpower problem in this field, and on the importance of feasibility studies, an inventory of electronic computers in the Federal Government as of June 30, 1960, and recommendations developed by the subcommittee.

The inventory of 1960 listed 524 computers. The latest inventory recently released by the Bureau of the Budget shows an estimated 1,006 computers as of June 30, 1962. As substantial as the increase in number of computers has been, almost doubling in the 2 years, it

is but a fraction of the increase in data processing capabilities of these installations because of the advances in equipment and in systems analysis during the period.

We have requested a number of Federal agencies to submit statements to the subcommittee relating to the uses of electronic data processing equipment in their operations. Representatives of several of these agencies have been asked to present highlights from their statements and to answer questions of the members of the subcommittee at the hearings today and tomorrow.

In addition to the agencies appearing here, statements which will be included in the record of the hearings have been received from the Department of Commerce, the Department of Justice, the Post Office Department, Civil Aeronautics Board, Federal Aviation Agency, Housing and Home Finance Agency, Interstate Commerce Commission, and the Railroad Retirement Board.

It should be noted that the Department of Defense, the Atomic Energy Commission, and the National Aeronautics and Space Administration were purposely excluded from the scope of these hearings as the magnitude of their computer holdings indicates the appropriateness of separate hearings at a later date.

We have with us this morning from the General Accounting Office, Mr. Edward J. Mahoney, Assistant Director of the Accounting and Auditing Policy Staff. Mr. Mahoney, who has had considerable experience in this relatively young and fast-growing field testified at the subcommittee hearings in June 1959. We have asked the General Accounting Office to tell us something about their responsibilities and activities relating to the use of electronic data-processing equipment in the Federal Government. I understand you have a prepared statement, Mr. Mahoney. If you wish, you may give us a few highlights from the statement which will be included in the record in its entirety.

Before you begin, Mr. Mahoney, I will place in the record a copy of my letter of May 17, 1962, to General Campbell, which states the purpose of our investigation.

(The letter follows:)

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON CENSUS AND GOVERNMENT STATISTICS  
OF THE COMMITTEE ON POST OFFICE AND CIVIL SERVICE,  
May 17, 1962.

HON. JOSEPH CAMPBELL,  
*Comptroller General of the United States,*  
*Washington, D.C.*

DEAR GENERAL CAMPBELL: Under authority of House Resolution No. 75, 87th Congress, the Subcommittee on Census and Government Statistics, of the House Post Office and Civil Service Committee, is continuing its studies relating to the use of electronic data processing (EDP) equipment in the Federal Government. It is believed that developments since the publication of our subcommittee Report on the Use of Electronic Data-Processing Equipment in the Federal Government, issued in August 1960, have been of sufficient importance to warrant a review of current activities in this field.

The subcommittee plans to hold EDP hearings in Washington later this session, probably in mid-July. Attention will be directed (1) toward agency planning prior to installation of equipment (the extent and effectiveness of feasibility studies, the background of decisions to shift to new or different equipment, etc.); (2) effectiveness of the policies outlined in the Bureau of the Budget Circular A-54 and agency compliance therewith (efficient utilization of the equipment, lease versus purchase of equipment, interagency arrangements for machine use, etc.); (3) manpower utilization in the initial planning, installation, and operational phases, and later in current planning and routine operations (training of employees, problems of recruitment and turnover in this area, adequacy of grade

structure, job opportunities for displaced employees and the overall effect of automation; (4) efforts to increase use of byproduct statistical data in management decisions where primary usage of equipment is inventory, supply, finance or other type accounting; efforts to reduce and simplify business reporting requirements of the Federal Government by use of machine tape for records, etc.; and, (5) progress of the Interagency Committee on Automatic Data Processing as a Federal clearinghouse for the exchange of EDP information.

The following agencies will be invited to report on their EDP activities: Agriculture Marketing Service, Economic Research Service, and the Statistical Reporting Service of the Department of Agriculture; Bureau of the Census, Patent Office, Bureau of Public Roads, and the National Bureau of Standards of the Department of Commerce; Social Security Administration, Office of Education, and Public Health Service of the Department of Health, Education, and Welfare; Federal Bureau of Investigation in the Department of Justice; Bureau of Labor Statistics and Bureau of Employment Security in the Department of Labor; Post Office Department; Bureau of Accounts, Internal Revenue Service, Bureau of the Public Debt, and Office of the Treasurer in the Department of the Treasury; Civil Aeronautics Board; Civil Service Commission; Federal Aviation Agency; General Services Administration; Housing and Home Finance Agency; Interstate Commerce Commission; Railroad Retirement Board; and, Veterans' Administration. [Department of Defense, Atomic Energy Commission, and National Aeronautics and Space Administration have been omitted from this list as the magnitude of their overall holdings of computer equipment indicates the appropriateness of separate hearings for them at a later date.]

Our committee has followed with interest the fine reports you have submitted to the Congress on the automatic data processing operations in various Federal programs. It would be appreciated if you could provide this subcommittee with any additional EDP material relating to the agencies listed above. Moreover, we would like to have representatives of your office open the hearings, as they did in our first hearings on this subject, June 5, 1959.

Your continued cooperation in our subcommittee's work is greatly appreciated.

Sincerely yours,

DAVID N. HENDERSON, *Chairman.*

#### STATEMENT OF E. J. MAHONEY, ASSISTANT DIRECTOR, ACCOUNTING AND AUDITING POLICY STAFF, GENERAL ACCOUNTING OFFICE

Mr. MAHONEY. Mr. Chairman and members of the subcommittee, on behalf of the Comptroller General, I appreciate the opportunity to appear again before your committee to discuss the trend of development and use of automatic data processing in Federal Government operations. This is a rapidly expanding and dynamic field in which new equipment, new methods, and even new concepts are constantly being developed. Extensive and important changes are taking place in Government operations as a result of this new technology. For this reason, we have tried to keep in close touch with these developments from the outset.

Also, as you know, the General Accounting Office has a number of responsibilities which require us to be vitally interested in the entire field of electronic data processing. These systems not only involve significant expenditures, but they also directly affect the efficiency, economy, and effectiveness with which the operations in which they are used are carried out. Our audit and investigative work involves us in these matters. In addition, as a participating central agency in the joint financial management improvement program, along with the Bureau of the Budget and the Treasury Department, we are directly concerned with all agency financial management improvement programs. Many of these involve the use of electronic data processing systems. We are also concerned with accounting principles,

standards and related requirements, fiscal procedures, and some aspects of records management in the Government.

In our testimony before this subcommittee in June 1959, we pointed out that the Government had in many respects pioneered the use of these systems as a means of improving and speeding up operations involving complex computations and the handling of large volumes of data. At the time of our previous testimony, we estimated that over 175 computers had been installed in the business and management control operations of the Government. This number was exclusive of equipment used for military tactical operations, intelligence, surveillance systems, and certain other military programs. Today over a thousand computers are installed in Federal agencies for these same types of operations. These machines are being used in a wide variety of activities for many important and diverse purposes.

The potential impact of automatic data processing on Government operations is not possible to foresee at this time. However, the important changes which have taken place in Government methods and organization so far are indicative of the further changes which can be expected in the future through use of the constantly increasing capability of electronic equipment, and our increasing ability to know how best to use these new tools.

Some of the points that we presented in our earlier testimony are at least equally and perhaps more important today to a consideration of how the new technology is developing and being controlled.

We commented in our earlier testimony that almost every major activity in the Government which has large volumes of information to process, or large-scale paperwork or recordkeeping operations, has been affected in some degree by the introduction of electronic methods.

At the hearings in June 1959, we pointed out that even though electronic equipment had come into widespread use, the entire field was in an early state of development. We also stated that despite the pioneering aspects of many applications, important advances had already been made which had far-reaching implications for improvement in the efficiency and economy of Government operations.

We also commented that in some instances closely related operations had been integrated into a single system as an outgrowth of extensive examination and evaluation of interrelated procedures and management needs.

A major point that we made earlier had to do with the possibilities for integration of procedures through electronic methods not only within an agency and between agencies, but between Government agencies and organizations outside the Government. We also reported on a number of problems that had arisen which gave indications that more central direction and support was needed if the Government was to make the most effective use of the new technology in the period ahead.

Based on our continuing studies of ADP (automatic data processing) developments in Government operations, we are convinced that our earlier comments are still in order and that while some of the possibilities for integration, for example, have been accomplished, much remains to be done to make full use of the new technology.

One example of progress already made in the development of integrated systems, is the program in which the Veterans' Administration and the Treasury Department coordinated their planning

and use of ADP methods. In this instance, the check payment data produced in the veterans' benefit electronic system on magnetic tape is providing a machine-processing media for direct use in the Treasury electronic system for preparation of veterans' benefit payment checks in Chicago, Ill. As part of this integrated systems development, the magnetic tapes used in the check-writing process are further used in a third electronic system to automatically record individual check disbursement data in the Treasury electronic banking system in Washington, D.C. This system controls check payment and check reconciliation operations for all U.S. Treasury checks. These systems, which were in the planning stage at the time of the 1959 hearings, are now a reality.

The increasing capability of electronic equipment and the Government's improved knowledge of how to use this equipment is reflected in another development involving the Treasury and Post Office Departments. The electronic system originally designed for the payment and reconciliation of Treasury checks has now been extended to include a similar operation for Post Office Department postal money orders. In this case, the same equipment and personnel in the Treasury Department that is used for Treasury check operations also process postal money orders. This is a further indication of the trend toward centralized processing of routine transactions on which we commented during the 1959 hearings of this subcommittee.

Since our earlier testimony, the inventory of computers installed in Government agencies has increased beyond the 1,000 mark. Approximately 160 additional computers are scheduled for installation during fiscal year 1963.

The increased use of the new electronic machines in Government operations is directly related to both the development of new equipment within the data processing field and the constantly expanding need for faster methods of handling data and retrieving information in various fields of effort.

Our general interest in this field, coupled with our belief that the introduction of electronic systems would cause a considerable impact on many Government operations, led us to undertake two rather comprehensive surveys of uses and plans for the use of automatic data processing equipment by Federal Government agencies. Our first survey was completed in 1958, and a special report which summarized the results of our study was submitted to the Congress on June 27, 1958. Copies of this report were made available to members of this subcommittee, and portions of this report were included as appendix B in your June 5, 1959, report on the hearings on the "Use of Electronic Data Processing Equipment."

Our second overall report on this subject was completed in 1960, and a report entitled "Review of Automatic Data Processing Developments in the Federal Government" was submitted to the Congress on December 30, 1960. A copy of this report was sent at that time to the chairman of this subcommittee.

These two general Government-wide survey reports were prepared for the express purpose of advising the Congress of the trend of development of this rapidly expanding field. Also, as a result of our regular accounting and auditing work in the agencies, we have issued a number of audit reports to the Congress and the agencies covering specific ADP installation matters.

In addition, our Office conducted a number of other studies of individual agency ADP installations at the request of the chairman of the House Post Office and Civil Service Committee. I have a list of all of these reports that have been issued to the Congress and to congressional committees which I would like to offer for inclusion in the record, if you desire.

Mr. HENDERSON. Without objection it is so ordered.  
(The list of reports follows:)

*List of reports on automatic data processing issued to the Congress or its committees by the Comptroller General of the United States, June 1958 to August 1962*

	Reference	Date issued
Reports to the Congress:		
Governmentwide reports:		
Survey of Progress and Trend of Development and Use of ADP in Business and Management Control Systems of the Federal Government as of December 1957.....	B-115369	June 27, 1958
Review of ADP Developments in the Federal Government.....	B-115369	Dec. 30, 1960
Reports on individual agencies:		
Review of ADP Installations, New Orleans Commodity Office, Commodity Stabilization Service, Department of Agriculture.....	B-133306	May 20, 1960
Audit of Check Payment and Reconciliation Functions, Office of the Treasurer of the United States, Treasury Department.....	B-118608	Aug. 23, 1960
Review of ADPS at the Transportation Materiel Command, Department of the Army, St. Louis, Mo.....	B-125073	Sept. 7, 1960
Review of ADP Activities at Department Headquarters and at the New York and Richmond Offices, Post Office Department.....	B-133385	Jan. 15, 1962
Review of ADP of Series E U.S. Savings Bonds, Bureau of the Public Debt (Parkersburg, W. Va., Office), Treasury Department.....	B-133180	Apr. 18, 1962
Review of ADPS Used in Supply Management by the Department of the Navy, Aviation Supply Office, Philadelphia, Pa.....	B-133118	May 31, 1962
Review of Selected Aspects of Awards by General Services Administration and Administration by Certain Using Agencies of Contracts for Rental of EDP Equipment.....	B-146732	June 21, 1962
Review of the Administration of Contracts for Rental of ADP Equipment at Selected Military Installations Within the Department of Defense.....	B-146732	June 29, 1962
Review of Planning for ADP Equipment, Washington, D.C., Regional Office, General Services Administration.....	B-146744	Aug. 20, 1962
Reports to congressional committees: <sup>1</sup>		
Committee on Post Office and Civil Service, House of Representatives:		
Investigation of Allegations Pertaining to Waste and Mismanagement in the Statistical Service Operations, Warner Robins Air Materiel Area, Robins Air Force Base, Ga.....	B-133090	Sept. 28, 1959
Review of ADP Installation, Geological Survey, Department of the Interior.....	B-133261	Dec. 15, 1959
Review of Selection and Utilization of ADP Equipment, National Institutes of Health, Public Health Service, Department of Health, Education, and Welfare.....	B-133268	Jan. 29, 1960
Review of Electric Accounting Machine Reports, U.S. Army Signal Supply Agency, Philadelphia, Pa.....	{ B-115386 B-132978 }	{ Mar. 4, 1960
Review of Payroll Earning Records Produced by EDP Equipment, Mare Island Naval Shipyard, Vallejo, Calif.....	B-118734	Apr. 6, 1960
Review of Certain Aspects of EDP, San Antonio Air Materiel Area, Kelly Air Force Base, Tex.....	B-133311	June 30, 1960
Review of Research and Development Costs for BIZMAC, Radio Corp. of America.....	B-133323	Do.
Lease versus Purchase of ADP Equipment (Interim Report).....	B-115386	Aug. 26, 1960
Lease versus Purchase of ADP Equipment.....	B-115386	Nov. 8, 1961
Committee on Government Operations, House of Representatives:		
Review of Procurement of ADP Equipment, U.S. Army, Fort Benjamin Harrison, Ind.....	B-133063	Feb. 8, 1960
Committee on Veterans' Affairs, House of Representatives:		
Study of Feasibility and Desirability of Merging Insurance Office, Veterans' Administration.....	B-114859	Aug. 8, 1962
Select Committee on Small Business, House of Representatives:		
Review of Department of the Army Procurement of ADP Equipment, Fort Meade, Md.....	B-133270	Jan. 29, 1960

<sup>1</sup> Reports not available for general distribution without permission of the congressional committee.

Mr. MAHONEY. Also, at the request of this subcommittee, during the 1959 hearings on ADP, we made a joint study with the Bureau of the Budget on the problem of lease versus purchase of ADP equipment. This study led to the publication of Bureau of the Budget Circular

A-54, dated October 14, 1961, which established executive branch policies to be followed by Federal agencies in the selection of ADP equipment and in determining whether such equipment was to be acquired by lease or purchase. We understand that the Bureau of the Budget representatives plan to discuss this subject at some length in their testimony.

In a letter to the chairman of your subcommittee dated November 8, 1961, we stated that our office planned to carry out additional reviews in individual agencies with respect to the utilization of electronic equipment, including lease versus purchase matters. We are now in the process of preparing our report to the Congress on the results of this review. Copies will be submitted to your subcommittee when it is issued.

One of the important considerations in our recent study involves the matter of technical obsolescence versus economic obsolescence. This question arises because of the fact that newer equipment is constantly being developed which has a greater productive capacity than the earlier equipment. This does not mean, however, that the earlier equipment cannot be usefully and economically employed for less demanding tasks even though from a technical standpoint it has been surpassed by newer models. As a matter of fact, some equipment suppliers offer some models of used equipment at substantially reduced purchase prices which in effect presents an opportunity for Government agencies to obtain the older equipment for use in tasks which may otherwise be beyond the reach of mechanized methods. Also, Government-owned equipment which is no longer suitable for the work for which it was originally procured can be transferred to other activities to replace leased equipment under certain circumstances.

In our December 1960 report to the Congress on ADP developments, we stated that:

Generally, the practice of each Government agency is to procure equipment for its own needs on either a purchase or rental basis and to trade in purchased equipment or exchange older rented equipment for newer models in accordance with its own particular needs. Possible needs of other agencies for the traded or exchanged equipment are generally not considered. However, it is possible that such equipment can be used to serve the needs of other Government agencies.

Since used equipment can be purchased at a substantial reduction from the original purchase price, we believe that a Government-wide approach is needed to determine which machines should be purchased and retained for Government use in lieu of new procurement. Likewise, before trading in purchased equipment which is no longer suitable for the original using organization, efforts should be made to determine the possibility of transferring the purchased equipment to other Government organizations requiring such equipment in lieu of new procurement.

We believe that a mechanism should be established in the Government to provide the necessary arrangements whereby the procurement and transfer of data-processing equipment between Government agencies would be fully coordinated so as to keep costs as low as possible consistent with obtaining needed processing facilities.

In our June 1958 and December 1960 reports, we presented a series of needs which we felt required attention in individual agency ADP programs if improvements were to be made in the state of development of electronic systems which would provide more effective and econom-

ical use of such systems in Government operations. Attention was directed at the following kinds of needs which we feel are still pertinent.

Need for continuing research and development on such problems as improvement of source data and control over documentation procedures, improvement of management analysis and scientific techniques, and development of integrated systems.

Need for master planning for development of integrated agency systems in order to realize all potential benefits of ADP methods.

Need to eliminate unnecessary reports and duplication in processing procedures when converting to electronic systems by reviewing reporting requirements and establishing programs under the general concept that fewer but more effective reports, geared to the management-by-exception principle, represent one of the real potentials of electronic methods.

Need for analysis of systems to determine optimum data processing cycles by reviewing present procedures for data processing in relation to cost and value of information produced by the electronic system. Too frequent processing cycles can often be more costly than the value of the information produced warrants. On the other hand, infrequent processing may result in additional expense by causing out-of-date reports to be used in making management decisions thereby creating costs out of proportion to the cost of more frequent processing cycles.

Need for review of existing variations in data systems concepts in order to determine the validity of pursuing separate development of the wide variation of systems concepts for using electronic systems that have been under development in the individual military services.

Need for more specific and systematic measurement of costs and progress in development of electronic systems in order to establish a basis for more effective programs of management control over the acquisition and use of electronic systems.

Need for participation and support by top management in order to develop programs for the most effective use of this new technology and to provide a means of insuring management participation in long-range planning efforts for the development of integrated agency systems.

Our continuing reviews of ADP developments in individual Government agencies indicate that many of the foregoing points are still in need of attention if the most productive use of electronic systems is to be achieved.

In our reviews of selected activities, we found that the degree of success in working with electronic systems is directly related to the amount of preplanning and study that has been undertaken before the equipment is acquired. In some instances, we noted that several months elapsed between the time equipment was acquired and useful production of results was achieved. In other cases, we found that frequent changes were made in the types of equipment being used and, as a result, unnecessary costs were being incurred for reprogramming and conversion costs as each new type of equipment was installed.

We also found that there is still duplication of effort in designing systems and programming operations for the computers where the same type of effort has been previously worked out in other agencies. In addition to the duplication which sometimes occurs because of lack of coordination between agencies, we noted in some cases that experimental systems were developed at multiple locations within an agency which resulted in duplication of effort and unnecessary expense.

Also, we noted instances in which reports prepared under the previous system were carried over and continued under the new electronic system without adequate study as to the possibilities for elimination of reports which were no longer required.

In still other instances, we found that unnecessary costs were being incurred for equipment which was in excess to the needs of the individual installation. In general, our reviews disclosed the need for more careful preplanning efforts to make more effective use of costly electronic equipment systems when such systems are installed.

In our first Government-wide study we reported that no single agency of the Government was responsible for directing and coordinating continuing developments in automatic data processing. Subsequently, the Bureau of the Budget established a small staff group for the purpose of providing Government-wide coordination and leadership for the ADP program of the Government. Since that time the Bureau has taken several actions which we feel are good steps in the right direction. We understand that Bureau representatives plan to discuss some of these matters in their testimony.

We recognize that from an overall Government standpoint, the establishment of the Bureau of the Budget's ADP program has been a desirable step toward providing more coordination in this field. However, in view of the large expenditures involved and the long-range implications of far-reaching effect on Government operations generally, we feel that more positive long-range planning efforts on some kind of Government-wide basis need to be undertaken if the Government is to achieve most effective, efficient, and economical use of these systems.

Among the important problems that require Government-wide attention, for example, are the following:

1. The extent to which the Government is equipped with the required know-how to proceed with the development of electronic information systems in view of the costs involved and the enormous challenge presented to all levels of management. The answer to this question should, to a considerable degree, assist in determining the rate of growth which should be allowed or fostered.

2. The extent to which long-range planning and control should be centralized in view of the potentials for development of integrated systems on a Government-wide scale.

No single operating agency can be expected to plan for Government-wide integration of systems. Comprehensive planning in connection with significant jobs could readily involve the functions of more than one agency, and a central planning group could actively encourage early consideration of automatic interchange of records, development programs, and research data. A central group should be alert to the desirability of reorganizations if better data processing could be arranged through integration of systems. Central coordination could also provide assistance with regard to the interchange of magnetic tape records between industry and Government.

We believe that the Bureau of the Budget occupies a position in the executive branch which makes it the logical agency to exercise the kind of central leadership needed. We also feel, however, that more recognition needs to be given to the far-reaching role which electronic systems seem destined to play in governmental processes and the re-

lated need for sound planning for their use. Therefore, in carrying out its leadership responsibilities, we believe that the Bureau should extend its role to include more positive central planning so as to provide the kind of integrated long-range planning and coordination which is needed to promote the maximum degree of efficiency, economy, and effectiveness in the continuing development and use of electronic systems in Federal Government operations.

Before closing, I would like to offer for inclusion in the record such parts of our previous ADP reports as your subcommittee deems appropriate.

Mr. HENDERSON. Thank you, Mr. Mahoney. We will ask the staff to coordinate with you in that regard.

Mr. Mahoney, in your statement you say "more positive long-range planning efforts on some kind of Government-wide basis need to be undertaken." I wonder if you would expand and comment further on that remark.

Mr. MAHONEY. Yes. It is a very difficult matter to deal with. We have a little explanation on this in our 1960 report, a few paragraphs, perhaps a few pages. Essentially, some of the things we had in mind which were covered in that report involved about four different fields. For example, in the payrolling field, in Government we have developed the capability to use these systems in our payroll work at successive levels of agency organizations from the lower organizational levels up to the bureau level and in some cases on a departmental level. The problem is to establish a long-range planning group to come up with answers leading up to 4 or 5 or 6 years hence as to what should be the proper level of this development within agencies and between agencies to make full use of the tremendous potential that is involved here in this equipment.

The same is true in many other areas, in the personnel area, for example, in the matter of rosters of skills that could be maintained perhaps on a Government-wide basis if we were organized for the long-range objective. Or in the supply area, where we could develop systems to determine immediate availability of supplies and equipment, and the long-range need for materials.

These objectives are of very long-range nature but they need continuing attention and an active kind of attention.

Mr. HENDERSON. I notice in your statement you list some of the needs which were presented in your 1958 and 1960 reports which you feel are still pertinent. We would like to know if you feel legislation is required to meet these needs or could the executive branch, under its present authority, assuming adequate appropriations were made, meet them?

Mr. MAHONEY. We feel primarily these needs are matters which the individual agencies can deal with without any need for legislation. They are basic systems development matters. For example on the first one, the need to improve source data; this is a typical problem in the use of electronic computers throughout the Government. One of our recent studies of a major installation showed that a real problem area existed in getting accurate source data for use in the computer system. This problem had existed for some time. It was a matter of the agency taking the ball in their hands and really developing a program to correct the situation. Basically, all the points needing attention are internal to the development of the individual EDP system.

Mr. HENDERSON. In your statement you refer to a letter dated November 8, 1961, in which you stated that your office planned to carry out additional reviews in individual agencies with respect to the utilization of electronic equipment, including lease versus purchase matters.

Do you think the situation has changed materially since 1960? If so, tell us how it might have changed.

Mr. MAHONEY. I think with regard to the lease versus purchase situation at least there has been some definition of the problem and the establishment of some rules to be followed. The latest percentages indicate that while there has not been an increase on the purchase side, there is an indication that the tendency toward leasing has slowed down. It is a very difficult thing to change overnight. I think the Bureau of the Budget representatives will address themselves to this matter. But it looks like we gradually will assume a posture in the Government where we will favor outright purchase of more equipment.

I do not mean to indicate that there is going to be any tremendous surge toward purchasing. However, we are a little concerned; we feel there should be a great deal more purchasing on the part of the Government. We also feel that in many cases used equipment should be purchased and placed to use for less-demanding tasks, where it no longer is best for the original task.

The pioneering people in this field felt they were not sure the equipment would work out right and therefore there was more of a tendency toward leasing originally. However, I think the general posture has improved since 1960.

Mr. JOHANSEN. Will the chairman yield at that point?

Mr. HENDERSON. Yes.

Mr. JOHANSEN. What is your reason for preference for purchase rather than lease? Is it primarily cost, and if so how does that relate to flexibility in terms of replacement of equipment with higher-developed type equipment?

Mr. MAHONEY. Our basic philosophy is this, which goes a step beyond the Bureau of the Budget's policy at the moment: We feel this is a very large Government and we recognize there are some cases where the original equipment may no longer be the best equipment for the job. However, we feel there are less demanding tasks in the Government that could use the older equipment if we had purchased it in the first place.

It is a very complicated situation because it involves the funding and transferring of funds and transferring of equipment and asking people to use equipment which is not the latest technologically available equipment. For example, in a very crucial kind of a problem we would not want the agency to continue to use the older equipment. We are in favor of progress and of going on to the newer equipment. However, it is still economically feasible to use the older equipment on the less demanding tasks. That is why we are in favor of doing more purchasing. However, we are not in favor of purchasing everything that comes along. Some equipment does not pay off.

Mr. JOHANSEN. Would you not have that flexibility under a leasing arrangement with reference to this obsolete equipment?

Mr. MAHONEY. Getting back to your question, it is a matter of economics. If you use a piece of equipment for more than one shift—

Mr. JOHANSEN. For more than what?

Mr. MAHONEY. For more than one shift of work, generally when the equipment is used for two or three shifts it pays out in a relatively short period, something like 3 to 4 years. So from an economic standpoint we favor purchasing where the utilization factors, that is, where it is used more than one shift or where other factors will bring the payoff period down.

Mr. JOHANSEN. What do you mean by "payoff"?

Mr. MAHONEY. Equating the rental, all costs under a lease arrangement, versus all costs under a purchase arrangement. If the rental equals the purchase price in 2 or 3 years where we are using the equipment around the clock, it seems pertinent that we obtain it by purchase.

Mr. JOHANSEN. When you make a leasing arrangement, is it for a stated period of time or is it continuing?

Mr. MAHONEY. Essentially it is continuing although it is for a fixed period, that is, for the fiscal year and it is renewed at the end of each fiscal year.

Mr. HENDERSON. You stated that you feel some mechanism should be developed whereby the procurement and transferring of equipment between agencies could be fully coordinated, and you point out this could keep our costs low and it might determine whether you would lease or purchase.

Have you come up with any definite conclusions or recommendations as to the type of mechanism or organization that should be established to accomplish that objective?

Mr. MAHONEY. We feel that the General Services Administration is the logical agency to deal with the interplay between agencies, being sure we get the utilization and arranging for transfers of equipment. We have not settled on the problem of what is involved in the funding. We are still considering this in the report we have under development.

Mr. HENDERSON. This becomes far more important as we go toward Government ownership.

Mr. MAHONEY. Very definitely so. Under a lease basis we avoid this whole problem because if we want to discontinue a piece of equipment at one point and secure it at another point the supplier takes care of that, though we pay the transportation expenses.

Mr. JOHANSEN. Would that not mean there is more flexibility under the leasing arrangement?

Mr. MAHONEY. There is no question there is more flexibility under the leasing arrangement. Our earlier report of August 1961 pointed out there were a number of elements on each side for lease and purchase and the flexibility is very strong on the lease side. The question really comes down to your first question, the economics of the question.

Mr. HENDERSON. Any further questions?

Mr. JOHANSEN. Yes. The witness touched on a point I would like him to develop because I have made some notations here and I suppose I will make the Bureau of the Budget mad for taking something away from them and I will make the General Services Administration mad for giving them something, but why suggest the Bureau of the Budget as the agency to carry out the function you are talking about rather than the GSA? Is this not basically a purchasing and procurement function of the type that in other areas is recognized as logically a GSA operation?

Mr. MAHONEY. On the matter of the procurement and the transferring of equipment and all these features we feel GSA is the logical place. The matter of the long-range planning with regard to developing an action program for the Government as a whole is the part we feel belongs to the Bureau of the Budget.

Mr. JOHANSEN. Certainly in other areas where the GSA does the procuring there are problems of long-range planning involved. Do you give those functions to the Bureau of the Budget or do you leave them in GSA?

Mr. MAHONEY. Well, it gets down to a philosophical situation, I think, or perhaps more than that, where the Bureau of the Budget has certain responsibilities anyway for the policy as to how the Government operates under certain programs. When you get to those matters of long-range planning of the Government where similar data is being handled by more than one activity, I think you are in something which is a very significant policy area.

Mr. JOHANSEN. Are you saying the reason it should be in the Bureau of the Budget is because it is more of a management function than a purchasing functioning?

Mr. MAHONEY. Yes. The purchasing I would agree should be exercised by GSA under the leadership of the Bureau of the Budget.

Mr. JOHANSEN. I have never been able to figure out why, with regard to the control of personnel and the policing of manpower utilization we have never been able to center that in any one management group. If we can do it with machines why can we not do it with personnel?

Mr. MAHONEY. That is a very good observation.

Mr. JOHANSEN. Thank you. I am afraid it will just rest as a very good observation.

Mr. HENDERSON. Mr. Udall.

Mr. UDALL. I have just one question and that is this: With the increasing use of ADP equipment, have any studies been made or can you comment on what we may expect from the increasing use of ADP equipment with regard to the effect on Government personnel? Will this eventually call for fewer Government employees or do you calculate the employment level will remain the same?

Mr. MAHONEY. My feeling is that over a long period the manpower requirements will decrease. I do not know whether any of the other people appearing today plan to develop this at more length. I purposely did not get into it, since I felt that it would be covered in other statements. I might mention that in our 1959 hearings we recited for use of the subcommittee the fact that we had looked at 37 major ADP facilities in the Federal Government and aside from about two or three installations the major problem of reduction of personnel had not occurred. In these two or three installations it was a significant problem. Several hundred people had been completely displaced and had to find other employment. In the main, however, the people displaced by EDP had been shifted around to other duties within the same facility. Our conclusion was that so far the impact had not been very great. It was great, naturally, on any one individual that was affected; that is a serious thing.

My feeling is that in the long range it will have a rather drastic effect. I think at the conclusion of the 1959 testimony we stated that planning for the use of this equipment should include in the

planning stage a full blown look of the effect on employment and the retraining and so on of those affected so that it does not come on suddenly.

Mr. UDALL. I am glad this forward planning is being considered so that we are not faced with a large reduction of Government workers. However, I hope we do not find ourselves in a position like in industry where union contracts make it impossible to take advantage of the gains of electronic data processing.

The primary job of a legislature is to legislate, and I notice from your earlier statement that this committee is not requested at this point to pass or recommend any additional legislation in this field. The matter is to get sufficient appropriations to carry out the investigations and studies and purchase the additional equipment needed.

Do you know if any of the agencies are having trouble with the Appropriations Committee in regard to looking forward in this field? Have you any comments on that?

Mr. MAHONEY. My only comment is not to my knowledge. One problem may be if we attempted to embark on a wholesale purchasing program we might have some difficulty because of the enormous amount of money that would be involved. However, in looking at the Appropriations Committee hearings, the Appropriations Committees generally have pushed the agencies toward outright purchase, so I presume if they are willing to push the agencies in that direction they would fund them.

Mr. UDALL. That is all.

Mr. JOHANSEN. May I pursue that point to this extent: Are there not two sides to the coin of the manpower utilization effects of this? Number one, of course, is a regard for either retraining or relocating personnel or the nonfilling of vacancies through attrition. None of us quarrel with facing up to the human problem, but what is the justification for this equipment if it does not result in manpower savings? Is there any justification for it if it does not involve manpower savings?

Mr. UDALL. And budgetary savings as well.

Mr. MAHONEY. In our previous testimony in 1959, we brought out that probably the major effect would be in reductions of inventories and other major savings besides just the effect on personnel. So the impetus in many of the ADP programs is the savings in the activities involved rather than savings in personnel. I say that by way of indicating that perhaps two-thirds of all the equipment installed are in military agencies, in the supply-management area of the Department of Defense, where all of these things are involved, transportation, better determination of requirements, and so on. In the civil agencies, the one in the Treasury Department for handling checks which I worked on directly several years ago, this did affect several hundred people in our organization. About 400 people in the General Accounting Office were affected directly and had to be transferred to other duties.

Mr. JOHANSEN. When you say "were affected," was there a net reduction to the Federal Government in the number of personnel?

Mr. MAHONEY. This gets to be pretty difficult to say. One whole branch of our office was eliminated in this case and we made a report on the effect on personnel in the agencies concerned. We inserted in the record a summary of the net reduction of personnel as the result of the introduction of this system. I believe 755 people were affected and in essence had to be shifted to other work somewhere.

Mr. JOHANSEN. Now, we have this same problem in the Manpower Utilization Committee. I can never find a net reduction. They are always shifted somewhere else. The overall employment figures of the Federal Government do not show any net reduction, I will say very emphatically. I marvel endlessly at the faculty of the Federal Government to introduce laborsaving equipment and not effect any reduction in total personnel. How do you do it?

Mr. MAHONEY. Getting back to this one example, the Treasury, a number of those people dispersed in various directions. We had an analysis made. Some retired, some transferred to other Government activities, some left the Government; they scattered in all directions. Some were used to fill vacancies in other agencies.

Mr. JOHANSEN. If they filled vacancies there was still a net reduction.

Mr. MAHONEY. I feel very strongly there was a net reduction but I am well aware that there is no reduction in the total Federal employment picture.

Mr. JOHANSEN. I am well aware of it too.

Mr. HENDERSON. Mr. Mahoney, we appreciate your testimony. We asked Mr. Campbell to provide the subcommittee with technical assistance and we are delighted that he provided you as a technical assistant to us during the remainder of these hearings. I believe the staff has provided accommodations for you.

Mr. MAHONEY. Thank you.

Mr. HENDERSON. Our next witness is Mr. Harold Seidman, Acting Chief of the Office of Management and Organization of the Bureau of the Budget.

Will you introduce your associates, Mr. Seidman? I might say we have had excellent cooperation from your office and we are very appreciative of this fact.

**STATEMENT OF HAROLD SEIDMAN, ACTING CHIEF OF THE OFFICE OF MANAGEMENT AND ORGANIZATION, BUREAU OF THE BUDGET, ACCOMPANIED BY GORDON OSBORN, CHIEF, MANAGEMENT IMPROVEMENT AND RESEARCH BRANCH, BUREAU OF THE BUDGET, AND WILLIAM GILL, CHIEF, ADP STAFF, BUREAU OF THE BUDGET**

Mr. SEIDMAN. We in the Bureau of the Budget feel that this subcommittee has made a very substantial contribution in the field of the use of electronic data processing equipment in the Federal Government. We have always welcomed your cooperation.

On my left is Mr. Gordon Osborn, Chief of the Management Improvement and Research Branch of the Bureau; and on my right is Mr. William Gill, who I am sure is known to this committee. He is the Chief of our ADP group.

Mr. HENDERSON. We are very glad to have you appear this morning. I understand you have a prepared statement which will be inserted in the record in its entirety at this point and you may proceed as you desire.

Mr. SEIDMAN. Mr. Chairman, I would like to read the statement.

Mr. HENDERSON. You may proceed.

Mr. SEIDMAN. Mr. Chairman and members of the committee, I am pleased to appear before this subcommittee to discuss the utilization

of automatic data processing (ADP) equipment in the executive branch of the Government. We are aware of your great interest in this subject as evidenced by previous hearings you have held and by Chairman Henderson's letter of May 23, 1962, which announced these hearings. The Chairman's letter indicated a desire to be informed relative to five major aspects of ADP equipment utilization. I shall comment briefly on each of those five areas of interest.

1. Agency planning prior to installation of equipment.

To the extent that the Bureau is able to do so within its limited staff resources, we review the adequacy of the planning that takes place in the departments prior to their decisions on the selection and acquisition of ADP equipment. This type of agency planning, which includes systems analysis and design, is quite detailed and embraces a substantial period of time at the agency level—sometimes as much as 3 years or more.

In the majority of cases our reviews occur as part of the normal responsibilities of Bureau of the Budget staff members for keeping track of developments which may affect agency programs and budgets. Thus these reviews are not ordinarily based upon an analysis in depth of all of the detailed planning processes followed by the agencies. However, in selected cases, we do participate in, or review, agency plans and studies in substantial detail.

All members of the Bureau of the Budget staff have been provided with guidelines for the review of ADP planning in the agencies. Members of the examining divisions are involved in all of the reviews and in most cases staff of the Offices of Management and Organization, Statistical Standards, or Financial Management collaborate.

Based upon our reviews, we have concluded that the planning for ADP equipment utilization has shown marked improvement, especially during the past 2 years. Several factors have contributed to this improvement. Experience and training probably lead the list. The publication of guidelines was an important step also. In this connection, our bulletin No. 60-6 ("Automatic Data Processing (ADP) Program of the Executive Branch: Studies Preceding the Acquisition of ADP Equipment"), which your committee included in the appendix to your report of August 1960, has had a favorable impact. Last October, in our Circular No. A-54, "Selection and Acquisition of ADP Equipment," additional emphasis was placed upon ADP planning by stipulating:

- (1) That no function or process will be considered for automation until it first has been established as being essential to perform;
- (2) That, before automation, operating systems be designed to "achieve the highest practicable degree of effectiveness with optimum efficiency and operational economy"; and
- (3) That the foregoing determinations will be reached as the result of system studies in depth, which studies are to be documented for future review.

Mr. HENDERSON. Without objection, we shall insert Circular A-54 in the record at this point.

(The circular follows:)

## EXECUTIVE OFFICE OF THE PRESIDENT

## BUREAU OF THE BUDGET

Washington 25, D.C.

October 14, 1961

Circular No. A-54

To: The heads of executive departments and establishments.

Subject: Policies on selection and acquisition of automatic data processing (ADP) equipment.

1. *Purpose.* This circular prescribes policies on (a) making selections of equipment to be acquired for use in the automatic data processing (ADP) program of the executive branch, and (b) making determinations as to whether the ADP equipment to be acquired will be leased, purchased, or leased with an option to purchase.

2. *Scope.* The ADP equipment affected by the policies stated herein includes—
- Electronic digital computers, irrespective of use, size, capacity, or price;
  - All peripheral or auxiliary equipment used in support of electronic computers, whether or not cable-connected and whether selected and acquired with the computer or separately;
  - Punched-card equipment, whether used in conjunction with or independent of an electronic computer; and
  - Data transmission or communications equipment that is selected and acquired solely or primarily for use with a configuration of ADP equipment which includes an electronic computer.

Analog computers are covered only when computers of this type are being used as equipment peripheral to a digital computer.

Items of ADP equipment that are (a) physically incorporated in a weapon, or (b) manufactured for the Government under a developmental contract, are not affected by the policies stated herein.

3. *Applicability.* The policies herein apply to ADP equipment acquired by the Government and to that ADP equipment which is acquired and operated by Government contractors solely to process Government data at Government expense (e.g., Government-owned, contractor-operated facilities). These policies do not apply to ADP equipment acquired by universities and similar institutions with financial assistance through grants-in-aid of Government funds.

The policy provisions of this circular become applicable when a determination has been made that the utilization of ADP equipment is essential. It is assumed that such determinations have been preceded by and are based upon the results of well-documented studies which provide an adequate factual basis for concluding (a) that the functions or processes for which the ADP equipment can be used are essential to perform, and (b) that the systems, procedures, and methods to be employed in performing these functions or processes have been designed to achieve the highest practicable degree of effectiveness with optimum efficiency and operational economy. Guidelines for planning and conducting studies preceding a decision to utilize ADP equipment, for the development of system specifications, and for equipment evaluation and selection are contained in Bureau of the Budget Bulletin No. 60-6, "Automatic Data Processing (ADP) Program of the Executive Branch: Studies Preceding the Acquisition of ADP Equipment," dated March 18, 1960.

4. *Policies on equipment selection.* The selection of ADP equipment includes the initial selection of ADP equipment, the selection of ADP equipment additional to that on hand, the selection of ADP equipment to replace ADP equipment on hand, the modification of equipment on hand, usually for the purpose of increasing memory capacity, computational capability, or speed of input or output, or combinations of the foregoing. In all these circumstances, the following policies apply:

- The selection of ADP equipment will not be made until system specifications are available to serve as a basis for selection. For purposes of this circular, the term "system specifications" means (1) the delineation of the objectives which the system is intended to accomplish; (2) the data processing requirements underlying that accomplishment, i.e., a description of the data output and its intended uses, the data input, data files, volumes of data, processing frequencies and timing; and (3) such ADP equipment capabilities as may need to be identified.

System specifications will be designed to insure free competition among equipment manufacturers.

b. The officials responsible for making decisions on the selection of ADP equipment will assure that the selection process accords equal opportunity and appropriate consideration to all manufacturers who offer equipment capable of meeting the system specifications. In this connection, the selection process may be facilitated by written invitations to manufacturers to submit proposals as a means for obtaining information regarding the capabilities of ADP equipment to meet the system specifications.

c. Two prime factors will be considered in the selection of equipment: (1) its capability to fulfill the system specifications, and (2) its overall costs, in terms of acquisition, preparation for use, and operation. The term overall costs, as used in this paragraph, will be interpreted to include such cost elements as personnel, purchase price or rentals, maintenance of purchased equipment, site preparation and installation, programming and training. When ADP equipment of two or more manufacturers meets the system specifications, the equipment which represents the least overall cost to the Government will be selected. Factors which do not relate directly or indirectly to the capability of ADP equipment to meet system specifications or overall costs normally will not be included in the considerations unless a conclusive judgment cannot be made on the basis of the two prime factors.

5. *Policies on equipment acquisition.*—Most commercially available ADP equipment can be acquired by purchase or by lease, with or without an option to purchase. The General Services Administration has contracts with principal manufacturers, listed in Federal Supply Schedules (FSS), for the rental of ADP equipment. GSA currently is negotiating contracts for the purchase (including provisions for trade-in allowances) and maintenance of ADP equipment. Until such time as these contracts appear on the Federal Supply Schedule, it will be necessary for departments and agencies to negotiate purchase and maintenance transactions. All ADP equipment acquisition transactions are subject to prevailing policies, laws and regulations governing procurement by Federal Government agencies. In addition, except for equipment that can be acquired by the purchase method only, the following policies are applicable:

a. The method of acquiring ADP equipment will be determined after careful consideration of the relative merits of all methods available (i.e., purchase, lease, or lease with option to purchase). The method chosen will be that which offers the greatest advantage to the Government under the circumstances which pertain to each situation. In this connection, the following general guidelines will be taken into account:

(1) The purchase method is preferred when all of the following conditions exist:

(a) The system study which preceded the selection of the equipment has established a reasonable expectancy that the ADP equipment under consideration can be successfully and advantageously used.

(b) A comparative cost analysis of the alternative methods of acquisition, of the types illustrated by attachments A and B, indicates that a cost advantage can be obtained by the purchase method in six years or less after the date of delivery. This analysis usually will include the following cost elements under each method: for the lease method—rental costs, including maintenance; for the purchase method—purchase costs, including purchase price, maintenance, and other one-time costs applicable only to purchase; for the lease with option to purchase method—rental costs, and purchase costs less credits applicable upon purchase. In addition to the cost elements described above, the residual value of equipment to the Federal Government will be considered as a factor in a comparative cost analysis. Trade-in allowances quoted by manufacturers may be used as a representation of the residual value.

(c) The capabilities of the ADP equipment will continue to be needed and will be sufficient to satisfy the system requirements, current and projected, for a period beyond the point in time at which the purchase method begins to provide a cost advantage. The possibility that future technological advances will render the selected equipment comparatively obsolete before the cost advantage point is reached should not rule out purchase if the selected equipment is expected to be able to satisfy the system requirements.

(2) The lease with option to purchase method is indicated when it is necessary or advantageous to proceed with the acquisition of the equipment that meets system specifications, but it is desirable to defer temporarily a decision on purchase because circumstances do not fully satisfy the conditions which would indicate purchase. This situation might arise when it is determined that a short period of operational experience is desirable to prove the validity of a system design on which there is no previous experience, or where decisions which might substantially alter the system specifications are imminent.

(3) The lease method, without option to purchase, is indicated only when it is necessary or advantageous to proceed with the acquisition of equipment that meets system specifications and it has been established conclusively that any one of the conditions under which purchase is indicated is not attainable.

b. Negotiations or renegotiations of equipment delivery dates will be conducted in a manner which insures that firm and final commitments by the Government to accept delivery of ADP equipment on a specific date will not be made until it has been determined through a readiness review that the using agency will be prepared to use the equipment productively as soon as it becomes operational.

6. *Review of current or pending lease transactions.*

a. Lease or lease with purchase option transactions in effect at the time this circular is issued, and which are expected to remain in effect until fiscal year 1964, will be reviewed in the light of the provisions of paragraph 5. If it is found to be to the advantage of the Government to purchase leased ADP equipment in this category, steps will be taken to make such purchases during the earliest fiscal year in which funds for this purpose are available to the agency. Reviews of current lease transactions should be undertaken as soon as practicable and completed by June 30, 1962.

b. The method of acquisition of ADP equipment selected but not yet accepted for delivery at the time this circular is issued will be reviewed for adherence to the policies herein stated, and, when indicated, the basis of acquisition will be changed to conform if permitted by the terms of the contract or agreement.

7. *Documentation.* System studies (sometimes referred to as applications studies, feasibility studies, and by other terms), system specifications, and readiness reviews will be fully documented. Decisions on the selection of ADP equipment, on the method of acquisition, and on the review of the current status of the method of acquisition also will be documented to reflect adequately the considerations taken into account and the basis for the decisions.

8. *Administration of policies.* The head of each executive department and establishment will establish the necessary framework of procedures, including appropriate reviews and controls, that will assure compliance with the policies herein stated.

By direction of the President.

DAVID E. BELL, *Director.*

ATTACHMENT A

*Lease versus purchase, representative ADP computer system based on 2-shift use*

Item of cost	Costs by fiscal year					
	1962 <sup>1</sup>	1963	1964	1965	1966	1967
1. Purchase basis:						
(a) Purchase costs.....	\$600,000	0	0	0	0	0
(b) Maintenance, cumulative.....	45,000	\$90,000	\$135,000	\$190,000	\$245,000	\$300,000
(c) Cumulative, purchase basis.....	645,000	690,000	735,000	790,000	845,000	900,000
2. Lease basis, cumulative (including maintenance).....	200,000	400,000	600,000	800,000	1,000,000	1,200,000
3. Purchase basis exceeds lease basis.....	445,000	290,000	135,000	-----	-----	-----
4. Lease basis exceeds purchase basis.....	-----	-----	-----	10,000	145,000	300,000

<sup>1</sup> Year acquired, utilized full year.

## ATTACHMENT B

*Lease versus lease-with-option-to-purchase representative ADP computer system based on 1-shift use*

Item of cost	Costs by fiscal year					
	1962 <sup>1</sup>	1963	1964	1965	1966	1967
1. Lease basis, with-option-to-purchase (option exercised at end of first year):						
(a) Lease.....	\$150,000	-----	-----	-----	-----	-----
(b) Less credit upon purchase.....	75,000	-----	-----	-----	-----	-----
(c) Purchase costs.....	600,000	0	0	0	0	0
(d) Maintenance, cumulative.....	26,000	\$52,000	\$78,000	\$108,000	\$138,000	\$168,000
(e) Cumulative lease/option basis.....	701,000	727,000	753,000	783,000	813,000	843,000
2. Lease basis, cumulative (including maintenance).....	150,000	300,000	450,000	600,000	750,000	900,000
3. Lease/option exceeds lease basis.....	551,000	427,000	303,000	183,000	63,000	-----
4. Lease basis exceeds lease/option basis.....	-----	-----	-----	-----	-----	57,000

<sup>1</sup> Year acquired, utilized full year.

Mr. HENDERSON. I wonder if I may ask you a question. In your statement you say "to the extent the Bureau is able to do so within its limited staff resources."

I know you can understand from what we have said here this morning we do not want to suggest increasing Federal personnel indiscriminately in the Government. One of our objectives is to find out whether or not there is adequate attention given at your level. You say that you are limited by staff resources. I commend the Bureau of the Budget for setting an example for other Government agencies in this regard, but we do not want you to overlook the possibility of not doing the best job of reviewing the planning for this very expensive equipment.

I wonder if at this point your notation of the limited staff resources is a problem in the Bureau of the Budget.

Mr. SEIDMAN. It is only a problem as in any other area. I would not want to single this area out. Proportionately, in terms of all the problems we face, which involve very large expenditures of money, we are concentrating more of our staff resources in the area of ADP equipment at the moment than any other area in our Management Improvement and Research Branch. It is a dynamic area, and we must be sensitive to adjustments required by an evolving technology.

We have four professional staff members who work full time on ADP problems. This is a larger staff than we have on many other problems such as the one Mr. Johansen referred to on manpower utilization. We expect to step up our effort in that particular area in the fairly near future. It becomes a problem of selection and how you determine where you are going to put your resources.

I think our staff is adequate for the purpose. It cannot do all the things that many people would like us to do.

Mr. HENDERSON. I do not want to break the continuity of your very well-prepared statement.

We on this committee are all so interested in manpower utilization that we cannot put it aside. We recently heard testimony where everybody in the Commerce Department was interested in saving manpower, but no one had the responsibility. As we get into this, we want to work with you to be sure someone in the Bureau of the

Budget, full time, has the responsibility of continuing to review the planning and requests of the agencies for automatic data processing equipment.

Mr. SEIDMAN. This is done. Initially this is a responsibility of the budget examiner, and we have provided them with guidance. You cannot expect every staff member to be an ADP expert, but you can train them to the point of at least identifying the problems, and, if there are difficult problems, bringing in our staff.

We believe that procedure provides the best use of our staff. We would not propose we increase it.

Mr. JOHANSEN. I would like at this time to request the staff members here present to convey to Mr. Bray of the Manpower Utilization Subcommittee the witness' statement they are planning some stepped up activity. I certainly would want, as a member of the Manpower Utilization Subcommittee, to hear from you as to what is being done, whether we have hearings this fall after election, or whoever is around here next year to have hearings.

Mr. SEIDMAN. Specific plans have not been finally developed in this area at this point. It comes from the President. The President shares your concern with respect to the problems of manpower utilization.

Mr. JOHANSEN. I am most happy to hear it.

Mr. SEIDMAN. He has conveyed this to the Bureau of the Budget.  
2. Effectiveness of A-54 policies; agency compliance.

We have already alluded to Circular A-54 in our preceding references to agency planning. Indications of agency compliance with this directive are many and on the whole encouraging. While all agencies have distributed copies of the circular to their principal officials, a few, such as Treasury and Post Office, have in addition published their own circulars which embody and expand upon the policy provisions of Circular A-54.

With regard to the question of lease versus purchase, we do not expect any significant change as a result of Circular A-54 to be apparent until fiscal year 1964 and fiscal year 1965, due to the substantial lead-time involved in budget preparation. We do know that agencies are now making objective evaluations of the alternative methods of acquiring ADP equipment.

In addition, the agencies are reviewing existing contractual arrangements to determine whether leasing should continue. The Bureau of the Budget staff has been alerted to the economic implications of lease versus purchase.

The sharing of ADP equipment within and between agencies is increasing. Based upon a study made by the Bureau of the Budget, begun last fall, we have inaugurated an experimental computer sharing plan in the geographical region of which Philadelphia is the center. For a period of up to 6 months we will test procedures developed for sharing computer time in this regional area. If the experiment proves successful, we will take steps to establish similar arrangements in other regional areas of the country.

A significant development in the case of the Philadelphia experiment is the involvement of the Philadelphia Federal Executive Board. This Board, one of several established pursuant to memorandum from the President to the heads of departments and agencies, dated November 13, 1961, is cooperating actively in the sharing plan, and has set

up a special committee for that purpose. We were pleased to find that most of the executive boards have established an ADP group or otherwise demonstrated an interest in the sharing of equipment.

We are pleased to supply to your subcommittee copies of a report on regional sharing possibilities, which includes an outline of the specific sharing plan now being operated experimentally in Philadelphia.

3. Personnel management implications.

We believe that the Civil Service Commission is the appropriate agency to respond in detail to your request for a statement on the actual and potential personnel management implications involved in ADP equipment utilization. We are concerned, however, with the human implications of ADP equipment. Executive branch agencies appear on the whole to have done an effective job in planning and implementing measures for coping with the impact of ADP equipment on personnel management.

Agencies can anticipate the personnel management impact of ADP equipment, and have the leadtime they need (18 months on the average) to take the necessary measures to accomplish personnel adjustments with minimum hardship. It should be noted that ADP is only one technological development which can influence the number and character of Federal jobs. The typewriter, telephone, punched card and facsimile equipment are further examples of technological innovations that affect personnel.

The computer, with its auxiliary gear, has opened up many opportunities for improving upon the productivity and efficiency of governmental operations. But this is only a start; we are constantly seeking new ways to tap the potential for management improvement that this equipment provides.

I believe that our first obligation is to improve the efficiency and effectiveness of the Federal Government. In so doing, however, we should plan the changes so as to reduce the adverse effect on Government personnel as far as practicable.

Mr. JOHANSEN. May I interrupt?

In the first sentence of that paragraph, I assume you mean we should also plan the changes so as to reduce the number of Government personnel as far as practical; is that correct?

Mr. SEIDMAN. That is correct.

We do not want to keep people on the payroll unless there is productive work to do. I think in some instances, as we found in Philadelphia in the VA insurance operations, there were reductions in personnel.

Mr. JOHANSEN. You mean actual net reductions?

Mr. SEIDMAN. Actual net reductions in personnel.

I think we have found this in other areas. However, the other measure of the use of personnel is productivity of the people. We have, I think, other rather dramatic examples which we can supply to the committee where the volume of work has gone up significantly without an increase in the number of people to do the work.

Mr. JOHANSEN. That simply means more efficient manpower utilization?

Mr. SEIDMAN. That is correct. More efficient manpower utilization. We have to look at two sides of the coin. One is the number of people, and the other is the productivity of the people.

Mr. JOHANSEN. I agree completely.

Mr. SEIDMAN. No. 4. (a) Efforts to increase use of byproduct statistical data in management decisions.

The electronic computer has added significantly to our ability to generate, as a byproduct of a basic information system, statistical and other data useful for managerial purposes. This feature was recognized early in our experience and has been employed rather extensively throughout our computer installations. Some common examples are: (1) The provision of personnel statistics and reports as a byproduct of payroll systems, and (2), the analysis of financial transactions as a byproduct of supply systems.

Efforts of this type are, in effect, the first steps toward integrating data common to several functions into a single master information system, so that the same data collection and processing procedures can serve many purposes on a systematic basis. It is also the first step toward total system planning, in which the essential needs of all users of information are taken into account in the broad design of a system, so that information needed for decisionmaking—which might otherwise be provided solely on a “byproduct” or “bonus” basis—thus becomes an integral and key part of the system.

We encourage the further development of systems in such a way that they serve the decisionmaking functions first and foremost. The computer has provided an added dimension to assist the manager in assimilating all of the variable and complex factors bearing upon important decisions. While we have made some strides toward capitalizing on this new capability in such fields as supply management, we believe much more can be done. But the principal stimulus must come from those whom it will benefit most directly—the managers themselves.

Mr. JOHANSEN. Before we proceed, I wonder if I might ask if you could supply for the record some examples of personnel reductions and/or increased productivity as a result of installations.

Mr. SEIDMAN. We would be happy to do that.  
(The information requested follows:)

#### EXAMPLES OF INCREASED PRODUCTIVITY IN FEDERAL AGENCIES

##### *Department of the Treasury*

The Division of Disbursement employed 1,891 persons in fiscal year 1960 and issued 282 million checks. In 1962 it employed 1,625—266 less persons—and issued 316 million checks—34 million more checks. The Division estimates that it will process some 330,300,000 payments for the Government in 1963, an increase of 17,487,000 over 1962. At 1962 rates of output per man this would have required 103 more people. Increased productivity, chiefly from improved use of machines, has made it possible to request only 29 additional people for the increased workload, resulting in a net saving of 74 people. The increased productivity per employee over the 2-year period was more than 30 percent.

##### *Department of Agriculture, Agricultural Stabilization and Conservation Service*

The commodity offices of the Agricultural Stabilization and Conservation Service, which manage, store, transport, and dispose of CCC inventories of price-support commodities, have steadily increased their efficiency over several years through use of work measurement, production standards, ADP equipment, and improved management techniques. If these offices were still operating at the production efficiency they had in 1952, they would have required 9,554 man-years of employment in the fiscal year 1961 to do the work they actually performed with 3,868. The 1963 budget projects 1963 fiscal year employment at 4,038 man-years, whereas 10,257 would be required at 1952 production rates.

*Agriculture Department, Soil Conservation Service*

During the past 3 years the number of acres mapped has increased on the average of more than 2½ million acres each year. This increase was accomplished with approximately the same number of soil scientists, and, in large part, was the result of improved equipment and scheduling of activities, use of new equipment, and special technical training in the use of stereoscopes.

*Department of Commerce*

The total amount of work performed by the Bureau of the Census in 1961 is estimated to be between two and three times that performed in 1952. The total program at Census, in terms of appropriations, was at the level of \$20.8 million in 1952 and at \$36.8 million in 1961. In fiscal year 1952 the total permanent employment at Census was 2,227; in 1961 the total permanent employment was 2,007.<sup>1</sup> Most of the increases in productivity at Census are attributed to the automation of routine data capturing and data handling procedures.

Mr. JOHANSEN. I want to make a commendatory comment.

In your statement the first of the factors in the guidelines that you listed is "No function or process will be considered for automation until it has first been established as essential to perform"; that is a very elemental statement, but I think it is one of the fundamentals we cannot attach too much weight to.

The only amendment I would offer to it would be, in the case of those functions or processes for which it has not been established they are essential to perform, I suggest we just eliminate them.

Mr. SEIDMAN. A very good point.

No. 4(b). Efforts to reduce and simplify business reporting requirements of Federal Government by use of machine tape.

A considerable amount of exploratory work has gone into the potential simplification of business reporting requirements by arranging for the acceptance of magnetic tape, paper tape, or punched cards in lieu of paper reports. Several departments are conducting experiments with this procedure now. We appointed a task force of the Interagency Committee on ADP to study existing practices and to suggest policies and a course of action for tapping the potential of this procedure, whatever that potential might be. The task force report is due in 30 days.

At this stage of experimentation and study, we have reason to believe that while the procedure is sound, large scale realization of its potential is dependent upon greater standardization of data processing and data transmission equipment and techniques. However, there is no reason to retard our current exploratory efforts in areas involving high volume data interchange arrangements, such as in social security, income taxes, and defense contracts, where tape and/or card submissions are being accepted now or are in prospect.

We are cooperating fully with the American Standards Association in its current program for standardizing ADP hardware and techniques for its use.

5. Progress of IAC/ADP as clearinghouse for ADP information. The Interagency Committee on ADP continues to be a most useful medium for communication between departments as well as between the Bureau and the departments. The committee, since its inception 5 years ago, has served also as a quorum for interagency discussions of mutual problems and for exchange of experience. It has been a source to which the Bureau has turned frequently for advice.

<sup>1</sup> Since the completion of work and the publication of final reports from the Eighteenth Decennial Census (1960) is approximately 1 year ahead of the schedule established during the Seventeenth Decennial (1950), it is necessary to compare the actual employment of the Bureau of the Census for the years 1961 and 1952 to establish comparability.

Mr. JOHANSEN. I wonder if it would not be of interest to have, if not the names, what agencies or functions the membership represents.

Mr. SEIDMAN. We would be very happy to provide that.

Mr. HENDERSON. I suggest the staff collect that and insert it at the proper place in the record.

(The information requested follows:)

INTERAGENCY COMMITTEE ON AUTOMATIC DATA PROCESSING

Agriculture, Department of	Interior, Department of
Atomic Energy Commission	Interstate Commerce Commission
Bureau of the Budget	Justice, Department of
Central Intelligence Agency	Labor, Department of
Civil Aeronautics Board	Library of Congress
Civil Service Commission	National Aeronautics and Space Administration
Commerce, Department of	National Capital Housing Authority
Defense, Department of	National Labor Relations Board
District of Columbia Government	National Science Foundation
Emergency Planning, Office of	Post Office Department
Export-Import Bank of Washington	Railroad Retirement Board
Farm Credit Administration	Securities and Exchange Commission
Federal Aviation Agency	Selective Service System
Federal Communications Commission	Small Business Administration
Federal Deposit Insurance Corporation	Smithsonian Institution
Federal Home Loan Bank Board	State, Department of
Federal Mediation and Conciliation Service	Agency for International Development
Federal Power Commission	Subversive Activities Control Board
General Accounting Office	Tennessee Valley Authority
General Services Administration	Treasury Department
Health, Education, and Welfare, Department of	U.S. Information Agency
Housing and Home Finance Agency	Veterans' Administration

Mr. SEIDMAN. Your subcommittee regularly receives copies of all documents of the committee. During most of the past year a member of your staff has attended committee meetings. We welcome this interest.

I have already referred to the work of the committee task force on the exchange of data between industry and Government. Another task force has completed its work on the development of a Government glossary of ADP terms and this document is about to be placed in the hands of the Public Printer. The task force on ADP bibliography has become a permanent body which publishes a monthly bibliography of new ADP literature, plus special bibliographies on request. Another task force is developing the plans and procedures for assembling and maintaining at one centralized location a library of ADP applications throughout the Government, the use of which will be a significant advance in our unified efforts to improve upon equipment utilization. The vulnerability of ADP equipment to fire, natural disaster, sabotage and enemy action has been the subject of still another task force for the past 18 months. One result has been the publication of fire protection standards, through the Federal Fire Council. A final report on other types of vulnerability is scheduled for later this year.

The committee recently launched a program of roundtables on selected subjects of mutual concern. The first symposium, held on May 31, 1962, dealt with information retrieval. The Government's outstanding researchers and experts in this field were in attendance. A summary of the proceedings will soon be available and we will supply your subcommittee with copies.

In order to facilitate interchange of information among the various agencies, it was found advisable in 1960 to add additional members to the committee. The committee is now composed of 44 agencies represented by 88 members and alternates.

Mr. JOHANSEN. Did I understand that correctly, an 88-member committee?

Mr. SEIDMAN. Yes, sir.

Mr. JOHANSEN. Is there a steering committee, or an executive committee?

Mr. SEIDMAN. That has been one of our concerns.

Mr. JOHANSEN. How often do you have full membership meetings of this committee?

Mr. GILL. Every month except July and August.

I might say there are not 88 members. There are 44 members, and 44 alternates to the members, that make up the 88.

In addition, there is a total of approximately 80 more persons who are known as associate members. This is merely a reflection, we believe, of the great interest that the agencies have in this medium of interchange of information.

Mr. SEIDMAN. The committee has taken on more the character of a professional society rather than the advisory group we contemplated. For this reason, we are taking steps to reestablish such an advisory group. We are creating a 13-member advisory council.

Mr. JOHANSEN. That would be a good idea.

Mr. SEIDMAN. We recognize the problem. While the enlargement has increased the usefulness of this committee, it has become quite a different organization from that originally intended—a small group of experts meeting from time to time to consider significant ADP developments and to advise the Bureau of the Budget regarding them. Accordingly, we are taking steps to reestablish such an advisory group, and the director is inviting a small number of agencies to designate members. Some agencies will be represented permanently, other memberships will rotate. As soon as the members have been officially designated, we will be happy to advise you as to the composition of the group.

In addition, it was believed appropriate to relinquish the chairmanship of the large committee and to arrange for the members to elect their own chairman.

The Bureau of the Budget will continue to provide the executive secretary to the committee. The committee and the advisory council will be linked by virtue of the fact that the committee chairman will be a member of the council.

These steps are in accord with recommendations made by the committee to the Bureau of the Budget last June.

Mr. Chairman, in your letter to Mr. Bell of May 23, 1962, in which you announced these hearings, you called attention to earlier testimony given to the subcommittee by Dr. Raymond T. Bowman at hearings on the proposed mid-decade census. You stated that members of the subcommittee expressed concern that costly Federal data processing installations would be widely deployed and that this might be inefficient. The basis of concern was Dr. Bowman's use of the phrase "deployment of the Federal statistical establishment."

The phrase under discussion referred to the distribution of statistical functions among a number of agencies, and not to the physical

location of computing equipment; the term "deployment" was also intended to cover the distribution of Federal agency responsibility for the collection of local as well as national data.

Illustrative of the "deployment" of Federal statistical resources is the allocation of responsibility to the Bureau of Labor Statistics for employment and unemployment measures, whereas the Bureau of the Census is responsible for data on the growth and movement of the population. The Census Bureau is also responsible for collecting detailed local data in several periodic censuses and for obtaining current data covering various activities on a national basis through sample surveys.

We regret that this question was not clarified in the discussion at the hearing. We are naturally concerned with the "optimum efficiency and operational economy" of any statistical operation. However, we do not now recommend, nor do we have plans to recommend, the deployment of any Federal statistical computer installation.

Mr. HENDERSON. You mention the reorganization of the Inter-agency Committee on ADP, and the proposed establishment of the advisory group on ADP. Do you feel that this is enough?

You know the effectiveness of an interagency committee is limited to the support its members get from their parent organization unless there is some effective procedure for implementing their recommendations; would you comment on that?

Mr. SEIDMAN. We deal with this in two ways, one through the Director himself dealing with the heads of agencies and emphasizing the importance of the decisions being made in that agency on the procurement and use of ADP equipment. This comes up in the budget process and it comes up in other ways. The Director periodically meets with the heads of the agencies, discussing various management problems.

We have also encouraged agencies to make an appropriate assignment of responsibility within the agency for ADP problems so they will be given attention at the top levels. You will recall one of the ways we attempted to stress to the heads of agencies the importance of this problem was the computer conference which we ran last fall.

I believe members of the committee attended the conference. We did this in conjunction with the joint computer conference. It was held at the Shoreham. The principal people from the agencies were invited and were given an introductory course on ADP from the point of view of the top manager, as well as some introduction to the equipment itself.

Mr. HENDERSON. I know the members of the subcommittee have been following with interest the experimental computer plan in effect in the Philadelphia region. We will be looking forward to being fully informed as to the progress. I wonder if any action has been taken on the recommendation of the subcommittee in its August 1960 report that an experimental service center for electronic data processing should be established within the Government. Has anything been done on this?

Mr. SEIDMAN. This matter has been given active consideration. It has not been a recommendation that has been ignored, I can assure you. There are many rather complex problems as you are well aware in establishing such a central computer service.

That would be true of any central service.

You have the problem of which agency should do this. There is the question of whether it should be the General Services Administration, or the Bureau of Standards which operates the computer center.

There are questions of how to finance a service center. This has been the matter under very active consideration in the last year, but no final conclusion has been reached. We will continue to give it active consideration.

Mr. JOHANSEN. It is like Cuba, a matter of very active consideration.

Mr. HENDERSON. We want you to know the subcommittee will follow the recommendation, and will be very interested in any action taken in this regard.

Mr. JOHANSEN. Let's get down to a hard-boiled problem of management. A department of the Government, perhaps Labor, perhaps some other department, wants to install equipment, decides it would be wise to install some of this equipment. What is there within the Bureau of the Budget that exercises any control, or has any function with respect to the decision on the request, or on the recommendation of the Department of Labor?

Mr. SEIDMAN. They would require a fair amount of money if they were going to purchase a computer. It would be a fairly substantial item in their budget. This would come in as a part of their budget submission.

As in the case of any other request for funds, it would be initially scrutinized by the budget examiner who handles the Department of Labor budget. He would have instructions which our staff has provided to all budget examiners which guides him in how he analyzes a request for ADP equipment. If he had problems and did not feel he understood it, he would be in touch with our staff. This happens almost on a day-to-day basis.

On the basis of this, unless there was some followup information that we would require from the Department itself, judgments would be reached, not only on the need for the computer, but on the priority of expenditures for this purpose.

Mr. JOHANSEN. This 88-man, or 44-member and 44 alternate committee would have nothing to do?

Mr. SEIDMAN. It would have nothing to do with it. The budget would contain the recommendation.

Mr. JOHANSEN. Are there specialists within the Bureau of the Budget who would review this thing with a background of experience and judgment and knowledge?

Mr. SEIDMAN. I would say this is perhaps an example of management by exception. The budget examiner would review it, with instructions the specialists have provided, and if he finds there are problems going through the check list which has been furnished to him, he brings in people who are specialists from our ADP staff. We have four people in the Bureau of the Budget who are competent and qualified specialists in ADP. The budget examiner who originally scrutinizes the requests is not an ADP specialist.

Mr. JOHANSEN. Is he sufficiently a specialist to recognize a problem when he sees it so he known when, or whether he ought to go to this staff of experts?

Mr. SEIDMAN. We have given him both the training and instructions which would enable him to at least identify problems in review-

ing the budget so he will recognize when he needs to obtain additional advice.

Mr. JOHANSEN. It might end up on your desk?

Mr. SEIDMAN. Yes. This is informal. It is on a day-to-day basis. This is something that goes on day in and day out. Where there is a large computer item, one of the systems used in the Budget Bureau prescribes that, after one of the budget divisions makes their recommendations it is ultimately presented to our director's review committee. Here the director and the deputy director sit, and this is where the examiners have to defend their agencies' requests and decisions.

Mr. JOHANSEN. How large a committee?

Mr. SEIDMAN. This usually consists of the director and the deputy director and the appointed assistant directors, what we call the non-career assistant directors of the Bureau, usually four people, and the head of the Office of Budget Review.

Our ADP staff man very likely may be present at a hearing where there is a computer element in the budget estimate, so the director would have the advice of the ADP specialist as well as the budget examiner.

Mr. JOHANSEN. Would you care to comment briefly on the alternatives of lease versus purchases of ADP equipment?

Mr. SEIDMAN. Yes. This is covered in the circular. We do feel that there are definite economic advantages which can be obtained relatively quickly. If the equipment is retained for a period in excess of 3½ to 6 years, depending on whether it is a one-shift or three-shift operation, you have an advantage to the Government in purchase over lease in terms of cost.

As the circular points out, given the cost advantages, there are circumstances where a lease with an option to purchase might be the preferable method of procurement. We have in mind instances where you want to validate a system and you are not sure that it is what you want, or you want to confirm judgments and you need a period of experience.

We are persuaded, recognizing all the problems cited this morning, that the cost advantage generally is such as to argue for purchase rather than lease.

Mr. JOHANSEN. Let me ask you a rather delicate question.

I am implying nothing improper. The industry that produces this equipment, does it have a bias from the standpoint of a legitimate interest in profit in favoring one over the other method, and if so, do they undertake to promote one as against the other approach?

Mr. SEIDMAN. I will call on Mr. Osborn or Mr. Gill to expand on this.

Historically, with punchcard equipment, the IBM system was one which they leased. Their policy was lease rather than sale of equipment. They have been the major supplier. I think this has now changed and IBM has changed its policy. Historically, you did have the principal supplier of automatic data processing equipment following the policy of leasing rather than selling.

Mr. JOHANSEN. When you say "did follow the policy," you mean gave the Government no option?

Mr. SEIDMAN. That is correct.

Mr. GILL. May I add to that?

The consent decree of 1956 required that IBM make its equipment available for purchase.

Mr. JOHANSEN. That was in a judicial proceeding?

Mr. GILL. That is right, so today both punchcard equipment and computers and all other equipment is available to the Government and industry, either on a lease, or lease with option, or outright purchase basis.

Mr. JOHANSEN. The fact they may, as I understood your statement, still prefer the lease arrangement would seem to support your position that costwise to the Government, it might be an economy to purchase. Is that correct?

Mr. SEIDMAN. We have not attempted to analyze their motives. I would not want anything to be construed that way. Our studies have indicated there is a cost benefit to the Government in purchasing over a period of time.

Mr. JOHANSEN. I do not criticize the salesmen for wanting to sell at the most advantageous terms.

Mr. SEIDMAN. I think it is part of the private enterprise system that a company might want to maximize its profits.

Mr. JOHANSEN. Except the steel industry.

Mr. HENDERSON. We are appreciative of your testimony this morning. Again I want to thank you for your fine cooperation with the subcommittee staff.

Our next witness is Mr. O. Glenn Stahl, Director of the Bureau of Program and Standards, Civil Service Commission, who will present a statement for Mr. Macy of the Civil Service Commission.

Mr. Stahl, it is a pleasure to have you before us this morning. You might introduce your associates.

In view of the time we will certainly insert all of the statement in the record.

**STATEMENT OF O. GLENN STAHL, DIRECTOR, BUREAU OF PROGRAMS AND STANDARDS, CIVIL SERVICE COMMISSION, ACCOMPANIED BY ANDREW E. COMERFORD, OF THE PROGRAM PLANNING STAFF OF THE CIVIL SERVICE COMMISSION, AND CHARLES J. SPARKS, CHIEF, MANAGEMENT SYSTEMS DIVISION**

Mr. STAHL. I have with me today Mr. Andrew E. Comerford, of the staff of the Civil Service Commission, who has acquainted himself with many of the personnel problems that relate to automation, and Mr. Charles J. Sparks, who is head of our Management Systems Division, and is particularly well-informed on the Commission's own automated program.

As indicated in your request, it would be my purpose to highlight Mr. Macy's statement primarily with respect to the interest that the Civil Service Commission has with the overall personnel program and the impact of automatic data processing on that program. But in doing so, I think it might be helpful if I do make some comments about the Commission's internal ADP program, then turn to better personnel programs and changes that relate to the ADP occupations and the impact this has on the personnel function, and then finally a few remarks about the limited survey that we have made of activities in Federal agencies in this regard.

(The statement of Hon. John W. Macy, Jr., follows:)

PREPARED STATEMENT OF JOHN W. MACY, JR., CHAIRMAN, U.S. CIVIL SERVICE COMMISSION

The Civil Service Commission is keenly interested in ADP and is working closely with Federal agencies to assist them in the recruiting, staffing, training, placement, and all other personnel areas involved in the efficient utilization of data processing equipment. Members of the committee are equally concerned that the Government's adjustments to this new technology take place with maximum efficiency and an absolute minimum of hardship for individuals.

Before getting into the personnel aspects of ADP, this statement will bring to the committee's attention the fact that the information we are presenting is only representative. Information about the personnel aspects of ADP is not regularly collected on a Government-wide basis. To be as responsive as possible to your interests, however, we have supplemented the data normally available from Commission sources with additional information from several agencies having ADP installations. This will enable us to discuss the personnel aspects of ADP from different viewpoints which are possibly indicative of some trends in this very broad field.

This paper will report first on the Commission's own internal ADP program as it has a significant bearing on Federal personnel statistics and reports. After that it will refer to Federal personnel programs and changes in ADP occupations. Finally, it will report our findings from the limited survey we made of activities in Federal agencies.

THE CIVIL SERVICE COMMISSION'S INTERNAL ADP PROGRAM

*1. Planning prior to equipment installation*

In June 1962 the Commission completed conversion to a new medium-size computer. This step was taken only after we had completely explored and assessed both current and future possibilities.

As the central personnel agency of the Government, the Commission has to pay particular attention to careful planning prior to any change in equipment. This derives from the fact that in many personnel program areas there is a significant volume of data interchange between the agencies and the Commission. Although not all of this data appears susceptible to automatic data processing at this time, we in the Commission have held a strong belief that no possibility for the future exploitation of ADP should be left out of consideration entering into the planning of current systems.

The equipment we are using was selected on the basis of a brasstacks, dollars-and-cents comparison of available equipments in relation to systems already being machined or about to be programmed. To illustrate the thoroughness of feasibility studies conducted by the Commission staff, we studied the automating of our Federal Service Entrance Examination for well over a year before we arrived at any definite conclusions about the nature of ADP's role in the examining process. Similar thorough studies indicated the desirability of acquiring more sophisticated equipment for processing the annuity roll, actuarial statistics, retirement computations, group health benefits, and the Federal personnel statistics sample file.

Because of careful study and thorough planning, such as that called for in Bureau of the Budget Circular A-54, the Commission was able to complete a conversion involving these applications without incident during the period from February 15, 1962, when the equipment was selected, to June 30, 1962, when the conversion was completed.

It is just this kind of planning which gives us considerable confidence in our effort to automate certain features of the Federal Service entrance examination in the Washington area beginning in October. We are most enthusiastic about the potential of ADP, both in terms of what we have already realized and in terms of future prospects.

*2. Maxpower utilization*

The Commission has been fortunate in several respects in effecting its recent conversion to new equipment. Through training of our own staff, we were able to avoid recruiting problems and at the same time augment our experienced staff with employees who had knowledge of the Commission's operations. We were able to minimize the impact of the conversion by using a variety of devices such as skeleton crews, overtime, and reassigning employees to other positions. So

far we have taken care of displacement by reassignment and we have not experienced any difficulty in retaining our staff.

### *3. Statistical data and reduction of reporting requirements*

The internal efforts of the Commission to produce statistical data are modest by comparison with the significance of our efforts to reduce and simplify personnel reporting requirements of the Federal Government. We refer to the systems design entering into implementation of the Federal personnel statistics program under which a continuing 10 percent living sample of the entire Federal work force is maintained. This living sample gives us a major statistical tool for improved manpower management at a minimum cost.

These statistical benefits, however, may be completely overshadowed by the long-term effects of the way in which the new reporting system was designed and implemented. Under this new program we have standardized the source document and codes for a variety of items of personnel information. As a result of this standardization, data interchange within agencies and between them and the Commission has been reduced to a matter of hardware. We are now planning an exchange of magnetic tapes with several agencies. By providing magnetic tapes as byproducts of their own ADP systems we estimate that these agencies can be excused from virtually all recurring reports to the Commission. Through our ADP information exchange and cooperative planning with the agencies we are proceeding to develop a standardized approach to automating personnel data that will satisfy both agency and Commission needs most expeditiously and efficiently.

## FEDERAL PERSONNEL PROGRAMS AND THE GROWTH OF ADP

The Civil Service Commission is continuing to work closely with Federal agencies to facilitate the growth of ADP without seriously interrupting essential services or causing undue hardship to employees. We believe that the record of adjustment to the new technology, although not perfect, is one of significant achievement.

### *1. Recruitment and selection*

There has been, as will be shown later in this report, a phenomenal growth in ADP occupations in the Federal civil service. Commission offices and boards of civil service examiners have conducted recruiting campaigns and competitive examinations to help the agencies meet their staffing needs. Federal recruiting efforts have generally been successful in attracting well-qualified applicants for the less complex operator-type jobs. Present pay levels and a real shortage of well-qualified programmers and systems analysts make it nearly impossible for Federal agencies to fill such positions with trained people from outside the Government.

The agencies have relied primarily on the training of their own staffs to fill most of the new positions created by the conversion to ADP. The Commission has assisted agencies by approving training agreements which allow training or substitute experience to be used in meeting the qualifying requirements, or provide for accelerated promotion based on completion of prescribed training. Whereas the use of training agreements was quite limited when agencies were beginning to install ADP equipment, the majority of agencies now have Commission-approved training agreements to facilitate the development of employees with potential. We are continuing to add new training agreements as needed by the agencies.

The Commission is also working closely with agencies to improve methods for testing and selecting people for ADP jobs. A recent example is the promising development of an experimental special test for aptitude to do the work of an ADP programmer or systems analyst. We are working with the Internal Revenue Service on improving their method of selecting, from among their present employees, persons to be trained as programmers. As a result of our work with the Department of Agriculture and the Internal Revenue Service, we expect to obtain material which will be helpful in improving the selection of programmers, systems analysts, and console operators.

### *2. Standards for ADP occupations*

When we first published classification and qualification standards for digital computer occupations in March 1958, we recognized that we should review the guides after a year of experience, in order to make any necessary revisions. Accordingly, on December 16, 1958, agencies were asked for comments and recommended changes. These comments were received in February 1959, with agencies generally reporting satisfactory experience with the guidelines estab-

lished. A number of detailed modifications and improvements were recommended, and were incorporated in revised standards published in June 1959.

In the spring of 1961, Standards Division representatives met with a committee representing the Interagency Committee on Automatic Data processing to discuss the currency and possible need for revision of these standards. Again, the consensus was that the standards were basically satisfactory tools, although there was a suggestion that it might be desirable to cover one or two additional related areas, and that technological changes would continue to make desirable rather frequent reviews of the status of these standards.

It appears that our standards still provide satisfactory guidelines as no requests for revision of any of the digital computer classification or qualification standards are contained in agency responses to the May 1962 request for identification of urgent needs in the standards area. A few agencies did express a need for classification standards for systems analyst jobs, for which directly applicable standards do not exist.

While no dissatisfaction has been expressed with regard to the usefulness of the current standards, the many new developments in digital computer equipment, and new techniques, such as the problem oriented languages, make a review and updating of classification standards necessary. Accordingly, a review of all standards for the digital computer occupations has been scheduled for September of this year. This study will include the development of guides, as requested, for the digital computer systems analysis series.

### *3. Interagency training in ADP*

The Commission began conducting interagency training programs in ADP in April 1959. Since that time more than 2,300 Federal employees have participated in 33 of these courses. The purpose of this training is to disseminate the existing knowledge about effective management uses of the computer among key Government employees.

During fiscal year 1962, over 1,200 employees participated in 22 separate programs, such as: Executive seminars in ADP, executive seminars in operations research, ADP and personnel management, ADP and financial management, and ADP orientation.

Our training plans for this year envision an even greater program both in scope and attendance. We are making a strong effort to keep abreast of the rapidly changing technology by providing up-to-date information on the actual and potential applications of such technology to the management process. The need for this kind of training is massive and far beyond the Commission's capacity to deliver. We are hopeful that our programs will serve as prototypes and perhaps even as incentives to other agencies to develop their own training programs to meet their own specific requirements.

### *4. Impact of ADP on employees*

Another aspect of ADP that greatly concerns the Commission is the impact of this new technology on Federal employees and their jobs. We know that the members of this committee are equally interested in the manpower adjustments that result from the installation of ADP equipment.

Although the installation of automatic data processing equipment occasionally cuts down the total number of employees, the more frequent problem is that of retraining present employees in the skills demanded by a computer operation. We have, therefore, in the training programs mentioned above, stressed the importance of planning ahead so as to minimize the adverse effects on employees of an ADP installation. On almost every program the impact of ADP on the work force has been emphasized. Speakers have been brought in from industry and labor, as well as Government, to speak specifically on this topic. In addition, on the lengthier programs, examples of how Government agencies have met these personnel problems are scheduled regularly. We have cooperated with agencies in every possible way to place employees threatened with separation in other jobs. We have, where this seemed necessary, modified our qualification requirements to permit ready transfer of such employees.

Through our scheduled inspections and other contacts with agencies we are alert to the personnel problems which accompany the transition to ADP. We do not pretend to have the answer to all the problems raised by this new technological development. However, we are working closely with the agencies in their efforts to make conversions to ADP operations as efficiently as possible and without undue hardships on employee.

Fortunately most conversions to ADP operations are phased over a period of several years or longer. This has made it possible for agencies to plan and take

appropriate actions to soften the impact on their staffs. We do not suggest that the record is perfect, but we certainly think that Federal agencies should be commended for the orderly manner in which they have made adjustments to the tremendous increases in ADP operations.

As more operations are automated we might have to look for new ways to solve some of the problems that accompany the transition. We are hopeful that our present experience with the Internal Revenue Service will be successful not only in keeping personal hardships to an absolute minimum in this conversion, but that we will have developed some workable formulas for facilitating future transitions.

The pertinent activities of the Internal Revenue Service are not discussed at length in this report because we understand that the Treasury Department has been asked to provide a statement for this committee. However, we would like to point out that we have been able to help the Internal Revenue Service solve the problems they encountered or anticipated entirely within the standard rules and regulations, or recognizing the gravity of the situation, we have developed special and unprecedented delegations of authority to facilitate this major change in operations.

##### *5. Growth and changes in ADP manpower*

In view of the committee's interest in the manpower aspects of the Government's ADP operations we have developed some statistical data showing the broad changes that occurred in ADP occupations during the period fiscal year 1958 through fiscal year 1961, the latest year available. We would like to highlight the changes now and submit the detailed information for the committee's use.

Our data is derived from agency reports on jobs in each classification series and includes the following occupations: digital computer systems administrators, computer programmer, computer systems operator, peripheral equipment operator, and digital computer systems analyst. These are the positions that are directly involved in automatic data processing and they are generally considered as making up the ADP staff of an organization.

There has been a tremendous buildup in the ADP staffs of Federal agencies. In fiscal year 1958, the agencies reported a total of 2,979 employees in ADP occupations. By the end of fiscal 1961, there were 8,255 employees, an overall increase of 177 percent.

Within the Federal ADP staff the largest single occupation is computer programmer. This position accounted for 57 percent of the ADP personnel in 1958. At the end of 1961, it remained the largest single category although it had decreased to 40 percent of the total. The change is largely attributable to the buildup in the computer systems analyst job which went from zero employees in 1958 to 1,663 by the end of fiscal 1961. This change in personnel is a reflection of the significant increase in the amount of more sophisticated ADP work being performed as the new technology is being used more widely to assist management in doing its job more efficiently and effectively.

The Department of Defense is the principal employer of ADP personnel. In 1958, 80 percent of all ADP personnel worked for the Defense establishments. As a result of a more rapid rate of growth in the nondefense installations, the Department of Defense accounted for 74 percent of the total ADP staff at the end of fiscal 1961.

With the exception of the computer-systems operation position which changed from GS-5 to GS-7, the median grade levels for computer positions have not increased during this period. The median grade level for systems administrator is GS-12; for programmer it is GS-9; for peripheral equipment operators it is GS-4; and for systems analysts it is GS-12.

These broad changes show the general characteristics of the development in Federal ADP occupations. From our limited survey of agencies it is possible to get a representative view of the personnel activities required to develop the Federal ADP staff and some indication of future needs.

##### SURVEY OF ADP IN SELECTED AGENCIES

Our survey covered ADP programs in five agencies of the Treasury Department, three in the Department of Health, Education, and Welfare, headquarters personnel in the Post Office Department, the Veterans' Administration, and four Agricultural Stabilization and Conservation Services offices of the Department of Agriculture.

These agencies reported that they filled 576 vacancies in ADP occupations in fiscal year 1962: 82 percent of these vacancies were filled with employees from

within the reporting organizations, 8 percent from other Federal agencies, and 10 percent from sources outside the Government. Those responding agencies that evaluated the quality of the candidates considered 68 percent to be of high quality, 31.4 percent were average, and less than 1 percent were rated as low quality. Between fiscal year 1963 and 1968 these agencies estimated that they will fill 980 vacancies in ADP occupations to take care of anticipated changes in hardware, programs, and turnover of personnel. About 600 of these employees will be needed as either programmers or systems analysts.

In response to a question about the adequacy of the grade structure for ADP positions, 10 out of 12 agencies considered it adequate. However, the agencies pointed out that they were having difficulties in recruiting experienced programmers and analysts. One agency remarked that the grade structure was adequate as long as you can keep training and promoting employees. However, once they reach their target positions, turnover occurs in the major cities because of higher pay outside.

When asked about the effect of present Federal salary rates on recruiting ADP personnel in fiscal year 1962, the agencies said that they were unable to recruit experienced people and had to rely on training their own people. In regard to losses of trained ADP personnel, we received comments such as:

"During fiscal year 1962 we lost four programmers and three analysts to private industry because of higher pay. Most programmers and analysts are products of our own training and have only 2 years specialized experience. They will be hard to hold when they are more experienced."

"Out of a total staff of 69 ADP personnel, 8 left for private employment in fiscal year 1962. While not excessive in numbers, the employees who left were very capable and well trained."

"Two GS-12 employees left for private industry when offered salaries of \$10,000 and \$12,000 a year. Constant demand by other Federal agencies for experienced ADP personnel creates many opportunities for transfers and promotions. To hold ADP employees the agency must promote them as soon as they are eligible."

The responding agencies are relying heavily on the training and development of their own employees to staff the Government's growing ADP operations. During the 1962 fiscal year alone, the agencies included in our survey had trained 688 persons at 33 internal ADP classes, and 705 employees had participated in 119 courses conducted by manufacturers, college universities, and so forth.

In addition to increases in the numbers being trained and retrained because of turnover, hardware changes, and new applications of ADP, more employees are being trained in systems analysis and the use and development of ADP in management control.

In an attempt to get some indication of the effect of ADP on the total staffs of the agencies, we asked for estimates of changes in staff attributable to ADP. The agencies reported increases and decreases in size in the 1962 fiscal year. However, these changes could not be identified as solely attributable to ADP because of accompanying changes in mission, function, and so forth. Future applications of ADP to the management of the Federal work force should make it possible to develop meaningful information about ADP impact and other characteristics of Federal manpower at a reasonable cost.

The Air Force now maintains its manpower authorization on ADP. The system provides records of authorized and programed manpower and the statistical and planning reports used to allocate, distribute and manage manpower resources.

Other agencies are using or beginning to use ADP for such purposes as allotting manpower, forecasting requirements, and maintaining personnel management inventories.

The findings from our small sample indicate that Federal agencies are using a wide variety of means to soften the impact of ADP on employees whose jobs are adversely affected by the transition. These means include—

Putting attrition plans and no hiring injunctions into effect well in advance of changeover.

Providing full information as early as possible to employees so they will know how the plan affects them.

Make temporary appointments and details to avoid increasing permanent staff and to save jobs for affected employees.

Training to equip employees for reassignment to other jobs.

Transfer and relocate employees at Government expense.

Giving up to 6 months advance notice to employees whose jobs are affected.

Widely distribute qualifications and history statements of affected employees as part of a comprehensive outplacement program.

Special personnel procedures such as waiver of qualification requirements; temporary appointments and details in excess of 1 year; temporary appointments of former employees; temporary promotions; and discontinued service retirement for eligible employees whose jobs are to be abolished.

In addition, some agencies indicated that they have used the Government Employees Training Act to train employees for new skills or for updating unused skills that are helpful in placement. Other installations said that they would not hesitate to use the Training Act if necessary.

#### SUMMARY

I realize that my comments have only touched on the most important personnel aspects of a very broad and complex subject. In summary I would like to state that we believe that the record of accomplishments in staffing the Government's ADP operations is a good one. There has been a tremendous growth in the usage of ADP equipment by Federal installations. This equipment has caused and is continuing to cause basic alterations in major Federal operations. Although adjustments to this new technology have been accomplished in an orderly manner and every effort has been put forth to keep hardships for individuals to an absolute minimum, the Commission intends to continue scrutinizing ADP developments so necessary action can be taken in a timely manner.

From our limited survey it appears that Federal agencies will be facing serious recruiting problems because of real shortages of experienced programmers and analysts and higher pay by private employers for people with these skills. Whereas training of present employees has taken care of most staffing needs in the past, this source has definite limitations as indicated by the estimate that almost one-third of last year's vacancies were filled with persons rated average or below. As indicated earlier, agencies are not losing large numbers of their ADP staff, but they are losing the more capable programmers and analysts because of higher pay elsewhere. The President's proposed salary reform plan is designed to make it possible for the agencies to recruit and retain quality personnel by paying salaries comparable with other employers.

There is a general awareness and concern among agencies about the displacement aspects of ADP. The Commission and the agencies are working closely together to make ADP transitions as orderly as possible.

#### FEDERAL PERSONNEL ACTIVITIES IN THE AUTOMATIC DATA PROCESSING OCCUPATIONS, AUGUST 1962

NOTE.—The following tables present statistical information obtained from occupational reports regularly submitted to the Civil Service Commission and from a survey conducted among the Federal establishments listed on page 40.

TABLE 1.—Federal employees (general schedule) in digital computer occupations,<sup>1</sup> fiscal years 1958-61

Grade	Washington, D.C., metropolitan area				Outside Washington, D.C.				Total, United States			
	1958 <sup>2</sup>	1959	1960	1961	1958 <sup>2</sup>	1959	1960	1961	1958 <sup>2</sup>	1959	1960	1961
2.....	2	1	22	-----	5	5	7	16	7	6	7	16
3.....	11	24	22	21	62	90	110	129	73	114	132	150
4.....	19	40	46	49	185	193	271	310	204	233	317	359
5.....	80	81	122	148	420	570	708	831	500	651	830	979
6.....	2	1	5	3	15	18	27	33	17	19	32	36
7.....	95	141	163	245	494	691	841	999	589	832	1,004	1,244
8.....	7	9	12	13	19	26	26	30	26	35	38	43
9.....	113	118	167	236	610	795	1,112	1,356	723	913	1,279	1,592
10.....	1	2	9	6	13	30	39	35	14	32	48	41
11.....	78	129	209	298	365	663	1,162	1,383	443	792	1,371	1,681
12.....	49	73	167	223	164	292	625	871	213	365	792	1,094
13.....	29	68	124	185	70	118	225	351	99	186	349	536
14.....	11	23	40	83	17	37	75	124	28	60	115	207
15.....	3	3	8	19	6	12	16	22	9	15	24	41
Total.....	500	713	1,094	1,529	2,445	3,540	5,244	6,490	2,945	4,253	6,338	8,019

<sup>1</sup> Digital Computer [Systems Administrator (GS-330), Programmer (GS-331), Systems Operation (GS-332), Peripheral Equipment Operator (GS-333), and Systems Analyst (GS-334).

<sup>2</sup> Excludes Alaska and Hawaii.

TABLE 2.—Percentage increases in Federal employees (General Schedule) in digital computer occupations using fiscal year 1958 as base year

[Percent]

Area	1958	1959	1960	1961
Washington, D. C., metropolitan area.....	-----	43	119	206
Outside Washington, D.C.....	-----	45	114	165
Total United States.....	-----	44	115	117

TABLE 3.—Average (median) grade levels of Federal employees (General Schedule) in digital computer occupations, fiscal year 1958 through 1961

Occupation	Average (median) grade			
	1958 <sup>1</sup>	1959	1960	1961
Digital computer systems administrator, GS-330.....	GS-12	GS-12	GS-12	GS-12
Digital computer programmer, GS-331.....	GS-9	GS-9	GS-9	GS-9
Digital computer systems operation, GS-332.....	GS-5	GS-7	GS-7	GS-7
Peripheral computer equipment operator, GS-333.....	GS-4	GS-4	GS-4	GS-4
Digital computer systems analysis, GS-334.....	-----	GS-12	GS-11	GS-12

<sup>1</sup> Excludes Alaska and Hawaii.TABLE 4.—Occupational distribution of Federal employees<sup>1</sup> in digital computer positions from fiscal year 1958 through fiscal year 1961

Occupation	1958		1959		1960		1961	
	Number of employees	Percent						
Digital computer systems administrator, GS-330.....	326	11	471	11	612	9	629	7
Digital computer programmer, GS-331.....	1,702	57	2,366	54	2,848	44	3,282	40
Digital computer systems operation, GS-332.....	725	24	1,034	24	1,381	21	2,045	25
Peripheral computer equipment operator, GS-333.....	226	8	413	9	607	9	636	8
Digital computer systems analysis, GS-334.....	-----	-----	108	2	1,111	17	1,663	20
Total.....	2,979	100	4,392	100	6,559	100	8,255	100

<sup>1</sup> General schedule and post office employees.TABLE 5.—Distribution of Federal employees<sup>1</sup> in digital computer occupations by employing agency, fiscal years 1958 through 1961

Agency	1958	1959	1960	1961
U.S. Army.....	764	1,014	1,580	1,920
U.S. Navy.....	525	826	1,148	1,527
U.S. Air Force.....	1,100	1,561	2,263	2,673
Department of Agriculture.....	131	191	220	252
Department of Health, Education, and Welfare.....	139	178	293	407
Veterans' Administration.....	20	59	139	158
Treasury Department.....	106	139	222	410
Post Office Department.....	6	115	197	207
All other agencies.....	188	309	497	701
Total.....	2,979	4,392	6,559	8,255

<sup>1</sup> General schedule and post office employees.

TABLE 6.—*Distribution of Federal employees in digital computer occupations among defense and nondefense establishments, fiscal year 1958 through 1961*

Type of Federal establishment	1958		1959		1960		1961	
	Number of employees	Per cent						
Defense.....	2,389	80	3,401	79	4,991	76	6,120	74
Nondefense.....	590	20	991	21	1,568	24	2,135	26

TABLE 7.—*Recruitment of personnel for digital computer occupations in selected Federal agencies<sup>1</sup> in fiscal year 1962*

Title of position	GS grade range of positions filled	Total vacancies filled, fiscal year 1962	Sources of employees			Quality of applicants <sup>2</sup>		
			Responding agency	Other Federal agencies	Outside Federal Government	High	Average	Low
Digital computer systems administrator.....	GS-9—GS-15....	32	30	2	0	9	6	0
Digital computer programmer.....	GS-4—GS-14....	282	234	17	31	125	59	1
Digital computer systems operator.....	GS-4—GS-13....	119	95	11	13	66	28	1
Peripheral computer equipment operator.....	GS-3—GS-7....	62	55	1	6	34	27	1
Digital computer systems analyst.....	GS-6—GS-14....	81	57	15	9	42	8	0

<sup>1</sup> Participating agencies identified on p. 34.<sup>2</sup> Not all agencies provided evaluations of candidates.TABLE 8.—*Estimated requirements for digital computer personnel in selected agencies, fiscal years 1963 through 1968*

Occupation	Estimated personnel requirements
Digital computer systems administrator, GS-330.....	108
Digital computer programmer, GS-331.....	311
Digital computer systems operation, GS-332.....	194
Peripheral computer equipment operator, GS-333.....	113
Digital computer systems analysis, GS-334.....	254
Total.....	980

TABLE 9.—*Training (estimated) of digital computer personnel in selected Federal agencies from fiscal year 1958 through 1961*

	Total number of digital computer personnel trained
1958.....	244
1959.....	212
1960.....	378
1961.....	597
1962.....	712

TABLE 10.—*Digital computer training activity in selected Federal agencies in fiscal year 1962*

Agency	Agency conducted courses	Number of employees participating	Courses conducted by sources other than agency	Number of employees participating
Agricultural Stabilization and Conservation Service:				
Dallas.....	1	5	9	68
New Orleans.....	11	160	4	60
Evanston.....	7	59	4	4
Kansas City.....	0	0	8	174
Veterans' Administration.....	2	16	18	86
U.S. Air Force Computer Center and Bolling AFB.....	2	17	10	39
Department of Health, Education, and Welfare:				
Office of Education.....	0	0	1	2
Food and Drug Administration.....	0	0	1	1
Public Health Service.....	5	288	24	77
Treasury Department:				
Office of the Treasurer, United States.....	0	0	2	9
U.S. Coast Guard.....	0	0	5	14
Bureau of the Public Debt.....	0	0	2	35
Bureau of Accounts.....	4	129	7	59
Internal Revenue Service (national office and Martinsburg, W. Va.).....	1	14	24	77
Total.....	33	688	119	705

TABLE 11.—*Estimated voluntary separations<sup>1</sup> in digital computer occupations in selected agencies, fiscal years 1958-62*

Occupation	Estimated numbers of voluntary separations					Fiscal year 1962 voluntary separations who accepted employment	
	1958	1959	1960	1961	1962	In other Federal agencies	Outside Federal Government
Digital computer systems administrator, GS-330.....	1	0	2	0	5	3	1
Digital computer programmer, GS-331.....	6	7	23	30	64	29	35
Digital computer systems operation, GS-332.....	1	1	2	4	6	4	0
Peripheral computer equipment operator, GS-333.....	0	3	10	8	20	6	5
Digital computer systems analysis, GS-334.....	2	0	3	5	29	15	13

<sup>1</sup> Includes all separations other than those resulting from death, retirement, and for cause.

## LIST OF FEDERAL AGENCIES INCLUDED IN LIMITED SURVEY OF ADP PERSONNEL ACTIVITIES

## Treasury Department:

Office of the Treasurer, United States.  
 Bureau of Accounts.  
 Bureau of the Public Debt.  
 U.S. Coast Guard.  
 Internal Revenue Service (National Office and Martinsburg, W. Va.).

## Department of Health, Education, and Welfare:

Office of Education.  
 Food and Drug Administration.  
 Public Health Service.

## Post Office Department (Headquarters personnel only).

## U.S. Air Force:

Headquarters USAF Computer Center.  
 Bolling AFB.

## Veterans' Administration:

## U.S. Department of Agriculture:

Kansas City ASCS Data Processing Center.  
 Evanston ASCS Commodity Office.  
 New Orleans ASCS Commodity Office.  
 Dallas ASCS Commodity Office.

Mr. STAHL. First of all, with respect to the Civil Service Commission's internal program, we have been very mindful, having had the advantage of learning from what quite a few larger agencies did before us, of the necessity of planning ahead. As a consequence, before we converted just this summer some of our operations to a medium-sized computer, our action was based on a good deal of planning, actually traceable back for several years.

A great deal of what we are doing in our own internal program is evidenced by the responsibility that the Civil Service Commission has on continuing statistical reporting. In this process, we have been able to make a move to this modest automated establishment without any serious change in personnel. We have not had to lay anyone off. On the other hand, we have not had to acquire any new staff.

But we do think that the impact of this particular program within the Commission will have some effects throughout the service because we are now able to provide a basis for interchange of information between the agencies and the Commission on all kinds of personnel reporting. This should simplify things, not only for our own aggregation of this information in one place in the Commission, out it will simplify the reporting and assembly of information in the agencies because they can even go so far as submitting magnetic tapes which will work in our computer. Hence they would not even have to go through the process of publication of some of the information.

Mr. HENDERSON. On that point, I think there is a great potential. This committee is interested in the voluminous reports that the various agencies do have to make. We have given a great deal of thought to having studies and hearings on this one facet of this entire Government operation. We would be very interested in having your comments at this time.

Mr. STAHL. While we have just now gotten it underway, we have so far been pleased with the way our reporting system has operated, and it shows a very considerable promise for making it possible to provide information rapidly and to answer inquiries, provide reports to the Congress, the President, the Bureau of the Budget, and elsewhere, without making laborious special requests.

We have this ability on the basis of a continuous 10-percent sample. By having a 10-percent living sample of the Federal service population, we are able to follow that sample through on all kinds of personnel activities that take place. This gives us an adequate sampling of everything that is going on in the Federal service so, for most statistical purposes, not all, we can rely on the processing of information on that 10-percent sample.

Mr. HENDERSON. I think it would be helpful to the committee if you would prepare a writeup on this program for our use. If you would supply that, we would be very appreciative.

One matter that has been called to our attention, you could explain in this writeup, is the requirement that the Federal workers obtain their social security numbers. You might want to comment on that this morning.

Mr. STAHL. I will be glad to comment on that. We will also supply for the record a more complete statement.

The reason for the selection of the social security number as a device out of which to get a sample was this; we found somewhere around 95 or 96 percent of Federal employees had social security numbers anyway for one reason or the other. In the first place, those employees who were not under the retirement system had to have social security numbers because they were under social security, they were the temporaries. In addition, most people have had some kind of employment sometime in their career under social security, so they already had a number. We made a quick spot check and we found this phenomenally high proportion had numbers.

We hit upon the idea a long time ago, even before we got into the automated feature of this, that one way to handle a 10-percent sample is to take everyone who has the number "5" in the last digit in his social security number and you automatically get a random sample.

Checking this out with people who were more statistically expert than we, we found this was a pretty solid basis for getting a random sample. That is why we asked all employees to get their social security numbers. We do now use this as a device for maintaining this continuous 10 percent sample. So it is only an accident. If you happen to have the number "5" as the last digit in your social security number, you get into the sample.

We will supply more complete statements on that.

(The information follows:)

#### THE FEDERAL PERSONNEL STATISTICS PROGRAM

The Federal personnel statistics program is a new data reporting system designed to produce continuing statistics for improved personnel management of the Federal work force. With a steady flow of information from Federal agencies and through the use of electronic data processing equipment, the first of a number of reports is being produced showing, for example, personnel inventories by geographic area, type of employment, and characteristics such as age, grade, salary, sex, physical handicap, and veterans' preference.

Basically, data for the new system is developed by abstraction from copies of the "Notification of Personnel Action," standard form 50, for a scientifically designed, random 10-percent sample of Federal personnel. The employees in this sample are identified by the number 5 in the terminal digit of their social security numbers. The personnel action form identifies most significant changes that occur in the work history of a Federal employee. Each promotion, job change, hiring, firing, retirement, and transfer is recorded for both current and historical statistical report purposes.

The Federal personnel statistics program supplements and streamlines the present 100-percent head-count reporting system by providing data for special and periodic studies without recourse to the agencies. With detailed information on individuals in the sample, studies of various complex interrelationships can be made which are expected to serve as a basis for more improved personnel management of the Federal work force.

For example, through individual work histories of the sample of Federal employees, the dynamics of Federal service career patterns can be compiled and comparisons made within the service and with career patterns of similar occupations in private industry. Selected groups of employees such as veterans, handicapped, and major occupational groups can be studied without costly special surveys to obtain the basic information.

The availability of current sample data is being used to reduce agency reporting costs by reducing the total number of items reported and the frequency of submission. The informational items in the sample data which are now compiled for Commission use and not generally required by the agencies for their own purposes will not be reported or the time period between reports lengthened. Additional savings are being achieved through the ability to produce special studies from sample data without requesting agency surveys.

The reporting phase of the program was inaugurated on January 1, 1962, with the first submission of selected data on sample personnel. All covered agencies have now implemented the program and the magnetic tape sample file has been produced. The sample file has already been put to a number of practical uses and the first special survey report will be produced for the House Committee on Post Office and Civil Service by October 31, 1962.

Mr. STAHL. I might say we were quite pleased recently to have appear in the October issue—which we have just received—of *Business Automation*, a very favorable editorial about our system as a result of an article that appears in this issue by Mr. Sparks here on my right, who wrote up the Civil Service Commission plan for standardizing personnel reporting.

I will submit a copy of this report for the record. I would like to quote from the editorial by saying this: In citing the article, the editor says—and he was talking about the Federal Government in general and talking about standardization:

The Federal Government has recognized this need and is doing a great deal of work in this direction. Such an instance is the current program to standardize personnel reporting functions at, and associated with, the Federal Civil Service Commission. Such efforts on the part of Government are commendable for several reasons:

First, they set the pace for business and industry to follow in similar situations; Second, they lead to increased efficiency and its attendant benefits; and Third, they can result in considerable savings which—we can hope—may help to ease the public tax burden.

We think the work of Charles Sparks and his associates is praiseworthy—and makes for some very good reading.

We do have copies of this and will supply one for the record.

Mr. HENDERSON. We will be very happy to receive it.

(The information referred to follows:)

[*Business Automation*, October 1962]

#### EDITORIAL INPUT

Standardization—in hardware, procedures, and applications—is becoming more and more important. The Federal Government has recognized this need and is doing a great deal of work in this direction. Such an instance is the current program to standardize personnel reporting functions at, and associated with, the Federal Civil Service Commission. Such efforts on the part of Government are commendable for several reasons: (1) they set the pace for business and industry to follow in similar situations, (2) they lead to increased efficiency and its attendant benefits, and (3) they can result in considerable savings, which—we can hope—

may help to ease the public tax burden. We think the work of Charles Sparks and his associates is praiseworthy—and makes for some very good reading.

DON YOUNG.

[Business Automation, October 1962]

### IDP—A STEP TOWARD FEDERAL ECONOMY

The Civil Service Commission standardized various personnel reporting procedures for more efficiency, savings

(By Charles J. Sparks)

Contrary to the popular notion of big government as a monolithic entity operating under strict central control, the Federal Government is much like many private corporations. Departments and divisions, working as they are for the commonweal (or maximum profits), seek widely differing organizational goals.

The initial realization of a need to integrate data processing in support of the Federal Civil Service Commission arose from a preliminary survey of the use of ADP for personnel management. Performed in spring 1960, this survey disclosed a growing problem arising from the conversion of personnel systems to ADP. Although each agency of the Federal Government was attempting to perform essentially the same job, each was using a different approach. In the absence of standard automated forms, each agency was designing its own. Unique data sequencing and coding systems were being installed. In addition, agencies seeking to convert personnel management functions to ADP did not have an organized means for determining what had been accomplished elsewhere in the Government. The stage was set for costly duplication of systems design effort.

The need for systems integration was seen as critical to Civil Service, since much of its data input consisted of output from other agencies, and in some cases, a reciprocal data relationship existed. Much of the personnel data reported by various agencies required expensive conversion to standard codes so that comparable summary data could be published. In response to requests stating specific qualifications for agency vacancies, the Commission issues lists of eligible job applicants; the lack of common language could block high speed servicing of such requests.

From survey findings, it was concluded that a uniform Federal personnel data processing system was needed, since efficient operation would depend upon recognizably similar records, forms, and ways of doing paperwork. A greater similarity of agency systems could facilitate the Commission's own data processing by providing more uniform data input, and would provide the basis for future data exchange between agencies in automated form. In its broadest sense, the problem was to develop an integrated data processing system in support of the entire Federal civil service. Such a systems concept would include every data processing operation supporting the development and maintenance of the Federal civilian workforce. This also would mean sustaining a measure of order and efficiency throughout a variety of manual, mechanized and electronic subsystems.

Of the many possible approaches toward full integration, three were promised early realization of practical benefits:

1. A specific survey of agency applications.
2. Restandardization of the basic personnel data input form in an automated format.
3. Redesign of the Federal personnel reporting system.

Before the Commission's systems staff could begin to design a specific framework for Government-wide integration, it had to learn the exact nature of what already had been accomplished in the various departments and agencies. A survey was launched to gather documentations of agency personnel applications. These were designed for an additional purpose too: The establishment of an ADP information exchange which could serve as a clearinghouse for agencies interested in the automation (or improving the automation) of their personnel programs.

### AN ASSIST FROM INDUSTRY

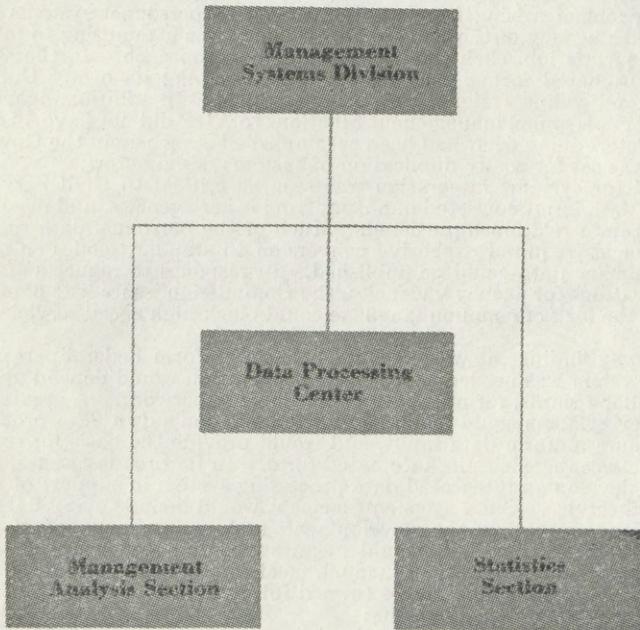
In the course of this survey, contact was made with 55 Federal and non-Federal activities. Private corporations participated at the suggestion of a manufacturer which believed an information exchange would serve industrial as well as governmental purposes. Their participation was welcomed, since it would aid in insuring

that new ideas developed in private industry would find their way into governmental thinking.

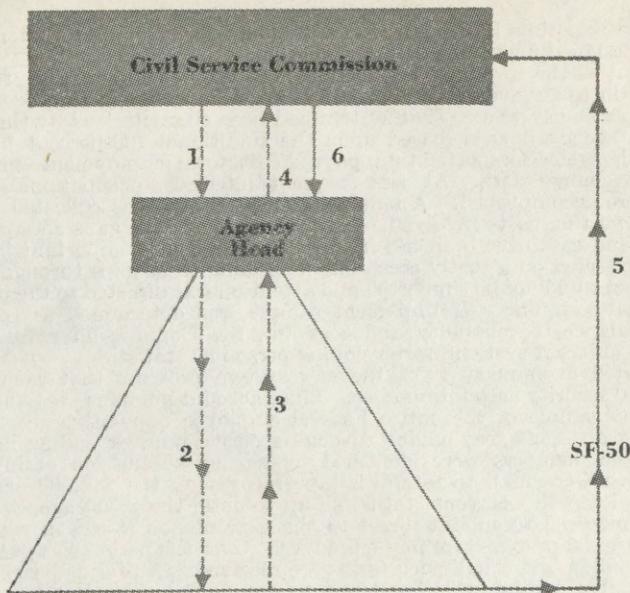
The participating agencies and companies contributed information on one or more applications. The information was in the form of narrative discussions, flow charts, and graphic presentations. Of the total gathered during the initial survey, 68 involved the use of electronics and 57 were on punched card equipment. Although the vast majority were basically personnel accounting applications, a number of personnel functions other than statistics were being supported to some extent—for example, promotion, skills location, salary administration, and manpower requirements determination. A few other areas not normally considered personnel, such as work sampling, also were included because information was volunteered and appeared useful.

The documentations were classified and indexed, and the Commission's ADP Information Exchange opened its doors in May 1961. Although the Commission staff was convinced the Exchange would provide a necessary service, they did not anticipate the heavy volume of requests for service. Beside heavy Federal usage, requests for information were received from as far away as Australia.

## How They're Organized



As an integral part of the program to exploit the full potential of ADP, the Management Systems Division was created in the Bureau of Management Services (above). Its assignment was to bring together systems design, data processing operations, and the largest consumer of output.



Triangle represents the reporting pyramid of a department or agency. Line of dashes traces the traditional flow in which (1) CSC issues reporting requirement to agency head; (2) agency head issues call for report, which finally filters down to base of pyramid where reports are rendered; and (3) data moves up through many echelons where abstractions and/or consolidations occur. Many months later, (4) a final report is received by the Commission. Under the new system, copies of source documents are (5) sent direct to CSC for preparation of (6) feedback to agency head as well as government-wide summaries.

Although a continuing need for special features to meet unique agency problems was demonstrated by the survey, basic data processing in support of the personnel function was found to be common to all Federal agencies. Since personnel actions affecting a Federal employee are originally recorded on the Standard Form 50, Notification of Personnel Action, this document quite logically had been selected as the basic input to agency systems.

Not so logically, a variety of exceptions to this form had been adopted. In many cases, the form had been adapted in a variety of ways for preparation on punched paper tape typewriters. There did not appear to be sufficient basis for the variety of exceptions, and the Commission called a meeting of the agency personnel involved. From this first meeting, a work group was organized to produce one form which would serve the needs of all agencies using ADP. The group also was requested to plan ahead for the possible advent of optical character recognition.

#### A GOVERNMENT "FIRST"

As the project progressed, it was found that the ADP version of the form was more efficient for manual use on a conventional typewriter than the so-called manual standard form 50. As a result, the effort was broadened and all agencies having an exception to the standard form for any reason participated. The result was a new standard form 50, released in the fall of 1961. This new form provided for standard sequencing and positioning of all basic data. Its release

marked the first time in history that a standard form for Government-wide use had been designed for source data automation.

Important as the survey of applications and the development of standardized input were in themselves, they took on added significance in the redesign of the Federal reporting system. That system had been characterized by the rendering of periodic agency reports, based upon the traditional 100-percent head count. Each month, agencies reported total payroll cost, total employment, and a limited amount of change data. At less frequent intervals, occupational and wage surveys were accomplished. A bare minimum of data was collected because of the high reporting costs involved. An inventory of data gaps showed that the legislative and executive branches frequently were denied important information or it was collected on a costly crash basis. Filling these gaps through the traditional system could not be supported and attention was directed to the possibilities of statistical sampling. A 10-percent sample was determined as representing the best balance of reliability and cost and the Commission embarked upon design of a different system for developing personnel statistics.

Inaugurated in January 1962, the new system provides that each employee have a social security account number. Since account numbers are issued serially, a 10-percent sample of the entire Federal employee population was developed by selecting all employees having a social security number ending in the digit "5." Sample members were identified by agency submission of initial input sheets, which were used to establish tape records on the 240,000-man sample. In order to keep this current status file up to date, the 2,500 agency personnel offices are required to submit direct to the Commission a carbon copy of each standard form 50 prepared for any employee. Over the period of a year, approximately a million and a half such forms are received. All forms bearing a social security number ending in "5" are used to update the current status file; many of the remainder are used for a variety of other purposes.

As the status of a sample member changes, the old status record is moved to a historical file, where cumulative data is being recorded for career progression and other valuable historical studies. The net effect is the development of a wide range of statistics never before available. Because changes are received and stored in computer-processable form within 2 weeks after they occur, timelags which in some cases ran to a year are reduced to 30 days. Both benefits are achieved with a reduction in agency reporting costs through elimination of line items and reduction of frequency of regular reports.

#### NOT QUITE PERFECT

As part of the implementation of the new statistical system, standard codes were established for agency, pay plan, pay basis, type of personnel change, veteran preference, insurance coverage, retirement coverage, physical handicap, location, and occupation. These codes, which are required on every standard form 50 prepared for manual, mechanical, or electronic processing, are considered basic and may be added to where local agency needs require further breakdown. With data sequencing and coding standardized, data interchange within agencies and between them and the Commission has been reduced to a matter of hardware. Exchange of magnetic tapes with the Agriculture and Commerce Departments is now being planned, with others to follow.

The establishment of standard format, coding and processing concepts for personnel accounting is a significant improvement, but it has not accomplished the Commission's goal of "total integration." A total systems approach has been developed and sufficiently implemented to assure further progress from a broad base. With personnel accounting constituting the most common application, which in turn is basic to almost all other personnel applications, standardization and integration of optimized approaches to other problems should require far less effort. Reprogramming a few computers today will avoid the necessity of reprogramming hundreds at sometime in the future.

Mr. STAHL. The second main area of our concern is the Federal personnel program as a whole, and the growth of ADP throughout the Federal establishment.

Our objectives in this regard are primarily to facilitate the growth of ADP without seriously interrupting Government operations or essential services, and at the same time to see whether it can be done without causing undue hardship to employees and to make it possible to make the maximum utilization of employees already on the rolls.

With this in mind, and without necessarily following the order of the subject that happens to appear in the statement by Mr. Macy, I would like to introduce the scope of this thing by calling attention to the fact that just in the past few years we really have, within the Government, as has industry of course, a variety of wholly new occupations; occupations for which there just have been practically no predecessors in the past.

We have digital computer system administrators, we have computer programmers, we have computer systems operators, we have peripheral equipment operators, we have digital computer systems analysts. These are pretty formidable mouthfuls. Some of the work that is performed is pretty formidable.

We find in a quick check that in fiscal year 1958, for example, there were a total of just a little under 3,000 employees in these occupations, and by the end of fiscal year 1961, there were 8,255 employees in these occupations.

That was an overall increase of 177 percent.

That is an indication of the amount of concentration of personnel in this area.

Now, the largest single occupation is the computer programmer. This is the individual who plans the method by which a particular procedure can be automated.

As we look at these statistics, we find that there is going to be a continuing increase in still another occupation, the one that is called digital computer systems analyst, which actually is the type of individual who determines whether or not it is desirable for a particular program, or a particular process, to be automated, whether it would pay off in the long run.

Mr. JOHANSEN. If I may interrupt, at that point, against your testimony regarding the increased number of jobs created, I find some of my worst apprehensions aroused by this in your statement:

"Although the installation of automatic data-processing equipment occasionally cuts down the total number of employees," and so on.

Now, especially that word "occasionally" gives me pause. In other words, are we having all these increased number of jobs, and yet only "occasionally" any net reduction of employees as a result of the installation and operation of this equipment?

Mr. STAHL. I do not think we have the complete information on that, Mr. Johansen. The "occasionally" was used in looking at this from the personnel standpoint—that is, what do you do about the people who have to be laid off?

What we mean by this is not that the savings are only "occasional," but that, because of the process which is explained throughout this statement and of the fact that the development of the installation of ADP usually covers a substantial period of time, because there is attrition, and because you try to make as much use of present employees as possible by retraining them to do the new jobs—which means taking them off of old jobs—it is only occasionally that you reach the point where you actually have to lay people off. That is not the same thing as saying we only occasionally save on numbers of personnel.

Mr. JOHANSEN. Let's not quibble about words. You can cut down the total number of employees without layoffs, but this says "occasionally cuts down the total number."

This seems to say it is only occasionally that there is a net reduction in personnel, and that is the thing that I am sorry to be so insistent on. Unless we realize benefits from this installation of this equipment in both a net reduction of personnel and in increased productivity, I do not see how you justify the installation and the expenditure.

Mr. STAHL. Let me comment on that this way—I am sure the Bureau of the Budget would have additional information, and additional comments.

My observation would be this—in many aspects, in many parts of the Government program, we are bound to have growth just because the population grows. The Post Office and Internal Revenue and other things would grow if we did not automate; so automation often prevents additional expansion. We do not show its efficiency and the productivity it produces only in terms of net reduction in the past.

Mr. JOHANSEN. I realize that.

Mr. STAHL. It can prevent expansion. Here we were simply making the point, as against having to let some people go, that there is the more frequent problem—as the rest of that sentence states—of retraining present employees in the new skills. This is the only point to which we were addressing ourselves. We were not trying to address ourselves here to the question of how much net saving there may be. This is the Budget Bureau's concern, and the one to which they have addressed themselves, and will, I am sure, in the future.

Mr. JOHANSEN. Is that not also the Civil Service Commission's concern?

Mr. STAHL. Our concern is only, to the extent we have been asked by the Budget Bureau, in the course of our inspections, to make certain that agencies do have some kind of program for manpower utilization and to report on that program. Ours is not the responsibility to enforce manpower utilization.

Mr. JOHANSEN. We realize that.

We found out, in the other committee, there is no one who has that responsibility.

Mr. STAHL. Proceeding with this matter of the new occupations, the Department of Defense is the principal employer of ADP personnel. While back in 1958 they had 80 percent of all ADP personnel, and this has come down to about 74 percent, nevertheless, they clearly have the overwhelming majority of people in these categories.

Now, I would like to go back. In view of the size of this new activity, I would like to make some comments about recruitment and selection.

We have not been able to do much recruiting of people from outside the Government service to fill these kinds of occupations because, in the first place, they have not been in the market to any great number, and in the second place, where they have been available in the market, we have often not been able to meet the competition from a salary standpoint. Hence, agencies have relied on the training of their own staffs, almost entirely, to convert people to handling these kinds of jobs.

We have been doing some work with a number of agencies to improve the methods of testing and selecting, so we can try to find out what kind of characteristics and aptitudes make for success in holding these jobs. And from that development, the kind of tests that will enable us to identify these aptitudes in the future.

Mr. HENDERSON. On that point, Mr. Stahl, you might comment on the type of experimental tests you have developed. We have heard, on the committee, that chess players make pretty good programmers. Is that true?

Mr. STAHL. I do not know.

I have heard some cracks about that, but whether it is actually a fact, I do not know. Even if it were, I doubt whether we would want to rely on it as a testing device. We have not developed anything yet that you would think of as a test, in the form of a written test, for this purpose. It takes a substantial amount of time and a great deal of care to study these things before you go that far. We are still in the process of trying to identify, trying to relate success on the job with characteristics and aptitudes and skills in order to determine what we should test for, and until we do that, we will not be coming forth with any written test.

Mr. JOHANSEN. I would like to say a word in behalf of the lowly checker players. Let's bring the checker players in here.

Mr. STAHL. Another aspect of this growth in these new occupations has been the problem that has been imposed by way of establishment of job classification standards.

We first published some standards for the job classification, including the job evaluation characteristics and the qualification requirements, for digital computer jobs in 1958, and we have had to revise them in minor respects several times, but in one major respect we revised them just a little over a year later, in 1959. We now have under review all of the occupations again to see whether further revisions are necessary. However, in the process of doing this, we have been making annual checks with the agencies, and by and large our personnel standards for these occupations have apparently been holding up pretty well. There have been relatively few grade changes in the structure as initially set up in 1958, and as a consequence we think this is a fairly stable part of the personnel program.

Now, I probably have already alluded in effect to the impact of ADP on employees. Certainly 3 or 4 years ago many of us were under the impression that the introduction of automation into the Federal service would result in thousands upon thousands of people being laid off summarily overnight. Somehow or other there was the fancy created that a machine would move in one day and about 30 days later hundreds of employees would move out. This actually has not been the experience because of the point I made a while ago, that it takes a long time to convert to any kind of automated equipment, and actually, what is needed is a system of personnel administration which adapts to that.

Mr. JOHANSEN. Has that been the experience in private enterprise also?

Mr. STAHL. My assumption is that it has been the experience, although I am not qualified to answer that authoritatively.

I do not see how it could be otherwise.

But the point is this. Just as illustrated by the experience with the Internal Revenue Service, we found that we were able to ease the impact of the installation of computers by introducing such steps as this: As normal personnel turnover takes place, of course the normal thing to do is to replace them with more permanent people. Instead, in IRS, and in many other computer installations, we have devised

ways to make what you might call long-range temporary appointments, rather than the old-fashioned temporary appointment which was not to exceed a year.

We have permitted the Internal Revenue Service and some other establishments to make temporary appointments which do exceed a year but still keeps them temporary. So when normal attrition takes place, instead of filling the jobs in the clerical levels with permanent people, you fill them with temporary people who can be let off much more readily, and without any commitment as to years when the time comes to cut back on that kind of staff. Of course, it is usually the lower grade jobs which tend to disappear because the machines do the routine work, and these are the jobs that tend to disappear.

So that is an example of a personnel device of using the temporary appointment more extensively. Other aspects have to do with re-training and the like.

Now to allude quickly to some of the information we have received in making a check with a number of agencies. We checked with five agencies of the Treasury Department, three in the Department of Health, Education, and Welfare, headquarters personnel in the Post Office Department, the Veterans' Administration, and four Agricultural Stabilization and Conservation Service offices of the Department of Agriculture.

These agencies reported that in fiscal year 1962 they filled 576 vacancies in ADP occupations. Eighty two percent of these vacancies were filled with employees from within their own organizations. Eight percent came from other Federal agencies, and 10 percent from sources outside the Government, which means 90 percent came from within the Government and only 10 percent from outside the Government.

These agencies estimated that in the next 5 years they will fill 980 vacancies in the ADP occupations to take care of anticipated changes in hardware, programs, and turnover of personnel. About 600 of these employees will be needed as either programers or systems analysts.

Most of the agencies consider the grade structure for ADP positions adequate for their purposes. We, of course, have been having some difficulty, as I also implied earlier, in attracting people to the higher level occupations in this field because of not being in a competitive salary position, but we are on the road to being in a better position in this regard, so I have heard.

The agencies are relying heavily on the training and development of their own employees to staff the Government's growing ADP operations. During the 1962 fiscal year the agencies included in our survey had trained 688 persons at 33 internal ADP classes and 705 employees had participated in 119 courses conducted by manufacturers, colleges, universities, and so forth.

In addition, 2,300 people have attended various short-term training programs that have been sponsored by the Civil Service Commission in order to permit this type of conversion. It is not just the conversion of people who will go in and operate the computers; that is part of it, but the part the Commission has been concerned with is the training of supervisory personnel to know how to make use of

this equipment. We use as our instructional staff not only people in the Government but many outside the Government.

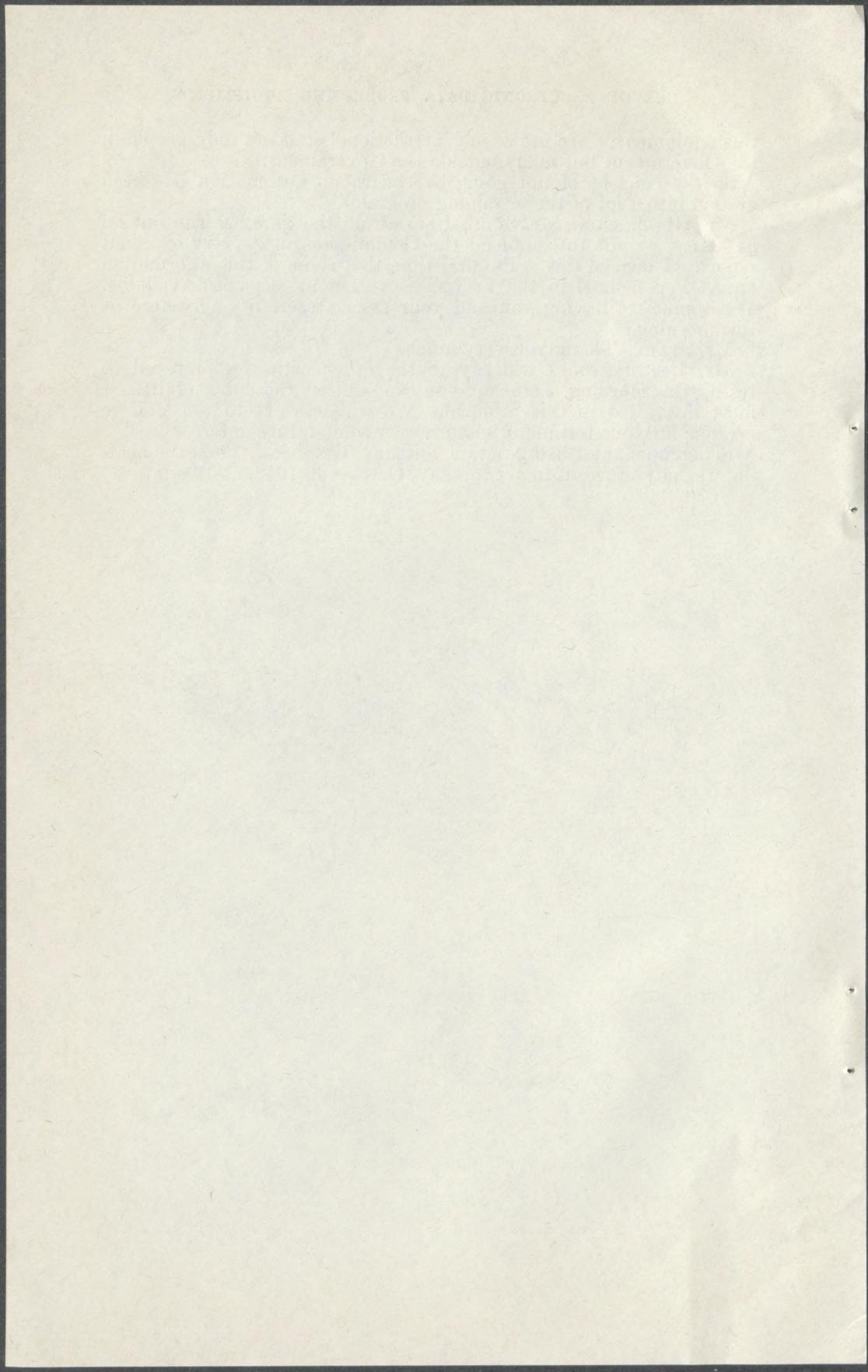
So the concept of not going overboard on automation has been ground into a lot of these training programs.

Mr. HENDERSON. Mr. Stahl, I am afraid the time has run out on us here. I want to commend the Commission on its very excellent report. I believe this is the first time that some of this information on ADP personnel in the Federal Government has been available. We appreciate having you and your associates testifying before us this morning.

Mr. STAHL. Thank you very much.

Mr. HENDERSON. I will say to the other witnesses prepared to testify this morning, I am sure you can see that this subcommittee is most interested in this problem. We will leave it to the staff to arrange for your testimony tomorrow or some future date.

(Thereupon, at 12:10 p.m., on Tuesday, October 2, 1962, the hearing was adjourned until Wednesday, October 3, 1962, at 10 a.m.)



# USE OF ELECTRONIC DATA PROCESSING EQUIPMENT

WEDNESDAY, OCTOBER 3, 1962

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON CENSUS AND GOVERNMENT STATISTICS  
OF THE POST OFFICE AND CIVIL SERVICE COMMITTEE,  
*Washington, D.C.*

The subcommittee met, pursuant to recess, at 10 a.m., in room 215, Cannon Building, Hon. David N. Henderson (subcommittee chairman) presiding.

Mr. HENDERSON. The subcommittee will come to order.

We will continue at this time the hearings of our Subcommittee on Census and Government Statistics regarding the use of electronic data processing equipment in the Federal Government. Yesterday we heard from representatives of the General Accounting Office, the Bureau of the Budget, and the Civil Service Commission.

As the House is meeting at 11 a.m. today, we shall hear from as many witnesses as possible this morning and continue the hearings tomorrow morning starting at 10 a.m. Inasmuch as our time is limited, we are asking the witnesses to be as brief as possible, preferably no more than 10 minutes, in presenting the highlights of their statements, which will be included in the record. Answers to questions of the subcommittee members should also be brief and can be supplemented by material submitted for the record. I will appreciate your cooperation in this regard.

Before we call our first witness this morning, I am going to ask Mr. Edward Mahoney, of the General Accounting Office, who is serving as a special assistant to the subcommittee, if he has any comments he would like to make about the proceedings yesterday.

Mr. MAHONEY. Yes, sir. I would like to comment briefly on the possible need for clarification of the effect of ADP on personnel, with particular regard to the question of elimination of positions where ADP is installed.

There have been several instances where a considerable number of positions were eliminated by converting to ADP methods.

On the other hand, there have been a number of other cases where the objective definitely was not the elimination of positions, rather the objective in these cases was the development of more responsive and more effective systems.

In this latter category, we have for a long period of time had need for improvement in many of our systems, for better control over resources; that is, Government facilities, equipment, supplies, and so forth. This is where significant gains can be made.

A further illustration of opportunities for improvement is represented in the development of the Internal Revenue System, wherein

ADP is being used as the vehicle to improve our tax collection procedures. In these cases, we probably will need more people than we needed before to fully carry out and implement these programs.

However, with regard to the first point; the impact on personnel—many positions were eliminated by this Treasury check ADP system when it was installed. From 1955 when that system was first conceived until today, the volume increased from 350 million checks annually to 460 million. There was a tremendous increase in volume. However, the ADP system is handling this total volume with several hundred less people than were employed to perform this work in 1955.

We also have had reductions in the wage record ADP system in the Social Security Administration.

These are definite cases where the equipment has replaced people where this was one of the primary objectives.

Mr. HENDERSON. Certainly you might consider giving us a brief memorandum on this particular point. I know we are intensely interested in this. If you would do that, it would be helpful to us.

Mr. MAHONEY. I will be pleased to do that. One of the most complete studies on this point was made by the General Accounting Office and the Treasury Department after the ADP system for U.S. Treasury checks was installed. This report is available for the record if you care to use it.

Mr. HENDERSON. Without objection the report will be included at this point.

(The report follows:)

FINAL JOINT REPORT ON THE ELECTRONIC DATA PROCESSING INSTALLATION IN THE OFFICE OF THE TREASURER OF THE UNITED STATES, AUGUST 28, 1959

This is the final report of the joint committee you appointed in June 1953 to develop the potentials of electronic data processing for the payment and reconciliation of Government checks and to spearhead installation of the system you approved in October 1955.

Fiscal year 1956 was the last year of operation completely under the old system—a system in which the job of paying checks (by use of tabulating equipment) and handling check claims was divided between the Office of the Treasurer of the United States and the Federal Reserve banks, and the detailed check reconciliation was done separately in the General Accounting Office as a part of the function of audit. Fiscal year 1959 just ended was the first year of operation completely under the new system—one in which the payment and reconciliation of checks and check claim operations are merged in a central electronic data processing organization of the Treasurer of the United States, and in which the General Accounting Office performs an audit of operating results in light of the internal control features of the integrated system.

Therefore, we are now in a position to present some rather concrete results of the new system from the standpoint of annual operating costs to the Government and staffing.

Our joint report of September 1, 1955, which was the basis for your decision to install the system, contained an estimate of potential recurring savings to the Government aggregating about \$2.2 million annually—the estimate subsequently used in the Treasury's press release of October 14, 1955. We are pleased to report that, based on a comparison of fiscal year 1959 and 1956 costs, the original expectations (developed before conversion to the new system) have been exceeded, as follows:

*Estimates of annual recurring savings*

	Final estimate <sup>1</sup>	Preliminary estimate	Difference
Treasury Department, Office of the Treasurer, United States:			
Check payment and reconciliation.....	-\$313,000	\$23,000	-\$336,000
Check claims.....	-55,000		-55,000
Subtotal, Treasurer's Office.....	-368,000	23,000	-391,000
General Accounting Office.....	1,955,000	1,670,000	285,000
Subtotal, appropriated funds.....	1,587,000	1,693,000	-106,000
Federal Reserve System <sup>2</sup> .....	1,362,000	\$ 500,000	862,000
Total.....	2,949,000	2,193,000	756,000

<sup>1</sup> The basis used in developing these final estimates of savings is explained in the paragraph immediately following this table. Included is a discussion of the variance between the original estimate showing savings of \$23,000 for the check payment operations of the Treasurer's Office and the final estimate of \$313,000 increased cost.

<sup>2</sup> Represents 90 percent of the savings reported by the Federal Reserve banks. 90 percent of the earnings of the Federal Reserve System is covered into the Treasury as miscellaneous receipts.

<sup>3</sup> The preliminary estimate of savings for the Federal Reserve banks was \$750,000, or \$675,000 accruing to the Treasury at the 90-percent rate. A conservative estimate was stated in the Oct. 14, 1955, press release as "\$500,000 or more a year."

The estimate originally made in 1955 was based on a comparison of costs for fiscal year 1956 under the old system and an estimate of what the new system costs would be. The final estimate now presented is based on actual costs in fiscal 1959 under the new system compared with what the costs would have been in fiscal 1959 if the old system had remained unchanged. To establish a comparable base, the 1956 costs were projected to 1959 (old system), taking into account the increase in workload and increase in salary rates between 1956 and 1959. At the same time, with a view to presenting an estimate of savings in minimal terms, the projection of old system costs included assumptions of improvements that might have been made, with reductions of costs, even if the old system had continued into 1959. With respect to the check payment operations of the Treasurer's Office, for example, actual personal services in 1956 amounted to 369 people for a total of \$1,450,000. Yet, the projection to 1959 on the old system basis, despite a 14-percent increase in workload and a 10-percent increase in salary rates, resulted in a 1959 base of only 330 people and \$1,446,000. In large measure, this basis adopted for the estimate, which we believe to be realistic, accounts for the difference between the original estimated savings of \$23,000 shown in the table and the final estimate of \$313,000 additional cost for the Treasurer's check payment operations.

There is attached a more detailed statement comparing former and present system costs, supporting the estimated annual savings of \$2.9 million. Considering the above comments and the fact that the value of substantial space requirements eliminated by the new system was not included in the cost comparison, we believe this is a conservative estimate. All comparative cost data were furnished by the operating organizations concerned, including the individual Federal Reserve banks. A consolidated statement of Federal Reserve System costs was prepared and furnished to the banks and the Board. The reaction of the Federal Reserve Board is contained in a letter dated May 21, 1959, a copy of which is attached hereto.

The following table presents the results of the new system in terms of staffing requirements. As in the case of the foregoing table concerning costs, the comparison is made on the basis of the number of operating employees that would have been needed to handle the fiscal year 1959 workload under the old system and the actual number of operating employees for fiscal year 1959.

## Number of operating employees

	Old system (projected from fiscal year 1956 in terms of fiscal year 1959)	New system (fiscal year 1959 actual)	Change in staffing re- quirements
Treasury Department, Office of the Treasurer, United States:			
Check payment and reconciliation.....	1 330	287	-43
Check claims.....	275	282	+17
Subtotal, Treasurer's Office.....	595	569	-26
General Accounting Office.....	<sup>2</sup> 369	( <sup>3</sup> )	-369
Subtotal, appropriated funds.....	964	569	-395
Federal Reserve System.....	633	234	-399
Total.....	1,597	803	-794

<sup>1</sup> Actual number of employees for fiscal year 1956 was 369. As indicated in the explanation following the preceding table on estimated savings, assumed improvements of the old system were included in the projection of the old system costs into fiscal year 1959, resulting in the assumption that 39 fewer people would have been able to handle 14 percent more workload in 1959 than in 1956.

<sup>2</sup> This was the actual number of employees in 1956, exclusive of 15 people for continuing operations with respect to accounts of disbursing officers drawing on designated depositaries unrelated to the Treasury check project. The assumption is made that the same number of people (369) could have handled the 14 percent increased workload in fiscal year 1959 if the old system had been continued.

<sup>3</sup> In actuality, there were 70 people remaining on the rolls at the end of fiscal year 1959 to complete the residue of reconciliation work under the old system. Windup of these activities is expected to be completed prior to Dec. 31, 1959, and such completion is anticipated in this table.

The following table indicates the number of operating employees in the check payment and reconciliation system on the rolls in fiscal year 1956, immediately prior to conversion to the new system, and the number presently on the rolls:

## Number of operating employees

	Fiscal year 1956	Fiscal year 1959	Change
Treasury Department, Office of the Treasurer, United States:			
Check payment (and reconciliation).....	369	287	-82
Check claims.....	249	282	+33
Subtotal, Treasurer's Office.....	618	569	-49
General Accounting Office.....	384	15	-369
Subtotal, appropriated funds.....	1,002	584	-418
Federal Reserve System.....	565	234	-331
Total.....	1,567	818	-749

With respect to the data in the preceding table, reference is made to one of the recommendations in our report of September 1, 1955, quoted as follows:

"*Recommendation No. 5.*—We recommend that present personnel employed by the Treasury Department and the General Accounting Office in the payment and reconciliation of checks, be given first consideration for positions under the new program and those who would not be so placed be considered for reassignment to other positions in both agencies consistent with their qualifications.

Comment: Approximately 755 people will be required by the Treasury Department and the General Accounting Office in carrying out the functions of payment and reconciling Treasury checks in the fiscal year 1956. (Note: The forgoing table shows a total of 753 for fiscal 1956, consisting of 369 in the check payment work of the Treasurer's Office and 384 in the check reconciliation operations of the General Accounting Office.) Approximately 270 employees will be needed under the new program. (Note: The number of employees for the present check payment and reconciliation operation of the Treasurer's Office in fiscal year 1959 is shown as 287 in the preceding table. The increase of 17 people over the original estimate reflects what is a normal, relatively small increase in staffing proportionate to the substantially large increase in workload. The original estimates were based on an annual volume of 350 million checks and that volume is now over 400 million.) Therefore, we believe that the qualifications of the personnel presently employed in both agencies in the check payment and reconciliation operations should be carefully reviewed to select the best qualified personnel for the new program. The remaining 485 employees should be given first considera-

tion for reassignment to any positions for which they are qualified in either the Treasury or the General Accounting Office. The latter figure does not take into consideration the attrition which would occur during the conversion period."

In our opinion, the manner in which the operating officials of the Treasurer's Office and the General Accounting Office pursued this recommendation and the results they achieved with respect to the major problem of staff curtailment transcend all other aspects of the undertaking. When conversion to the new system was to be started, there were 369 people in the Treasurer's payment operations and 384 people in the reconciliation operations of the General Accounting Office—a total of 753 people directly concerned. The immediate impact on these people was promptly alleviated by telling them about the plans as soon as the decision was made, which was well in advance of the actual conversion. They were assured of every assistance toward selection and training for positions in the new system or for placement to fill vacancies in their respective agencies and other Government agencies. The Treasurer of the United States, for example, talked to all the employees about these matters as early as October 14, 1955.

This advance planning in the mutual interest of the personnel and the Government also provided maximum opportunity to take advantage of normal attrition. As a result, formal reduction-in-force proceedings (and the consequent widespread chain reactions) were entirely precluded. The following table shows how the 753 people in the Treasury Department and General Accounting Office were affected.

	Total personnel	Office of Treasurer, United States (check payment operations)	General Accounting Office
<b>1. Transfers:</b>			
(a) To other activities within Treasurer's Office or within General Accounting Office.....	244	86	158
(b) To new system in Treasurer's Office.....	31	-----	31
(c) To other Treasury bureaus.....	44	44	-----
(d) To other agencies.....	80	28	52
(e) Total transfers.....	399	158	241
<b>2. Reductions by attrition:</b>			
(a) Resignations and retirements.....	104	49	55
(b) Deceased.....	6	3	3
(c) Dropped.....	2	-----	2
(d) Total reductions by attrition.....	112	52	60
<b>3. Retained for continuing operations:</b>			
(a) Check payment and reconciliation system.....	159	159	-----
(b) Settlement of accounts of disbursing officers drawing on designated depositaries, continued in General Accounting Office.....	15	-----	15
(c) Total retained for continuing operations.....	174	159	15
<b>4. Temporarily retained to complete residual operations in GAO under old system. Operation expected to be completed before Dec. 31, 1959.....</b>			
	170	-----	170
<b>5. Total.....</b>			
	755	369	386

<sup>1</sup> Includes 2 employees transferred in subsequent to July 1, 1956, to assist in completing the residual operation.

This final report would not be complete without a further word of high commendation for the Chief of the Depository Accounts Branch in the General Accounting Office, and his staff, who have diligently carried on the residue of work under the old system and for the officials and employees of the Office of the Treasurer of the United States who have operated the new system with ever-increasing efficiency since the initial installation, and with many refinements and innovations. To cite one example: In fiscal year 1958, the Treasurer's Office had to rent time on EDP equipment of another agency, at a cost of \$130,000, to accommodate the peakload work during the seasonal period of income tax refunds. The budget for fiscal year 1959 contemplated a cost of \$105,000 for the same purpose. During the spring of 1959, however, monthly production reached as high as 41.5 million checks paid; no outside rental was needed.

EDWARD J. MAHONEY,  
General Accounting Office.  
GEORGE F. STICKNEY,  
Treasury Department.

Comparison of annual costs—Present and former Government check systems (operations of Treasurer of the United States, Federal Reserve banks and General Accounting Office)

[Dollar amounts in thousands]

	Total cost	Treasurer, United States			Federal Reserve banks	General Accounting Office	Classification of costs						Number operating employees	
		Check payment (and reconciliation)	Check claims	Total			Retirement and other fringe costs	Shipping and communications	Forms and supplies	Equipment (rental)	Other (indirect costs)			
<b>I. Former system:</b>														
<b>A. Fiscal year 1956 (actual):<sup>1</sup></b>														
Treasurer of the United States:	\$1,990	\$1,990		\$1,990			\$1,450	\$68	\$146	\$308	\$13		369	
Check claims:	1,105	\$1,105		1,105			1,053	14	30	5			249	
<b>Total, Treasurer, United States:</b>	3,095	1,990	1,105	3,095			2,503	82	176	308	18		618	
Federal Reserve banks:	2,396				\$2,396		1,911	149	148	98	15		565	
General Accounting Office: <sup>2</sup>	1,697					\$1,697	1,504	(3)	20	173			369	
<b>Total, fiscal year 1956:</b>	7,188	1,990	1,105	3,095	2,396	1,697	5,918	231	244	579	33		1,552	
<b>B. Fiscal year 1959 (hypothetical—projected from fiscal year 1956, after considering increase in volume and pay scales):<sup>3</sup></b>														
Treasurer of the United States:	2,250	2,250		\$2,250			1,446	99	182	412	12		530	
Check claims:	1,395	1,395		1,395			1,262	85	85	5			265	
<b>Total, Treasurer, United States:</b>	3,645	2,250	1,395	3,645			2,698	184	217	412	17		595	
Federal Reserve banks:	3,069				3,069		2,416	274	55	119	21		633	
General Accounting Office: <sup>4</sup>	1,955					\$1,955	1,655	107	20	173			369	
<b>Total, fiscal year 1959:</b>	8,669	2,250	1,395	3,645	3,069	1,955	6,769	565	292	704	38		1,597	

II. Present system (fiscal year 1959): <sup>4</sup>											
Treasurer of the United States:											
Check payment and reconciliation.....	2,563	2,563	2,563	2,563	1,395	92	10	66	993	7	287
Check claims.....	1,450	1,450	1,450	1,450	1,299	86	19	41		5	282
Total, Treasurer, United States.....	4,013	2,563	4,013	4,013	2,694	178	29	107	993	12	569
Federal Reserve banks.....	1,556				914	105	212	86	229	10	284
General Accounting Office.....											
Total, fiscal year 1959.....	5,569	2,563	4,013	4,013	3,608	283	241	193	1,222	22	803
III. Difference (II minus I-B):											
Treasurer of the United States:											
Check payment and reconciliation.....	+313	+313	+313	+313	-51	-7	-89	-116	+581	-5	-43
Check claims.....	+55	+55	+55	+55	+47	+1	+1	+6			+17
Total, Treasurer, United States.....	+368	+313	+368	+368	-4	-6	-88	-110	+581	-5	-26
Federal Reserve banks <sup>7</sup> .....	-1,513				-1,502	-169	+28	+31	+110	-11	-399
General Accounting Office <sup>8</sup> .....	-1,955				-1,655	-107		-20	-173		-369
Subtotal.....	-3,100	+313	+55	+368	-3,161	-282	-60	-99	+518	-16	-794
Less 10 percent of savings by F.R.B.'s.....	151				151						
Total annual effect on Government <sup>9</sup> .....	-2,949	+313	+55	+368	-3,161	-282	-60	-99	+518	-16	-794

<sup>1</sup> Workload: 345,000,000 checks.  
<sup>2</sup> Government contributions to retirement fund were not paid from these appropriations in fiscal year 1956.  
<sup>3</sup> Excludes 15 people (and related costs) for continuing operations in the General Accounting Office concerning accounts of disbursing officers drawing on designated deposits, unrelated to the Treasury check system.  
<sup>4</sup> Workload: 393,000,000 checks.  
<sup>5</sup> Reflects projection of possible improvements under the old system with consequent savings to a degree which more than offsets increased costs in 1959 over 1956 for the 10 percent pay raise and 14 percent increase in workload.  
<sup>6</sup> Projects only the 10 percent pay increase on 1956 staffing level. Assumes no increase in staffing or other costs to handle 14 percent increase in workload.  
<sup>7</sup> 90 percent of Federal Reserve System earnings is covered into the Treasury as miscellaneous receipts. Hence, 10 percent of these savings is deducted below.  
<sup>8</sup> A residue of 70 people were completing the old system reconciliation in GAO at the close of fiscal 1959. This is a projection to the latter part of calendar year 1959, when that work is expected to be completed.  
<sup>9</sup> Does not include value of space requirements eliminated by new system.

Mr. HENDERSON. Our first witness today is Mr. Edmond J. Rouhana, Executive Assistant to Assistant Administrator for Finance and Administration, General Services Administration.

**STATEMENT OF EDMOND J. ROUHANA, EXECUTIVE ASSISTANT TO ASSISTANT ADMINISTRATOR FOR FINANCE AND ADMINISTRATION, GENERAL SERVICES ADMINISTRATION, ACCOMPANIED BY WILLIAM W. WARBURTON, ASSISTANT DIRECTOR, NATIONAL BUYING DIVISION, AND F. W. HORTON, CHIEF, PLANNING BRANCH, ADP DIVISION**

Mr. ROUHANA. I have with me Mr. William Warburton, Assistant Director of the National Buying Division, and Mr. F. W. Horton, Chief of the Planning Branch, ADP Division.

GSA's involvement in data processing activities stems from two sources.

First, we have under our basic law a Government-wide property management and records management responsibility; and secondly, as an agency with a great volume of paperwork operations, we use ADP internally in GSA.

From a Government-wide standpoint, GSA is involved in several facets of ADP. First, on the procurement side, which is handled by our supply service, we have issued in the past, or negotiated FSS schedule contracts, for the guidance of all agencies, with as many as 17 computer manufacturers.

As of the moment, for fiscal year 1963, 10 of these contracts have been awarded for rental, the balance are still being negotiated with the companies.

On the purchase side, eight have been awarded and another nine are still in process.

On the maintenance side, we have also awarded eight. One contract may cover all three parts, the rental, purchase, and maintenance, and we can act on them simultaneously.

We are also involved, of course, with the utilization of excess ADP equipment which is owned by the Government, but to the best of our knowledge up until recently, probably not more than 10 or 15 percent of ADP equipment was owned by the Government. With the issuance of Budget Bureau Circular A-54, this percentage is bound to increase.

As we all know, whenever you have Government-owned equipment, sooner or later it becomes excess to the using agency. Under normal procedures, excess equipment is reported to GSA, to our Utilization and Disposal Service, and we attempt to get utilization within the Government, and if we are not able to, sometimes we will donate it to a school, or educational institution, or, lacking that, we would sell it.

We are anticipating increases in the excess category, and are trying to work out some procedures to get the best out of the excess.

For example, some agencies own equipment. They may want to trade it in on a new piece of equipment. There is a good question whether they should be allowed to trade. Perhaps the trade-in allowance could be minor in amount and we could use that piece of equipment someplace else. In any event, we are working with the Budget Bureau on some general policies to govern the utilization and

the methods and so on and how to best accomplish the utilization of excess in the Government.

In our National Archives and Records Service we have a two-pronged responsibility. One is to provide guidance to the agencies on retention of records, and ADP cards and tapes and so on, and the second is a program which has been recently developed in cooperation with the Budget Bureau for extending the source data automation technique in the agencies.

Our Archives and Record Service has set up a 40-hour workshop, as they call it, to train agency people in source data automation, and so far in the past year or so over 200 people in the Washington area from the agencies have participated, and we are now at the point of extending this workshop to our 10 regional offices to train people at the grassroots level where much of the data that comes into the central office is generated.

We have through our Public Building Service another Government-wide responsibility, and that is, site preparation for ADP, and in the design of new buildings to provide for possible ADP installations, based on the need of the agencies that are going to occupy the buildings.

We have standards for fire protection, air conditioning, floor load, and things of that nature. Very recently we issued a fire-protection handbook to be used by the agencies in setting up their ADP installations.

There are other aspects of ADP that we are working with the Budget Bureau. One is the annual inventory of ADP equipment in the Government. We have agreed with the Bureau of the Budget to take on this job for them. It is very similar to our annual inventories of motor vehicles, our real property owned and leased, and so on. It is just another piece of property, if you will, that is being reported on.

We are also studying along with the Budget Bureau, on a cooperative basis, the possibility of extending the Philadelphia computer-sharing plan, if successful; and the possibility of getting a computer market guide for the use of all other agencies, and a library of computer applications that are already in use in Government.

Internally, ADP in GSA has been in the evolutionary stage since GSA was created in 1949. At that time we had punchcard equipment in the central office, and then we began extending it into the regions, and by 1957 we had punchcard equipment in all 10 regions. But also by 1957, we found in some regions our punchcard equipment was being outgrown, and we went into a pilot test on the IBM Ramac 305 for Federal supply order processing and inventory management application.

That was quite successful. There were a lot of benefits gained, both to the supply people and the accounting people, and we extended that Ramac system to San Francisco, Atlanta, Dallas, and Denver.

We are in a peculiar position in GSA. We are on a constant growth pattern in almost every activity in the program services.

I will give you a few examples.

The sales from our stores depots in 1955 were \$80 million. In 1962, they were \$229 million.

The line items shipped from these depots were 2.4 million in 1955; in 1962, 5.4 million.

Our buildings management expenses—this is the operation, maintenance, and protection of buildings—has gone from \$135 million to \$285 million a year.

The vouchers we process in the accounting department, 600,000 to 1.1 million.

The accounting documents, such as billings, claims, inventory documents, went from 1.3 million to 2.9 million.

Mr. JOHANSEN. Is this all due to the increase in population we heard about yesterday?

Mr. ROUHANA. Not entirely. GSA's services to other agencies is growing each year. People are coming to us for more and more services because we are the central service agency of the Government in these housekeeping functions. Part of it you might say in the space area is due directly to Federal employee population growth, but in the case of supply area, for example, the Department of Defense, which was slow getting on what we call the GSA bandwagon for supply-support, is now rapidly coming in, not only in the continental United States, but all oversea installations are now buying from GSA.

We have a tremendous growth pattern which we have already been faced with, and which we expect to continue on into the future.

Now, to give you an example, the supply sales that I mention of \$229 million, actual in 1962 from the depots, is expected to triple in the next 3 years because DOD is really making a determined effort to use GSA facilities so they can concentrate on procuring the military end items.

We have a task force studying the possibility of GSA taking on the sales activity of the DOD surpluses. DOD has 34 sales centers around the country selling surplus. We have a joint task force with the Budget Bureau and DOD studying the possibility of taking that one function, just the sales activity, and melding it with the sales activities for the civilian agencies.

We have a new telecommunication system for the civil agencies which has just been approved by the Congress. Our present level is \$25 million. We expect that to go to \$100 million in about 4 years, servicing all agencies of the Government.

Now, these added workload factors certainly are going to have a further impact on our ADP setups in GSA. Today we have nine IBM 1401 machines in all regions, except region 3, where we have an IBM 1410.

We know that this is an interim device at the moment. These computers are not going to be large enough to handle the forecasted workload and we are going to have to move to a higher level piece of equipment some time in the future. I do not know when.

But with respect to the question that you are talking about, that Mr. Mahoney mentioned, about the impact on employees, I want to give you a couple of quick statistics to show you what the trend has been in GSA.

In 1955 we processed 600,000 vouchers. In 1962, we processed 1.1 million.

The average per man-year in 1955 was 2,400. The average in 1962 was 4,665.

Our productivity is just about doubled there, from 2,400 to 4,665. This is just an indication with mechanized equipment you can produce a great deal more work.

Mr. HENDERSON. Let me ask you this question with regard to the military and DOD.

Is your arrangement such that an on-base user of the common item that you are speaking about is able to process his order for this common item and have it delivered directly from GSA, or does it have to go through the Defense Department, or the Navy, or the Air Force Supply Agency?

I am thinking about warehousing. Are we cutting out the handling of these items?

Mr. ROUHANA. Under the Milstrip system, a single line item is prepared at the soldier-in-the-field level, so to speak. It comes directly to the GSA processing unit where it is shipped out of our warehouse if it is a stores warehouse item. It does not come through any intermediary in the military, to my knowledge. This is a straightline transaction, from the using installations to the GSA depot, shipped back out, and we bill from the central regional offices.

Mr. HENDERSON. Take the paper clip item. Say the military base at Andrews has a requisition for paper clips. Can they requisition that from the nearest GSA supply point and will it be delivered to the supply agency on the base? It does not have to go through an Air Force depot?

Mr. ROUHANA. No, sir. It goes direct.

Mr. WARBURTON. We also have retail stores, and they can come in and pick up certain items, which they do frequently.

Mr. JOHANSEN. What has the military been able to close down as a result of this shift of function?

I like this. It sounds good. What has been closed down as a result?

Mr. ROUHANA. I do not know of anything that has been closed down. I do know to the extent that they rely on GSA to supply them with common use items, their inventory levels for these same items are eliminated. They do not have to stock this item as they used to in all their many installations. Now they come directly to GSA for the common use items of supply.

We do have a savings to the Government in that one agency is stocking the inventory. There is no inventory investment, or carrying cost.

Since we only handle a very small portion of the total military use items, in the common use area, in relation to the total of which I am speaking, I am sure that just by taking out the paper clips, the desks, the pen sets, and the paper, and so on, they are not going to close down a warehouse unless they happen to have one that happens to handle just common use items.

The Air Force never did stock any of this material. They relied on GSA almost exclusively.

The Army and Navy are now coming along under our joint agreement with Tom Morris' shop over there. They are using the facilities of GSA more and more.

I illustrated this productivity angle. I will give you one other example of how you increase productivity by mechanizing the processing of billings, claims, and so on. Our productivity went from 2,500 a year to 9,500 a year from 1955 to 1962. We used to have 534 people, man-years expended in 1955 to process 1,300,000 documents. Today, with 313 people, or a reduction of 221 man-years, we are processing almost twice as many documents.

This is the advantage.

Mr. JOHANSEN. That is an impressive figure. That is the kind of information I like.

Mr. ROUHANA. These are published statistics in GSA official reports. I went back and checked the performance analysis statistics to be sure.

One other point I would like to make.

For internal GSA planning and operations for its own ADP needs, we are following the standard practices of feasibility studies determining output requirements, cost comparisons, and things of that nature.

Mr. HENDERSON. I wonder if you would furnish the subcommittee a list of the companies and the status of the 1963 contracts that you have negotiated out.

Mr. ROUHANA. I have it right here. I will be happy to submit it for the record.

(The list referred to follows:)

*Automatic data processing systems contracts awarded, Oct. 2, 1962*

Contractor	132-1 rental	132-16 purchase	132-23 maintenance
Advanced Scientific Instruments.....	Awarded	(1)	(1)
Bendix Corp.....	Submitted	Submitted	Submitted.
Burroughs Corp.....	Awarded	Awarded	Awarded.
Control Data Corp.....	do	do	Do.
Farrington Manufacturing Co.....	(1)	(1)	(1)
General Electric.....	Submitted	Submitted	Submitted.
General Precision.....	Awarded	Awarded	Awarded.
International Business Machines.....	Submitted	Submitted	Submitted.
Minneapolis-Honeywell.....	Awarded	Awarded	Awarded.
Monroe.....	do	do	Do.
National Cash Register.....	Submitted	Submitted	Submitted.
Philco Corp.....	Awarded	Awarded	Awarded.
Radio Corp. of America.....	do	Submitted	Submitted.
North American Aviation.....	Submitted	(1)	(1)
Scientific Data Systems.....	Awarded	Awarded	Awarded.
Sylvania.....	Submitted	(1)	(1)
Remington Rand.....	Awarded	Awarded	Awarded.

<sup>1</sup> Not submitted.

Mr. HENDERSON. Inasmuch as the jurisdiction of the Post Office and Civil Service Committee includes the National Archives, we were pleased to hear about the activities of the Archives and Records Service.

I assure you that the committee will follow their activities with interest and we appreciate you bringing this pertinent information to us this morning.

Mr. ROUHANA. I took the course myself yesterday to be sure I knew what I was talking about, a 2-hour briefing.

Mr. JOHANSEN. I have just one question—what rule does GSA have in relation to the Bureau of the Budget in the decisionmaking regarding the acquisition of new equipment by any given department?

Mr. ROUHANA. As I mentioned, we do issue the scheduled contracts for purchase, rental, and maintenance.

We have a team of negotiators made up of GSA, Army and Navy and Air Force personnel that deal with the companies. The military uses 74 percent—the major user in the Government.

I think our relationship with the Bureau is quite good. There is quite a bit of cooperation going on between the Bureau and ourselves on the Government-wide management aspects of ADP generally.

Mr. JOHANSEN. Let me be more specific.

Do you have any voice in saying to a department, "We do not think you ought to have this equipment"?

Mr. ROUHANA. No, sir; we have not.

Mr. JOHANSEN. Or do you have any voice in saying, "We think this is the type of equipment that will meet your needs?"

Mr. ROUHANA. No, sir.

We have had many requests from agencies for advice. For example, I can remember one of the small commissions called me and asked me if we could devote some staff time to analyzing a feasibility study and equipment selection that had been developed by the agency staff.

I told them we did not have the resources and suggested they contact the National Bureau of Standards who were experts and who did it on a reimbursable basis for other agencies. We did not have that kind of talent we could spare at the moment. We are heavily involved in our own internal operations. We do not provide a Government-wide service from that standpoint. We do not advise the agencies as to the proper kind of equipment, or whether it is suited to their particular needs, or things of that nature.

This is, I believe, one of the committee's recommendations about the service center which Mr. Seidman said was under consideration. This is the kind of thing you could visualize if you had a service center with trained personnel that smaller agencies could come to for advice, or even take on an application for them.

Mr. JOHANSEN. I think it is important we strengthen the controls so there is as competent and qualified a center of authority for making these decisions as possible.

Mr. ROUHANA. It is true.

No doubt there are probably some agencies in the Government who have either rented or purchased computers when they could probably have gotten it done cheaper some other way, or they should not have been in the computer business anyway. This is a possibility.

Mr. HENDERSON. You mentioned you were trying to get an inventory of the type and capacity of computers available throughout the Government. Certainly when that is done, the subcommittee could appreciate that information.

Would that information not be of great value to the service center in making plans?

You mentioned in GSA you have a computer that you anticipate will have to be larger. If this knowledge was known to a central agency, as other requests come in they might take the equipment from you.

Mr. ROUHANA. This cross utilization has many potentials. This is entirely possible.

Mr. HENDERSON. It would be important as we increase the ownership of the equipment.

Mr. ROUHANA. Yes.

The inventory I referred to was the one normally produced by the Bureau of the Budget, but by agreement we have agreed to do it from now on. The content of the inventory will be worked out with the Budget Bureau to see what kind of additional data we need.

I think we need specific identification of what is owned and leased, and we might have to go in a little more detail on the types of applications on hand on the computers in all the agencies.

I think that the last inventory has 116 IBM Rmac installations throughout the Government.

Mr. JOHANSEN. We are going to end up needing a computer to compute how many computers we have.

Mr. HENDERSON. We appreciate your appearance this morning. We thank you very much for your fine statement and your cooperation with the subcommittee. Your entire statement will be included at this point in the record.

Mr. ROUHANA. Thank you.

(The prepared statement follows:)

PREPARED STATEMENT CONCERNING THE USE OF ELECTRONIC DATA PROCESSING EQUIPMENT FOR ADMINISTRATIVE AND PROGRAM ACTIVITIES WITHIN GSA AND THE SERVICES PERFORMED BY GSA IN BEHALF OF OTHER FEDERAL AGENCIES IN CONNECTION WITH THE USE OF SUCH EQUIPMENT

(1) Agency planning prior to installation of equipment (the extent and effectiveness of feasibility studies, the background of decisions to shift to new or different equipment, etc.).

GSA comment: GSA planning prior to installation of equipment, whether for new equipment or for changes to existing configurations, is accomplished through accepted techniques. These techniques divide themselves into two major groups. The first is concerned with external regulatory guidance and instructional material, such as BOB Circular No. A-54, Policies on Selection and Acquisition of ADP Equipment; the second takes the form of internal policy and procedure. A full expression of GSA's policy for the selection, acquisition, and use of ADP equipment will be stated in chapter 1 of the revised GSA ADP Equipment Management Handbook (attachment No. 1).<sup>1</sup> The policies governing the relationship of equipment planning to project planning will be set forth in chapter 1 of the revised GSA ADP Project Management Handbook (attachment No. 2).

Equipment feasibility studies are conducted in a comprehensive, detailed, and systematic manner. A tabloid summary is always prepared in the conclusion section of each study, showing clearly, and in a form readily understandable to top management, the "disqualification process" for each competitive piece of equipment considered, giving the major reason(s) why it was disqualified in the selection process. Each major disqualifying reason is supported in turn by second level, more detailed supporting reasons. For example, if delivery must be guaranteed by a certain date, then the reasons why are fully documented and made a part of the file. Attachment No. 3 illustrates the disqualification process which led to the selection of interim equipment in 1961 to handle Milstrip (military standard requisitioning and issue procedure) which GSA agreed to implement into its supply system.

The background of decisions to shift to new or different equipment is usually embedded in both ADP planning decisions and operating management decisions, oftentimes making it difficult to pinpoint, isolate, and "select out" the logical trail of events which leads to these ultimate equipment decisions.

The selection of interim equipment in 1961 was perhaps an exception to this rule. Because of its tremendous impact, the management decisionmaking process was telescoped into a series of documented program planning documents which showed precisely how GSA was affected by the new military Milstrip system and what resources would be required to handle the system in terms of personnel, supplies, and ADP equipment. Attachments 4 through 8 are planning documents which give the background of the decisions which went into the selection of interim equipment to handle Milstrip. These documents evidence the primary features of the system, why GSA was implementing it, what program areas in GSA were involved and major problems anticipated, and required action at all levels.

<sup>1</sup> Attachments referred to have been received and are retained in the subcommittee file.

- (2) Effectiveness of the policies outlined in the Bureau of the Budget Circular A-54 and agency compliance therewith (efficient utilization of the equipment, lease versus purchase of equipment, interagency arrangements for machine use, etc.).

GSA comment: The publication of A-54 unquestionably served a long needed purpose to clearly set forth guidelines which Government agencies could follow in selecting the most appropriate rental or purchase method for the acquisition of ADP equipment, given their particular situation. Since the circular wasn't published until October 14, 1961, and since the acquisition of GSA's present equipment system was based on interim grounds, we have not had adequate opportunity to measure its effectiveness. Our present plans call for preparing a proposal for long-range equipment by the end of this year. We are presently developing the specifications for our existing and projected applications. We do anticipate that the provisions of A-54 will be of real value to us in our future planning.

GSA has made several arrangements with other agencies to cross-utilize equipment for program testing and debugging purposes. For example, one agency requested testing time recently on one of our machines. Arrangements were then made through the respective equipment manufacturer's marketing representatives of that agency and GSA to coordinate the availability of machine time. Such arrangements have been infrequent, however, because of the following practical considerations:

1. Scheduling another agency's requirements in consonance with our own is difficult because while we sincerely desire to be responsive to their needs, our own production time and testing requirements must have priority. More often than not, conflicts in scheduling, such as last-minute changes, are frustrating to the other agency.

2. Every computer program is designed for a specific equipment configuration. The person preparing the program naturally uses the equipment features provided to the best advantage. In order to run a program on another machine, the features used in the program must be available on such other machine. If the features incorporated in the program are not available on the other equipment, the program must be modified, at a considerable cost, before it can be run. Our experience to date is that it is most unusual to find equipment that is sufficiently similar to the equipment for which our programs have been written to permit us to run our programs without modifications. The Bureau of the Budget has taken the initiative to alleviate this problem by establishing an experimental sharing plan. The experimental Philadelphia regional sharing plan is being tested in the Philadelphia, Pa., regional area for a period of about 6 months, commencing in July 1962. Briefly, the plan calls for establishing a "computer sharing exchange" at which computer resources will be registered and which will serve as a focal point for inquiries and assistance covering sharing possibilities.

- (3) Manpower utilization in the initial planning, installation, and operational phases, and later in current planning and routine operations (training of employees, problems of recruitment, and turnover in this area).

GSA comment: Perhaps the best example this agency can offer by way of illustrating the planning aspects of manpower utilization during installation and operational phases is again to allude to the Milstrip effort. The timetable of that project was so critical and the scope of such a magnitude as to require the highest degree of effective utilization of our available personnel resources.

A team was convened, composed of representatives from the central office and each of the 10 regions. By way of initial planning, this team was charged with the responsibility of such things as (1) deciding whether to adopt Milstrip as a separate system or integrate it into the present system; (2) determine whether the existing EDP equipment could handle the recommended approach; (3) systems design and documentation, programing, testing, and debugging, and converting and finally installing the new system.

Such an effort could never have been handled without the closest form of coordination and the most complete kind of personnel utilization. Attachments 10 through 20 are the training and installation planning materials associated with the operational side of this project. They contain the necessary schedules for training and conversion, key review intervals to measure progress, etc. We felt they aptly illustrate the kind, extent, and duration of manpower utilization which is an essential part of ADP planning.

Cross-training of employees is, of course, accepted personnel administration policy. Results have been good and often have served to ameliorate the effect of

losses. Particularly is this true in the operations area where EAM operators are cross-trained as computer operators. Results are less significant in the programmer and analyst area, however. We have agreements with the Civil Service Commission to accept trainees under an ADP training agreement. These trainees have been of exceptional caliber and we are very pleased with the arrangement.

Recruitment and turnover continue to be a substantial problem. Losses to private industry and to other Government agencies are still attributable in large part to more attractive salaries.

The situation has improved somewhat in the last year largely as a result of the highly commendable efforts of our Personnel Division to more closely approximate our salary scale with that of competitive private enterprise. We are hopeful that with the administration's proposed legislation which is now pending before the Congress and continued efforts on the part of our Personnel Division, recruitment and turnover will not be problems of an insurmountable nature.

- (4) Efforts to increase use of byproduct statistical data in management decisions where primary usage of equipment is for inventory, supply, finance, or other type accounting; efforts to reduce and simplify business reporting requirements of the Federal Government by use of machine tape for records, etc.

GSA comment: As a general policy, explicitly spelled out in the GSA ADP Project Management Handbook, we have been able in several different applications to utilize byproduct statistical data in management decisions. In this manner, we are able to optimize and make multiple use of the same basic elements of data.

Two good examples are described below:

1. The workload analysis report is a statistical byproduct of the supply system, and makes use of "open to buy" item information on the master inventory record disk file to provide a report by commodity class to the Chief of the Buying Division in each of our 10 regions. The latter then uses this report as a tool to equalize the total buying workload among his buyers.

2. The inventory simulation report makes use of a statistical technique, mathematical simulation, to permit inventory management personnel to establish the optimal ratio of the dollar of sales to the dollar value of inventory on a projected basis. In this manner, budget forecasts are made against a more accurate framework and variations of actual inventory and sales against the projected figures can be compared analytically.

With regard to the question of efforts to reduce and simplify machine reporting requirements of the Federal Government by the use of machine tape for records, there are several examples which could be cited. Among the more significant of these is the current programming of the so-called Government owned and leased real property reports for Congress on one of our tape systems. It is intended that eventually the complete inventory of all Government owned and leased real property will be maintained on magnetic tape. Normal business as well as special reports can then be generated. An example of the business type is the generation of a "rent roll" tape to be used to generate automatic paying documents to lessors for all Government-leased space. An example of the special type report is the statistical summaries prepared annually for Congress on all real property, owned and leased.

The ADP space management system as it is called (which we are currently installing) is designed to produce a series of prescribed reports (monthly, quarterly, annually) for use in regional and central office by operations and management personnel to assist in making decisions and discharge of assigned functional responsibilities. In addition, the system contains or can automatically generate additional statistical data as a byproduct. For example (1) with criteria developed by PBS it is possible to select those buildings where utilization of space per person exceeds X number of square feet; (2) comparison of agency and/or bureau space holdings by like activity can be made; (3) comparison of rental cost by agency in leased buildings by geographical area; and (4) nationwide utilization of office space (average net assignable square feet per person) for federally owned space compared to leased space—under control of GSA.

- (5) Progress of the Interagency Committee on ADP as a Federal clearinghouse for the exchange of EDP information.

GSA comment: The concept of a Federal clearinghouse for the exchange of EDP information is a good one. Further, widespread interagency representation on a committee for such a purpose is self-evident. The many fine working committees have turned out some excellent material that has been of real value

to the agencies. Among these, were the development of a standard glossary of computer terms and the developmental work which was used by the BOB in Circulars A-54 and A-55 and Bulletin 60-6, which generally deal with the management of data processing. Moreover, the Committee's general meetings have provided a very useful forum for the effective exchange of EDP information. The very helpful guidance of the Bureau as the sponsoring agency has been largely responsible for the successful efforts of the committee's endeavors.

(6) Providing guidance in the negotiation of contract terms for such equipment.

GSA comment: At the request of the Department of Defense, GSA developed Federal supply schedule contracts for the rental of automatic data processing systems beginning in 1956. Punched card machines had been covered by Federal supply schedules for a number of years prior to that time. These contracts are negotiated under the authority of section 302(c)(10) of the Federal Property and Administrative Services Act of 1949, as amended. In order to assure that the contracts for ADPS were responsive to the needs of the Government, a negotiating team was established in 1955 comprised of representatives of GSA, Air Force, Army, and Navy.

For the first few years the offerors submitted their commercial ADPS rental terms and conditions which were used as a basis for negotiation. The negotiating team was successful in obtaining more advantageous terms and conditions. It was determined in 1958 that the negotiating team should develop standard uniform terms and conditions applicable to the Government's requirements which would be used as a new basis for negotiation. It was realized that it would not be possible to obtain the exact terms and conditions for each contractor, but generally a reasonable degree of similarity was considered desirable. Such uniformity would be of great value to using agencies in determining the equipment to be obtained. Information is furnished to ordering offices on the Government's desired terms, and deviations therefrom negotiated with the several contractors.

The following is a list of the major improvements and benefits that have been obtained on the rental of ADPS for the Government by the negotiating team in the past several years:

(1) Rental contracts for ADPS were placed on a "use" instead of "availability" basis. Under the availability basis the rental rate was computed on a period of 8 consecutive hours, 176 hours a month. Any use of the equipment at other times was paid by the Government as extra shift rental. Under the use basis no extra shift rental is paid until the equipment is used 176 hours in the month.

(2) A standard of performance was developed to require that the equipment perform for a 30-day period before rental will be paid.

(3) Liquidated damages were included for failure to install the equipment by the specified delivery date.

(4) The date for computing liquidated damages was changed from the date of delivery to the date of installation.

(5) A provision was included that a system may be discontinued by the Government upon 90 days' notice and on an individual machine by 30 days' notice.

(6) A provision was included to provide that when a Government agency is converting from one machine or system of a contractor to another machine or system of the same contractor, there will be no rental charge for the first installed machine or system for a conversion period up to 30 days.

(7) The amount of free program testing furnished by the contractor has been increased.

It is anticipated that use contracts will be available in fiscal year 1963 for punched card machines.

The negotiating team will continue to improve the terms and conditions for rental, purchase, and maintenance of automatic data processing systems and punched card machines as the needs of the agencies develop, and as the competitive conditions within the industry make this possible.

(7) Providing guidance in the construction and maintenance of facilities for such equipment in public buildings.

GSA comment: Effective August 1, 1962, our Public Buildings Service inaugurated an expanded program for site preparations for EDP equipment.

EDP facilities require independent electrical wiring and air-conditioning systems. Such installations also require a special floor, special fire protection, space for tape storage, and space for office and related facilities to support the EDP operation. EDP facilities can be provided in new Federal office buildings and most existing public buildings without any unusual problems in design and

construction. In instances involving older existing buildings which are not readily adaptable to change in use, the alterations required to accommodate an EDP unit may be more costly than providing the facility by an alternative method such as through new construction.

In the design of new Federal office buildings consideration should be given to the allocation of space for future EDP installations. This practice would offer savings in the alteration of such buildings for future EDP installations.

In the interest of offering guidelines to all Federal agencies for fire protection of electronic equipment, GSA has sponsored the preparation and issuance of a handbook of recommended practices, RP-1. This handbook covers fire protection for installation and use of EDP equipment. A copy is attached hereto (attachment No. 22).

A major problem which GSA has experienced in providing accommodations for EDP centers has been the short leadtime offered by agencies for acquiring and altering space to accommodate their equipment. This short leadtime has presented problems in meeting completion dates which are to coincide with equipment delivery dates.

(8) Providing guidance for the retention and disposal of records promotion and conduct of interagency training in source data automation (SDA).

GSA comment: As used in this document, "data processing" includes the creation, collection, recording, transmission, maintenance, organization, use, compilation, storage, retrieval, and disposition of repetitive information.

Under the Federal Records Act of 1950 the Administrator of GSA (sec. 505) is responsible for:

"(a) \* \* \* the economical and efficient management of records of Federal agencies (1) by analyzing, developing, promoting, and coordinating standards, procedures, and techniques designed to improve the management of records, to insure the maintenance and security of records deemed appropriate for preservation, and to facilitate the segregation and disposal of records of temporary value, and (2) by promoting the efficient and economical utilization of space, equipment, and supplies needed for the purpose of creating, maintaining, storing, and servicing records.

"(b) The Administrator shall establish standards for the selective retention of records of continuing value, and assist Federal agencies in applying such standards to records in their custody; and he shall notify the head of any Federal agency of any actual, impending, or threatened unlawful removal, defacing, alteration, or destruction of records in the custody of such agency that shall come to his attention, and assist the head of such agency in initiating action through the Attorney General for the recovery of such records as shall have been unlawfully removed and for such other redress as may be provided by law.

"(c) The Administrator is authorized to inspect or survey personally or by deputy the records of any Federal agency, as well as to make surveys of records management and records disposal practices in such agencies, and shall be given the full cooperation of officials and employees of agencies in such inspections and surveys: *Provided*, That records, the use of which is restricted by or pursuant to law or for reasons of national security or the public interest, shall be inspected or surveyed in accordance with regulations promulgated by the Administrator subject to the approval of the head of the custodial agency.

"(d) The Administrator is authorized to establish, maintain, and operate records centers for the storage, processing, and servicing of records for Federal agencies pending their deposit with the National Archives of the United States or their disposition in any other manner authorized by law; and to establish, maintain, and operate centralized microfilming services for Federal agencies.

"(e) Subject to applicable provisions of law, the Administrator shall promulgate regulations governing the transfer of records from the custody of one executive agency to that of another.

"(f) The Administrator may empower any Federal agency, upon the submission of evidence of need therefor, to retain records for a longer period than that specified in disposal schedules approved by Congress, and, in accordance with regulations promulgated by him, may withdraw disposal authorizations covering records listed in disposal schedules approved by Congress."

The Administrator of General Services, acting through NARS, cannot carry forward the above responsibilities without getting involved in data processing. For convenience of discussion, the approach by NARS to developments in the field of data processing is taking these forms:

1. *Promotion and conduct of interagency training in source data automation (SDA).*—In the fall of 1960 the Bureau of the Budget recognized that another

body of management techniques had arisen which were associated with the mechanization of paperwork processing. These techniques involve the initial recording of data at the source of the data and maximum automatic handling throughout the entire paperwork cycle. These techniques have grown to be recognized as and called source data automation (SDA), set forth in an attached article from the Systems and Procedures Journal.

In a letter dated November 15, 1960, the Bureau of the Budget stated that "SDA has emerged as a recognized management technique and since it offers potential advantages over manualized operations, the Bureau considers that a Government-wide effort should be undertaken to exploit SDA for the Government much in the same manner as ADP." Accordingly, the Bureau requested General Services Administration to "program its work in the paperwork management area to give emphasis to SDA."

Source data automation integrates dissimilar office machines into a coordinated mechanized paperwork system. It utilizes conventional office machines, such as typewriters and bookkeeping machines, for many mechanized operations. It provides, as a byproduct of other necessary operations, a direct and efficient means of communicating with some of the complex electronic data processing equipment.

General Services Administration, National Archives and Records Service, in compliance with the Bureau of the Budget letter, developed a 40-hour source data automation workshop. Since November 1960 over 200 persons in the metropolitan area, from various Government agencies, have attended this workshop. A session is held each month with a maximum of 20 participants. Participants are GS-9 or above in such categories as methods analysts, management analysts, records officers, data processing analysts, and digital computer specialists, as well as subject matter specialists.

A sample agenda for a source data automation workshop is attached along with a workshop brochure. In May 1962 the content of the various sessions listed on this agenda were "packaged" for field use. Each regional director, National Archives and Records Service, is now equipped to present this workshop to participants in their geographical area.

The booklet prepared for use by instructors is also attached. It was prepared to assist regional offices to present the workshop. It is also available for agency personnel who propose to present this workshop themselves to their agencies.

Also attached is the student kit given each participant in a source data automation workshop. This booklet has been prepared to provide the participants with reference documents of the subject matter of the workshop. It includes a library of successful operating programs which has been duplicated for distribution to agencies. This file of workable applications alone has been highly useful to Federal executives.

2. *Issuance of standards on disposing of records in tape form.*—The National Archives and Records Service has been studying the matter of disposition of magnetic tape and other media created from the use of electronic data processing equipment for some time. A preliminary study was conducted in 1961 to determine the current disposition practices and the future possibilities for storage of data of long-term or permanent retention value on magnetic tape; and the relationship between the erase and reuse techniques in EDP and the Records Disposal Act of 1943 which requires congressional authority for disposal of Federal records. Interviews with persons directly involved in EDP operations and agency records management officials were the principal factfinding techniques employed.

The resultant findings and tentative conclusions were incorporated in a transcript of a training lecture entitled "Records Disposition and Magnetic Tape," copy attached. The study disclosed that few agencies had developed formal plans for disposition of magnetic tape. Most agencies regarded the tape as a working tool and not as records as defined in the Records Disposal Act. Observations of many EDP operations, at that time, generally bore out this conclusion since the input and/or output documentation could be considered the record information governed by the provisions of the Records Disposal Act. However, it was recognized that there were instances, and more could be expected in the future, where the information on tape would be the sole documentation. In such cases erasure or reuse techniques should be carefully scrutinized to prevent the loss of necessary data and to provide for the proper long-term documentation. Attention to this aspect of EDPS has more recently been given by the Navy Department in the Secretary of the Navy Instruction of June 21, 1961 (P5212.5B, ch. 1, par. 13), copy attached.

The findings of the study as to whether tape itself can safely replace long-term or permanent records were inconclusive. Such factors as machine incompatibility

in transferring tape from one machine to another, expense of machine time for reference purposes in archival operations, and uncertainty as to the lasting quality of tape led to the tentative thought that data of long-term or permanent value should be recorded on paper, microfilm, or other media of proven durability. Further study is admittedly needed. NARS is planning a more definite study of both the disposal and documentation problems and other effects of EDPS on recordkeeping practices of the Government. Although the preliminary study was made available to records management officials on request, it is hoped that from the more complete study a handbook can be prepared as a guide to agency officials with conclusive recommendations in regard to documentation and disposal.

3. *Consultative advice and assistance to agencies conducting feasibility surveys.*—Once the capabilities of NARS became known in automating the processing of data, it was to be expected that agencies would seek assistance. Within its personnel resources NARS has responded.

Within the last 6 months help has been given to (1) ICC in its 1-percent sampling of railroad waybills; (2) FDA in tabulating the results of its inspections; (3) USCS in keeping a perpetual inventory of its records holdings; (4) State Department in certain personnel operations; and (5) AID, also in the personnel field.

4. *Cooperation with the Interagency Committee on Automatic Data Processing.*—NARS renders continuing assistance to the Interagency Committee on Automatic Data Processing in the training area. The Assistant Archivist, Office of Records Management, serving as the Chairman of the Task Force on Bibliography, produces a monthly review of the significant works on data processing. Attached are samples of this work.

Another member of the staff is assisting the Committee in the preparation of a glossary of data-processing terms. The bibliography is proving very helpful to those persons having ADP responsibilities.

5. *Problems requiring attention.*—(a) NARS next needs to provide the same standards, based on research, in the field of automated information retrieval. Since much agency information is stored in correspondence files, this amounts to automating such agency files. So far almost none of this has been done in the Federal Government. Agencies indicate the need for guidance.

Guidance can be provided in much the same way as has been done for source data automation—a workshop, a library of successful applications, handbooks, and simulated problems to work to see how automated information retrieval works.

(b) Not enough agency feasibility surveys include the agency records management officer as part of the ad hoc study group. This results in a number of records problems being ignored and overlooked. Later on, to correct this oversight is usually needlessly costly.

**STATEMENT OF CARL W. CLEWLOW, DEPUTY ADMINISTRATIVE ASSISTANT SECRETARY, DEPARTMENT OF THE TREASURY, ACCOMPANIED BY NICHOLAS SCHAUER, OFFICE OF THE SECRETARY, AND GEORGE LEIBOWITZ, OFFICE OF THE ASSISTANT COMMISSIONER FOR PLANNING AND RESEARCH, INTERNAL REVENUE SERVICE**

Mr. CLEWLOW. I would like to introduce the two members with me.

On my left, Mr. Nicholas Schauer, who is in the Office of the Secretary, and on my right, Mr. George Leibowitz from the Internal Revenue Service, from the Office of the Assistant Commissioner for Planning and Research. Mr. Leibowitz is the Director of the Systems Development in Internal Revenue.

These are the offices most closely concerned with the problems of data processing.

I have a very short prepared statement I will leave with you and attempt to summarize that.

(Prepared statement of Mr. Clewlow follows:)

PREPARED STATEMENT OF DEPUTY ADMINISTRATIVE ASSISTANT SECRETARY  
CARL W. CLEWLOW, TREASURY DEPARTMENT

Mr. Chairman and members of the subcommittee, on behalf of the Secretary of the Treasury, we appreciate the opportunity to appear before you today to discuss the management of automatic data processing activities.

As you know, the Treasury Department, through the Office of the Secretary and 12 operating bureaus, carries out its responsibilities in a diversity of areas including—

- Fiscal, monetary, and public debt policy development and operations;
- Tax and tariff policy development and internal revenue and customs operations;
- International financial activities;
- Supervision of activities of national banking associations;
- Manufacture, custody, and distribution of currency, coin, and bullion;
- Law enforcement in the areas of counterfeiting, forgery, narcotics, tax fraud, and smuggling; and
- Administration of laws relating to navigable waters subject to the jurisdiction of the United States.

The Secretary has assigned to officials in the Office of the Secretary the responsibilities of general supervision of the several activities of the Department. The responsibility for the general management of the resources of the Department—the equipment used, the money provided, and, that most valuable of all our resources, over 84,000 civilian personnel—has been assigned to the Administrative Assistant Secretary.

The Treasury Department will have among its resources, at the end of this fiscal year, 36 electronic digital computers. The operation of these computers and other automatic data processing equipment and the management of the systems of which this equipment is a part utilizes nearly 4,000 employees and will cost over \$30 million.

Offices and bureaus in the Treasury Department have increased their attention to and efforts in developing and utilizing automatic data processing systems in the 2 years that have passed since this committee previously held hearings. Within the Office of the Secretary a reorganization of the Office of Management and Organization has been accomplished. As a result of this action there is an increased emphasis on improvements in the operations of the Department. One aspect of this emphasis is the development of policy and guidelines on the management of automatic data processing. The Secretary has indicated his personal interest in this area. He has delegated responsibilities for appraisal of ADP activities to the Office of the Administrative Assistant Secretary.

As an example, we have recently completed a departmental review of lease versus purchase of ADP equipment. This review has led to the determination that additional computers should be purchased. By the end of fiscal 1964, the Department will have purchased one-third to one-half of its computers. These purchases will result in well over \$2 million a year savings after the cost advantage point has been reached.

The Department is sensitive to the human implications of the introduction of computers into its operations. More than 3,000 employees (less than 5 percent of the Department's total civilian employees) were assigned to operations affected by the introduction of computers during the 6-year period from July 1956 to June 1962. Through careful attention by management, we have been able to place the majority of these employees either in the new ADP operations or in other positions. The key to our success in minimizing impact on employees is a positive attempt to plan well in advance, providing training opportunities for employees about to be displaced, and using every administrative device possible to assure that these employees can continue to utilize their knowledges and skills within the Department.

The Internal Revenue Service is now in the midst of converting to its new ADP plan. This plan represents a dramatic step forward in tax administration by providing for a consolidated central file against which all tax transactions can be processed. Commissioner Caplin has informed us that he regards the pilot operation in the Atlanta Regional Service Center as a success. Accordingly, Internal Revenue is moving ahead with the plan and the Philadelphia region will go into operation in January 1963. Since the magnitude of the master file plan is so great, care has been exercised to schedule each step of the implementation so as to keep the program within manageable proportions. The regional service centers are being activated gradually and the operations within each of these service centers are expected to be phased in over a span of 3 years.

IRS has recognized from the outset that the effect on employees was one of the principal considerations in the plan for conversion to ADP. Since there are over 6,000 employees who will be affected, it is essential to avoid, if at all possible, reductions in force and involuntary transfers to other commuting areas. At the same time, we have emphasized the necessity of placing the maximum number of affected employees in productive jobs in other work areas, thereby utilizing invaluable skills and experience. These personnel objectives played an important part in the decision to phase the original conversions over a period of years and within each region a little at a time. Personnel will be redeployed on an orderly basis, to complete established minimum staffing goals. IRS's redeployment plan features (a) full understanding and support of the plan at all management and supervisory levels, (b) a complete and continuing information program to let employees know how conversion affects them, (c) the application of a variety of special management techniques developed to facilitate maximum redeployment and fullest utilization of skills, and (d) training to equip affected employees with the skills needed for reassignment to positions in the new service centers or other Service activities.

The Bureau of Accounts is establishing electronic data processing centers in its Kansas City, Birmingham, San Francisco, and Philadelphia regional disbursing offices and is revising the equipment located in the Chicago regional disbursing office. Primary impetus for the use of computers by the Division of Disbursement results from expanded use of computers by the Veterans' Administration in its veterans' benefits payment activities, the Social Security Administration in its social security benefit accounting work, and by the Internal Revenue Service in its tax refund program. The installation of these computers, which are being purchased, culminates 4 years of planning efforts.

Because of the centralization of workload in the new computer-equipped disbursing offices, the Bureau of Accounts has closed seven regional disbursing offices. In addition, it has reduced the number of employees on the rolls of many of the remaining disbursing offices. The Bureau has taken positive steps to assure that the impact on the employees of all these offices was minimized. Reductions in force were avoided by providing advance notice to employees, putting a freeze on permanent recruitment, use of temporary employees during the transition period, and developing a nationwide placement program. As of this date, none of the over 400 employees affected has been involuntarily separated.

Earlier this year the Bureau of the Public Debt installed new computer equipment replacing that previously installed in its Parkersburg office in 1958. The new system became fully operative in May 1962; its installation had no adverse impact whatever on personnel and resulted in an estimated annual savings in equipment rental costs of \$450,000. The Bureau is purchasing its computer this month.

Because the volume of redeemed paper savings bonds is steadily being reduced, the Bureau decided to close its Cincinnati audit branch. The closing of this office should result in a savings of about \$100,000 annually. The announcement of the closing was made in March 1962 and it will be finally closed later this year. Every attempt is being made to place the employees of this office in other positions.

The Office of the Treasurer, United States, installed and purchased updated computer equipment in July of this year. This revised equipment enables performing more work in 5 days, at less cost, than could be achieved with the former computing system in 7 days of operation.

As a result of studies conducted jointly by the Post Office Department and the Treasury Department, an agreement was reached that the Office of the Treasurer will use its computer to process paid money orders for the Post Office Department. This project is now underway and is scheduled for completion by April 1963. It is estimated that these joint efforts will result in an estimated savings to the Government of about \$650,000 annually.

The impact that automatic data processing has, and will continue to have, on the operations, organization, and employees of the Department warrants special care and attention. We have prepared a statement on (1) the central management of ADP in the Department, (2) planning prior to installation of ADP equipment, (3) the effectiveness of Bureau of the Budget policies on ADP, (4) manpower and ADP, (5) use of byproducts of ADP operations in management decisions, and (6) the progress of the Interagency Committee on Automatic Data Processing.

As requested by the subcommittee, this statement concentrates on the activities in the Office of the Secretary, Internal Revenue Service, Bureau of Accounts, Public Debt, and the Office of the Treasurer, United States.

With your permission, I would like to submit this information for the record, and would be pleased to discuss the contents with you.

THE TREASURY DEPARTMENT—INFORMATION ACCOMPANYING THE STATEMENT GIVEN BY DEPUTY ADMINISTRATIVE ASSISTANT SECRETARY CARL W. CLEWLOW

*Departmental management of ADP*

1. *Organization of staff.*—The Office of Management and Organization, in the Office of the Secretary, was reorganized in 1961 to provide more effective support in discharging the responsibilities of the Administrative Assistant Secretary for managing resources of the Department. (A detailed list of the responsibilities of the Office of Management and Organization is contained in Administrative Circular No. 55, exhibit No. 1.)

2. *Policy issuances.*—The Office of the Secretary has issued several instructions on matters relating to ADP since 1953. As a result of the rapidly increasing use of ADP equipment and the resulting impact on the operations of the Department, a comprehensive review of these policies was initiated in 1961. The result of the review was the issuance of a circular on the "management of automatic data processing" (exhibit No. 2).

The Secretary sent a letter to the heads of bureaus on July 5, 1962, calling attention to the circular and stating in part:

"The circular is designed to (1) implement the recent BOB circular on the selection and acquisition of ADP equipment; (2) to provide guidelines for the development and management of ADP systems; (3) to establish a basis for evaluating the management of ADP operations; and (4) to coordinate proposed plans for the acquisition of ADP equipment or services."

The Office of the Secretary has also issued other policy statements relating to ADP matters:

A circular on cooperative arrangements among Treasury bureaus (exhibit No. 3);

A circular on policies on the procurement of supplies, equipment, or services (exhibit No. 4);

A circular, implementing Bureau of the Budget Circular No. A-55, calling for annual reports on utilization of ADP equipment;

A bulletin transmitting Bureau of the Budget Circular No. A-54; and

A bulletin calling for a one-time review of current or pending lease transactions for automatic data processing equipment.

3. *Review of proposed acquisitions of ADP equipment or services.*—There is a departmental requirement that proposed acquisitions of ADP equipment or service by Treasury bureaus be submitted to the Administrative Assistant Secretary for approval, if the proposed action meets certain criteria.

These requests are reviewed to assure—

(a) That appropriate approval of the objectives of the data processing system has been obtained;

(b) That appropriate systems studies have been made;

(c) That the process of selection and the proposed method of acquisition conforms to departmental requirements; and

(d) That financial, personnel, and organizational plans are complete.

During fiscal year 1962, the Office of the Secretary reviewed 19 requests relating to the initial acquisition, change, or purchase of ADP equipment or obtaining ADP services.

4. *Appraisal of ADP operations*—Within the past year, the Office of the Secretary has developed a program to conduct appraisals of field operations. A part of that program is a review of operations at ADP installations. The general objectives of these appraisals are to identify—

(a) The degree of accomplishment of the ADP operation as measured against expectations;

(b) Whether or not satisfactory cost-benefit relationships have been obtained;

(c) Areas needing improvement;

(d) Requirements for future developments; and

(e) Adequacy of plans, policies, and guidelines.

During fiscal year 1962, staff of the Office of the Secretary visited four ADP installations to conduct preliminary reviews.

5. *Coordination with bureaus.*—Some time ago, the Department established an ADP subcommittee of the Treasury Management Committee. This subcommittee is composed of representatives from each Treasury bureau who have

knowledge of ADP activities. The objectives of the committee are to resolve problems of common interest and to serve as a means of information exchange in this rapidly changing activity.

6. *Coordination with other agencies.*—The Department has participated in the activities of the Interagency Committee on Automatic Data Processing established by the Bureau of the Budget.

The Treasury Department, recognizing that there is a growing interest throughout the Government in the use of electronic data processing systems for large-scale accounting and related operations, issued Department Circular No. 1035 on November 30, 1959 (exhibit No. 5). This circular states in part:

"All agencies that decide to study the feasibility of magnetic tape systems or that have already made decisions to install such systems for programs which directly or indirectly affect the banking or disbursing functions of the Treasury, or both, are requested to communicate with the Fiscal Assistant Secretary, with a view to developing the most advantageous coordination between agencies and the Treasury in these operations."

#### OFFICE OF THE SECRETARY

##### A. *Planning prior to installation of equipment*

Circumstances which may influence any decision to acquire new or to change existing ADP equipment can be classified generally into factors internal or external to the organization.

Within Treasury organizations, there are two significant factors. One is a continuing review to stimulate efficiency and economy in existing operations. The other is the identification and resolution of problems which reduce the effectiveness of carrying out assigned responsibilities.

Three significant influences, external to Treasury organizations, are—

- (a) Changes in policies or objectives by the executive or legislative branch;
- (b) Changes in other agencies' data processing systems which are related to systems within the Department; and
- (c) Changes in equipment or systems technology and techniques.

Each of these three factors feed back as a stimulus to considering new or a change in existing ADP equipment.

Accordingly, basic Treasury policy requires that all bureaus consider the potential use of automatic data processing equipment in their data processing activities. Also, periodic inventories of data processing activities are made in order to establish relative priorities and time schedules to consider the use of ADP equipment.

Experience in the Treasury Department shows that the extent and effectiveness of studies preceding the acquisition of equipment will vary considerably depending on a number of factors, such as—

- The extent to which top management provides direction;
- The kinds of objectives given to those conducting the studies;
- The relative priority of resolving competing or conflicting problems within the organization;
- The size and quality of the staff available to conduct the study;
- The experience that the organization has had with data processing and the conduct of studies;
- The kind and quality of study and analytical techniques available for use; and
- The size, scope, and complexity of the data processing system under study.

The Office of the Secretary has issued a policy statement which provides guidelines or standards to be followed in order to increase the effectiveness of studies leading to the acquisition of ADP equipment.

One part of this statement requires a preliminary, or feasibility, study prior to undertaking large-scale systems studies. These feasibility studies identify data processing problems and develop general conclusions concerning the functions and processes involved, their essentiality, and whether there is a reasonable expectancy that the introduction or revision of ADP equipment or services would contribute to the resolution of the problems.

When the preliminary study indicates that introduction or revision of ADP equipment or services would be beneficial, a systems or application study is initiated.

Although it is difficult to specify precisely the nature of such studies, the systems studies are sufficient in scope to provide a factual basis for—

Designing the systems, procedures, and methods to be employed in performing these functions or processes, so as to achieve the highest practicable degree of effectiveness, maximum efficiency, and operational economy;

Developing specifications for required resources including personnel, supplies, equipment, or services; and

Preparing a comparative analysis of the immediate and long-range costs and benefits of the proposed versus the old system.

Another major phase of activity, following the systems study phase and after the selection of equipment, which requires considerable planning, is the conversion phase. To insure effectiveness of planning during this phase, readiness reviews are required to be made 1 to 3 months prior to the delivery of equipment. Such reviews provide a reasonable assurance that when ADP equipment is delivered, it will be used as fully as possible for productive work. Elements considered during readiness reviews include—

- Is the site ready to receive equipment;
- Have operating procedures and manuals been written;
- Have the programs been tested and debugged;
- Are they ready to convert basic files and records;
- Have forms and supplies been acquired;
- Have personnel been recruited and trained; and
- Are they ready to commence operations?

#### *B. Effectiveness of policies outlined in Bureau of the Budget Circular No. A-54*

When discussing the effectiveness of any policy issued at the higher levels of Government, it is useful to consider carefully to what degree it is interpreted and implemented and the effect that the implementing actions have on the effectiveness of Government operations.

The Treasury Department agrees with the thought expressed by the Director of the Bureau of the Budget in a recent speech:

"I take it the key to improvements in the efficiency of governmental operations is the responsibility of the Cabinet officer and agency head. Presidential staff can suggest, advise, and assist. Congressional committees can probe, explore, and needle. But the necessary leadership must be forthcoming from the agency head if progress is to be made."

The Treasury Department has issued a policy statement to implement Bureau of the Budget Circular No. A-54. A description of this issuance is discussed under the heading "Departmental Management of ADP."

Bureau of the Budget Circular No. A-54 addresses itself, either directly or indirectly, to several facets in the management of ADP. Paragraph 3 of the circular states that the policy provisions become applicable when a determination has been made that the utilization of ADP equipment is essential and assumes that the determination was based on an adequate study. A discussion of Treasury's implementation of this condition is carried under the heading of "Planning Prior to the Installation of Equipment."

Paragraph 4 of the Bureau of the Budget circular relates to the selection of equipment. This statement, in effect, reaffirms basic procurement policy of the Federal Government, i.e., to provide equal opportunity to all manufacturers of equipment, and assure procurement at least possible cost by careful determination of requirements and facilitation of the competitive process. Prior to the issuance of Bureau of the Budget Circular No. A-54, the Office of the Secretary issued Administrative Circular No. 48 (exhibit No. 4) which addressed itself to this same subject. Both of these issuances have been incorporated by reference in the Department's recent circular on "Management of Automatic Data Processing" (exhibit No. 2), which states in summary:

"The selection of ADP equipment or services will not be made until non-equipment-oriented specifications are available as a basis for selection and all qualified suppliers of equipment or services have been given equal opportunity to show how their equipment or service would meet the specifications; and

"The two prime factors to be considered in selection of ADP equipment or services are the capability of the equipment or service to meet the specifications and the overall cost of converting to and operating the system."

References to equipment acquisition are contained in paragraphs 5 and 6 of Circular A-54. They relate to the method of acquiring ADP equipment, whether by lease, lease with option to purchase, or by purchase.

The Treasury Department has studied carefully and participated actively in the development of policies on whether to lease or purchase computers ever since

a task force of the second Hoover Commission raised the question on a Government-wide basis in 1954.

In the past, several significant problems have tended to preclude purchase of computers. First, one of the major suppliers of such equipment offered only the lease method of acquisition until 1956. Rapid technological advances in a new field led to uncertainty as to the reliability of the equipment and fear of acquiring equipment that would be less than the best for the job to be done.

Within Government agencies, concern was expressed about the possible lack of flexibility resulting from purchase, especially in systems subject to rapid changes as a result of influences external to the organization. Also, funding for purchase, especially for smaller organizations having separate appropriations, raised concern about the acceptance of budgets which would show an increase over prior years solely because equipment would be purchased instead of leased.

Finally, there was a lack of generally acceptable guidelines which would provide standards for cost comparisons and other criteria for determining whether such equipment should or should not be purchased.

These problems were studied extensively by the Interagency Committee on Automatic Data Processing, the General Accounting Office, the Bureau of the Budget, and committees of Congress. The result of these activities was the issuance of the policies and guidelines contained in Bureau of the Budget Circular No. A-54.

The Treasury Department believes that experience in the use of computers, the significant advances in computer technology which have provided a diversity of sizes and capacities of equipment, and the issuance of guidelines which are workable and enable reasonable judgments on whether to lease or purchase equipment, combine to enable positive consideration of the course of action which will best serve the interest of the Government.

The Office of the Secretary has adopted the guidelines contained in Bureau of the Budget Circular No. A-54 for use in considering methods for acquiring computers within the Department. In summary, the guidelines are as follows:

(a) The purchase method is preferred when—

(1) The systems study \* \* \* has established a reasonable expectancy that the ADP equipment can be successfully and advantageously used.

(2) A comparative cost analysis \* \* \* indicates that a cost advantage can be obtained by the purchase method in 6 years or less after the date of delivery.

(3) The capabilities of the ADP equipment will continue to be needed and will be sufficient to satisfy the system requirements, current and projected, for a period beyond the point in time at which the purchase method begins to provide a cost advantage.

(b) The lease-with-option-to-purchase method is indicated when it is necessary or advantageous to proceed with the acquisition of the equipment \* \* \* but it may be desirable to defer temporarily a decision on purchase because conditions indicating purchase are not fully met.

(c) The lease method \* \* \* is indicated only when it is necessary or advantageous to proceed \* \* \* and it has been established conclusively that any one of the conditions under which purchase is indicated is not attainable.

The Treasury Department took its first steps toward purchase of computers over a year before the formal issuance of the policies discussed above. After discussions with the House Appropriations Committee, two bureaus included funds for options to purchase in their fiscal year 1962 budget estimates and subsequently included funds for purchase in the fiscal year 1963 budget estimates.

The Office of the Secretary, in complying with the provisions of paragraph 6 of Bureau of the Budget Circular No. A-54, undertook a review of all current and pending lease transactions to determine whether further purchases would be to the advantage of the Government. Subsequent to the one-time review, each transaction for the acquisition of equipment has been and will continue to be reviewed in terms of the policy guidelines.

The result of these reviews and actions are summarized in tables I and II. By the end of fiscal year 1964, over a third of the computers in the Department will have been purchased. The tables show that after the cost advantage point has been reached, annual savings in excess of \$2 million will result from purchasing rather than leasing.

TABLE I.—Comparative analysis of projected expenditures for computers actually purchased through Aug. 1, 1962

Expenditures	Fiscal year					
	1963	1964	1965	1966	1967	1968
Purchase expenditures:						
Net purchase price.....	\$1,496,000	-----	-----	-----	-----	-----
Annual maintenance expenditures.....	21,000	\$21,000	\$21,000	\$21,000	\$21,000	\$21,000
Total, annual purchase expenditures.....	1,517,000	21,000	21,000	21,000	21,000	21,000
Annual lease expenditures.....	621,000	621,000	621,000	621,000	621,000	621,000
Expenditure comparisons:						
Annual lease expenditures exceeds annual purchase expenditures.....	(896,000)	600,000	600,000	600,000	600,000	600,000
Cumulative savings by purchase.....	(896,000)	(296,000)	304,000	904,000	1,504,000	2,104,000

NOTE 1.—Includes costs for 6 computer main frames purchased by the Bureau of Accounts and the Office of the Treasurer, United States.

TABLE II.—Comparative analysis of projected expenditures for computers proposed for purchase during the remainder of fiscal year 1963 and during fiscal year 1964

Expenditures	Fiscal year					
	1963	1964	1965	1966	1967	1968
Purchase expenditures:						
Net purchase price.....	\$2,740,440	\$3,183,632	-----	-----	-----	-----
Annual maintenance expenditures.....	44,392	156,152	\$156,155	\$165,834	\$169,938	\$169,938
Total, annual purchase expenditures.....	2,784,832	3,339,784	156,155	165,834	169,938	169,938
Annual lease expenditures.....	966,177	1,745,180	1,745,180	1,745,180	1,745,180	1,745,180
Expenditure comparisons:						
Annual lease expenditures exceeds annual purchase expenditures.....	(1,818,655)	(1,594,604)	1,589,025	1,579,346	1,575,242	1,575,242
Cumulative savings by purchase.....	(1,818,655)	(3,413,259)	(1,824,234)	(244,888)	1,330,354	2,905,596

NOTE 1.—Includes costs for 9 computer main frames and computer peripheral equipment proposed for purchase by the Bureau of Accounts, Internal Revenue Service, Bureau of the Public Debt, and Office of the Treasurer, United States.

NOTE 2.—The dollar amounts shown on this table are as of August 1962, and are subject to change because:

- Purchase of some equipment is subject to delivery and acceptance,
- Purchase of all equipment is subject to availability of funds including appropriations for fiscal year 1964 which have not yet been requested, and
- Purchase of additional equipment is under consideration.

Although Bureau of the Budget Circular No. A-54 does not address itself directly to the questions of efficient utilization of equipment or interagency arrangements for machine use, the Treasury Department has taken a position in these matters.

The question of how efficiently equipment is being used is approached in two general ways. One approach is to give consideration to the requirements of the data processing system of which the equipment is a part. This approach is generally taken at the time determinations are made that equipment is required and is discussed under the section "Planning Prior to Installation of Equipment."

Second, consideration is given to the actual time the equipment is used. For example, during fiscal year 1962, the 35 computers in the Treasury Department were utilized an average of 247 hours a month—equivalent to over 8 hours a day 7 days a week, or over 11 hours a day 5 days a week. This is only part of the story because this approach requires consideration of additional factors.

First, a computer installation involves several related pieces of equipment which can be used in various combinations and which have different speeds and capacities. Second, the work processed by the computer installation varies in

volume and kind over time, both within the same and between different installations all of which creates work scheduling problems. Finally, the method of acquiring the computer—by lease or by purchase—is significant in determining the cost of using the equipment, especially as between “prime” and extra shift use.

All these approaches and factors are being taken into consideration by the administrative officials responsible for the utilization of equipment. The Office of the Secretary has issued the following statement:

“Measures must be employed to assure effective use of ADP equipment owned or operated by the Department. Effective use means using equipment only for operations which are essential to perform, acquiring the proper configuration of equipment so that each component is used as fully as possible in relation to other components, and scheduling the work in such a manner so as to obtain the best possible balance between the use of personnel and equipment and the relevant costs.”

There are also requirements for taking full advantage of the provisions of lease contracts, disposing of excess equipment promptly, and considering the use of excess equipment before acquiring new equipment.

Within the Treasury Department, there are two general approaches to making interagency arrangements for machine use.

In the first approach, consideration is given to consolidating interrelated functions into the same system and thereby reducing overall equipment requirements. Departmental policies in this area operate in two directions. First, Treasury organizations are encouraged to develop integrated systems including: “\* \* \* integrating data processing systems relating to the same function between organizations.”

On the other hand, the Department has requested other agencies, in Treasury Department Circular No. 1035, to develop coordinated systems when central banking or disbursing functions are directly or indirectly involved.

The major example of this kind of interagency arrangement is the system whereby other agencies, such as Veterans' Administration and the Department of Health, Education, and Welfare, and Treasury bureaus, such as Internal Revenue Service, all provide, as a byproduct of their systems, check issue information on magnetic tape to the Division of Disbursement. The Division of Disbursement in the Treasury Department and certain other governmental disbursing offices in turn, as a byproduct of their system, provide magnetic tape check issue information as input to the check payment and reconciliation system operated by the Office of the Treasurer, United States. A further degree of utilization is illustrated by the fact that the Division of Disbursement uses its equipment to sort checks by geographical location thereby reducing the workload in the Post Office Department.

The second approach to sharing relates to the use of existing equipment by others either on a reimbursable basis, exchange of time basis, or by allowing other agencies to use equipment at their expense.

One category of this kind of sharing involves a continuing arrangement to use the equipment of others for regular programs. Examples of this are the use, as well as joint ownership, of the Bureau of Census' computer by Internal Revenue Service for statistics of income work and the use of the Office of the Treasurer's computer by the Post Office Department for processing money orders.

Another category of sharing is to use other agencies' computers for one-time problems or for peak workload or emergency work. The Treasury Department has done much sharing of this kind. During fiscal year 1962, the Department paid over \$400,000 for the use of other agencies' computers and was reimbursed over \$200,000 for the use of the Department's computers by other agencies.

The last policy requirement, contained in paragraph 7 of the Bureau of the Budget Circular No. A-54, relates to documentation of studies, specifications, readiness reviews, and decisions on selection and method of acquisition. Each of these documents are required as a part of fulfilling Treasury Department requirements. The Office of the Secretary requires that the documents will be retained to serve as a basis for—

- (a) Fulfilling external reporting requirements;
- (b) Identifying the size and scope of data processing and automatic data processing activities of the Department;
- (c) Fulfilling review, approval, and audit requirements; and
- (d) Evaluating the operation of ADP systems in terms of approved objectives.

### C. Manpower utilization

Two general conclusions about the overall effect of automation can be made as a result of Treasury's experience in the 6 years which have elapsed since plans were made for the introduction of the first computer into Treasury operations. The first conclusion is that the use of computers has had a beneficial effect on Treasury operations. The second is that the introduction of office automation does have an impact on Treasury employees, but the impact has been minimized by positive managerial actions.

There were 3,000 to 3,500 employees, or less than 5 percent of the Department's total civilian employment, who were assigned to operations affected by the introduction of computers during the 6-year period from July 1956 to June 1962.

About 30 percent of these employees were placed in the new ADP operations, about 46 percent were placed in other jobs, about 10 percent were involuntarily separated, and normal attrition (resignations, retirements, etc.) affected the remaining 14 percent.

In addition to the employees in affected operations who were placed into ADP activities, 1,200 other employees were hired for new ADP jobs. The resulting net reduction in employment requirements throughout the Department over the 6-year period was approximately 1,000 positions.

In the years ahead, the Treasury Department anticipates operational changes involving several thousand employees who will be affected by the use of computers. The impact on individuals, however, will continue to be minimized through constant management attention.

Basic departmental policy recognizes the implications of automation and states: "The Department is sensitive to the human implications of automation. Automatic data processing equipment or services should not be acquired in the absence of approved plans for the solution of the personnel and training problems involved."

Supplementing this statement are the standard Civil Service and Treasury policies applying not only to personnel affected by the introduction of computers but also to any employee affected by any change in operations which might result in an employee losing a job.

During the initial planning, installation, and operational phases resulting from a decision to introduce the use of a computer, there are two major categories of efforts required in the personnel area. First, to provide job opportunities for displaced employees. Second, to provide the appropriate staff for the new operations.

In Treasury organizations, programs for providing jobs for displaced employees contain the following elements:

- (a) Informing and obtaining full support of management on all personnel matters relating to the installation of equipment.
- (b) Informing employees of the plan and how it will affect them.
- (c) Identifying and preparing to utilize all skills of employees who may be displaced.
- (d) Freezing hiring for permanent positions and utilizing temporary employees during transition periods.
- (e) Training displaced employees in new skills to qualify them for other positions.
- (f) Filling new ADP positions with displaced employees wherever possible.
- (g) Filling other vacancies with displaced employees.
- (h) Finding other vacancies in other Treasury or Federal Government organizations and private business and assisting in placing displaced employees in those positions.
- (i) And finally, if displaced employees are separated, providing reemployment rights for filling future vacancies.

One of the key elements in Treasury's success in providing jobs for displaced employees has been extensive use of training to equip these employees with new skills. In recent years the provisions of the Government Employees Training Act has facilitated these activities. Training for these employees is conducted in two general phases. First, the employee is trained in advance of displacement to qualify the employee for other jobs. Second, after the employee has been placed, further training is given on the specific job to enable the employee to reach full productive capacity as rapidly as possible. The training is provided both within and without the Government, during and after working hours, in formal classes and in directed on-the-job training. Approximately 400 employees of the



TABLE III.—Personnel assigned to automatic data-processing operations, fiscal year 1962—Continued

Schedule and grade	Classification series													
	331	332	333	334	340	341	342	343	350	356 <sup>1</sup>	358	359	362	382
Total.....	181	73	78	97	36	4	1	44	22	1,172	4	492	14	1
Subtotal, GS.....	181	73	78	97	36	4	1	44	22	1,172	4	492	14	1
GS grade:														
1.....									14	551		114		
2.....									4	448	1	228		1
3.....		2	13											
4.....		1	32	6					2	67	1	65		
5.....	12	20	28					2	1	69	1	43	1	
6.....			1							18	1	5	1	
7.....	27	20	4					2	1	6		18	6	
8.....									1	8		4	1	
9.....	46	14				2		4		5		7	3	
10.....		1											1	
11.....	54	15		17		1		7				1	1	
12.....	41			34	4		1	13						
13.....	1			34	6			9						
14.....				6	10	1		6						
15.....					8			1						
16.....					7									
17.....														
18.....					1									
Military.....														
Wage board.....														

Schedule and grade	Classification series												Military	Wage board
	501	510	520	525	540	592	1531	1532	1533	2001	2033			
Total.....	42	5	74	50	3	2	45	1	1	1	1	21	14	
Subtotal, GS.....	42	5	74	50	3	2	45	1	1	1	1			
GS grade:														
1.....														
2.....												1		
3.....		3		35		3								
4.....		18		33	5		22							
5.....		7		3	16		13	1	1					
6.....		6		1	11		2							
7.....		4		2	7		1	3						
8.....		3					1	2						
9.....		1			4		1	2		1				
10.....														
11.....					5		2							
12.....					2									
13.....			3											
14.....			1											
15.....			1											
16.....														
17.....														
18.....														
Military.....												21		
Wage board.....													14	

<sup>1</sup> Excludes 1,000 to 2,000 temporary key punch operators in grades GS 2-3.

Source: Annual reports under Administrative Circular No. 65.

Of all these employees, 75 percent were assigned to computer operations, including supporting punched-card activities which prepare the input to the computers; and 25 percent were assigned to punched-card units not related to computer operations.

About 90 percent of the total permanent work force are in the GS 300 occupational group which includes digital computer, punched-card equipment, analytical, clerical, and general supervisory and managerial positions.

About 40 percent of the permanent work force are key punch machine operators and their immediate supervisors. Computer and other punched-card equipment operators and their immediate supervisors make up 22 percent of the work force. About 13 percent of the work force are the analysts—the ones who do the detail planning, systems, design, and programming work. The remaining work force, about 25 percent, include the general managers, other supervisory, other technical, and general clerical personnel.

The grades for personnel in automatic data processing operations range from GS-1 through GS-18. About 65 percent are in grades GS-1 to GS-4; 21 percent in grades GS-5 to GS-10; 13 percent in grades GS-11 to GS-18; and less than 2 percent in military and wage board positions. The overall average grade for all permanent GS personnel is between a GS-4 and GS-5.

Although the Treasury Department has experienced some problems in the turnover and the recruiting of personnel, the nature and extent of the problems have been conditioned by three factors.

First, employees to be displaced because of ADP receive primary consideration for the new specialized jobs and since the market is in relatively short supply for highly trained personnel, most personnel, other than key punch operators, are recruited from within. This tends to reduce the turnover rate on the one hand and shifts much of the recruiting activity to training activity on the other hand.

Second, the relative newness of most of the computer operations means that many personnel are placed at entry or intermediate levels providing opportunity for promotions, thereby reducing turnover rates and attendant recruitment requirements.

Finally, the different skills and grade levels required in an ADP operation have a bearing on recruitment and turnover problems. Generally speaking, the key punch operations and lower graded clerical operations have a greater rate of turnover because of the relatively unskilled nature of the work. The recruitment problems for these kinds of positions vary primarily in direct relation to the economic conditions of the geographic area of the operations.

The equipment operators are in the lower to intermediate grade levels and are usually filled by employees with a higher degree of training. The turnover usually results from promotion. Thus, recruitment is at the lower grade levels where qualification standards are not too rigid thereby permitting adequate hiring but requiring on-the-job training.

The higher supervisory and managerial personnel are almost invariably promoted from within and there are no significant turnover or recruitment problems in the ordinary sense.

The critical positions in computer operations are the analytical positions in the intermediate and higher grade levels. Because 80 to 90 percent of these employees have been hired at the entry levels from within the Treasury bureaus in recent years and because some advancement opportunities still exist, the turnover rate remains low at this time. There are signs, however, pointing to potential problems in future years because of the highly competitive market for these employees. An important fact to keep in mind is that these are the positions in which the most time-consuming training activities are taking place. In spite of the care taken in placing and training these employees, not all are of the high quality the Department desires for these jobs.

Many persons associated with computer operations have been concerned about the adequacy of the grade structure of computer positions. The grade structure itself is dependent on two factors. The first is the establishment of occupational series and appropriate standards by the Civil Service Commission. The Department believes the Commission has done a good job in providing these for the computer field. The second factor is how Government agencies apply the standards and classify the positions. While there may be variations in the application of standards, within Treasury the standards appear to be reasonably applied. It should be noted that the key to any superficially apparent differences in grade structures between organizations is usually directly related to either how the operation is organized or the scope and complexity of the system of which the computer is a part.

#### *D. Use of byproduct statistical data in management decisions*

It is policy of the Treasury Department to consider "integrating all data processing which contributes, in whole or in part, to the same or a number of operating or managerial functions of an organization."

There are three categories of computer applications which should be identified when considering the question of using byproducts of computer operations in the management decision processes—scientific or computational, administrative, and program.

The Treasury Department does not have any computers, separate from those in program activities, which are used solely for computational activities. From time to time, the Office of the Secretary and a few of the bureaus have special computational problems which are done on the spare time of computers used for regular operations or on computers of other organizations. These problems are essentially analytical in nature with the object of directly, rather than indirectly, aiding the management decision process.

There is no department wide computer application in the administrative area. A few Treasury bureaus have or are planning such applications. This category of applications involves data processing relating to the resources of Government organizations; that is, personnel, property and supplies, and payroll and fund accounting. Wherever such applications are performed, there are usually several byproducts of the system which are used in the managerial decisionmaking process.

The final category, program applications, relates to the substantive activities performed by Government organizations. Within the Treasury Department, each of the major applications relates to major financial programs of the Federal Government; i.e., issuing and retiring savings bonds, issuing checks, payment and reconciliation of issued checks, and internal revenue operations. In these areas there are significant uses of the byproducts of these operations in the management decisionmaking processes. These sets of data are typically used in longer range program planning, planning future processing operations, work measurement and production control systems, and finally in the very significant area of maintaining vital controls over the financial activities of the Federal Government which are the basis for each of the major program applications within the Department.

#### *E. Progress of the Interagency Committee on Automatic Data Processing*

The Department fully supports the basic concept of having an interagency organization which can fulfill definite needs in the field of automatic data processing. The objectives—a meeting place for sharing experiences, a testing ground for ideas, a source of advice for the Bureau of the Budget and other central agencies, and a two-way channel for discussion of common problems—have been met in many ways. The Treasury Department supports the recent recommendations of the Committee that it be continued in somewhat modified form and that a separate, but related, Advisory Council on ADP be formed to enable providing more effective advice to the Bureau of the Budget in certain planning and problem areas.

### INTERNAL REVENUE SERVICE

#### *A. Planning prior to installation of equipment*

The Internal Revenue Service is currently engaged in implementing its master file plan, a program conceived to utilize the special characteristics of ADP equipment—high-speed processing and data storage facilities—to do a more efficient job of verifying, posting, billing, and refunding as well as improving enforcement techniques. This plan representing a dramatic step forward in tax administration provides for a consolidated central file against which all tax transactions can be rapidly processed before preparing a net bill or refund and against which compliance checks can be made.

The master file plan is the culmination of a long-range planning effort that began officially in May 1958 when the planning and research functions of the Service were strengthened and raised to the Office of Assistant Commissioner, Planning and Research. This office was given the responsibility of developing and maintaining a master plan aimed toward more economical and efficient operations and was directed to coordinate the planning activity of all elements of the Service. One division of the office was assigned as one of its major responsibilities the determination of the needs of the Service for ADP systems.

It was immediately recognized that the card-fed equipment being used in the three area service centers, while being used efficiently, were obviously inadequate to fulfill the speed, capacity, and versatility requirements needed to handle the

growing workload. A program was undertaken with approval of the Office of the Secretary to upgrade the equipment then in use which included provisions for the installation of high-speed ADP equipment. Further study revealed an urgent need for an integrated processing system which would relate in one location all activities of a taxpayer so as to improve the service given to the taxpayer and to facilitate compliance checking. EDP equipment offered the potential means through which such a system could be realized.

On December 10, 1958, a document entitled "Summary of Operational Plan for Electronic Data Processing" was submitted to the Commissioner. This paper set forth the basic outline of what is now referred to as the master file plan and the objectives to be obtained. The plan was subsequently submitted to the Under Secretary of the Treasury and was approved on March 30, 1959.

A task force was established on July 7, 1959, to proceed with the detailed planning necessary for the creation of an integrated ADP system which would accomplish the desired objectives. The task force, directed by the Assistant Commissioner, Planning and Research, and made up of key personnel of affected units of the Service, completed the document analysis and broad system design by October 1959. In addition, other studies were conducted to explore and resolve problems in the area of system support and implementation such as personnel, legal and technical, facilities, and public relations. After an evaluation of its feasibility was completed by a management consultant firm on December 3, 1959, the plan was adjusted accordingly and system specifications were issued to 42 manufacturers on January 1, 1960. The successful bidder was chosen from the six manufacturers who had submitted proposals. Necessary precautions were exercised throughout to see that equal opportunity was afforded all manufacturers of computer equipment. The equipment selection was announced on July 21, 1960.

With the selection of equipment, the master file plan passed from the planning phase to the preparation or implementation phase. The Assistant Commissioner (Operations) was assigned the prime responsibility of implementing the plan. The goal was to establish a master file of permanently numbered accounts for all taxpayers, for all types and classes of taxes, maintained up to date on electronic tape at the National Computer Center (which has now been located in Martinsburg, W. Va.). It was planned that input and output to the master file would be performed in nine regional service centers, a pilot installation of which was activated in Atlanta, Ga., on January 1, 1961. Under the plan the remaining eight regional service centers were to be phased in gradually with the full system to be operational in 1966.

Organizationally, the functions necessary to development and operation of the centers were incorporated into a Data Processing Division in January 1961. In September 1961, this Division was established as the Office of Assistant Commissioner, Data Processing. Detailed procedures and machine programs were developed; equipment, operational facilities, forms, and supplies were obtained; recruitment, training, and redevelopment of personnel problems were resolved during the preinstallation period. However, since the magnitude of the master file plan was so great, care was exercised to schedule each step of the implementation so as to keep the program within manageable proportions. The regional service centers were planned to be activated gradually and the operations within each of these service centers were scheduled to be phased in over a span of 3 years.

Although it is recognized that the master file system will not fully mature for a number of years, the Service is constantly studying areas in which ADP might permit greater utilization of information contained in the file. Included are areas such as selection of tax returns for audit consideration, interchange of tax information between Federal and State Governments, information retrieval in the legal field, and operations research in tax administration. Also being studied are current advances in equipment development which appear to offer opportunity to make the master file plan even more efficient. Examples of some of the developments presently being studied are improved input and output devices through character recognition in optical scanners and microfilm printers and the use of electronic data transmission devices to speed communication.

The field of automatic data processing is developing very rapidly, new techniques and equipment are constantly being introduced, and the Service feels it must make every effort to utilize whatever innovation necessary to give the people of this Nation the best tax administration possible.

#### *B. Effectiveness of the policies outlined in the Bureau of the Budget Circular No. A-54*

Although Bureau of the Budget Circular No. A-54 was issued some 5 months after the Service made its decision on equipment to be used under the master file plan, the principles of selection outlined in the circular were followed. Sys-

tem specifications were made available, 42 manufacturers were afforded equal opportunity to propose equipment for use, and the equipment was selected on its capability to fulfill the system specifications after giving due consideration to comparative cost.

The policy guidelines in Circular A-54 on the method of acquisition were used as criteria by a Service task force assigned to study the method of acquisition for ADP equipment currently in use or intended to be acquired during fiscal year 1963. This study has been completed and a report has been submitted to the Office of the Secretary.

The study indicated that two groups of computers clearly did not meet the criteria for purchase. One group, those presently in "area" service centers, will be phased out prior to the time that a cost advantage would be reached if they were purchased. The other group, those computers initially installed under the ADP plan, are scheduled for replacement within a year.

The main computer and certain conversion equipment scheduled for installation in the National Computer Center, to replace the existing computer, clearly meets the criteria for purchase and will be purchased when funds are available.

The consideration of whether to purchase the new group of computers, scheduled for installation in the regional service centers, has not been completed. However, placement of an option to purchase equipment to be delivered this fiscal year is under consideration and final actions should be completed within the next month.

While Circular A-54 does not address itself specifically to the possibility of joint usage of ADP equipment between different agencies of the Government, the possibility is provided for in Treasury Department Administrative Circular No. 6, "Cooperative Arrangements Among Treasury Bureaus" dated June 3, 1960, and Administrative Circular No. 73, "Management of Automatic Data Processing," dated June 27, 1962.

In planning the master file operation, the magnitude of the system visualized precluded any serious consideration of use of equipment in ADP installations elsewhere in the Treasury Department. As it has always been the policy of the Treasury Department to tailor equipment capacity to the job, there was no reasonable prospect of obtaining sufficient continuing capacity for the IRS master file operation in any other organizational segment of the Treasury.

Nevertheless, the Service is alert to using time on equipment in other agencies. For example, the Service has been using an electronic computer (of which IRS is one-third owner) jointly with the Census Bureau since 1955 for the preparation of statistics of income. On the other hand the Service has made time available on its equipment to other bureaus, both within and outside the Treasury Department.

### *C. Manpower utilization*

IRS recognized from the outset that the effect on employees was one of the central considerations in the plan for conversion to ADP. In the initial planning phase it was decided that it was essential to avoid, if at all possible, reductions in force and involuntary transfers to other commuting areas and, at the same time, to place the maximum number of affected employees in productive jobs, thereby utilizing invaluable skills and experience. These personnel objectives played an important part in the decision to phase the regional conversions over a period of years, and within each region a little at a time.

One month after invitations to bid on the data processing system were issued in 1960, revenue officials met in the Atlanta pilot region to consider the personnel implications of the conversion and to plan a program for accomplishing the agreed-upon personnel objectives. Studies were then undertaken resulting in the formulation of a plan for personnel redeployment which has become a part of the Service's master plan for ADP conversion.

The conversion plan estimated that about 50 percent of the returns processing and accounting work now done in the Service's 62 districts would shift to the new regional service centers. This would result in a corresponding loss of about 6,000 out of the approximately 12,000 permanent district positions in the affected activities. Under the conversion schedule the loss of work would be staggered in each district over a 3-year period, with the overall Service conversion scheduled to commence in 1961 and be completed by 1967. Over the 3-year cycle an estimated average of 10 percent of the work is shifted to the service centers in the first year, 15 percent the second, and 25 percent the third. The plan provides for the establishment of minimum permanent staffing goals for the affected activities for each year of the 3-year cycle.

Personnel will be redeployed on a staggered basis tied into the established minimum staffing goals. Every effort is made to redeploy affected personnel ahead of the scheduled loss of work.

The redeployment plan features (a) full understanding and support of the plan at all management and supervisory levels, (b) a complete and continuing information program to let employees know how conversion affects them, (c) the application of a variety of special management techniques developed to facilitate maximum redeployment and fullest utilization of skills, and (d) training to equip affected employees with the skills needed for reassignment to positions in the new service centers or other Service activities.

Continuing emphasis is given at all levels of responsibility for the success in installing the conversion program with the least possible adverse effect on employees. Redeployment officers in each region and district are responsible for insuring that day-to-day personnel decisions are compatible with redeployment objectives.

In the initial planning for ADP it was realized that there would be a great need for information throughout the Service and particularly in the areas that would be directly affected. With this in mind officials of the various divisions concerned identified the framework for an extensive information program designed to provide employees with up-to-date information about the personnel aspects of the ADP conversion. The program is now operating and includes a film entitled "ADP and You," which tells the overall ADP story; a monthly publication, outlining job opportunities and the latest ADP developments called ADP News which is distributed to all employees; a filmstrip "Let's Get Down to Brass Tacks," which describes the special personnel procedures being used to lessen the impact on personnel; and, national, regional, and district employee issuances concerning ADP.

In addition to issuances relating to the ADP program, meetings with employees and employee groups, and employee interviews are being held. Regional and district ADP coordinators have developed organized orientation programs; at an appropriate period of time during the conversion period, each employee directly affected by the conversion is interviewed with a view toward placing him in a continuing position; meetings are held at the national, regional, and district levels with leaders of employee groups to spell out the latest developments affecting personnel; and regional office personnel maintain a close liaison with regional officials of the Civil Service Commission to mutually solve problems created by the conversion.

The entire information program is based on the premise that in an organization converting to automatic data processing, there is a constant need for information on the part of employees.

The special techniques used in the redeployment plan are—

- (1) Individual employees affected are identified at each step of the conversion cycle and specific plans made to effect their placement in advance of the loss of work.

- (2) Redeployment guidelines are issued outlining specific techniques to be used.

- (3) Temporary appointments or details are made to avoid increasing permanent staff and to save positions for affected employees who will be shifted at a later date.

- (4) Affected employees are used to staff the new service centers wherever possible. The combined permanent staffing of the 9 new centers will come to about 8,000 employees.

- (5) Vacancies occurring throughout all Service activities are examined to determine whether they will provide suitable placements for affected employees.

- (6) An inventory of the qualifications and skills of each affected employee is systematically maintained.

- (7) Special personnel procedures have been worked out by the CSC to give the service maximum flexibility in redeploying personnel. Included are provisions for waiver of CSC qualification standards for capable employees who, with special training, can meet the performance requirements; temporary appointment of former IRS employees; details of longer than the normal 6-month duration; selective certification from CSC registers of employees with dual qualifications for both preconversion and postconversion positions; temporary promotions which allows IRA to pay employees in affected activities for the work they are doing without adding to the permanent grade structure; and, discontinued-service retirement for eligible employees whose positions are to be abolished as a result of conversion.

A massive training effort is required to orient top management officials on the impact of conversion to ADP, and to prepare employees for the change and provide training for new positions. Training is now being conducted in the following areas:

1. *Redeployment training.*—For employees whose jobs will be adversely affected by ADP.

Phase I: Training conducted to increase the employee's potential for other positions and given before firm placement in a new position is possible.

Phase II: Training conducted after reassignment to a new position directly pertaining to needs of the employee and his job.

Phase III: Training given to the employee who has extreme difficulty in obtaining new assignments.

2. *Staff and supervisory training.*—For regional service center employees who will be directly concerned with implementing the ADP program.

3. *Technical training.*—A variety of programs designed to develop new skills and abilities for various computer positions.

4. *Executive training.*—For regional commissioners, service center directors, district directors, and other officials.

The Service believes that the conversion can be accomplished with a minimum of adverse effect upon employees because of the leadtime involved; early planning; the staggered shift of work; cooperative efforts of all levels of management, employee groups and employees; and other favorable factors such as attrition and growth. Everything possible is being done to place affected employees. They have skills and knowledges which represent a great investment by the Revenue Service and it is hoped to utilize these skills to the maximum extent possible.

Experience to date in the Atlanta pilot region has been favorable. According to the conversion plan goals, the Atlanta districts are required to pare their permanent staffing by 530 positions. As of June of this year, a year and a half after the activation of the Atlanta regional service center, the districts have reduced their permanent staffing by about 260 positions, or 50 percent of the postconversion goal. This reduction has been accomplished without resorting to adverse personnel actions or involuntary transfers. The region, following the principles and techniques of the redeployment plan, has been able to place 206 employees from activities affected by the conversion in positions in the service center or in continuing positions in other Service activities.

The Labor Department representatives recently visited the Atlanta region to gather data in connection with a long-range study of our conversion to ADP. The Department selected IRS for this study, which it hopes will aid other organizations in converting to ADP, because of the scope of the program and the intensified planning and preventive action undertaken by the Service in personnel redeployment.

#### *D. Use of byproduct statistical data in management decisions*

The Service, in designing its master file program, gave considerable attention to the use of byproduct statistical data in making management decisions. Incorporated into the core of the operations were provisions for the preparation of operating and statistical reports which could be used not only for short-run production control but also for long-range work planning. The system provides for the development of work plans, work schedules and reports indicating status of production and measurement against established standards. Byproduct information from the payroll operations is coordinated with the work planning program and provides personnel statistics useful in planning programs and measuring accomplishments. The statistics gained from these two operations will continue to be utilized in decisionmaking.

Byproducts from the master file operation will increase as the operation matures. Consideration will be given to utilizing the master file to aid in the development of statistics of income which is now an independent operation. Other projects as they are initiated will be examined to see if the information contained in the file on tape can be used to provide information which might be required. For example, the Bureau of Census conducts a quinquennial economic census which requires their obtaining information returns from small business entities. In 1954 and 1958 this information was obtained from Internal Revenue's files, relieving businesses of the necessity of filing reports. It is conceivable that this information might be obtained from the master file. Such a project would require considerable study but it exemplifies the type of byproduct use of ADP that is foreseen.

At present, information contained in the file is intended to be used in making preliminary selections for audit examination. Returns in which certain normal

conditions are not met will be selected by the system and indicated for possible audit. These standards against which the audit determination is made will be adjusted by statistical evaluation of the master file after giving due consideration to the results of audits.

Exchange of tax information with State governments through the use of ADP equipment is expected to be a valuable augmentation of enforcement programs for both Federal and State Governments. Some exchanges have taken place to date but inadequate identification methods have diminished the potential effect that might be realized. ADP equipment should provide the basic tools to make exchange of information on a mass scale feasible.

Other byproduct effects may be achieved. Reporting of tax information on magnetic tapes may be provided so as to simplify business reporting requirements. Use of magnetic tape for such purpose would not only save the reporting entity the cost of printout but would provide the Service with the data in machine-usable form relieving it of an expensive manual transcription operation. This entire activity, however, is a long-range matter which will develop slowly due principally to the prerequisite need for a going master file operation, for standards of format to be employed, and for appropriate translating equipment for intercomputer communication.

#### *E. Progress of the Interagency Committee on Automatic Data Processing*

The Service participates in this Committee as a unit of the Treasury Department. The Service, of course, endorses the general aims of the Committee and its long-range program for bettering the computer community.

### BUREAU OF ACCOUNTS

#### *A. Planning prior to installation of equipment*

On May 28, 1958, the Veterans' Administration advised the Treasury Department of plans to convert its statistical and accounting work for veterans benefits to an electronic data processing system and to centralize this work in Chicago beginning in January 1960. This decision by the Veterans' Administration meant that for the Division of Disbursement of the Bureau of Accounts to continue to render prompt and efficient service, the function of preparing and issuing approximately 60 million checks annually to veterans and their dependents must also be centralized in Chicago. This centralized workload together with other classes of repetitive payments in the Chicago area would bring the total of checks to be issued by the Chicago regional disbursing office in the foreseeable future to approximately 110 million annually.

The issuance of such a large volume of payments from one disbursing office presented the need for study and planning, particularly when the shifting of veterans benefits payments work indicated the likelihood that some offices would have to be closed. New methods of checkwriting and file maintenance had to be investigated. Conversion, as well as operating procedures had to be developed. Innovations in method brought about by new thinking had to be tested and approved. Foremost, the cost of issuing checks must be borne in mind, along with any possible economies that might be afforded associated agencies. On July 24, 1958, the Fiscal Assistant Secretary forwarded a letter to 25 manufacturers of EDP equipment announcing the Department's interest in equipment capable of writing Government checks directly from magnetic tape. Following a 1-year study and evaluation of manufacturers' proposals, a fiscal service task force recommended that the Division of Disbursement install an IBM 7070 electronic system in the Chicago RDO. The recommendation was approved by the Fiscal Assistant Secretary and the system was installed in December 1960.

In August 1960 the Bureau of Old-Age and Survivors Insurance of the Social Security Administration informed the Division of Disbursement of its plans to install electronic equipment in five of its payment centers for social security benefit accounting commencing in January 1961. At that time, in connection with the tax refund workload, the Bureau was also aware of the Internal Revenue Service's plans for expanded use of electronic equipment for processing of tax refunds. As a result of these developments, the Fiscal Assistant Secretary again sent letters to manufacturers of electronic equipment announcing the Treasury's interest in extending the use of electronic equipment in the issuance of checks. On December 28, 1960, after studying the proposals submitted by the manufacturers, the fiscal service task force recommended installation of an IBM 1401 electronic system in the Philadelphia office to be operational by January 1, 1962. This was followed by recommendations to install like systems in the Kansas City, Birmingham, and San Francisco offices, all of which also service social security

payment centers. The IBM 1401 electronic systems for the Philadelphia and Kansas City offices are already operational. The systems for the Birmingham and San Francisco offices are scheduled to be operational by October 1, 1962.

In conducting the studies for selection of EDP equipment for the Philadelphia, Kansas City, Birmingham, and San Francisco offices, it became apparent that more economical computers and tape drives and improved printers had become available subsequent to installation of the IBM 7070 system in the Chicago office. Letters soliciting proposals for updating of the Chicago office system were again sent to manufacturers. After evaluation of the proposals submitted by the manufacturers, the task force has recommended the replacement of the 7070 system in Chicago with an IBM 1410/1401 system to be operational by June 1, 1963. The preliminary study indicated an estimated annual savings of \$184,000. The replacement system will also provide additional capacity for future growth.

The uniform type of EDP equipment now installed or to be installed will provide for complete interchangeability of workload in emergencies.

A fiscal service task force was established in September 1958 to determine the effect that administrative agencies' plans to establish electronic data processing centers, and in some instances to centralize the work, would have on disbursing operations. During the course of its existence the task force has kept in close contact with technological developments of equipment suitable for checkwriting purposes, through manufacturers and their representatives, professional societies, publications, and users of equipment in general.

Specifically, the task force was charged with the following responsibilities:

- (1) Analyze agencies' plans for centralization of work and conversion to EDP with respect to their effect on disbursing operations.

- (2) Investigate systems adaptable for check preparation which are applicable to a large volume operation.

- (3) Study equipment manufacturers' hardware.

- (4) Develop efficient and expandable check preparation systems, compatible with all the types of input media available from administrative agencies as a byproduct of their operations.

- (5) Investigate possibilities for improvement in operations affecting the Division and other agencies concerned.

- (6) Originate correspondence and planning documents having to do with the Division's function in the planned system.

- (7) Keep management informed and supply supporting documents periodically.

- (8) Give consideration to the longstanding goals of the Treasury for alleviating the peakload problem caused by monthly periodic payments, including the recommendation contained in the Hoover Commission report on paperwork management (report dated January 19, 1955, sec. 4, item 5) that: "The Treasury Department review the laws governing check issuing operations and report on the same to Congress with a view to staggering required issue dates to spread the workload over the full month."

- (9) Make specific recommendations including all ramifications of system improvement.

During the course of its work, the task force has been given responsibility for additional procedural matters as determined by the Chief Disbursing Officer, the Commissioner of Accounts, or the Head, Fiscal Service Systems and Methods Staff. Among these are:

- (1) New method for furnishing check-issue data to the Treasurer's Office enhancing overall integration.

- (2) Discontinuing the preparation of detail check-issue listings.

- (3) Development of preliminary budget figures incorporating features of current planning.

- (4) Participation in the selection and training of employees who will man the check production operation.

The task force established the following criteria for evaluating manufacturers' proposals:

- (1) Compatibility of input with administrative agencies and output with the Office of the Treasurer of the United States.

- (2) Cost of equipment.

- (3) Reliability and efficiency.

- (4) Direct labor requirements.

- (5) Maintenance and service requirements.

- (6) Cost of supplies (tape, power, etc.)

- (7) Building specifications and cost of installation.

- (8) Availability of equipment.

- (9) Purchase versus rental.

*B. Effectiveness of the policies outlined in the Bureau of the Budget Circular No. A-54*

With the encouragement of the Treasury-Post Office House Appropriations Subcommittee and as a result of Bureau studies, an option agreement was entered into with the manufacturer for the purchase of the main frame components and the power supply units of the EDP systems to be installed in the Philadelphia, Kansas City, Birmingham, and San Francisco offices, prior to release of the Budget circular. Funds for the purchase of this equipment are included in the Division of Disbursement's appropriation for the fiscal year 1963. Thus, the Bureau naturally is in agreement with the principles of the Budget circular.

In accordance with the provisions of the circular, the lease transactions for the remaining components of the systems for the four offices were reviewed to determine if this equipment should also be purchased. Comparative cost analyses indicate that it would be to the advantage of the Government to purchase this equipment as well as the replacement system for the Chicago office. Accordingly, the Division is planning to request funds for the purchase of this equipment in fiscal year 1964.

Computer equipment is utilized to punch and print U.S. Treasury card checks issued in payment of Government obligations to veterans and their dependents, social security annuitants, holders of series H and K savings bonds for interest due, and holders of national service life insurance for dividends due. Checks covering income tax refunds and salary payments are also issued on the computer equipment. In addition to checkwriting, this equipment is used to perform the updating of master magnetic tape records necessitated by new cases, terminations, and changes of rate or address actions as well as to produce a matrix tape for use by the Treasurer of the United States in reconciling checks paid. Complete accounting controls are kept throughout the various computer runs.

Programs for the various computer runs have been designed so as to obtain the best possible utilization of the equipment. Every attempt is made to schedule work on the computer in a manner that will result in effective and economical use of the equipment.

During fiscal year 1962, the Chicago regional disbursing office used approximately 295 hours of computer time on computers installed at the Veterans' Administration Data Processing Center at Hines, Ill., and the Railroad Retirement Board in Chicago, Ill., for card-to-tape operations. It was found more economical to perform this type of operation on the smaller computers installed at these agencies than on the larger computer at the disbursing office.

*C. Manpower utilization*

The installation of electronic data processing equipment has had a dual effect upon personnel management in the Bureau of Accounts, Division of Disbursement. First, it led to the closing of seven regional offices and the reorganization and consolidation of an additional five offices. Secondly, it made necessary resource planning to accommodate the installation of EDP equipment in the Chicago, Philadelphia, Kansas City, Birmingham, and San Francisco regional disbursing offices.

A thorough study was conducted to determine the effect that the transfer of veterans' payments to the Chicago office would have upon the Division's regional disbursing offices. A careful review of the workload and other considerations made it apparent that after consolidation of the veterans' benefit payment workload in Chicago, certain offices would not have sufficient remaining workload to justify their continuance. For this reason the Secretary of the Treasury, in April 1959, authorized the closing of 6 of the 21 regional disbursing offices in operation at the time. The six offices and their closing dates are as follows:

Cleveland, February 29, 1960.  
Los Angeles, February 29, 1960.  
St. Louis, April 30, 1960.  
Atlanta, June 30, 1960.  
Richmond, June 30, 1960.  
Minneapolis, July 31, 1960.

In each of the offices mentioned above the veterans' benefit payments involved in the transfer to Chicago constituted more than 50 percent of the total volume of work. The remaining work in each of the offices was redistributed to other regional disbursing offices without impairment of essential disbursing services.

On May 4, 1959, 10 months before the first office was scheduled to close and 13 months before the last office was scheduled to close, the regional disbursing officers concerned were notified by the Chief Disbursing Officer of the impending change. In the announcement it was stated, "I fully realize that by providing you, and through you, your employees with this information this far in advanced we are

creating problems for ourselves in connection with continuation of the work in an orderly fashion. However, I feel that the welfare of our employees is paramount." This early announcement was made in order to give employees and management the maximum period of time to plan for the closings. This was done at some hardship to the six regional offices involved as positive out placement activities were initiated and qualified employees transferred as jobs were available. Often office functions were performed by a minimal qualified staff supplemented by temporary employees. Disbursing service was not impaired during this period. In May, June, and July of 1959 the Chief Disbursing Officer visited each office scheduled to be closed. In these visits he offered his assistance in placement activities and talked to the employees involved.

In the fall of 1961 continued centralization of Veterans' Administration payments in Chicago, expanded use of EDP by the Internal Revenue Service in processing tax refunds, and the adaptation of social security benefit payments to computers necessitated further personnel adjustments in our regional offices. This was first announced in July of 1959. The establishment of new personnel ceilings followed the announcement. Because of changes in the Veterans' Administration schedule for centralizing accounts and other changes affecting social security and income tax refund payments, the reorganization of offices was conducted on an office-by-office basis as work was removed.

To prepare for these reductions, recruitment of permanent employees was again frozen and the offices involved were instructed to hire only temporary employees in the following 8 to 12 months. Organizational planning was conducted approximately 6 months in advance to determine the extent of reduction. In January of 1962 the Chief Disbursing Officer announced to the employees of the New York regional disbursing office that the work force would be reduced by more than 50 percent. In March of 1962 the Chief Disbursing Officer regretfully informed employees of the Salt Lake City office that consolidation of payments made it necessary to close the office as of June 30, 1962. Disbursing officers in Boston, Dallas, Denver, and Portland were advised that their offices would be losing payments during 1962 that would necessitate reductions in personnel.

During the period from 1959 to the closing of calendar year 1962 the Division of Disbursement will have effected EDP related reductions in gross of approximately 457 employees. These reductions are in part balanced by an increase of approximately 225 in the offices receiving additional work. The total division-wide reduction related to EDP amounted to about 232 employees. In order to handle this extensive reduction in personnel the above-mentioned notice to employees and freeze on permanent recruitment were used as two of the primary techniques to avoid reductions in force. A special program for the expeditious recruitment of temporary employees was negotiated with the Civil Service Commission. A nationwide placement program was established within the Bureau to accommodate displaced employees. Other Treasury bureaus and other departments and agencies were contacted by the fiscal assistant secretary to gain their assistance in placing employees. Regional disbursing officers maintained contact with Federal establishments and private industry in their areas to assist in placement activities. Representatives from the personnel staff in Washington gave personal assistance to regional offices by contacting agencies and industries during periodic visits to the closing or reducing offices.

As of September 14, 1962, placement actions on 16 of the 17 employees on the rolls of the Salt Lake City office had been effected. In the New York regional disbursing office, 96 percent, or all but two of the surplus employees, have been placed as of this same date.

The Bureau has consistently met with great success in placing employees and has not found it necessary to effect personnel actions on the basis of reduction-in-force proceedings in those offices either closed or reduced in size except in those instances where employees did not desire to continue working. Success in placing employees affected by the consolidation and closing of regional offices is due largely to the early notice of closings or reductions given by management, the utilization of temporary employees and overtime during the interim period, extensive positive placement activities, and utilization of displaced employees in expanding regional disbursing offices.

Activities in those offices experiencing reductions in employment have not been limited only to the period when reductions were being made. Necessary retraining has been continually conducted in these offices to prepare employees assigned to new work.

Following the decision to utilize EDP equipment in the Chicago regional disbursing office and later in the Philadelphia, Kansas City, Birmingham, and San

Francisco regional disbursing offices, planning began on the development of programs to adequately staff these offices. Initial planning in this area was related to (1) the type and duration of training, (2) training facilities to be utilized, (3) appropriate staffing patterns for computer operations, and (4) recruitment techniques. Following this initial planning, work began on the negotiation of a training agreement with the Civil Service Commission governing the Chicago installation. At a later date a nationwide EDP training agreement was developed and administered in staffing the Kansas City, Philadelphia, Birmingham and San Francisco offices.

In staffing computer operations it was decided that exhaustive efforts would be made to recruit from within the Bureau of Accounts prior to any recruiting from outside sources. These recruiting efforts touched over 700 employees of the Bureau through electronic data processing aptitude tests. Approximately 90 of those tested were involved in preliminary EDP programmer training. Fifty of these employees completed a full 6-month training program under the auspices of training agreements negotiated with the Civil Service Commission and were subsequently assigned to computer staffs. This training was administered in three separate 6-month training programs between 1960 and 1962. The equipment manufacturer supplied instructors for these programs. All other expenses were borne by the Division of Disbursement, including the cost of salaries of all participating employees. In addition to those employees receiving full programmer training in centralized training programs, between 10 and 15 employees have been trained in programming while on assignment in regional offices.

The 40 employees who did not complete the full 6-month training included 2 who found it necessary, for personal reasons, to drop out in the early part of the final training phase. This leaves a total of 38 who had been given preliminary training but could not qualify for the full training. In most of these cases, the preliminary training alone was beneficial for the employees and the organization—6 went on to positions involving operation of peripheral computer equipment and 14 to noncomputer positions—all of which are higher level positions than those previously held by these employees. The other 18 employees returned to positions at the grades they held prior to the preliminary training. A few of these, in offices that were being closed, transferred to other agencies.

Because of the extensive training necessary, it was imperative that a formal program be established and that qualifications for the program be sufficiently liberal to allow broad participation on the part of employees of the Bureau of Accounts. To aid in selecting employees with aptitude in the area of computer programming, special tests and appraisal forms were developed through the joint effort of the Bureau of Accounts and the Civil Service Commission.

In addition to the individuals utilized in computer offices after full or preliminary EDP training, it was necessary to train employees in the knowledges required for support positions on computer staffs and to give nontechnical training in operating procedures to employees who were not directly associated with computer operations. In most cases such auxiliary training activities involved over one-quarter of the staff of each of the five computer offices.

The vast majority of all individuals trained for programming or support positions come from within the Bureau of Accounts. In their new positions, these employees enjoy greatly broadened career opportunities. This has led to a relatively low turnover rate. Since January 1961, there have been only six resignations from the fully trained programming staffs; in two of these cases, the employees returned to school to further their education; three took positions in private industry.

#### *D. Use of byproduct statistical data in management decisions*

Each month, as a byproduct of their computer runs, the Social Security Administration and the Veterans' Administration furnish the disbursing offices with magnetic tape containing data for updating the master files of the disbursing offices. Changes to the master files are of three types—new accounts, accounts to be deleted, and accounts with a change in name, address, or rate of payment.

As a byproduct of processing checks on computers, the regional disbursing offices furnish the Treasurer's Office with matrix tapes. These tapes contain check issue data and are used by the Treasurer's Office as direct input for proof of checks as they are paid.

Further, magnetic tape has facilitated the use of geographic codes in the payment records. These codes are punched into the checks in the process of their preparation. Using high-speed mechanical equipment, the disbursing office sorts the checks into separate geographic groups, according to (1) each of the 48 largest cities in the United States and the remainder according to each of the 50 States;

and (2) foreign countries. This reduces the amount of handling required in the postal service and expedites delivery.

The development of the large-scale integrated EDP disbursing system was accomplished through the joint efforts and fine cooperation of the agencies served by the Division of Disbursement, particularly the Veterans' Administration, Social Security Administration, Internal Revenue Service, and Bureau of the Public Debt.

This whole matter of maximum utilization of byproducts of agency operations, to enhance overall integration of interrelated processes, was covered by Treasury Department Circular No. 1035, dated November 30, 1959.

#### *E. Progress of the Interagency Committee on Automatic Data Processing*

Distribution by the Interagency Committee on Automatic Data Processing of minutes of its meetings and other material has been helpful in keeping the Bureau apprised of the latest developments and trends in the ADP field. Informational material received from the Committee is studied for clues to better utilization of equipment.

### BUREAU OF THE PUBLIC DEBT

#### *A. Planning prior to installation of equipment*

It is the practice of the Bureau of the Public Debt to engage in a continuous review of all operations and procedures. Whenever the review process indicates a possible application for electronic data processing equipment, existing procedures are thoroughly analyzed and documented, modified if deemed necessary, and then discussed with systems representatives of interested electronic data equipment manufacturers, who present proposals showing how the operations concerned might be performed on their equipment. These proposals are thoroughly evaluated for the purpose of determining whether electronic data processing equipment may be effectively and economically utilized. This comprehensive feasibility study technique was utilized in connection with the installation of a D-1000 system in the Parkersburg office of the Bureau in 1958. A complete description of the original planning effort is contained in material submitted to the subcommittee in June 1959. In the latter months of 1960, a limited study was conducted by a committee of Bureau personnel, which led to the updating of the D-1000 system with a Honeywell 800 system. That study concerned itself only with the question of could the more advanced electronic data processing systems then available do the job efficiently at lower cost. Speeds and other capabilities of selected advanced systems were carefully analyzed and an affirmative answer to the question resulted. The updated system became wholly operative in May 1962; its installation had no adverse impact whatever on personnel and resulted in an estimated annual savings in equipment rental costs of \$450,000.

Two studies are now underway in the Bureau to determine whether it will be feasible to utilize electronic data processing equipment in the Washington and Chicago offices. The Washington study is directed at a force of about 55 employees engaged in the operation of conventional punched-card machines, the annual rental cost of which is about \$110,000. The Chicago study involves an examination of the procedures used in the maintenance of approximately 1,500,000 accounts of series H savings bondholders and the payment of interest semi-annually on those accounts. Checks in payment of such interest are inscribed from magnetic tapes maintained by the Treasury's regional disbursing office in Chicago. One of the purposes of the feasibility study is to determine if it would be more economical for the Bureau to furnish magnetic tape rather than punched cards for use by the RDO in updating their magnetic tape check issue file. While some preliminary data is available, particularly with respect to the Washington study, neither of the feasibility studies has progressed to the final decision-making stage.

#### *B. Effectiveness of policies outlined in Bureau of the Budget Circular No. A-54*

It is the Bureau's opinion that the policies contained in Bureau of the Budget Circular No. A-54 are generally sound. The Bureau has complied with the provisions of paragraph 6a of the circular and proposes to purchase, rather than to continue to lease, selected components of the H-800 system early in the fiscal year 1963.

Prior to selecting the equipment updating the D-1000 system, several manufacturers were given the opportunity to propose equipment. Three manufacturers submitted proposals and the equipment selection was made on the basis of meeting the specifications at the lowest cost.

It is the practice of the Bureau to make the best possible utilization of its equipment, keeping in mind the least costly combination of people and equipment considering the workload volumes. Machine utilization reports are maintained and the schedule for the use of equipment is revised, as appropriate. Although the Bureau has not shared time on its present equipment, because there are no computer installations close by which use the same type of equipment, it is prepared to exchange equipment time whenever it is mutually advantageous.

### *C. Manpower utilization*

Since installation of the electronic data processing system in the Parkersburg office, no problems have been encountered from the standpoint of manpower utilization. There has been a minimum turnover in such positions as programmer and peripheral equipment operator. The vacancies in such positions that had to be filled were filled from within, after requiring the employees concerned to demonstrate their aptitudes for the work and subjecting them to both training on the job and at special training sessions conducted by representatives of the manufacturer of the EDP equipment. This practice has more than adequately met the Bureau's needs.

The present grade structure for positions related to operation of the EDP system appears to be adequate, since, as stated above, the Bureau has experienced only a minimum turnover. The Bureau has observed, however, that some agencies appear to be offering higher grades to programmers to perform work at a level where the Bureau's positions are in lower grades. The Bureau believed that it had allocated its positions in accordance with standards published by the Civil Service Commission, but in view of the Bureau's observations it intends to accord the positions a critical review in the very near future for the purpose of determining whether they are graded properly.

As more and more EDP installations are utilized by Government agencies, the need for programmers will increase. Since there is an apparent dearth of persons with such skills, it is considered to be extremely important to keep the grades of the Bureau's positions in step with those of other agencies using business-type EDP equipment, in order to minimize the possibility of losing experienced employees by transfer.

A complete statement on the effects on employees of the original conversion to computer operations is contained in material submitted to the subcommittee in March 1960.

### *D. Use of byproduct statistical data in management decisions*

The Bureau has not experienced a need for byproduct statistical data of a type that could be obtained from the data that is recorded on magnetic tape. As time goes on, it may be that the Office of Debt Analysis attached to the Secretary's Office, for example, may develop a need for certain byproduct data; the Bureau would, of course, be prepared to explore the matter. The Bureau has no reporting requirements that involve the operation of its EDP system. The Bureau has engaged in discussions with representatives of the Navy and the Air Force, which issue series E savings bonds, for the purpose of determining whether data relating to bonds issued by them might be furnished on magnetic tapes for merging with the Bureau's magnetic tapes. At the present time such agencies, as well as all other issuing agents, furnish bond information on a prescribed punched card, which is called a registration stub; the data contained in the stub is converted to magnetic tape language and thereafter processed and stored in that form.

### *E. Progress of the Interagency Committee on Automatic Data Processing*

The Bureau has had no direct contacts with the Interagency Committee on Automatic Data Processing. It is believed, however, that a committee of such kind is desirable and that it probably has been and will continue to be helpful to Government agencies in making EDP information available to them. A central clearinghouse for the dissemination of useful EDP information may be likened to "users' conferences" which are participated in from time to time by representatives of this Bureau. These conferences, which are made up solely of representatives of users of Honeywell equipment and representatives of the company, afford opportunities for discussing common EDP problems and of learning of the experiences of each user from a viewpoint that has been generally useful in the operation of the Bureau's EDP system.

## OFFICE OF THE TREASURER, UNITED STATES

*A. Planning prior to installation of equipment*

On August 28, 1953, the Fiscal Assistant Secretary of the Treasury wrote to 16 manufacturers of electronic equipment, announcing the appointment of a Joint Government Committee, under the joint accounting improvement program, to study the feasibility of adapting electronic equipment in an integrated payment and reconciliation process for Government card checks. In his letter he invited interested manufacturers to attend a 2-day symposium in September 1953, in the Treasury. Interested manufacturers were requested to submit proposals contemplating the use of machines or components thereof presently being manufactured or those which had been developed. In order to assist manufacturers, he enclosed with his letter a memorandum setting forth the detailed specifications of present requirements for the clearance, payment and reconciliation of Treasury checks. Proposals were received from the following manufacturers:

International Business Machines Corp.  
Radio Corp. of America.  
Raytheon Manufacturing Co. (Minneapolis-Honeywell).  
Remington Rand, Inc.  
Underwood Corp.

The committee, with technical advice from representatives of the Bureau of Standards and the National Security Agency, established the following factors as criteria for evaluating proposals submitted by manufacturers:

1. Reliability and efficiency of equipment.
2. Cost of equipment—lease versus purchase.
3. Direct labor requirements.
4. Cost of supplies (tape, power, etc.).
5. Maintenance and service requirements.
6. Building specifications and cost of installation.
7. Availability of equipment.

Each proposal was analyzed in detail by the committee, with technical advice from representatives of the Bureau of Standards and the National Security Agency. Following this analysis, the committee met on numerous occasions with representatives of each manufacturer to discuss in detail certain points of procedure. On the basis of these discussions, four of the five proposals were amended by the manufacturers so that they became practically identical insofar as procedural techniques were concerned, although varying as to the specific electronic equipment to be used.

The committee concluded, from knowledge gained in evaluating the various proposals and tests which were conducted on different types of equipment, that the choice of equipment best suited for the proposed plan of operation should be made primarily on the basis of comparative costs. Accordingly, the recommendation was made by the committee that the electronic data processing equipment of one particular manufacturer should be acquired for the function of paying and reconciling Government checks.

The initial conversion to the electronic system encompassed only those checks drawn on the Treasurer, United States, in Washington, D.C. Beginning in January 1957 additional accounts were brought into the system and by January 1958 the conversion phase for all accounts had been completed. In the light of the prospects for an ever increasing workload, it had become evident during this period that even with the installation of newer and more sophisticated computer programs there would still be little margin of safety or reserve capacity available during the peak workload periods. From March through May, the former computer was in operation three shifts a day, 7 days a week (due to the large volume of income tax refunds), and it was becoming increasingly difficult to service individual check status inquiries on a reasonably current basis. It had become necessary to split the master files into halves and to service each half on alternate weekends; thus, 2 weeks might elapse before a report could be furnished on the status of a particular check. These considerations led to the exploration of the feasibility of acquiring faster, more modern computing equipment, with greater capacity. It was subsequently developed, through detailed analysis, that with more modern computing equipment, it would be possible to perform more work in 5 days, at less cost, than could be achieved with the former computing system in 7 days of operation.

In planning for the installation of a new computing system, there was one requirement that was paramount: There could be no cessation of operations during the period required for the changeover. Absolute continuity was man-

datory. It was obvious, therefore, that a different physical location would have to be found for the new computer system and with the full cooperation of the General Services Administration this was arranged.

Past experience in programing for the check payment operation prompted a fairly conservative approach with respect to the amount of time that should be provided for testing and debugging programs for the new equipment. Since final testing would involve dealing with large quantities of data, and with large master files which would have to be converted, it was felt that not less than 3 weeks of parallel operation should be scheduled for the period immediately preceding the contemplated changeover. In view of these considerations, sufficient funds were budgeted to provide for simultaneous usage of both computer systems. It is fortunate that this approach was taken, since it is now clear that a less conservative one could have led to rather serious difficulties.

*B. Effectiveness of the policies outlined in Bureau of the Budget circular No. A-54*

Examples are shown below which will serve to indicate the steps taken to carry out the policy of effective utilization of electronic equipment in the Treasury Department.

(1) Conversion of postal money order operation to an electronic system: In March 1960, agreement was reached between the Post Office and the Treasury Departments to initiate a joint study to determine the feasibility of expanding the electronic facilities of the Office of the Treasurer, United States to provide for processing money orders presented by the Federal Reserve banks and reconciling them with the accounts of the issuing postmasters. This study disclosed that the project was not only feasible but, in addition to improvements which would be made possible from an accounting and control standpoint, would result in an estimated savings to the Government of about \$650,000 annually. In addition to the monetary advantage shown above, the system will lend itself to the establishment of controls for each money order from the time it is manufactured until it is destroyed. This type of information will be available without delay and should prove to be extremely helpful in any case where the inspection service or other auditing or management activity of the Post Office Department desires to determine the accountability of any particular post office with respect to unissued and issued orders. The first conversion phase of this operation commenced on June 23, 1962, with the last phase scheduled for completion by April 1, 1963.

(2) Payroll automation: In December 1961, a computer systems analyst was assigned to participate in a joint study to determine the feasibility of converting payroll operations in the Fiscal Service to automatic data processing equipment. The Fiscal Service task force is to begin the study by surveying the present payroll operations in the Office of the Treasurer of the United States and also, if desirable, this study may be extended to the other Fiscal Service bureaus. If an ADP system is determined to be feasible, they will develop the system to be established. If this is accomplished, the team will continue by studying the feasibility of having those Treasury disbursing offices with ADP equipment provide similar payroll and personnel services for small agencies and offices in the field for which they are now preparing and issuing payroll checks.

Historically it may be of interest to recall that more than 2 years ago, officials of the Fiscal Service arranged to meet with members of the House Appropriations Subcommittee to discuss a plan which called for the acquisition of electronic equipment by the Treasurer of the United States, through the use of purchase option agreements. Their approval was received and funds to provide for the exercising of the options were allowed by this subcommittee subsequent to the last budgetary presentation.

More recently, the Office of the Treasurer, in complying with the provisions of the Bureau of the Budget Circular No. A-54, reviewed the method of acquiring certain equipment peripheral to the central processor. Experience to date indicates that this equipment will meet the criteria for purchase and the office plans on requesting the necessary funds for fiscal year 1964.

The Treasurer's Office has long followed the policy of extending its facilities and making its electronic equipment available to other Federal agencies for program testing and emergency usage. Among the agencies that have utilized these facilities are—

- (a) Department of Commerce, Public Roads.
- (b) Federal Housing Administration.
- (c) Government Printing Office.
- (d) Treasury, Internal Revenue Service.
- (e) Department of the Navy, Bureau of Ships.
- (f) Department of Labor, Bureau of Labor Statistics.
- (g) Department of Justice, Federal Bureau of Investigation.

Since it is obligatory that checks and money orders and related public inquiries be processed without delay, the nature of such operations requires these arrangements to be made on a basis of available time which must be subject to change or cancellation on a very short notice.

### C. Manpower utilization

This topic was covered in the March 1960 hearings before this subcommittee. In summary, 44 employees were transferred to other bureaus within the Treasury Department, and 28 employees to other Federal agencies. A total of 86 employees were reassigned to essential positions in other divisions of the Treasurer's Office; 27 employees resigned and 22 employees retired. The success of this placement program made it possible to avoid resorting to reduction in force procedures.

As to current operations, it may be said that no particular problems are being encountered in staffing for EDP operations. Turnover has been exceptionally low, in that only one experienced programmer and two experienced console operators have been lost in a period extending over 5 years. A formal training course is in effect for recruitment at the entrance levels, and the grade structure as defined by the Civil Service Commission's standards appears to be reasonably adequate.

### D. Use of byproduct statistical data in management decisions

The electronic system presently installed was initially designed to accept "Check Issue" or "Matrix" tapes containing check data furnished by disbursing officers using computer equipment to prepare their checks. Initially, only the regional disbursing office in Chicago furnished this information in magnetic tape format. At the present time, in addition to the Chicago office, tape data is being received from the major disbursement centers in Philadelphia, Kansas City, and Cleveland, with other centers scheduled to join this program in the not too distant future. The receipt of issue information in this format makes it possible to reconcile each check individually and economically. It is estimated that by the end of the next fiscal year, 60 to 70 percent of all checks issued will be reported and reconciled in this manner.

In addition to simplifying reporting requirements (the printing of hard-copy listings of checks drawn being obviated) the preparation of magnetic tapes containing comparable information is a natural and obviously economical extension of computer usage in the issuing office and in a very real sense exemplifies most excellent utilization of byproduct information.

## EXHIBITS

No. 1—Administrative Circular No. 55, "Statement of Functions and Responsibilities, Office of Management and Organization, Office of the Administrative Assistant Secretary."

No. 2—Administrative Circular No. 73, "Management of Automatic Data Processing."

No. 3—Administrative Circular No. 6, "Cooperative Arrangements Among Treasury Bureaus."

No. 4—Administrative Circular No. 48, "Procurement of Supplies, Equipment, or Services."

No. 5—Department Circular No. 1035, interagency coordination of planning in re: Disbursing and banking operations of the Government.

### ADMINISTRATIVE CIRCULAR No. 55

TREASURY DEPARTMENT,  
ADMINISTRATIVE ASSISTANT SECRETARY,  
Washington, November 28, 1961.

To: Heads of bureaus—Treasury Department:

Subject: Statement of functions and responsibilities, Office of Management and Organization, Office of the Administrative Assistant Secretary.

The Office of Management and Organization is an element of the Office of the Administrative Assistant Secretary. The following are included among its responsibilities:

1. Guiding, coordinating, stimulating, and reviewing management improvement programs of bureaus and participating in bureau management studies, surveys, and appraisals, and studies cutting across bureau lines.
2. Consulting with departmental and bureau officials on management problems, conducting research, and establishing guidelines for conduct of management

improvement efforts; and maintaining liaison with other organization elements of the executive and legislative branches of Government.

3. Providing general staff assistance to the Administrative Assistant Secretary, and formulating policy directives on matters of administration.

4. Serving as a medium for the exchange of information among bureaus on new management developments and progress; and keeping top officials generally informed of Treasury activities and problems.

5. Providing staff assistance for the Secretary and his principal assistants on emergency mobilization planning activities and furnishing central staff guidance in this area to bureaus.

6. Developing regulations to be observed in the several bureaus and providing departmental administration of internal auditing and administrative accounting systems for appropriations and funds.

7. Providing staff assistance at departmental level in developing systems relating to administrative appropriations, systems in the use of source data automation and automatic data processing equipment and other systems relating to operational procedures of a departmentwide nature.

In discharging these responsibilities, the Office of Management and Organization has been divided into three subordinate offices as follows:

Management Analysis Division,  
Systems Development Division, and  
Mobilization Planning Staff.

The functions and responsibilities of the separate offices include the following:

#### MANAGEMENT ANALYSIS DIVISION

1. Provide advisory services on organization, management improvement, planning, and systems of control, internal audit, and appraisal.

2. Formulate policies and plans for efficient and effective administrative management, organization, and long-range planning.

3. Formulate internal audit policies, standards, and practices, coordinate internal audit activities, and review results.

4. Review General Accounting Office reports of audit, examination, or review, and coordinate responses to recommendations.

5. Conduct reviews, surveys, and inspections of missions, organization, functions, activities, procedures, and systems of control, internal audit, and appraisal.

6. Review and make recommendations on plans, requests, and requirements for outside management consulting or advisory services.

7. Develop and install reporting systems on program and management performance and accomplishments.

8. Conduct projects to resolve special problems or provide required information in the area of administrative management.

9. Evaluate overall progress of organization, planning, management improvement, and systems development.

10. Conduct research and inquiries into new and unusual developments or problems and serve as a focal point for coordination and exchange of information relating to these activities.

11. Formulate policies and plans for, and coordinate participation in, foreign visitor educational programs sponsored by the Department of State, other Government agencies, embassies, universities, and private organizations.

#### SYSTEMS DEVELOPMENT DIVISION

1. Develop systems in the field of accounting relating to administrative appropriations, which includes, but is not limited to, providing coordination and professional assistance to the various bureaus and offices of the Treasury Department:

(a) In the development of accounting systems, procedures, and accounting forms and the review and approval of such systems, procedures, and forms, for the purpose of transmitting them, when appropriate, to the Comptroller General for his review and approval.

(b) In improving financial management practices followed by Treasury bureaus in connection with the joint financial management improvement program of the Secretary, Comptroller General, and the Director of the Bureau of the Budget.

2. Maintain active liaison and working arrangement with—
  - (a) The steering committee for the joint financial management improvement program.
  - (b) Representatives of the General Accounting Office and the Bureau of the Budget.
3. Advise and assist officials of the Office of the Secretary in matters relating to accounting as they may pertain to appropriations and other administrative accounting activities, by—
  - (a) The preparation of instructions for the guidance of Treasury bureau and offices in the development of their accounting systems.
  - (b) The review of accounting releases of the Bureau of the Budget and the General Accounting Office for the purpose of preparing and recommending Treasury policy statements relating to such matters.
4. Arrange for, or engage in appraisals, reviews, investigations, or studies of organizational structure or office procedures in the bureaus of the Department as directed by officials of the Office of the Secretary.
5. Identify departmentwide problems in or needs for the development of automatic data processing systems or the management of automatic data processing systems and equipment.
6. Provide for the availability of necessary information relating to the status of automatic data processing systems and the utilization of automatic data processing equipment within the Department.
7. Develop planning guidance, policies, criteria, standards, or procedures for the development and management of automatic data processing systems and equipment.
8. Review and appraise the management of automatic data processing systems and equipment by the Bureaus.
9. Review requests for approval of the selection and acquisition of automatic data processing equipment and prepare appropriate recommendations.
10. Participate with central agencies and other executive departments and agencies in matters relating to automatic data processing systems and equipment.
11. Promote the interbureau exchange of information on matters relating to automatic data processing systems and equipment.

## MOBILIZATION PLANNING STAFF

1. Develop, coordinate, and maintain in a current status emergency preparedness plans essential to the continuity of the Department and related Federal agencies.
2. Advise and assist officials of the Office of the Secretary on matters relating to emergency preparedness.
3. Develop instructions for the guidance of bureaus and offices in developing their emergency plans, implementing documents, and procedures.
4. Maintain liaison and participate in planning with the Office of Emergency Planning, the Federal Reserve Board, Bureau of the Budget, and other Government agencies on matters relating to emergency preparedness.
5. Maintain continuous activation of the departmental relocation site.
6. Develop programs for training personnel and testing emergency plans consistent with national exercise criteria.
7. Make periodic reviews and appraisals of Treasury's emergency preparedness plans and report on the status of readiness to execute such plans.

## REFERENCES

- Treasury Department Order No. 190, dated July 28, 1961.  
Treasury Department Order No. 170-9, dated July 28, 1961; subject: "Transfer of Responsibilities to the Administrative Assistant Secretary."  
Treasury Department Order No. 192, dated September 15, 1961; subject: "Assignment of Responsibilities to the Administrative Assistant Secretary."

A. E. WEATHERBEE,  
*Administrative Assistant Secretary.*

THE SECRETARY OF THE TREASURY,  
Washington, July 5, 1962.

To: Heads of bureaus—Treasury Department.  
Subject: Administrative Circular No. 73, dated June 27, 1962.

The Appropriations Committees of the House and Senate have, in the hearings held during the last 2 years, expressed a strong interest in automatic data processing. In addition, the General Accounting Office has issued a Government-wide report on ADP, as well as audit reports on its use within Treasury and other agencies. The Bureau of the Budget has also indicated its active interest in this field.

The expenditures of the Treasury Department for ADP operations are now exceeded only by the Department of Defense, NASA, and AEC among the various Government agencies. Annual operating costs for this purpose in Treasury alone are expected to reach \$100 million by fiscal year 1969, an increase of 500 percent over the sum spent in 1959.

In the light of the great importance of this subject, therefore, I want to call to your personal attention the attached circular on the "Management of Automatic Data Processing." The circular is designed to: (1) implement the recent BOB circular on the selection and acquisition of ADP equipment; (2) to provide guidelines for the development and management of ADP systems; (3) to establish a basis for evaluating the management of ADP operations; and (4) to coordinate proposed plans for the acquisition of ADP equipment or services.

The Administrative Assistant Secretary has the responsibility for the effective utilization of our automatic data processing systems. Accordingly, I ask all you to maintain close consultation with him in this vital field.

DOUGLAS DILLON.

#### ADMINISTRATIVE CIRCULAR No. 73

TREASURY DEPARTMENT,  
ADMINISTRATIVE ASSISTANT SECRETARY,  
Washington, June 27, 1962.

To: Heads of bureaus—Treasury Department:  
Subject: Management of automatic data processing.

#### I. INTRODUCTION

##### A. References

1. Bureau of the Budget Circular No. A-54, "Policies on the Selection and Acquisition of Automatic Data Processing (ADP) Equipment," dated October 14, 1961. (Transmitted to Bureaus by Administrative Bulletin No. 61-73, dated November 3, 1961.)

2. Bureau of the Budget Bulletin No. 60-6, "Automatic Data Processing (ADP) Program of the Executive Branch: Studies Preceding the Acquisition of ADP Equipment," dated March 18, 1960. (Transmitted to Bureaus by circular letter from the Administrative Assistant Secretary, dated May 3, 1960.)

3. Letters from the Comptroller General of the United States, reference No. B-115369, dated September 18, 1957, subject: "Accounting and Auditing Aspects of Automatic Data Processing" and dated January 14, 1959, subject "Automatic Data Processing Systems: Feasibility and Applications Studies and Retention of Records."

4. Treasury Department Administrative Circular No. 48, "Procurement of Supplies, Equipment, or Services," dated September 15, 1961.

5. Treasury Department Administrative Circular No. 6, "Cooperative Arrangements Among Treasury Bureaus," dated June 3, 1960.

##### B. Purpose.

This circular summarizes requirements for the development and management of automatic data processing systems and the selection, acquisition, and utilization of automatic data processing equipment and services.

##### C. Definitions

1. "Data processing" is effecting purposeful changes in the form or content of data to provide information for official purposes. Data processing involves all the actions or operations involved in the creation, collection, recordation, transmission, organization, compilation, manipulation, storage, retrieval, reporting, analysis, and utilization of information. The term also includes the processes of mathematical calculation and arithmetical computation.

2. "Automatic data processing (ADP)" is the processing of data with and through automatic data processing equipment.

3. "ADP applications" are the significant classes of data processing problems, functions, or activities to which ADP has been or is proposed to be put to practical use; e.g., checkwriting, check reconciliation, calculating solutions to linear equations, preparing payrolls, revenue accounting, etc.

4. "ADP equipment" includes the following classes of equipment:

(a) Electronic digital and analog computers irrespective of size, capacity, or price;

(b) All peripheral or auxiliary equipment, used in support of electronic computers, whether or not cable connected and whether selected or acquired with the computer or separately (e.g., input or output equipment such as magnetic tape drives, card readers, printers, etc.);

(c) Punched-card equipment, also called electromechanical punched-card equipment or electrical accounting machines, whether used in conjunction with or independent of an electronic computer;

(d) Source data automation equipment designed to capture data at the source in machine language including components capable of recognizing machine language, and where the machine language itself has been recorded in punched paper tape, punched cards, tags, embossed plates, or in the form of special characters which can be recognized optically or electronically; and

(e) Data transmission or communications equipment employing devices which convey or transmit data automatically or electronically from place to place or from equipment to equipment, for processing in conjunction with other ADP equipment as defined herein.

(f) Excluded from this definition is any equipment in items (a) through (e) above which is incorporated in a weapon or is being produced under developmental contract for defense purposes.

5. "ADP installation" is a configuration of ADP equipment at a single location operated by a single bureau or subdivision of a bureau, utilized as a part of a single data processing system or as a service center for several data processing systems within the area.

6. "ADP services" are those services acquired outside the organization responsible for the management of an ADP system whether acquired from within the Federal Government or from commercial sources. These include—

(a) The processing of data through the use of ADP equipment;

(b) ADP systems analysis and design;

(c) Programing; and

(d) Any other consultative service having a bearing on or relating to ADP systems and equipment.

(e) Excluded from this definition are those services acquired as a part of a contract for the lease or purchase of ADP equipment.

7. "ADP system" means any system for processing data which involves the use of ADP equipment.

## II. REQUIREMENTS

### A. General requirements

1. *Basic requirement.*—All Treasury bureaus and offices are expected to consider the potential use of automatic data processing equipment in their data processing activities. Automatic data processing equipment or services may be acquired when an objective analysis of the potential use of automatic data processing principles, techniques, systems, equipment, and services indicates that their use is in the general interest of the Federal Government and is operationally and technically feasible.

2. *Organization for automatic data processing.*—The conversion to automatic data processing systems often involves considerations of how to organize for the management of such systems. Automatic data processing equipment or services should not be acquired until appropriate organizational plans have been made.

3. *Human implications of automation.*—The Department is sensitive to the human implications of automation. Automatic data processing equipment or services should not be acquired in the absence of approved plans for the solution of the personnel and training problems involved.

4. *Funding automatic data processing systems.*—Conversion to automatic data processing systems and the acquisition of either ADP equipment or ADP services often involve major budgetary decisions. Bureaus should prepare both tentative and firm financial plans for automatic data processing systems and ADP equipment installations projected from 1 to 5 years into the future.

5. *Accounting and auditing aspects of ADP.*—The design of a system for any ADP application which involves, in whole or in part, the accounting for assets,

liabilities, income, or expense must take into consideration appropriate accounting principles, controls, standards, and internal auditing guidelines issued or prescribed by the Comptroller General of the United States.

6. *Integrated data processing.*—The development of integrated data processing is encouraged. Those conducting systems studies are expected to take into consideration the following elements of integrated data processing:

(a) Between organizations: Integrating data processing systems relating to the same function between organizations to provide for the minimum of data input, optimum efficiency and economy in data processing, and for the multiple or joint use of the same data input or output.

(b) Functional: Integrating all data processing which contributes, in whole or in part, to the same or a number of operating or managerial functions of an organization.

(c) Language: Coding names, characters, functions, and symbols so that data recorded by one machine may be transferred to and be utilized by another machine without intermediate code conversion; requiring physical and electrical characteristics of recorded media that will permit economical physical interchange of data between systems using the same type of recording media; and arranging the order of data content so that standard programming techniques may be utilized.

7. *Protection of ADP systems, equipment, and records.*—Plans for ADP systems and equipment installations should include appropriate provisions for reduction of the vulnerability of ADP systems, equipment, and records to damage or destruction by water, fire, power failure, natural disasters, and warfare.

8. *Emergency operations.*—Plans should be prepared for maintaining the continuity of essential ADP operations in the event an ADP installation is damaged, destroyed, or rendered inoperable as a result of national emergency, natural disaster, or other catastrophe. Such plans should provide for—

(a) Identification and protection of essential records;

(b) Identification of required standby and/or alternate facilities, equipment, and personnel; and

(c) Procedures for the reconstitution of essential operations.

#### *B. Inventories of activities and resources*

1. Inventories of data processing activities. Periodic inventories of data processing activities should be made. These inventories should be organized by major functions within appropriation activities and should serve as a basis for establishing relative priorities and time schedules for exploring the potential use of ADP equipment or services.

2. Inventories of ADP resources. Periodic inventories of ADP resources should be made. To facilitate such inventories, information on ADP applications, equipment, costs, and personnel utilization should be maintained. Such information should be incorporated, insofar as practicable, into the regular management information systems of the bureaus and offices.

#### *C. Studies preceding the acquisition of ADP equipment or services*

1. *Preliminary studies.*—(a) A preliminary study, sometimes called a feasibility study (see reference A-2), should be made prior to undertaking large-scale systems studies which may lead to the acquisition or major revision of ADP equipment or services. The study should identify data processing problems and develop general conclusions that the functions and processes involved are essential to perform and that there is a reasonable expectancy that the introduction or revision of automatic data processing equipment or services would contribute to the resolution of the problems.

(b) If the preliminary study results in recommendations for undertaking full-scale systems studies, then further information should be developed on the scope, methodology, organization, time schedule, and estimated costs of the proposed systems studies.

2. *Systems studies.*—(a) Systems studies, sometimes called applications studies, should be made prior to the initial selection or acquisition of ADP equipment or services.

(b) The scope of systems studies should be sufficient to provide a factual basis for—

(1) Confirming that the functions or processes for which ADP equipment or services can be used are essential to perform;

(2) Assuring that the systems, procedures, and methods to be employed in performing these functions or processes have been designed to achieve the highest practicable degree of effectiveness with optimum efficiency and operational economy;

(3) Developing general specifications for required resources including personnel, supplies, equipment, or services; and

(4) Making a comparative analysis of the immediate and long-range costs and benefits of the proposed versus the old system.

(c) The selection and acquisition of additional or replacement ADP equipment or services may be based on the original systems studies plus an analysis of those essential systems or volume changes which justify modifications in the equipment or service.

(d) General guidelines on conducting system studies are contained in reference A-2.

#### D. Selection and acquisition of ADP equipment or services

1. *Selection.*—(a) The selection of ADP equipment or services will not be made until—

(1) Systems specifications which are not equipment oriented are available to serve as a basis for the selection; and

(2) All qualified suppliers of equipment or services have been given equal opportunity to show how their equipment or service would meet the system specifications as provided in reference A-4.

(b) Two prime factors must be considered in the selection of ADP equipment or services:

(1) The capability of the equipment or service to meet the system specifications; and

(2) The overall costs of converting to and operating the automatic data processing system. The term "overall costs," as defined in paragraph 4c of reference A-1, will be interpreted within the Department to include elements of cost developed in the analysis of alternative methods of acquisition of equipment as provided in paragraph 5a of reference A-1.

2. *Acquisition.*—(a) The method of acquisition of ADP equipment (either by purchase, lease with option to purchase, or straight lease) will be determined by an analysis based on the guidelines contained in paragraph 5a of reference A-1.

(b) ADP services will not be acquired from commercial sources until consideration has been given to the availability of such services elsewhere in the Department or the Federal Government. The decision of where to obtain such services must be governed by the general interest of the Federal Government as it applies to each transaction.

3. *Readiness reviews.*—Heads of bureaus or offices should initiate and complete readiness reviews 1 to 3 months prior to the delivery of ADP equipment. These reviews are for the purpose of assuring that as soon as the equipment is operational, it will be used as fully as possible for productive work. Appropriate terms of the contract should be renegotiated if preparations are not sufficiently advanced to assure productive use of the equipment. Among the elements to be considered in readiness reviews are—

(a) Preparing the site for equipment and operations;

(b) Developing operating procedures and related manuals;

(c) Developing, testing, and debugging programs;

(d) Converting basic files or records;

(e) Acquiring forms and supplies; and

(f) Recruiting and training personnel.

#### E. Utilization of ADP equipment

1. *Effective use of equipment.*—Measures must be employed to assure effective use of ADP equipment owned or operated by the Department. Effective use means using equipment only for operations which are essential to perform, acquiring the proper configuration of equipment so that each component is used as fully as possible in relation to other components, and scheduling the work in such a manner so as to obtain the best possible balance between the use of personnel and equipment and the relevant costs.

2. *Sharing equipment.*—As provided in reference A-5, cooperative arrangements between bureaus for the joint utilization of equipment is encouraged. The sharing of equipment between Treasury bureaus and other Government agencies is also encouraged. The Economy Act of 1932, as amended (31 U.S.C. 686), provides general authority for acquiring services from or furnishing services to other Government agencies. Any payments made or received for such services will be handled in accordance with that act.

3. *Lease contracts.*—Federal supply contracts, negotiated between manufacturers of ADP equipment and the General Services Administration contain different provisions for different types of equipment and vary from year to year.

ADP installations will take full advantage of the provisions of current lease contracts to minimize costs and increase operating efficiency.

4. *Excess equipment.*—Appropriate reviews and controls must be established to identify ADP equipment, components, and parts which are or may become excess to the needs of the ADP installation. Leased equipment excess to current needs will be removed promptly. Owned equipment excess to current needs will be made available immediately to other organizations according to current excess and surplus property disposal procedures. Organizations having need of ADP equipment, components, and parts are expected to make inquiry of other organizations within the Department about the availability of such equipment prior to reaching decisions on the acquisition of such equipment through other channels.

*F. Evaluation of ADP systems and installations*

Periodic onsite performance evaluations of ADP installations will be made. These evaluations should identify—

1. The degree of accomplishment as measured against expectations;
2. Whether or not satisfactory cost-benefit relationships have been obtained;
3. Areas needing improvement;
4. Requirements for future developments; and
5. Adequacy of plans, policies, and guidelines.

III. ADMINISTRATION OF REQUIREMENTS

*A. Responsibilities*

1. Office of the Secretary: Officials in the Office of the Secretary should be briefed on ADP activities in bureaus or offices under their direct supervision. These officials may desire to be represented in the evaluation of the performance of ADP systems and installations located in bureaus or offices under their direct supervision.

2. The Administrative Assistant Secretary is responsible for—

- (a) Departmentwide coordination in the administration of this circular;
- (b) Approving requests for the acquisition of ADP equipment or services as provided in paragraph (C) below;
- (c) Arranging for and conducting departmental evaluations of ADP systems and installations; and
- (d) Providing guidelines and staff assistance, as necessary.

3. Heads of bureaus and offices are responsible for—

- (a) Establishing the necessary framework of procedures, including appropriate reviews and controls, that will assure compliance with the Department's requirements;
- (b) Obtaining appropriate approval of recommendations arising out of preliminary studies as provided in paragraph (B) below;
- (c) Submitting requests for approval for the acquisition of ADP equipment or services as provided in paragraph (C) below; and
- (d) Submitting information on changes in ADP applications or equipment as provided in paragraph (D) below.

*B. Approval of preliminary study recommendations*

1. *Approval.*—Heads of bureaus or offices are expected to provide for the appropriate approval of recommendations arising out of preliminary studies as follows:

(a) When the recommendations apply to activities within a bureau or office, the head of the bureau or office will approve.

(b) When the recommendations apply both to activities within the bureau or office and to activities within other Treasury bureaus or offices, or other governmental agencies, approval will be obtained from the officials concerned.

2. *Submission of information copies.*—As soon as approval has been obtained, two copies of preliminary studies and the approved recommendations arising out of such studies should be furnished to the Administrative Assistant Secretary when the data processing activities—

(a) Involve any governmental or private activity outside the Treasury Department;

(b) Cross bureau or office lines within the Department; or

(c) Relate to common service activities such as budgeting, administrative accounting, payroll accounting, personnel management, property management, or other administrative services.

*C. Approval of requests for acquisition of ADP equipment or services*

1. *Requirements for submission.*—Heads of bureaus or offices should submit requests for approval to acquire ADP equipment or services to the Secretary for the attention of the Administrative Assistant Secretary in the following cases:

- (a) The initial acquisition of any ADP equipment for use at a new ADP installation, regardless of cost;
- (b) The purchase of any ADP equipment, where the costs exceed \$12,000;
- (c) The initial acquisition of a computer or data transmission equipment for use at an existing ADP installation, regardless of cost;
- (d) The acquisition of additional, permanent, and leased ADP equipment for use at an existing ADP installation where the resulting net increase in equipment costs at the ADP installation is 5 percent of the annual costs or \$12,000 whichever is greater; and
- (e) The acquisition of ADP services where the cost under the individual contract or agreement is in excess of \$12,000.

2. *Form of submission.*—The submission required in item C-1 above should be in an original and one copy accompanied by two sets of the documents required to support the approval. The submission will be retained in the Office of the Secretary and approval will be provided by separate letter.

3. *Basis for approval.*—The Administrative Assistant Secretary will, as a minimum, take into consideration the following factors when approving requests for acquisition of ADP equipment or services:

- (a) That appropriate approval of the objectives of the data processing system has been obtained as evidenced by a copy of the approved recommendations arising out of the preliminary study;
- (b) That appropriate systems studies were made as evidenced by a copy of the systems studies;
- (c) That the process of selection and the proposed method of acquisition of ADP equipment or services conform to departmental requirements; and
- (d) That financial, personnel, and organizational plans are complete.

*D. Information on changes in ADP applications or equipment*

1. *Requirements for submission.*—Heads of bureaus or offices should submit information on changes in ADP applications or equipment to the Secretary for the attention of the Administrative Assistant Secretary in the following cases:

- (a) The processing of new and permanent applications at existing ADP installations;
- (b) Permanent additions to or modifications of leased ADP equipment when approval is not required under paragraph C-1 above and where the resulting net increase or decrease in annual operating costs at the ADP installation is 5 percent of the annual costs or more; and
- (c) Owned ADP equipment is to be declared excess to the needs of the bureau or office.

2. *Form and timing of submission.*—(a) The submission should be in memorandum form and should identify the nature of, the cost effect of, and the benefits to be derived from the changes.

(b) The information should be submitted as actions occur. In the cases outlined in paragraphs 1 (a) and (b) above, bureaus or offices may elect to submit, at least 90 days in advance of the beginning of the fiscal year involved, an outline of changes to occur during the fiscal year.

*E. Documentation*

The various documents prepared pursuant to this circular will be retained to serve as a basis for:

1. Fulfilling external reporting requirements;
2. Identifying the size and scope of the data processing and automatic data processing activities of the Department;
3. Fulfilling review, approval, and audit requirements; and
4. Evaluating the operation of ADP systems in terms of approved objectives.

#### IV. OTHER PROVISIONS

*A. Effective date*

The provisions of this circular are effective this date.

*B. Rescissions*

The following documents are rescinded:

1. Circular letter from the Acting Secretary, dated November 30, 1959, subject "Rental or Purchase of Service or Equipment for Automatic Data Processing Programs."

2. Treasury Department Administrative Circular No. 25, dated December 15, 1960, subject: "Bureau of the Budget Bulletin No. 61-6, November 23, 1960, relating to the Automatic Data Processing (ADP) Program of the Executive Branch: Policy on Program Scope; Reports Required."

3. Circular letter from the Administrative Assistant Secretary, dated October 19, 1959, subject: "Bureau of the Budget Bulletin No. 60-4, October 9, 1959, Relating to Automatic Data Processing (ADP) Program of the Executive Branch: Definitions and Reports Required."

A. E. WEATHERBEE,  
*Administrative Assistant Secretary.*

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ADMINISTRATIVE CIRCULAR NO. 48

UNDER SECRETARY OF THE TREASURY,  
*Washington, September 15, 1961.*

To: Heads of bureaus—Treasury Department.  
Subject: Procurement of supplies, equipment, or services.

In the procurement of supplies and equipment, responsible officers of the Treasury Department shall comply fully with all applicable laws and regulations, including but not by way of limitation, the provisions of title III of the Federal Property and Administrative Services Act of 1949, as amended, 41 U.S.C. 252-260, relating to purchases and contracts made pursuant to authority delegated by the Administrator of the General Services Administration and section 3709 of the Revised Statutes, as amended, 41 U.S.C. 5, setting forth certain limitations in respect to other procurement procedure.

Supplies and equipment procured from the general supply schedule or by competitive bid must be obtained at the lowest price available consistent with the needs and requirements of the Department. Any procurement of equipment or supplies at other than the lowest price available shall be made only where the necessity for such action is clearly supported by documentary evidence.

Supplies and equipment may be obtained by negotiation only where there is specific statutory authority for such action and then only if circumstances require a departure from formal competitive bid procedures.

Officials responsible for the selection of automatic data-processing equipment or services shall assure that the selection process, including the preparation of nonrestrictive specifications, affords equal opportunity for consideration to all suppliers who offer equipment capable of meeting the system specifications.

To assure that equal opportunity for consideration is in fact provided to all qualified suppliers, written proposals shall be invited from all qualified suppliers to show how their equipment would meet the specifications. Manufacturers who have expressed an interest in submitting proposals shall be furnished copies of identical system specifications with an invitation to submit equipment or service proposals.

The letter of invitation for such proposals shall contain the following statement:

"The U.S. Government does not intend to award a contract solely on the basis of any response made to the request for proposals or otherwise pay for the information solicited or obtained. The information obtained will be utilized in determining the suitability of equipment, procurement of which will be in accordance with GSA schedules or subsequent contractual action, as appropriate."

This circular reaffirms the provisions of the circular letter of November 30, 1959, from the Acting Secretary to the heads of bureaus, on the subject "Rental or Purchase of Services or Equipment for Automatic Data Processing Programs."

HENRY H. FOWLER,  
*Acting Secretary of the Treasury.*

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ADMINISTRATIVE CIRCULAR NO. 6

THE SECRETARY OF THE TREASURY,  
*Washington, June 3, 1960.*

To: Heads of bureaus—Treasury Department.  
Subject: Cooperative arrangements among Treasury bureaus.

As you know, the Treasury Department has encouraged its bureaus to cooperate with each other in any way that will promote overall economy, efficiency, or

effectiveness of operations, and substantial benefits have resulted from various cooperative arrangements made during the past several years. I would like now to express the Department's objective in written form to make sure that it is fully understood at all levels of operation, both at headquarters and in the field.

Whenever it is in the general interest of the Federal Government to do so, all bureaus and offices of the Treasury Department, wherever located, are requested to make cooperative arrangements with respect to the utilization or acquisition of personal services, supplies, equipment, space, training, transportation, duplicating, and other common services.

In addition, in order to broaden career opportunities for Treasury employees and to facilitate fuller utilization of Treasury personnel, each bureau head should see that appropriate arrangements are made with other Treasury bureaus to provide for consideration of personnel qualified to meet recruitment needs. In case of retrenchment or changes in work processes which may result in reductions in force, maximum efforts should be made to place Treasury personnel in other Treasury bureaus.

Close contact should be maintained among Treasury installations in each location to assure that full benefits are realized from such arrangements. In all cases, of course, applicable laws and regulations must be followed.

ROBERT B. ANDERSON,  
*Secretary of the Treasury.*

INTERAGENCY COORDINATION OF PLANNING TO TAKE ADVANTAGE OF TECHNOLOGICAL IMPROVEMENTS RELATING TO DISBURSING AND BANKING OPERATIONS OF THE GOVERNMENT

DEPARTMENT CIRCULAR NO. 1035, 1959

TREASURY DEPARTMENT,  
OFFICE OF THE SECRETARY,  
OFFICE OF THE FISCAL ASSISTANT SECRETARY,  
*Washington, D.C., November 30, 1959.*

*To the Heads of Executive Departments, Establishments, and Agencies, and Others Concerned:*

There is a growing interest throughout the Government in the use of electronic data processing systems, with magnetic tape, for large-scale accounting and related operations. The Treasury desires to call your attention to certain general information concerning possible corollary benefits of such systems in the agencies in relation to the central fiscal functions of the Treasury Department.

Broadly speaking, the Treasury's interest in these technological developments pertains to (1) its banking functions, involving the payment and reconciliation of all checks drawn on the Treasurer of the United States, tied in with the systems of all disbursing agencies; and (2) its central disbursing functions for most of the Government's civilian agencies, tied in with the accounting systems of the agencies. The specific factors involved are set forth in the attached statement of the Fiscal Assistant Secretary of the Treasury.

All agencies that decide to study the feasibility of magnetic tape systems or that have already made decisions to install such systems for programs which directly or indirectly affect the banking or disbursing functions of the Treasury, or both, are requested to communicate with the Fiscal Assistant Secretary, with a view to developing the most advantageous coordination between agencies and the Treasury in these operations.

This circular should not be construed as fostering electronic data processing systems in general or for any particular program. By the same token, it should not be inferred from the information furnished that the Department advocates equipment of any particular manufacturer or design for any agency's functions. It is fully recognized that these interagency potentials are not ends in themselves and that the decision to study or acquire an EDP system rests with the agency directly concerned, from the standpoint of its own operations.

JULIAN B. BAIRD,  
*Acting Secretary of the Treasury.*

## STATEMENT CONCERNING POTENTIAL IMPROVEMENTS OF INTERAGENCY OPERATIONS UNDER EDP MAGNETIC TAPE SYSTEMS

TREASURY DEPARTMENT,  
FISCAL ASSISTANT SECRETARY  
FISCAL SERVICE,  
Washington.

1. The Treasurer of the United States, utilizing an electronic data processing system, pays more than 400 million checks a year and reconciles them with check-issue data furnished by the more than 2,300 disbursing offices. The output of every disbursing office is the input for this magnetic tape system; that is, the standardized punchcard form of check which was the culmination of the Government-wide cooperative program to convert from paper form to punched cards and which contributed materially to the advantages of the present system. Aside from this, the Treasurer's operations and relations with the public, the Federal Reserve System and the commercial banks are directly affected by the quality of checks issued by all disbursing offices. New equipment needs to be appraised in terms of punching and inscription quality so as to insure proper delivery and negotiation of checks and minimize opportunities for alteration. The future outlook for application of EDP to checkwriting, along the lines described in paragraph 2, holds promise of substantial progress for all of these operations of the Treasurer.

With possible longer range implications for Government checks, certain interesting developments are underway to mechanize bank handling of commercial paper checks, utilizing a common machine language which is to be encoded in a standard position on checks, in magnetic ink. Various types of equipment to perform this function are currently undergoing test. The Government has long since had the advantages of a common machine language in the form of standardized punched-card checks. Nevertheless, the Treasury is keeping in touch with these developments, having in mind certain potentials from its use, particularly for large-scale payment programs. This envisions advantages for the disbursing function in producing, rather than punched-card checks, continuous form paper checks magnetically encoded in the same machine language planned for commercial checks, including dollar amount. Such systems, of course, will have to be compatible with future operations of the Federal Reserve banks and commercial banks.

2. The Treasury's Division of Disbursement, Bureau of Accounts, in its 21 regional offices, issues about two-thirds of the Government's checks. In large measure, technical progress over the years in producing punched-card checks and in mechanization of agency accounting have been coordinate. Thus, for example, tabulating card output of accounting systems in many agencies have become the direct input for much of the Division's workload, and the Division's output is, in turn, the input for the operations of the Treasurer of the United States. Such integrated developments have been carried forward with equal significance in other agencies which draw checks on the Treasurer, such as the military departments and the Post Office Department, among many others.

Manifestly, the disbursing function stands to gain in economy and efficiency, along with the Treasurer's function, coordinate with the advent of magnetic tape systems of accounting in the related agencies. Significant potential advantages are also involved for the check delivery operations of the Post Office Department. Planning for systems of this kind, with the collaboration of the Treasury disbursing and banking organizations, has been carried forward to various stages of completion in a number of agencies; for example, the Social Security Administration, the Veterans' Administration, and the Internal Revenue Service, Treasury Department, whose programs generate over 50 percent of the Government's check volume. It is understood that similar developments are underway in the military departments for certain accounting and disbursing operations.

3. The significance of all of these interagency potentials is illustrated below in terms of current plans for Treasury's Division of Disbursement, coordinate with plans of the Veterans' Administration. Forward planning in the Social Security Administration is likewise under consideration from the standpoint of the related disbursing operations.

An EDP magnetic tape system is scheduled to be installed in the Chicago regional disbursing office of the Division of Disbursement early in fiscal year 1961. This development is the direct result of planning in the Veterans' Administration to install an EDP system for its benefit payment accounting and

statistical operations, under which all related accounts will be centralized beginning in January 1960. Upon completion of the centralization program, the Chicago disbursing office will be issuing about 5 million veterans' checks each month. About 4 million other checks will be prepared monthly with the same equipment (e.g., those social security checks that are issued in that office, the public debt interest checks centralized in that office, and other periodic payments).

Apart from the substantial advantages planned for its own operations in the Veterans' Administration, its new system will result in a number of interagency benefits involving (a) checkwriting in the Treasury's Division of Disbursement, (b) check delivery by the Post Office Department, and (c) check payment and reconciliation by the Treasurer of the United States, which are outlined below as examples rather than a complete statement of all the advantages to be derived:

(a) Checks will be printed and punched in the disbursing office from a master payment file on magnetic tape for each of the several payment programs involved. In the periodic check production processes, the master file for veterans' payments will be updated for all account changes (names, addresses, amounts, etc.) by direct input of magnetic tape furnished by the VA system. For the other classes of payments, updating of the master tape file will be done with tabulating cards for changes, until such time as the agency involved might be in a position to furnish magnetic tape as a by-product of its own accounting. In the interim, if compatible with the agency's accounting system, the tabulating cards for changes will be furnished by the agency; otherwise, they will be prepared in the disbursing office from copies of change documents. In addition to achieving a maximum degree of integration between disbursing and the products of the agency's accounting, thereby obviating substantial work in maintenance of files of checkwriting media, the use of magnetic tape for checkwriting will permit a degree of speed, automatic control and precision not heretofore attainable with other punching and printing media.

(b) All payment records on tape for veterans' benefits will carry a geographic code which will be included with other data simultaneously punched into the checks. This will enable the disbursing office to sort the checks mechanically, prior to delivery to the postal service, according to (1) States, (2) the most populous cities, and (3) various foreign destinations—a matter of considerable significance to the Post Office Department. Similar results are planned for the other classes of checks prepared from magnetic tape, without necessarily having to use a geographic coding approach for social security checks.

(c) The conventional check-issue lists of a disbursing office will be eliminated in the Chicago disbursing office for the monthly volume of about 9 million checks prepared from magnetic tape (about 25 percent of all the Government's checks). A record of every check issued will be made readily available, on magnetic tape instead, for direct input to the EDP banking system of the Treasurer of the United States. By having the individual check-issue items on tape, along with the individual paid-check items on tape, the utmost of mechanization in check payment and reconciliation will be achieved. Among other things, this will eliminate a number of manual operations presently required in reconciling paid checks (which are recorded individually on tape) against checks issued (which are presently carried on tape in the form of "block" totals only, thereby requiring reference to paper lists of individual checks issued for outstanding items). Moreover, the proof will be expedited to the point of enabling the Treasurer to detect, directly on the electronic equipment, within a few days after a check is received for payment, any difference between the amount of a check stated on tape by the issuing officer and the amount of the check as presented for payment.

The foregoing should not be construed as fostering EDP in general or for any particular program. By the same token, it should not be inferred from the information furnished that the Department advocates equipment of any particular manufacturer or design for any agency's functions. It is fully recognized that these interagency potentials are not ends in themselves and that the decision to study or acquire an EDP system rests with the agency directly concerned, from the standpoint of its own operations.

W. HEFFELFINGER,  
*Fiscal Assistant Secretary.*

Mr. CLEWLOW. As you probably know, the Treasury Department has 12 operating bureaus which carry out responsibilities in quite a wide range of areas. We have fiscal, monetary, and public debt policy; we have tax and tariff policy development, as well as internal

revenue and custom operations; we have international activities, and we have supervision of activities of national banking associations; we have the manufacture, custody, and distribution of currency, coin, and bullion; we have law enforcement in the areas of counterfeiting, forgery, tax fraud, narcotics, and smuggling, as well as administration of laws relating to navigable waters of the United States. This gives us a fairly wide range of activities, and our data processing activities run the gamut of these.

The Treasury Department at the end of this year will have 36 electronic digital computers. At the present time we have 35, with one scheduled for delivery during this year. The operation of these computers and other automatic data processing equipment utilizes about 4,000 employees, and will cost over \$30 million this year.

The Secretary has become sufficiently concerned about the increasing use of data processing that he has established a focal point in the office of the Secretary that is responsible actually for the final approval on the acquisition of data processing equipment as well as service.

These requests from the various bureaus, which operate essentially autonomously under the direction of the Secretary, include an assurance that the appropriate level of review has been obtained at the Bureau before it comes to the office of the Secretary, that the system studies have in fact been made prior to the determination that equipment will be acquired, that the process of selection and the proposed methods of acquisition conform generally to policy guidelines that have been firmly established by the Secretary, and that financial personnel and organization plans attendant to the use of these equipments have been completed prior to determination to either purchase or lease the equipment.

A great deal of attention has been paid to this activity with the increase in the number of machines, up to 36 this year. We have actually recently completed a departmental review on lease versus purchase of data processing equipment, and this has led to the determination that the Treasury will be purchasing additional computers.

By the end of fiscal year 1964, at least one-third, and possibly as many as one-half, of the computers will have been purchased. This is on the basis of determining when we reach a cost advantage point.

In that connection, one of the basic questions which was raised yesterday had to do with when do we know when we reach a cost advantage point.

How do we provide for flexibility?

In that sense, flexibility is provided in some of our activities by knowing what our constant workload will be, and purchasing for the satisfaction of the constant workload, satisfying the peaks by the rental of equipment, so we rent over and above our regular purchase, therefore providing some measures of flexibility for ourselves.

Mr. HENDERSON. At that point, I note in the accompanying information sheets that there are some very interesting analyses of the lease versus purchase aspect for specific groups of computers.

I want to commend the Department on behalf of this subcommittee for providing us with concrete examples of savings available by purchase of equipment.

As you go along, please keep this committee informed of how the actual expenditures compare with the expenditures for the examples shown. It would certainly be most helpful to us in the coming years.

I would like to ask you or your IRS man to bring us up to date on the recommendations made in 1956 by the Hoover Commission that employers' quarterly Federal tax return for old-age and survivors insurance (Treasury Form 941) and the annual W-2 income tax form be combined.

I believe it was estimated that businessmen would save \$25 million if this could be done.

Where does this matter stand?

You might prepare us a detailed report on this and submit it to the subcommittee at a later date.

Mr. LEIBOWITZ. Just for the record, I think it should be said that this plan originated not with the Hoover Commission, but with the Treasury Department. The Hoover Commission, when they made their study in 1954, found it there, looked into it, and endorsed it.

At the moment, there is legislation, H.R. 5874, introduced in this Congress by Mr. Laird of Wisconsin, and H.R. 5471, introduced by Mr. Fulton of Pennsylvania.

Mr. HENDERSON. What committees are they before?

Mr. LEIBOWITZ. The Ways and Means Committee has had the legislation referred to it but has not reported it out.

This is the 87th Congress. There has been legislation in previous Congresses also. The earliest bill as I recall was in 1955.

Mr. HENDERSON. Do you consider this legislation is necessary for you to go forward with the proposal?

Mr. LEIBOWITZ. The reason for the legislation is that the proposal, in order to be effective, requires that the social security wage records be on an annual basis rather than on a quarterly basis. Essentially, this legislation would eliminate the quarterly wage report.

This is the crux of the legislation, and I believe this to be the big problem.

Mr. JOHANSEN. How vigorously is the administration pushing this proposal?

Has there been any message to Congress on it?

Mr. LEIBOWITZ. The last message to Congress was submitted by Mr. Scribner, as Acting Secretary of the Treasury in January 1961, during the closing days of the administration.

Mr. HENDERSON. I think it would be very helpful to this subcommittee if you would give us a detailed report on this referring to the legislative history, as well as the possibility of the improvement in the service, particularly with regard to computer operations and manpower savings as well, if you have that information.

Perhaps this subcommittee could assist the coming Congress on the point.

That is all I have. We are very appreciative of you, coming and making such a fine and detailed statement, which will be put in the record.

Perhaps the staff might again desire to call on you. We are particularly interested in your operation in the Atlanta region. We will certainly be following that carefully in the coming months.

Mr. CLEWLOW. Thank you very much.

Mr. HENDERSON. The next witness is Mr. John C. Cooper, Jr., Director of the Office of Management Appraisal and Systems Development of the Department of Agriculture.

Mr. Cooper, we are delighted to have you with us this morning. You may proceed, sir.

STATEMENT OF JOHN C. COOPER, JR., DIRECTOR, OFFICE OF MANAGEMENT APPRAISAL AND SYSTEMS DEVELOPMENT, DEPARTMENT OF AGRICULTURE; ACCOMPANIED BY CHARLES C. WEAVER, DEPUTY DIRECTOR, OFFICE OF MANAGEMENT APPRAISAL AND SYSTEMS DEVELOPMENT, DEPARTMENT OF AGRICULTURE

Mr. COOPER. Thank you very much, Mr. Chairman. I have with me Charles C. Weaver, Deputy Director of our Office.

Mr. Chairman, we have furnished a rather complete statement to the committee together with rather extensive attachments detailing the work presently being performed in the Department of Agriculture and some of our planning for further utilization of data processing and automation of various operations.

I would like, in the light of the time, to point to just three highlights in the statement, the first having to do with our department-wide efforts at centralization of payrolling and related activities.

Mr. Chairman, I believe you will recall that I had the privilege of presenting this statement in detail to the Manpower Utilization Subcommittee in February. At that time I presented various charts and a detailed description of the system, which I will not go into now. We have also furnished this committee with the detailed description of the system.

I would like to report to you, sir, that we are busily engaged in the development and installation of this complete system in the Department in January of 1963. We are just about on schedule with our plans as we presented them to the Subcommittee on Manpower Utilization and we are moving ahead just about on our planned schedule.

Mr. HENDERSON. Mr. Cooper, right at that point, I note that your statement points out that reporting from one central office will eliminate 17,000 reports. If you were here yesterday you know we are interested now, as we were interested last February, in the total number of employees we would save. Our objective is to know how much money we could save, so any time you can give us advice on cost savings to the Government on this payroll procedure, we would be delighted to have that information.

Mr. COOPER. Yes, sir. Mr. Chairman, our system when it was being developed, and with the development of the system as it has progressed to date, we feel the net savings to the Government will be approximately \$1.5 million annually. The system will cost about \$1 million to develop and install. The initial cost will be recovered in the second year of operation beginning in July 1963 and thereafter total savings in the specific projects will approximate \$1.5 million annually.

In terms of man-years we estimate that there will be a savings of approximately 250 average man-years presently devoted to these functions. Specifically, there will be full-time man-year savings in those offices where we have full-time individuals devoted to this activity.

At the present time we are payrolling from 87 individual offices scattered throughout the United States. We are developing personnel statistics and information in 130 personnel offices. Many of the

individuals in these offices constitute part-time man-years where perhaps one-fifth or two-fifths of a man-year is devoted to these activities. In large offices, for example in New Orleans, we had one group payrolling 5,500 people requiring 20 to 21 man-years. That entire payrolling activity has already been abolished and those 21 people are being used as the nucleus for the formation of our centralized payrolling in New Orleans. We would point to that as a specific example.

Our long-range savings, of course, will come about as a result of other changes that will be necessitated as the result of the removal of certain payrolling functions in certain offices. As soon as the operation gets underway in January 1963 our office will initiate a complete reappraisal of the necessity for the continuation of directly related functions in these offices. Many of these are State offices, some are regional offices and branch offices. In accordance with the Secretary's memorandum on the consolidation of offices and services, this will become a very significant part of an analysis of the impact of this automation.

We were here yesterday, and we are interested in specifically identifying the man-year savings that directly result from automation. As the system gets underway we will be happy to furnish this committee with the results of the automation. We look on this, Mr. Chairman, as merely the initiation of a program which can be extended to other areas.

In line with some of the questioning yesterday, I would also like to state to you that we have had excellent cooperation from those agencies in the Government on a central basis which are very intimately concerned with what we are doing in the development of this system. The General Accounting Office, Bureau of the Budget, Treasury, General Services Administration, Department of Labor, the Social Security Administration in the Department of Health, Education, and Welfare, the Civil Service Commission, and others are not only very much interested but have cooperated with us 100 percent.

This is a major undertaking, Mr. Chairman. It requires a very extensive system revision in the Department, where we have 15 to 18 individual agencies which over the years have developed their individual systems. We are trying to develop one system for operation on our computer at New Orleans which, after considerable cost analysis, was purchased sometime ago. We are presently negotiating with Treasury to accept magnetic tapes. We are proposing to use the disbursing offices at four locations in the United States. We will prepare the entire payroll on magnetic tapes and send them to the various disbursing offices. The production of these magnetic tapes will require very close relationships with Treasury.

We are working with the Civil Service Commission and only yesterday had a further development under which we would hope to furnish a great deal of personnel statistical information to the Civil Service Commission by transmission of a magnetic tape directly from our master records at our center in New Orleans.

With the Social Security people and withholding taxes and things of that nature we are working with Internal Revenue on the transmission of data by magnetic tapes.

We are presently conducting quite an extensive study of the use of optical scanning equipment which we think will effect savings in the system.

We are not able at this time to come up with an optimum system but we are working to optimize the system as we progress.

Mr. HENDERSON. We are certainly very appreciative of the magnitude of the problem. You mentioned it is a difficult one. I think this is always true when you try to save money. It is always easier to spend it.

I think it is refreshing to the Congress to know attention is being paid to this. You can rely on us to follow it with interest and we would be glad to receive reports on your progress from time to time.

Any questions?

Mr. JOHANSEN. I want to commend the gentleman on his statement and indications of what is being done in this regard.

Mr. COOPER. If I might mention two other brief items, because I think they are extremely important developments in the Department.

First, the Secretary, on December 8, 1961, for the first time in the Department, established a departmental office which has complete responsibility for all utilization of automatic data processing equipment in the Department. We presently have 16 computers, several on order, and some 35 EAM installations. This is the first time we have had complete departmental coordination with an office reporting directly to the Secretary, who is intensely interested in this development.

A second development is that several weeks ago the Secretary announced the establishment of three Department computer centers in which we have already, since this announcement, consolidated smaller computer operations. We will have one in New Orleans, one in Washington, and one in Kansas City. Our plans are to use this equipment to the maximum extent possible to service all agencies in the Department. In this endeavor we will be conducting very extensive systems analyses to determine those individual items which will be proper for conversion to computer equipment. We are presently considering the establishment of an installation on the west coast.

In each of these analyses we study the availability of other equipment. We are negotiating for the use of one of the Treasury's computers for third-shift operation. We are seeking the most economical way to do the job, whether with our own equipment or that of some other agency.

Mr. HENDERSON. Mr. Cooper, you said the Secretary was personally interested in this matter. I might say he offered to testify before our subcommittee, and knowing how busy he is we were most appreciative of his offer. I hope you will convey to him the subcommittee's appreciation of his personal interest. I think if some of the other Secretaries would give this subject the same emphasis it would result in savings to the Government.

Any questions?

Mr. UDALL. I want to join the gentleman from Michigan in commending the gentleman on an excellent statement. I think anyone who attempts to deal with this octopus known as the Department of Agriculture should have the prayers of all of us. It is a difficult task and I am impressed by what is being done in simplifying and making some overall sense in all the problems you have at the Department of Agriculture. I am not sure Congress is giving you the assistance you need in simplifying the problems.

Mr. COOPER. Thank you.

Mr. HENDERSON. Mr. Cooper, I wonder if you might comment on what you have done to be sure automation is not being applied to unnecessary programs?

Mr. COOPER. I think, Mr. Chairman, that we are carefully analyzing every job that is being done in line with the Bureau of the Budget circular, first determining whether the job should be done at all.

In the book which Mr. Udall refers to we have given you in detail some of the analyses. We have used as an example of our management appraisal work a detailed analysis of all the activities in the Federal Crop Insurance Branch office located in Chicago. As a result of our appraisal we recommended that the office in Chicago be closed, that certain of the work be eliminated because it in large part duplicated work being carried out at the State or county level. We recommended that instead of setting up an additional computer installation in Chicago that the function be transferred from Chicago to Kansas City and located in the same building where Department computer equipment is located. At the same time we recommended that instead of transferring common service personnel, FCIC should use the services available in Kansas City from another Department agency. That has resulted in savings. That was just done in August. I think this is an example where we determined the necessity for continuing a job, whether it should be done manually or automated, where it should be located, and whether or not service could be furnished more economically by a going organization already in existence.

Mr. HENDERSON. You are to be commended for doing that. Off the record.

(Discussion off the record.)

Mr. HENDERSON. Thank you very much, Mr. Cooper, for your very fine statement. We commend you for your appearance and for the work you are doing.

The prepared statement submitted by you will be made a part of the record at this point.

(The statement referred to follows:)

#### AUTOMATIC DATA PROCESSING IN THE U.S. DEPARTMENT OF AGRICULTURE

##### I. INTRODUCTION

Mr. Chairman and members of the subcommittee, first may I express my appreciation for the opportunity to be here. As you know, this is my first appearance before this subcommittee—and I must add that I am doing so as a substitute.

When Secretary Freeman received your invitation, Mr. Chairman, he told me that he wanted to meet with your subcommittee and discuss some of the things we are doing in the field of automatic data processing. Unfortunately, this did not prove possible, so I am here in his stead.

In his presentation of the Department's fiscal 1963 budget to the House Subcommittee on Appropriations last February, Secretary Freeman stated that one of the real frustrations of being the chief executive of an operation as big as the Department of Agriculture is trying to know what is going on. He found that answers to many of the questions that had to be answered—if the Department's programs and activities were to be administered effectively—and at the lowest possible cost—either were totally lacking or at best not readily available. We simply did not have the information or the management tools that are essential to the guidance and direction of the Department's total efforts on either a day-to-day or a long-range basis. So we set about to correct that situation. Mr. Chairman, with your permission, I should like to submit a report that I have just recently submitted to Secretary Freeman. This is a report dated September 10,

1962, entitled "Accomplishments of USDA in Improved Administration During Period January 1961-July 1962."<sup>1</sup>

This fiscal year the Department of Agriculture will spend approximately \$11 million on automatic data processing. Frankly, Mr. Chairman, I would prefer to call this an investment and not an expenditure because in fact it represents an investment in new and improved methods of doing a large number and variety of jobs at lesser cost than would be possible by other means—and in some instances jobs which otherwise would be entirely impracticable.

This \$11 million investment is being made almost entirely by 12 agencies of the Department. Four of these have 1 or more electronic computer installations and all 12 are using conventional electrical accounting machines—EAM—at various locations, largely in the field. Among exhibit materials which have been furnished this subcommittee is one which identifies the equipment being used by each agency, its location, the uses being made of it, and the man-years and dollar costs devoted to the activity.

Our ADP equipment is being used to do a very large number and variety of jobs. The majority of these jobs involve the processing of data that arises out of and is necessary to the conduct of the substantive programs of the agencies. This will continue to be the case because of the nature and requirements of the Department's programs. At the same time the equipment is also being used—and this use will increase—for Department and agency management purposes. We will continue to develop and install applications, in support of and similar to those involved in our MODE program, which will give us the means of improving administration and realizing economies throughout the Department.

If I may at this time, Mr. Chairman, I would like to describe briefly a few of the uses being made of ADP and then to summarize the principal things we have done, and have underway.

We have purposely selected only those examples of our uses of ADP which illustrate the potential that ADP has to offer the Department and its operating agencies. We intend to realize this potential through the program that we have inaugurated.

In the Forest Service, the capabilities of ADP have been brought to bear most effectively in solving major problems in forest survey and engineering (road design) programs. The forest survey consists of basic information on 535 million acres of forest land concerning conditions by classes of ownership; the volume, quality, and location of standing timber; trends in timber growth and mortality; and amounts and kinds of timber cut for industrial products.

The tremendous volume and variety of data collected for this survey is processed by ADP to provide timber growth and supply data for timber resource management. Initial inventories must be updated at intervals of 8 to 10 years, depending upon the rate of change in forest conditions and wood supply. This is accomplished by feeding new factors and data, such as growth rates on permanently established plots, into the machines. The result is accurate and comprehensive information for timber resource management which could not be obtained economically by manual methods.

The Forest Service constructs approximately 4,000 miles of timber access roads annually. These roads are used in the harvest of over 11 billion board feet of timber per year. In recent years the Forest Service has either pioneered or participated in the development and application of electronic control surveying, photogrammetric surveying for engineering purposes, and the use of digital computers for survey and design computations. These and similar developments have made it possible for the Service to save much time and do the engineering for an increasing construction program without a corresponding increase in staff. Use of computers for engineering purposes results in savings of 20 percent of the cost of doing the work manually. But more than that, the human element of error has been reduced, products are of higher quality, and timber harvesting goals are being met. Moreover, the shortage of engineering manpower, which has constituted a major problem, has to a considerable degree been offset by economies, more efficient handling, and increased output resulting from use of electronic computers.

The dairy herd improvement sire-proving program of the Agricultural Research Service, which is carried out in cooperation with the Dairy Herd Improvement Association, has been in operation since about 1909. The purpose of this program is to increase the milk production of dairy herds through the use of improved sires. Something more than a third of our dairy cows are artificially inseminated

<sup>1</sup> The report is retained in the subcommittee files.

but only about 35 percent of the bulls used for artificial insemination are proven sires. It is through analyzing production records that proven sires are identified.

Approximately 10 percent of the dairy herds participate in the improvement program. From these we receive records on about a million cows a year. We first handled the analyses of these records manually. Then we used punched cards but when we reached the point that we had 6 million active records, and about a million additions per year, we had to move to computer methods. By converting punched-card records to the computer, data were recorded and analyzed, in a total of 500 hours of computer time, that could not have been done in less than 13 years—manually—and at an estimated cost of \$3 million. In 1954 we had 56 people on this project, now we have 22. We are now spending less money but we, and the dairy industry, are getting much more for the same appropriated funds.

The capabilities of electronic computers are also being used by the Agricultural Research Service for the analysis of data collected in various research efforts. These analyses are more accurate, more comprehensive and useful and far more timely than would otherwise be possible. Thus, the research workers using the computer's capabilities are being freed of the chore that has taken so much of their time in the past—that of doing their own data reduction and analysis by pencil or desk calculator—and are using the saved time to do research. This, gentlemen, we consider most significant. Research scientists are not only in very short supply but in very great demand. It is not only difficult to recruit them; it is also difficult to retain those we have. Now in this situation, and the outlook is that it is going to remain essentially unchanged in the foreseeable future, if we can increase the productivity of the individual research worker—say by a factor of 2—through the use of ADP techniques and capabilities, then you can readily see what this tool is going to mean to us in the constantly growing pressures of the Department's total research effort.

In our programs of agricultural economics, ADP is being used increasingly to advance research and statistical work. In the Economic Research Service there are approximately 400 active line projects, representing 37 major areas of research, which require development and issuance of about 400 economic and statistical reports each year. The Statistical Reporting Service develops and issues more than 700 reports from Washington and somewhere near 9,000 from its field offices each year. We are moving rapidly to automate as much of this work as is possible. More specifically, the efforts in this area, involving use of computers, are to—

1. Accomplish a greater workload; that is, satisfy demands for more detailed analyses of statistical data;
2. Utilize advanced statistical methodology in our agricultural statistics data collection and estimates;
3. Utilize advanced economical and statistical techniques to enhance economic research and to improve the basis for formulating of national agricultural policies;
4. Provide a higher standard of accuracy in the processing of data; and
5. Decrease the timespan between collection of data and release of estimates.

Mr. Chairman, this subcommittee doubtlessly is quite familiar with some of the uses we are making of ADP in the Agricultural Stabilization and Conservation Service. However, I should still like to mention just two since the Agricultural Stabilization and Conservation Service has made far more extensive use of ADP to date than has any other agency in the Department.

The New Orleans Commodity Office of the Agricultural Stabilization and Conservation Service handles the cotton program. This office has achieved outstanding results through the use of ADP equipment. It is estimated that during 1960 this office saved nearly \$3½ million through use of this equipment.

Beginning in calendar year 1958 through a part of 1961, the accounting and reporting functions of the grain price-support loan program were handled on computers in the Evanston and Kansas City commodity offices. These proved to be very successful ADP operations. A study showed, however, that the operation was less economical than if the data were processed in a single center. In fact, the study demonstrated that through elimination of duplication approximately \$400,000—representing 70 man-years—could be saved annually in one center if centralization were accomplished within an existing organization and location. Further machine savings of nearly \$400,000 annually were estimated to be available from consolidation of such functions. As the result of this study, an Agricultural Stabilization and Conservation Service Data Processing Center was established in Kansas City in September 1961.

## II. OBJECTIVES

Mr. Chairman, early in my remarks I referred to the situation that Secretary Freeman found on becoming Secretary of Agriculture and stated that we set about to correct that situation. What did we do? First, in the field of ADP we set for ourselves two objectives. Now I might say that these are much simpler to state than to realize but the facts are that we are well underway with a hard-hitting, aggressive program. Our first objective is to reduce costs. This means exactly what it says. We intend to reduce costs in two ways. First, to reduce the direct costs of present operations. One way that we will do this is by increasing and insuring the effective use of ADP to do more jobs of the kind I had just described. Another way is to use ADP to reduce present costs of collecting and processing data, preparing reports, processing papers, maintaining records, and the like.

The second way in which we are going to reduce costs is through a continuing, aggressive program of systems improvement. By systems improvement I simply mean that we are going to take a hard look at all of our operations—program, management, and general administrative. We are going to simplify and streamline some, we are going to combine, to integrate, others; we are going to eliminate the outmoded time consuming and costly manual and semimechanical methods and the practices behind them wherever this is needed—and gentlemen—I rather suspect that we are going to find and throw out a lot of things that are being done for unknown and no longer necessary reasons.

Now our second objective is to do a better job by means of ADP. I have given you some very concrete illustrations of what we have in mind. But let me state it another way. We are going to develop and to use management tools and techniques to help us in managing and administering all activities of the Department of Agriculture. Through these management tools we are going to develop—and have readily available when it is needed—current and reliable information of the kind that is required to determine where we are, where we are going, what we should do—in other words to make intelligent, informed judgments and decisions. We are not unmindful that this is going to require some doing but we are prepared for that. It is to be expected in any pioneering undertaking—and ours is just such an undertaking—one that is going to the heart of every operation. Among other things, it is going to demand a lot more in the way of personal self-discipline on the part of both management and operating officials than most have experienced before. This is not a time in which we can afford to rely on any seat-of-the-pants decisions and actions—nor are we going to.

## III. POLICIES

To realize these objectives requires that we establish sound policies to guide and to govern us in what we do in ADP. It also requires that we undertake and carry through with a course of action that will insure the implementation of those policies. Mr. Chairman, our ADP policies are based upon our experience and judgment, but I think you will find that they are in close accord with past findings and recommendations of this subcommittee, as well as more recent policy set by the Bureau of the Budget.

1. We are going to make the capabilities of ADP techniques and equipment available to all within the Department of Agriculture. More specifically, we are going to exploit—to get full value from—ADP in each and every instance where it will pay off.

2. We are going to eliminate outmoded time consuming and costly manual and semimechanical paper handling and data collection, recording and reporting processes where they exist.

3. Feasibility studies according with the recommendations of this subcommittee and Bureau of the Budget Circular A-54 are going to be made, without exception, as a prerequisite to the acquisition of ADP equipment. Such studies are going to be closely coordinated by our Office of Management Appraisal and Systems Development and findings and recommendations of such studies are going to be approved or disapproved, as circumstances warrant. I want also to add that these studies are going to include cost calculations of existing as against proposed ADP methods; that cost studies and findings are going to be made and reported when computer programing and testing are completed; when the application is in operation and again thereafter at the discretion of the Office of Management Appraisal and Systems Development. In all instances the real advantages versus the real disadvantages of purchasing versus leasing ADP equipment also are going to be fully and critically explored and to dictate which we do.

I might say here, Mr. Chairman, that we have purchased two computers—now being used in the New Orleans commodity office. One of these is a large-scale system, the other is a small satellite. These purchases were based on studies which showed that with current and planned use, it would be much more economical to buy the computers than continue to rent them. We are also studying the pros and cons of purchasing the two computers in use in the Kansas City office as well as a new computer for the Department's data-processing center being set up here in Washington.

As members of this subcommittee well know, the technology of ADP is fast moving. It seems that about as soon as one new and advanced computer system is announced, it is immediately subjected to rapid obsolescence and certainly to being surpassed by announcement of the development of a more advanced machine. Now, we in the Department of Agriculture don't want to be in a position of wasting money and manpower on obsolete equipment any more than we want to be guilty of wasting money and manpower on new equipment with new features and gadgets that we don't need. So we're going to be prudent—to play it safe, you might say. Before we buy or rent new equipment we are going to know whether or not it is the best and most economical that is available for the job we have to do. Therefore, when new equipment is announced we're going to look into its capabilities and costs in relation to our needs. If our findings satisfy us that we should do so, then we are going to place a letter of intent for the number of units for which need has been established. We are then going to acquire one unit—or system—for use in one agency or at one location. It is going to be tried out, fully tested, operating costs determined and operating experience evaluated, and results made available to all agencies of the Department. In this way we can insure that we acquire the most modern equipment, of the kind required, as promptly as it is available and at the same time avoid the costs and other consequences of ill planned and poor equipment selections.

4. Just as we are interested in equipment that is best suited to our needs, we are also interested in achieving a maximum of compatibility in equipment, where that is an essential consideration. We don't want, and are not going to have, a miscellany of equipment and a myriad of like and closely similar applications scattered throughout the Department. Instead, we want the maximum of integrated applications, so that the users of both equipment and its products can benefit directly from what others do and from what is done for them. Our MODE program, of which Secretary Freeman and others of us throughout the Department are quite proud, illustrates what I have in mind. When fully implemented this one program will produce the Department's payroll, maintain most of its personnel records and prepare its required personnel reports, account for obligations and expenditures, and provide us with much of the information that we need to manage the Department's human resources and to develop and administer its budget in the way that they should be and can be.

When I think of the many integrated applications that must be possible throughout our action—research, control and regulatory programs—as well as in other management and general administrative areas—gentlemen, I am greatly challenged by the opportunities for improvement that are opened up for us by ADP.

5. We have already taken steps, and are following through to insure, that we obtain the maximum effective utilization of the ADP equipment that we own and lease, wherever it is located. To bring this about we have begun and are going to concentrate on the sharing of equipment by agencies of the Department. This sharing policy is accomplishing four things:

(a) It is meeting ADP needs of agencies which can't afford or can't make effective use of equipment.

(b) It is rapidly reducing the amount and costs of work that otherwise would be contracted out. All proposed ADP contracts must be cleared with our Office of Management Appraisal and Systems Development, which does one of two things. Generally, it arranges to have the job done on Department equipment, and at lesser cost, of course. Where that is not feasible, the Office of Management Appraisal and Systems Development insures that the contract is let at the lowest cost, and that we get what we pay for.

(c) It increases the effective utilization of our equipment—more and more of our installations are now operating on two and three shifts—with the result, of course, that the unit costs of work are being reduced to the minimum.

(d) It is the means by which we are going to implement, effectively, the first policy that I mentioned, that of making the capabilities of ADP techniques and equipment available to all in the Department who need them.

This equipment sharing policy, let me add, is the primary reason why we want a maximum of compatibility in equipment. If a job can't be done in one installation, then we want to be able to do it in another.

6. Mr. Chairman, I understand this subcommittee is just as interested in the people—the employees whose jobs are affected by machines—as it is in what we are doing with the machines. I am certainly in sympathy with and share this interest fully.

What we are doing in ADP is a Department-wide undertaking. To develop and get it underway we called upon people—the very best people in agencies of the Department—budget people, accounting people, personnel people, general administrative, management, and other people who know the Department, its programs and its management and administrative functions intimately. These same people are a part of the whole team that is now implementing our ADP program. I mention this, Mr. Chairman, simply to emphasize that ours is both a cooperative and a coordinated effort. The personnel people, along with other management and operating people, participate both in the planning and the execution of our plans. This has been and is going to be the case all along. There are two reasons, first, we want to do the best job that is possible and, secondly, it is Secretary Freeman's policy and firm intention to minimize the effects on employees of any and all adjustments that are brought about by ADP. No person has been displaced under our ADP program.

Last June we announced plans for staffing the Management Data Service Center at New Orleans, which will begin handling the Department's payrolls, on a scheduled basis during the period January through June of next year. We instructed the agencies to plan the training and reassignment of each and every employee whose job would be eliminated by the centralized ADP payrolling operations. We told the agencies—and we also told employees—that a job would be found for each person who would be eliminated by the operation. We have build up a roster of all such persons from which we are and will continue to fill new jobs in ADP as well as vacancies in other activities as they occur. We are convinced that planning of this kind, including proper planning of the retaining and reassignment to ADP and other activities of those whose jobs will be eliminated, with effective followthrough in each instance is going to preclude any need to displace career employees that otherwise might arise as the result of changes over to ADP.

#### IV. WHAT HAS BEEN DONE

##### *Centralization of payrolling and related activities*

Earlier I made reference to our MODE program. This system is described, in detail, in one of the exhibits submitted to this subcommittee. I should like to discuss that program with you now and then follow through with other actions that we have taken in the field of automatic data processing.

MODE stands for the management of objectives with dollars through employees. The concept behind MODE is that the objectives of the Department of Agriculture can be realized more effectively through the use of an automatic data processing system. MODE was developed in response to a desire to have a more effective control over money and manpower spent in the Department. Key barometers are budget, payroll, and personnel.

Personnel functions now are performed in 130 offices. Payroll operations are conducted in 87 offices. Reports from these offices must be compiled to furnish data on the Department's activities. MODE will permit us to payroll and report from one office. Initially, the cost of servicing the Department's employees will be reduced. Key data for analysis of the Department's objectives and accomplishments will be available within the data processing system. Reporting from one central office will eliminate 17,000 reports.

The total MODE system will be in operation 3 years after the beginning of the initial development. However, the installation will be phased in and benefits will be realized earlier. The initial phase will represent the payroll, personnel, and related financial reporting and accounting functions. Payroll will include the computation of salary payments, withholding, and the reporting on authorized deductions. The personnel functions will process records of employee transfers, promotions, and retirement standing. As a byproduct of these operations, MODE will provide accounting and financial information on a current basis.

Data used in the above applications will provide much of the information needed for the final phase of MODE. This phase is the application of mathematical techniques to the analysis of data. The results will provide management with more effective tools for (1) the accomplishment of the Department's objec-

tives and (2) the development of the employees of the Department. Costs of the common services to be absorbed by MODE are estimated as \$3.3 million annually. Development and conversion to data processing equipment will cost approximately \$1 million to be spent over 2 years. Under the data processing system the operating costs are estimated to be \$1.8 million, a net savings of \$1.5 million annually. Development and conversion costs of the entire system will be fully recovered in the second year of operation.

Development of the initial phase of MODE is underway. Early in 1963 the system will become operational for a pilot group of approximately 5,000 employees. The records of the remaining employees are to be converted within a 6-month period.

Development of the mathematical techniques has begun. It is anticipated that the initial part of these techniques will become operational early in 1964.

The development of MODE resulted in a decision to centralize our payroll, personnel recordkeeping, and related budget and accounting work in a management data service center in New Orleans. In the MODE study our people—who represented some of our best and most experienced people in the Department—found that this was not only feasible but would be most economical since we had a Department-owned computer in New Orleans.

To summarize, the MODE system will—

- (1) Reduce our administrative costs by a million and a half dollars per year;
- (2) Centralize into one office the payroll work now done in 87 different offices and some of the personnel work presently performed in 130 different offices;
- (3) Reduce labor requirements by approximately 240 employees;
- (4) Eliminate more than 17,000 individual reports now required each year;
- (5) Provide adequate data for the first time in the Department's history, looking toward really effective manpower utilization; and
- (6) Give Department officials new management tools for program evaluation.

#### *Establishment of Office of Management Appraisal and Systems Development*

In December of last year we established the Office of Management Appraisal and Systems Development. This small staff provides intensive leadership to agencies of the Department in the conduct of management studies and in coordinating the use of automatic data processing equipment. It supervises the development and installation of the new MODE system and serves as the focal point for a number of special task force groups that have been organized to review and improve selected management and operating procedures.

Mr. Chairman, attached to this statement is a description of the functions and responsibilities that have been assigned to that Office.

#### *Establishment of Department computer centers*

An example of a major use being made of ADP is the centralization of Agricultural Stabilization and Conservation Service grain loan accounting in one center at Kansas City.

On July 31, 1962, Secretary Freeman designated the Kansas City center as a Department computer center and simultaneously established two other Department computer centers. One of these is at New Orleans, the other is in Washington. At Washington we combined the two separate computer installations of the Agricultural Research Service and the Statistical Reporting Service into one.

Mr. Chairman, attached to this statement is a copy of Secretary's Memorandum No. 1509 of July 31, 1962, which established these Department computer centers.

We have no doubt that these centers are going to prove economical and otherwise advantageous both to individual agencies and to the Department as a whole. Primarily, these centers are going to provide data processing facilities for all Department agencies. Services will include systems design, problem definition, data transcriptions, and computer programming and operation. In addition, these centers will provide data reduction and computing services for research scientists and other technical personnel upon request. Our objective is to make the machines, and machine services, readily available to the research man. In some instances the center will do his programming and computing for him and in others will take the scientist's own computer program, test it for him, then take his data and produce and return the results to him. In research areas we have instances—and these will increase in number with time—in which agencies have been, and will be, encouraged to acquire small computers to serve their research needs. These are instances in which the nature and amount of the scientific

computing, the job to be done, are such that it can only, or best, be done by agency scientists rather than by a Department computer center.

I should like to add here that just as in staffing the New Orleans management data center to get the MODE program in operation, we are following the same policy in staffing the two other computer centers. We have and will continue to draw personnel from the various agencies of the Department—including persons whose jobs are being eliminated. Now this is not an altruistic, job-saving policy but quite the opposite. It is simply good business. We have a tremendous investment in our people, and they in the Department, and we need, and increasingly are going to need, the experience and the knowledge of the Department and its programs that they have to get the job done. Of course, we are going to be selective, because ADP demands able people. And we are also going to fill some of our center jobs through outside recruitment, primarily from the FSEE and junior scientist registers of the Civil Service Commission. By so doing, we are going to blend the experience and subject matter knowledge of the Department with the mathematical, scientific, and other specialized knowledges that are also required in our total operation.

In addition, Mr. Chairman, we have done and are doing a number of other things, to round out our ADP program, which I would like to discuss briefly.

We are not going to be able to meet the Department's total ADP needs through the Department computer centers—or through the efforts of the small staff that we have in our Office of Management Appraisal and Systems Development. I have stated that some agencies are using small-scale computers to do an increasing amount of their scientific computing and that we are going to encourage this because it is going to produce quicker and more accurate research results, at lower cost in dollars, and enable us to better utilize the capabilities of our scientists. Also, where there is a need to do so, we are going to train research workers to write their own computer programs so that the data accumulated in their research can be processed on available computers and returned to them promptly.

Because of the size of the job to be done we have also trained and are going to train more agency people in ADP systems, to identify areas that are suited to ADP, to define the problems and needs in these areas, and to design the system for solving and meeting these problems and needs through ADP methods.

In the latter half of 1961, a task force, employees from staff offices and several agencies, made a management appraisal in the Federal Crop Insurance Corporation. The result—

1. Elimination of duplication of audit insurance documents:

- (a) Eliminated about 30 positions—GS-3 to GS-11.
- (b) Reduced clerical space.
- (c) Reduced cost of office equipment, furniture, and machines.
- (d) Eliminated duplicate files:
  - (1) Seven hundred file cabinets released.
  - (2) Five thousand square feet of floor space released (\$20,000 annual rent).

2. Simplified insurance program, developed sales training aids, and increased participation at lower cost per insurance unit.

3. More efficient and economical use of current staff in expanded program operations.

4. Use of Department ADP facilities in Kansas City.

5. Decentralize functions from Washington.

Savings in fiscal year 1963 from these actions are estimated to be \$230,000. These savings will be used to finance an increase in the insurance program in 1963.

Over 1,800 separate mailing lists are in use in the Department in Washington. At least 15 days are required to change a list—add a name, drop a name, or correct an address. A separate change is required for each list. A new need requires a new list, or use of several lists to obtain required coverage—but with excessive mailings.

A task force studied the problem—cost and statistical data were computed. Solutions to similar problems in government and industry were studied. Equipment was tested. An ADP system has been designed.

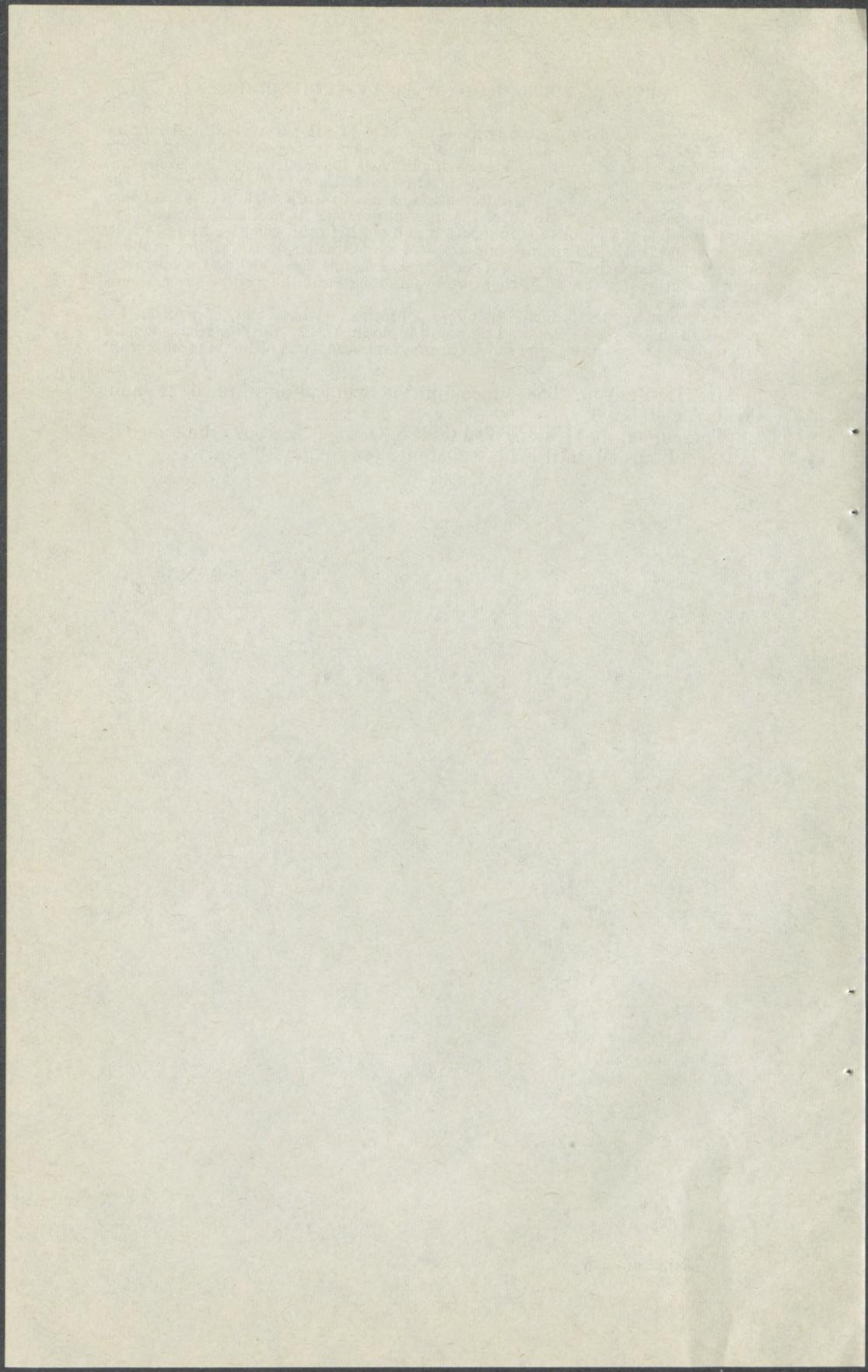
The proposed system will provide 1-day service on changes; one record per name, regardless of the number of lists the name is on; capability to generate lists for special uses from names on existing lists; one contact per name to circularize lists to keep them current; availability of lists and names on a Department basis. It appears that all of these advantages will be obtained—and the costs reduced, too.

We now have a task force study underway in the National Agricultural Library on the feasibility of automating some of our library processes—and particularly studying methods of storing and retrieving information relating to the agricultural sciences which our scientists urgently need to guide them in their research. The scientist is only as good as the information he has to work with. It is his basic, his most valuable tool. Much of the information that is needed is available or obtainable but the problem is to locate it and get it to the scientist who needs it, when he needs it. This is not our problem alone, rather, it is a major problem wherever research is done, but it nevertheless is one for which we desperately need a solution if we are to further improve and maintain the well-being of American agriculture.

Mr. Chairman, this concludes my presentation. I have not, of course, discussed all that we are doing and planning to do in ADP. Rather, I have sought to give you the perspective of our total program, and some of its more important features.

Mr. HENDERSON. The subcommittee will adjourn until 10 a.m. Friday, October 5.

(Thereupon, at 11 a.m. Wednesday, October 3, 1962, the subcommittee adjourned until Friday, October 5, 1962, at 10 a.m.)



## USE OF ELECTRONIC DATA PROCESSING EQUIPMENT

FRIDAY, OCTOBER 5, 1962

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON CENSUS AND  
GOVERNMENT STATISTICS OF THE  
POST OFFICE AND CIVIL SERVICE COMMITTEE,  
*Washington, D.C.*

The subcommittee met, pursuant to recess, at 10 a.m. in room 215, Cannon Building, Hon. David N. Henderson (subcommittee chairman) presiding.

Mr. HENDERSON. The subcommittee will come to order.

Today we will conclude the hearings of the Subcommittee on Census and Government Statistics on the use of electronic data processing equipment in the Federal Government.

Wednesday we heard representatives of the General Services Administration, the Department of the Treasury, and the Department of Agriculture. As the House met at 10 o'clock yesterday it was necessary to postpone scheduled hearings until today; I want to thank the witnesses for cooperating with the subcommittee.

Before calling our first witness this morning, we again will ask Mr. Edward J. Mahoney, Assistant Director of the Accounting and Auditing Policy Staff of the General Accounting Office, who is acting as technical adviser to the subcommittee, if he has any comments to make on the hearings thus far.

### STATEMENT OF EDWARD J. MAHONEY, ASSISTANT DIRECTOR, ACCOUNTING AND AUDITING POLICY STAFF, GENERAL ACCOUNTING OFFICE—Resumed

Mr. MAHONEY. Thank you, Mr. Chairman.

In the interest of time I would like to limit my comments to a few points. As the discussions here have proceeded, and as a number of points have come out, I am more and more convinced of the wisdom of the subcommittee in holding these hearings.

I am fully satisfied that much good will come from openly exploring the many involved facets of this tremendous new development as it affects our governmental processes.

I am sure everyone here recognizes that even at this early stage of development the impact has been significant and that we will all be affected eventually in some manner. If we have not already been affected we will be as the Internal Revenue Service ADP program develops.

These hearings have brought out a number of very hopeful indications for improvement in Government operations, including possibil-

ities for consolidation of Government offices and elimination of others; certain indications of increased productivity; and a definite trend toward more automatic transferring of data between systems which should provide more effective and more accurate entry of data into computer operations and eliminate many routine repetitive operations in Government activities and between Government and industry.

While much is being accomplished, many problems remain and much still needs to be done. We need to actively concern ourselves to see that the opportunities for improvement are all realized.

It was very encouraging to hear about the potential savings under the plan described by the Department of Agriculture's representative and to hear about the improvements in Treasury. It was also encouraging to hear of the increased attention that is being devoted to the lease versus purchase problem which is primarily because of the interest of this subcommittee in the past.

Also, probably the most heartening of all is the increased attention at the departmental level which is being given to many aspects of ADP—in program operations, in management and utilization of this costly equipment, and in such matters as lease versus purchase and the centralization of routine transactions and processing. Also it is important to note that increased attention is being given at the central agency level for the Government overall with indications of more coordination between GSA and the Bureau of the Budget on several procurement and training matters.

As brought out earlier in the testimony, because of the large expenditures involved and the effect generally on Government we must concern ourselves more and more with all of these matters as the expansion and full development of the new technology proceeds.

Mr. HENDERSON. Thank you very much, Mr. Mahoney.

Our first witness this morning is Mr. James F. Kelly, Deputy Administrative Assistant Secretary and Comptroller of the Department of Health, Education, and Welfare.

Mr. Kelly, you might introduce your colleague and proceed as you desire.

**STATEMENT OF JAMES F. KELLY, DEPUTY ADMINISTRATIVE ASSISTANT SECRETARY AND COMPTROLLER, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE; ACCOMPANIED BY JAMES W. GREENWOOD, DIRECTOR, OFFICE OF MANAGEMENT POLICY, OFFICE OF THE SECRETARY, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE**

Mr. KELLY. Mr. Chairman, I have with me Mr. James Greenwood, who is the Director of the Office of Management Policy in the Office of the Secretary of the Department.

We appreciate the opportunity to appear before you and I would like to underscore what was said by Mr. Mahoney. I think the developments occurring in this field and the impact they will have on the public service and the people who provide public services are profound.

We, at the committee's request, did submit a formal statement including detailed answers to your questions with regard to each of

our operating agencies. With your permission, I will dispense with reading that.

Mr. HENDERSON. Without objection it will be inserted in the record at this point in its entirety.

(The statement referred to follows:)

PREPARED STATEMENT OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE ON ELECTRONIC DATA PROCESSING ACTIVITIES

This Department welcomes the opportunity, afforded by your request of May 28, 1962, to discuss its use of electronic data processing systems. This Department has been a pioneer among Federal agencies in developing electronic data processing systems. In 1956, the Bureau of Old-Age and Survivors Insurance began maintaining national earnings records electronically. Since that beginning, the Department's computer needs have grown to the point where during this fiscal year the Department plans to have more than 25 computers operating in several geographical locations throughout the country on a variety of applications.

The background section which follows points up the Department's rapid growing in recent years and gives a summary of the problems encountered in electronic data processing. Following this there is a discussion of each of the five topics specified in your memorandum of May 28, 1962.

BACKGROUND

This Department has many widely diverse programs and has developed a philosophy of delegating, within broad policy guidelines, to the operating agencies the authority necessary to carry out these programs.

Data accumulated and processed in carrying out one program activity are seldom required by another program. Thus, program needs do not dictate centralization of data processing activities. On the other hand, it would not be either efficient or economical to provide for automatic data processing including the installation of equipment at every level of the Department requiring data processing services. In attempting to strike a balance between program needs and economical administration, the Department has evolved a policy of decentralization of data processing provided the volume or complexity justify separate installations of electronic equipment. The Bureau of Old-Age and Survivors Insurance and the National Institutes of Health, for example, support their own computers; conversely, the Office of Education and the Food and Drug Administration currently utilize a computer which is under the control of the Office of the Secretary and available for use by the smaller operating agencies of the Department.

The determination to process data centrally or to decentralize the processing to a subordinate level is neither simple nor easy to make. There are no hard and fast rules. The Department has attempted to make decisions on the basis of which type system offered the greatest promise of fulfilling data processing requirements with the least cost.

As expected there have been some difficulties because of the paucity of planning data and lack of experience. On the other hand, the solid practical experience gained in the use of electronic data processing equipment should increase the likelihood that installations of equipment will become increasingly economical and efficient.

AGENCY PLANNING PRIOR TO INSTALLATION OF EQUIPMENT

The Department's principal guidance materials on the development of data processing systems are contained in part 16 of our "General Administration Manual" and in the Department's "Guide for the Analysis and Improvement of Data Processing." A copy of each is appended to this statement. The departmental guidance is intended to provide for thorough planning and detailed systems analysis as a prerequisite to determining whether data processing needs can be met through the acquisition of electronic or other automatic equipment.

Each organization of the Department must support its request for electronic data processing equipment with a thorough systems analysis. The Office of the Secretary reviews all proposed new systems and proposed major revisions in

existing systems. The requesting organization must state the requirements which the equipment must meet and provide all qualified manufacturers with the opportunity to compete on equal terms. The actual selection of equipment, if the proposed system is approved, is left to the operating agencies. They are expected to make their selections on the basis of the manufacturer's ability to satisfy systems requirements; costs (purchase or rental costs, installation costs, etc.); and conformance to procurement policies and procedures. The "Guide for the Analysis and Improvement of Data Processing" contains specific criteria which should be considered in selection of the equipment including a checklist of "Suggested Criteria for Appraisal of Manufacturers' Proposals" (attachment C to the guide).

Scientific, engineering, and research data systems cannot always be planned in the same detail as those for accounting or other administrative operations. For this reason the Department does not require the same detailed systems planning and analysis on scientific systems as on business-type systems. However, the Department expects organizations designing scientific and related systems to consider such of the criteria as would be used in designing business-type systems as may be pertinent to the particular scientific application.

#### EFFECTIVENESS OF BUREAU OF THE BUDGET CIRCULAR A-54

The Department believes the policies contained in BOB Circular A-54 on selection of automatic data processing equipment are sound and consonant with the advice provided the operating agencies of this Department through its policy issuances and other guidance. On the question of "lease versus purchase" of automatic data processing equipment, the Department agrees with the general policy but believes that four considerations affect the purchase of equipment:

First, because of the speed with which technological advances are being made in the electronics field, 6 years may not be the optimum period for evaluation of the economy of purchasing or renting equipment. A 4-year period would appear to be more appropriate.

Second, provision to purchase a computer must be included in the budget, and probably involves a large outlay. The magnitude of the cash requirement might result in delaying the purchase until the next fiscal year or even longer. This problem can be overcome by acquiring the equipment with the lease-with-option-to-purchase provision in the contract. Subsequently the option to purchase would be exercised when funds to purchase become available.

Third, manufacturers will allow trade-ins only on their own equipment. This tends to tie a particular installation to the same manufacturer whenever equipment is replaced, unless some procedure can be worked out for Government-wide purchase of trade-ins by the Treasury with reassignment of equipment by the General Services Administration.

Fourth, the General Services Administration has not yet negotiated contracts with all manufacturers. In the absence of firm contracts, comparative costs analyses of lease versus purchase will be difficult.

#### MANPOWER UTILIZATION

The Department tries to consider the human factor in every stage of the development and operation of electronic data processing systems, including the initial planning, installation, and operational phases.

As the staffing requirements for a new or revised system become clear, the Department gives current personnel the opportunity to qualify for new jobs, including getting retraining if necessary. Employees who are neither eligible nor interested in new assignments are transferred or reassigned to other work. A thorough systems design provides time for orderly changes in personnel.

There are no known cases in which operating agencies of the Department has separated employees because of automation. Every electronic data processing system has been installed to service growing programs. The growth of the old-age, survivors, and disability insurance program, for example, has resulted in the hiring of more people, but the installation of automatic data processing systems has kept that increase much lower than it would otherwise have been. The jobs of some individuals have disappeared, but it has been possible to reassign them.

Shortages of personnel rather than surpluses have been the main problem. The electronic data processing units in the Department have had difficulty

in finding and retaining programmers. Some of the difficulty in retaining full-time programmers can be mitigated by training subject matter users to do their own programming and by extending the use of "common language" programming. The latter solution, however, is dependent on better service from manufacturers in reducing the serious timelags which now exist between the availability of equipment and the delivery of programming aids. Common-language programming would be much more extensive now if programming aids were delivered on schedule.

#### USE OF BYPRODUCT STATISTICAL DATA AND REPORTING IN MACHINE LANGUAGE

This Department uses computers primary for program purposes. As administrative applications are planned and installed, however, the Department will be alert to the possibilities of obtaining byproduct statistical information.

In an effort to simplify business reporting requirements, the Bureau of Old-Age and Survivors Insurance now accepts in magnetic tape form reports of covered earnings from employers. One problem which makes extension of this system to other applications difficult is that the magnetic tapes of different manufacturers are not compatible with each other. Converters do exist for converting the tape of one manufacturer to make it compatible with the tape or the computer of another manufacturer but these converters are ordinarily too expensive in relation to the limited use they would receive by individual agencies. This problem can be attacked in two directions. First, the Federal Government should improve administration and financial arrangements for the sharing of converters. Secondly, manufacturers should be urged to reduce the variety in the sizes and other characteristics of data media, particularly magnetic tape.

#### INTERAGENCY COMMITTEE ON AUTOMATIC DATA PROCESSING

This Department has been active in the work of the Interagency Committee on Automatic Data Processing since its establishment. The Committee has been very valuable as an orientation and educational medium for agencies planning new or revising existing automatic data processing systems; as a means of providing for informal staff communication; for exchange of information and ideas; and as a sponsor of interagency studies and projects. This Department has contributed manpower to the several task forces set up by the Committee and has utilized the products of the Committee.

#### ELECTRONIC DATA PROCESSING ACTIVITIES, OFFICE OF ADMINISTRATION, OFFICE OF THE SECRETARY

##### BACKGROUND

The Division of General Services and its predecessor divisions have operated a data processing service since 1937. The equipment operated by the Division is used by all headquarters units of the Department and on occasion by other Federal agencies; e.g., Small Business Administration, National Labor Relations Board, etc. Until June of 1962 the equipment operated by us was entirely in the electric accounting machine area. In June, however, an RCA 301 electronic data processing system was installed to complement the electric accounting machines in use.

##### SYSTEMS ANALYSIS

Investigation of the applicability of electronic data processing equipment to this Division's operations began in 1958 when an ad hoc committee composed of experts from a number of other agencies undertook to analyze our data processing operations. It was concluded that electronic equipment should not be considered until systems analyses had been carried out and personnel had been educated in the true capabilities of automatic data processing systems.

In the spring of 1960 study indicated that developments in the computer industry had changed to the extent that detailed analysis was again in order to determine if electronic equipment could make an effective contribution to lower data processing costs and more effective data for management decisions. All repetitive work was analyzed and manufacturers were invited to submit their recommendations. Analysis of proposals indicated that a potential application of

known requirements existed but it was not clear as to whether there would be optimum utilization of available time.

At approximately the same time as this Division was making its analysis the Food and Drug Administration of this Department had mounted a comprehensive analysis of its data processing requirements. The Food and Drug Administration study which began in the spring of 1960 culminated in a recommendation for a paper tape input computer system solely for the purposes of the Food and Drug Administration. The Food and Drug Administration recommendation was concurred in by the Office of the Secretary in August of 1960 and preparations begun for the installation of an RCA 301 computer. The RCA 301 was selected from a wide field of competitive equipments.

In September of 1961 in an effort to minimize costs and maximize benefits a cooperative arrangement was effected whereby this Division assumed operational responsibility for the Food and Drug Administration computer system for both the applications of the Food and Drug Administration and the applications previously identified by this Division as being susceptible to electronic data processing. Modifications necessary to the equipment selected for the Food and Drug Administration applications were the addition of a card reader and a card punch. The costs of the card input and output components will more than be offset by the electric accounting machines that will be displaced.

#### INITIAL APPLICATIONS

The applications that are now being processed or that will soon be processed run the computation and data processing gamut. The food and drug applications which are primarily statistical in nature include such items as—

- (1) Assays of vitamin D.
- (2) Manometric experiments.
- (3) Chronic and subacute toxicity studies.
- (4) Establishment inspection reports.
- (5) Tissue culture experiments.
- (6) Antibiotic certifications.

The applications of the other activities serviced by this Division are primarily administrative and logistical in nature but do cover a wide range of activities such as—

- (1) Hospital and medical facilities (Public Health Service).
- (2) Time and production reporting (FDA).
- (3) Cost analysis and billing (OS-DGS).
- (4) Construction grants for sanitary engineering (PHS).
- (5) Biometrics and sound studies (PHS).
- (6) National water quality studies (PHS).
- (7) Water inventory—cities of 25,000 (PHS).
- (8) Costs of sewage treatment (PHS).
- (9) Sewerage inventory (PHS).
- (10) Universe of school systems (Office of Education).
- (11) Earned degrees 1961 (OE).
- (12) National defense education aids financial reports (OE).

In addition to the applications identified above the computer has been found to be very effective and very economical for work of a nonrecurrent nature which involves calculations. This work is performed by a combination of electric accounting machine processes; e.g., sorters and collators, and electronic processes using a programing technique known as a "report generator." Comparative costs and times on a typical job susceptible to this type of processing were as follows:

Electrical accounting machine:	
Time in hours-----	35.5
Cost-----	\$237.37
Electrical accounting machines electronic data processing:	
Time in hours-----	2.75
Cost-----	\$85.47

As the foregoing table indicates, use of the computer in lieu of the calculating punch produced the desired results in less than 8 percent of the time and at less than 36 percent of the cost.

It should be noted, however, that such dramatic savings in time and cost are not universally obtainable and that a need will exist for some time to come for electrical accounting machines.

## MANPOWER CONSIDERATION

This Division has attempted to develop computer personnel from existing staff. Thus far we have been successful. Both of our full-time programmers were formerly electrical accounting machine planners. Console operators and tape handlers were former electrical accounting machine operators.

Intensive training has been undertaken to insure an easy transition. All personnel in the electrical accounting machine activity were given the opportunity to take aptitude tests for electronic data processing work and 80 percent of staff did so. The test in the main confirmed management's assessment of staff but did turn up a few individuals with latent potential. With the cooperation of the manufacturer both programmer and equipment operator training began in July of 1961, 11 months prior to installation.

The operating agencies we service were also afforded the opportunity to train existing staff in programming and thus far approximately 30 persons outside of our own staff have been so trained.

Turnover has not yet been a problem; however, we are apprehensive that persons we have trained will be attracted elsewhere at higher grades.

## BOB CIRCULAR A-54

The Division of General Services faces three serious limitations in the application of this circular:

1. Six years may not be a reasonable period of time for evaluation of automatic data processing equipment in all situations.
2. Leadtime for evaluation of lease versus purchase is not coincident in all cases with the budget cycle.
3. Consideration has not been given to outright purchase by the Treasury and reassignments of equipment made by the General Services Administration.

## BYPRODUCT STATISTICAL DATA

We are firm believers in the use of byproducts and endeavor to extract as much meaningful data as possible from a primary run. Although the Division of General Services unit does not come within the scope of question 4 of the committee's letter, we shall be alert to make use of the fact that on electronic data processing applications it is usually much easier to create byproduct data since the data can be manipulated with relative ease in the memory of the computer.

## OTHER FACTORS

The lack of compatibility in the various computers is becoming an increasingly severe problem and could cause selection decisions that are not intrinsically economic in nature. Inferior equipments might be selected because of existing files of magnetic tapes or programs that are incompatible with newer equipment. We do not believe that the factor of incompatibility is completely an engineering problem; marketing considerations are also involved to the detriment of the Government and the economy. It is somewhat analogous to the situation that existed in the infancy of the railroad industry where each line had its own gage of rails.

Consideration should be given to an interim measure by which the Federal Government might establish a center or centers where conversion equipment would be maintained to ease this problem area.

## DANGER OF MONOPOLY

The fact that one manufacturer has a dominant position in the computer industry is not good for the economy as a whole in our view. Where one firm has abundant systems expertise there is a temptation to allow the manufacturer to do the job that should be done by the user. The result is generalized systems rather than specific systems. In the long run this may result in less than optimum use of resources and further enhancement of the position of the dominant firm.

## ELECTRONIC DATA PROCESSING ACTIVITIES—OFFICE OF EDUCATION

The Office of Education does not itself have direct control over any EDP or ADP installations, but is involved in automatic data processing in two major ways. The first is through use of equipment, either departmentally controlled

or provided through contract with service bureaus or other sources, to process educational data obtained nationwide by means of statistical surveys. The second and less direct major involvement is through administration of title X (sec. 1009) of the National Defense Education Act, whereby the Office provides funds to States on a matching basis for use in improving their systems for gathering and analyzing educational data, up to a current maximum of \$50,000 per year per State. These funds, when expended for equipment, may be used in a variety of ways, such as purchase or lease of EDP equipment by State education agencies, or for securing time on equipment controlled by other organizations within the States.

Although the situation is changing rapidly, as of this date six State education agencies have electronic computers of their own: California, Florida, Illinois, Iowa, Texas, and Washington. Eleven others are using computers under the jurisdiction of other branches of State government: Colorado, Georgia, Maine, Maryland, New Jersey, Ohio, Pennsylvania, South Carolina, Tennessee, West Virginia, and Wisconsin.

During fiscal year 1961, 45 State education agencies used ADP equipment, both electronic and mechanical, in varying degrees for processing statistical data. The number of States processing one or more items of data in specific categories of educational information was:

Employed personnel-----	40	School facilities-----	21
Pupil personnel-----	37	Specialized services-----	30
School finance-----	37	Research and information serv-	
Curriculum and program study---	22	ices-----	32

More detailed data of this nature is appended.

A total of \$1,099,657.36 in Federal funds was expended under this title in fiscal year 1961. (See chart of State participation.) Although all information is not yet available, it is expected that a total of 52 States and territories will have used ADP equipment during fiscal year 1962 for processing educational data. A total of \$1,482,451.93 in Federal funds was requested for fiscal year 1962.

The provisions of title X exist to help the States improve their own educational statistics programs, and hence do not permit the Office of Education to specify in detail how the grant funds are to be used. The State develops a State plan specifying how the grant funds will be applied. These plans are approved by the Commissioner of Education before a grant is made. The Office provides technical advice, seeking to move toward standard terminology and units of measurement, but does not and cannot require the establishment of identical systems in participating States. Hence the proportion of grant funds actually applied to the purchase, lease, or other forms of access to ADP equipment varies greatly, as does the nature and type of the equipment itself.

At the present time, the Office is working toward comparability of data, mechanical compatibility of machine input, and standardization of data format. The first involves the development and use of standard definitions for basic items of educational information. The second is not one of the basic difficulties since most machine languages are readable by the equipment in Washington accessible to the Office. The third now involves the reinterpretation of data records so that comparable information appears in corresponding data fields.

To date, three handbooks have been prepared, in cooperation with local and State educational agencies, as a means to achieve reasonable standardization of terminology and definitions of basic items of educational information. Substantial progress in implementation has been made. The three handbooks now available are:

- Handbook I, "The Common Core of State Educational Information"
- Handbook II, "Financial Accounting for Local and State School Systems"
- Handbook III, "Property Accounting for Local and State School Systems"

Also under development are handbooks on staff accounting and pupil accounting.

The improvement of individual State educational statistics under the National Defense Education Act assists greatly in the overall problem of improving the Nation's knowledge of its educational system, and, over time, it is anticipated that the State systems will become more and more comparable, through the adoption of standard terminology and units of measure. This in turn will permit greatly improved cumulative educational statistics for the Nation as a whole. Substantially increased demands for data processing capacity in Washington are anticipated as the amount of compatible data from the States increases.

AUTOMATIC DATA PROCESSING OF STATISTICAL SERVICES DATA BY STATE EDUCATION AGENCIES, FISCAL YEAR 1961

PART 1.—*Availability of automatic data processing equipment to State education agencies, fiscal year 1961—How available to State education agency*

	<i>Number of States</i>
1. Using only equipment owned or leased by State education agency.....	14
2. Using equipment owned or leased by State education agency and also using services of a State centralized automatic data processing unit or unit of other State agency.....	13
3. Using equipment owned or leased by State education agency and also using services of an automatic data processing service bureau.....	7
4. Using equipment owned or leased by State education agency, using services of State centralized automatic data processing unit or unit of other State agency, and also using services of an automatic data processing service bureau.....	6
5. Utilizing only services of State centralized automatic data processing unit or unit of other State agency.....	2
6. Utilizing services of a State centralized automatic data processing unit or unit of other State agency and also utilizing services of automatic data processing service bureau.....	3
7. Total, number in which automatic data processing equipment was used for processing statistical data.....	45

PART 2.—*Areas of statistical services in which automatic data processing equipment was used by State education agencies during fiscal year 1961*

EMPLOYED PERSONNEL

	<i>Number of States</i>
1. Certification.....	23
2. Teacher approval.....	14
3. Teacher employment studies.....	27
4. Retirement.....	10
5. Supply and demand studies.....	23
6. Salary studies.....	29
7. Teacher-load studies.....	17
8. Miscellaneous statistics.....	31
9. Preparation of personnel directory.....	16
10. Other.....	6
11. Processing at least one item (above) relating to employed personnel on automatic data processing equipment.....	40

PUPIL PERSONNEL

1. School census.....	15
2. Pupil enrollment and attendance.....	26
3. Pupil dropouts.....	8
4. Socioeconomic characteristics of pupils.....	5
5. Census of pupils enrolled in special education programs.....	14
6. Pupil retardation and acceleration.....	7
7. Standardized test scoring.....	16
8. Standardized test score analysis.....	16
9. Other.....	5
10. Processing or least one item (above) relating to pupil personnel on automatic data processing equipment.....	37

PART 2.—Areas of statistical services in which automatic data processing equipment was used by State education agencies during fiscal year 1961—Continued

SCHOOL FINANCE		<i>Number of States</i>
1. State agency budget preparation.....		10
2. State aid distribution.....		22
3. Internal payroll and accounting.....		20
4. Cost analysis.....		15
5. Fee accounting.....		6
6. Recording expenditures and receipts of local school systems.....		26
7. Reconciliation of local receipts reported with State disbursements.....		11
8. Local finance studies.....		17
9. Other.....		3
10. Processing at least one item (above) relating to school finance on automatic data processing equipment.....		37
CURRICULUM AND PROGRAM STUDY		
1. School accreditation.....		6
2. Analysis of course offerings in terms of pupils enrolled.....		13
3. Study of high school graduates, number, courses completed, etc.....		11
4. Other.....		2
5. Processing at least one item (above) relating to curriculum and program study on automatic data processing equipment.....		22
SCHOOL FACILITIES		
1. Annual records on school sites.....		11
2. Annual records on school buildings.....		15
3. Annual records on equipment.....		5
4. Analysis of classroom shortage.....		16
5. Other.....		3
6. Processing at least one item (above) relating to school facilities on automatic data processing equipment.....		21
SPECIALIZED SERVICES		
1. School lunch reimbursement.....		15
2. School lunch commodity distribution.....		8
3. Miscellaneous data on food services.....		11
4. Pupil transportation records.....		15
5. Miscellaneous data on health services provided.....		5
6. Surplus property distribution.....		3
7. Vocational rehabilitation.....		16
8. Other.....		3
9. Processing at least one item (above) relating to specialized services on automatic data processing equipment.....		30
RESEARCH AND INFORMATION SERVICES		
1. Periodic statistical reports of State superintendent.....		30
2. Other.....		7
3. Processing at least one item (above) relating to research and information service on automatic data processing equipment.....		32

*Improvement of statistical services, program status report A—State participation under title X (sec. 1009) National Defense Education Act*

State	Effective date of title X State plan	Fiscal year 1959	Fiscal year 1960	Fiscal year 1961		Fiscal year 1962
		Federal share expenditure (1)	Federal share expenditure (2)	Federal funds requested (3)	Federal share of expenditure <sup>1</sup> (4)	Federal funds requested (5)
Total.....	<sup>2</sup> 53	\$236,592.09	\$812,101.27	\$1,299,806.47	\$1,099,657.36	\$1,482,451.93
Alabama.....	Jan. 5, 1959					2,260.00
Alaska.....	Apr. 27, 1959		7,902.00	13,950.00	13,931.22	19,000.00
Arizona.....	Aug. 31, 1959					
Arkansas.....	Apr. 23, 1959	1,593.68	8,534.45	11,100.00	7,190.67	12,750.00
California.....	July 6, 1959		30,113.84	50,000.00	36,117.03	50,000.00
Colorado.....	Mar. 16, 1959	12,205.49	33,321.63	50,000.00	48,925.30	50,000.00
Connecticut.....	Dec. 29, 1958	1,805.71	11,399.03	14,777.00	12,967.56	18,066.10
Delaware.....	June 2, 1959			42,500.00	0	
District of Columbia.....	Feb. 19, 1959					
Florida.....	Dec. 19, 1958	28,988.24	50,000.00	50,000.00	50,000.00	50,000.00
Georgia.....	Dec. 12, 1958	30,000.00	48,130.34	50,000.00	50,000.00	50,000.00
Hawaii.....	Dec. 5, 1958	4,031.76	31,195.51	44,532.50	45,610.28	50,000.00
Idaho.....	Jan. 19, 1959		2,975.29	2,500.00	2,289.36	7,720.00
Illinois.....	Mar. 9, 1959	7,159.32	25,755.35	50,000.00	50,000.00	50,000.00
Indiana.....	June 14, 1961					25,000.00
Iowa.....	Jan. 5, 1959	5,149.04	47,508.08	50,000.00	48,858.09	50,000.00
Kansas.....	Jan. 2, 1959	2,189.76	10,026.57	22,325.00	20,524.10	27,727.50
Kentucky.....	Feb. 19, 1959	601.97	4,899.70	30,454.00	30,454.00	44,928.00
Louisiana.....						
Maine.....	Apr. 17, 1959	585.81	6,577.70	20,130.00	18,035.48	41,000.00
Maryland.....	Jan. 26, 1959	1,734.56	7,042.57	9,450.00	5,842.24	11,250.00
Massachusetts.....	Mar. 5, 1959	11,995.24	17,450.91	50,000.00	42,252.50	50,000.00
Michigan.....	Feb. 2, 1959					
Minnesota.....	May 8, 1959	3,217.04	20,273.18	20,000.00	19,049.05	20,000.00
Mississippi.....	May 27, 1959		10,506.42	26,000.00	24,479.42	27,500.00
Missouri.....	June 5, 1959		3,154.35	2,500.00	7,358.51	12,400.00
Montana.....	Jan. 20, 1959	2,997.91	17,434.85	29,900.00	25,353.96	44,000.00
Nebraska.....	June 8, 1959	491.41	8,089.47	10,075.00	9,003.40	13,845.00
Nevada.....	Jan. 16, 1959					
New Hampshire.....	May 21, 1959		3,331.17	12,547.40	12,403.36	9,789.77
New Jersey.....	Apr. 6, 1959	1,568.80	13,905.55	28,202.00	25,698.53	30,510.00
New Mexico.....	Nov. 28, 1958	3,595.27	22,821.38	38,053.42	30,715.41	43,013.50
New York.....	Jan. 15, 1959	12,327.30	33,962.00	50,000.00	50,000.00	50,000.00
North Carolina.....	July 25, 1960			6,212.00	4,367.80	22,667.00
North Dakota.....	May 15, 1959		1,283.83	6,705.00	6,378.85	4,900.00
Ohio.....	Feb. 24, 1959	10,742.65	48,533.81	50,000.00	43,754.44	50,000.00
Oklahoma.....	Mar. 27, 1959		49,997.62	50,000.00	50,000.00	50,000.00
Oregon.....	Nov. 25, 1958	4,547.06	11,756.26	20,386.00	12,717.66	30,233.00
Pennsylvania.....	Nov. 7, 1958	3,826.82	21,815.65	50,000.00	25,952.81	50,000.00
Rhode Island.....	Jan. 20, 1959	21,286.56	33,268.47	43,525.00	40,090.90	50,000.00
South Carolina.....	June 22, 1959		18,016.23	27,590.00	24,549.84	35,405.00
South Dakota.....	Feb. 3, 1959	483.96	6,081.21	14,402.50	11,910.95	18,222.50
Tennessee.....	Dec. 23, 1958	42,676.68	39,124.82	50,000.00	36,715.68	47,500.00
Texas <sup>3</sup> .....	Nov. 6, 1959	14,271.30	40,079.62	50,000.00	50,000.00	50,000.00
Utah.....	Feb. 26, 1959	2,361.07	7,884.48	7,885.00	7,266.42	9,461.00
Vermont.....	June 17, 1959		2,567.48	11,605.00	6,209.36	7,567.56
Virginia.....	July 31, 1959					
Washington.....	Oct. 29, 1958	985.88	4,494.26	1,650.00	589.43	50,000.00
West Virginia.....	Feb. 11, 1959		8,000.00	10,000.00	9,282.53	50,000.00
Wisconsin <sup>3</sup> .....	Sept. 4, 1959		7,477.86	11,545.65	13,222.65	32,849.00
Wyoming.....	June 2, 1959		12,631.21	25,000.00	11,223.66	
Canal Zone.....						
Guam.....	Nov. 7, 1960			13,279.00	13,938.89	17,397.00
Puerto Rico.....	Sept. 23, 1959		8,755.52	39,525.00	30,429.71	32,460.00
Virgin Islands.....	June 2, 1959	3,221.80	14,021.60	13,750.00	13,996.31	13,000.00

<sup>1</sup> Based upon annual reports by participating State education agencies.

<sup>2</sup> 1 territory has indicated that it does not intend to participate and 1 State plan is pending approval because of legal questions.

<sup>3</sup> Texas received \$139.92 for interest earned fiscal year 1961. Wisconsin received \$310.17 for rental of equipment fiscal year 1961.

Note.—Total does not include request from Delaware—because of failure to obtain matching funds Delaware returned Federal funds received to OOE Jan. 15, 1962.

## ELECTRONIC DATA PROCESSING ACTIVITIES, PUBLIC HEALTH SERVICE

This statement will first describe generally the Public Health Service policy framework and background covering performance of electronic data processing activities in the Service and then move on to comment specifically on the points outlined in Chairman Henderson's letter to former Secretary Ribicoff of May 28, 1962.

On May 27, 1960, the Public Health Service issued a comprehensive statement of policy governing the acquisition of data processing and computational equipment and services to assure that maximum benefits would accrue throughout the Service from expenditures made for computer equipment and services. Under this policy Public Health Service units are required to prepare satisfactory documentation in support of proposals for electronic data processing equipment and services, including, where appropriate, workflow diagrams and analyses of workloads. In establishing this policy, the Service has necessarily distinguished between two general types of applications placed on computers:

(1) Those of a primarily mathematical-computational nature related to research programs, which are concerned with a variety of laboratory and clinical research problems and

(2) Those of a statistical data processing nature which involve relatively large volumes of data manipulation and processing but few, if any computations.

In the first category of applications fall many of those of the National Institutes of Health which do not lend themselves to the same type of analysis associated with the usual statistical data processing types of applications. For example, scientific computational applications may consist of mathematical formulas of one kind or another which minimize the benefits resulting from workflow analysis of input and output problems. In the data processing category fall many applications of the National Center for Health Statistics which are concerned with the processing of vital and health statistics. It is important to keep this distinction in mind to fully understand Public Health Service activities in the electronic data processing field.

Since implementation of the aforementioned policy, the Service has obtained quite comprehensive feasibility studies in support of electronic data processing equipment requested. One study in particular is outstanding in this respect; it was conducted by the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, and includes a computer evaluation report leading to a recommendation for a Honeywell 400 computer. Computer applications of the center include a wide variety of laboratory applications ranging from experiments on the survival of viruses in iodine solutions to intensive community air pollution surveys yielding hundreds of thousands of observations. In addition to the Honeywell 400 computer located at the Robert A. Taft Sanitary Engineering Center, other general purpose digital computer installations in the Service are as follows:

National Institutes of Health—Honeywell 800; IBM 1620; Monrobot XI.

Bureau of State Services—Division of Radiological Health, Rockville Laboratory—IBM 1620.

National Center for Health Statistics—IBM 1401; IBM 1410.

Originally the use of the computer for research problems at the National Institutes of Health developed gradually and was closely related to the reliability of well qualified mathematicians. By 1960 the workload on the IBM 650 at the National Institutes of Health was such that saturation was approaching, and also the workload had shifted so that there was an increasing proportion of research as compared to administrative applications. After conducting a computer evaluation, the National Institutes of Health recommended a Honeywell 800 to be used to handle the increasing number of projects of a research nature. The selection was somewhat complicated by the fact that the projection of research workload constituted a difficult task. At the National Institutes of Health the research workload can be divided into 3 general categories.

(1) Computing and data processing associated with the formation and processing of laboratory type problems. This area represents a tremendous potential for data processing at the National Institutes of Health since there are a large number of laboratories with equipment having output in the form of signals, graphs, etc. Although few of the laboratories have progressed to the stage of rapidly converting instrument output to a form in which it can be handled by computers, these developments are within the scope of known tech-

nology. During the past year, significant progress has been made in this area and future developments are expected to be at a much faster pace.

(2) Statistical problems involving epidemiological-type studies. These problems originate with biometricians and epidemiologists who approach problems from the viewpoint of examining large numbers of individual cases or elements with the hope of establishing significant correlations that will suggest the answer to a disease problem. The large computer makes this type of study possible and the number of such studies is increasing rapidly. Examples are the studies of the relationship of smoking to cancer, the cancer end result studies and the perinatal study.

(3) A third area of research problems at the National Institutes of Health involves mathematical models and simulation. This area requires the highest level of mathematical sophistication and is in its infancy at the National Institutes of Health. From a planning viewpoint, however, it is essential that the National Institutes of Health consider the essentiality of such studies as basic to effective use of computers in research.

Two other general purpose digital computers at the National Institutes of Health, IBM 1620 and Monrobot XI, are small computers with each oriented directly to laboratory applications in a particular institute. They are programed by scientists and operated by the using staffs. No personnel are assigned to them full time. The IBM 1620 computer at the Division of Radiological Health, Rockville Laboratory, was acquired for (1) translation of data from multichannel gamma analyzer and detection systems into estimates of radionuclides content of samples of air, food, water, biological specimens, and other samples (manual treatment of this data from a single sample would require approximately 10 man hours while ADP methods would reduce the time to minutes) and (2) processing of radionuclide assay results using acceptable biological and physical behavior models for radionuclides in man to rapidly estimate radiation dose to critical organs.

The National Center for Health Statistics is a general purpose statistical organization, established by the Surgeon General of the Public Health Service in August of 1960 by merging previously existing activities. The center is attached directly to the Office of the Surgeon General. Its basic mission is to provide for the collection and analysis of national vital and health statistics and to wide dissemination of the significance of these data. That mission includes the identification of significant associations between characteristics of the population and health related problems and the measurement of the health status of the Nation. Basically, these statistics are collected in two ways: through a program of continuing health surveys conducted by the National Health Survey Division and through compilation of vital statistics from records of births, deaths, fetal deaths, marriages, and divorces, a responsibility of the National Vital Statistics Division. Each of these divisions of the National Center for Health Statistics now utilizes electronic data processing equipment extensively.

The National Health Survey Division, which was established in 1956, processed its original data on electronic data processing equipment, utilizing one of the original Univac computers at the Bureau of the Census. It has continued this arrangement for health interview survey data, meanwhile programing data collected by other survey methods for processing on the National Center for Health Statistics' computers. The continuing utilization of Census equipment has been desirable for several reasons. It has eased the difficulties in the transition period involved in the establishment of the National Center for Health Statistics computer center and has proven valuable in continuing the close working relationship between Census and the National Center for Health Statistics.

The plans for processing of data for the National Vital Statistics Division on electronic data processing equipment, involving a complete transition from conventional data processing methods, began immediately when the division became a part of the National Center for Health Statistics in October 1960. It was decided that 1960 and 1961 natality data would be programed for the Census Univac in order to give priority to producing the more complex mortality data on the National Center for Health Statistics' computers. Natality programing for 1960 and 1961 has been completed and data are now being produced on the Univac computer at Census. The mortality programing activities are proceeding satisfactorily at the present time and some data are already available. In addition, programs are being developed to utilize electronic data processing equipment for the tabulating of marriage and divorce statistics.

Each division has a staff of programers which is responsible for working with subject matter specialists and for program preparation and operation. The

division programmers have direct access to the computer and responsibility for the division's computer processing rests with them. Computer facilities are operated as service units, providing the use of the computer hardware, the staff to operate it and certain programming assistance to the division such as development of general purpose routines. To date, the use of electronic data processing equipment for processing vital and health statistics data has proven invaluable in carrying forth the center's mission. As the transitional period passes, it is expected that computer utilization will become more sophisticated and that technological innovations in the compilation of health data will be exploited more fully.

The National Vital Statistics Division maintains a continuing close relationship with State vital and health statistics offices. Development of national vital statistics is based on vital records collected by the States and provided to the National Vital Statistics Division, usually on microfilm. In addition, the continuing development and improvement of the vital records and statistics system is of major concern and, for this reason, the division provides advice, guidance and technical assistance to the States' vital and health statistics offices. At the present time, some States are in the process of obtaining electronic data processing equipment, or access to such equipment, for vital and health statistics applications and the trend appears to be that more and more will follow suit. The National Center for Health Statistics has been, and will continue to be called on to provide technical advice to States on computer utilization and application problems including feasibility questions, requests for programming guidance, and other related questions. It is not foreseen that a computer-computer relationship will develop between the Federal and State vital statistics programs, e.g., that the National Center for Health Statistics will code and electronically process vital data on a central basis for input to State computers, or vice versa, because of the need for each State to develop and maintain its own program according to its own interests and needs. The possibility does exist, however, that there might be developed a standard transcription at the document source that would insure uniform input to both the National Center for Health Statistics and State computers. This possibility is under study at the present time.

The Public Health Service has a contract underway with Airborne Instruments Laboratory to establish a demonstration project—associating cardiographic recordings and digital computer analysis of these—to attempt to show the feasibility of analyzing electrocardiographic information with the assistance of a digital computer (Control Data Corporation 160A).

In early 1963 a computer based system is planned for installation in the new National Library of Medicine Building, Bethesda, Md. Library officials believe that under its existing system for producing the "Index Medicus" there is too much concentration on index problems and on improvements in a single major output and this has resulted in a certain rigidity and inflexibility of systems. Library officials became convinced that a more profitable and flexible approach would be to try to derive the composition function from an overall electronic bibliographic system. The basic analysis including feasibility of the computer has been done and the contractor (the General Electric Co.) is performing system development work on this project.

The following products are to be derived from Medlars:

(1) An increased high-speed composition capacity for the published "Index Medicus";

(2) Recurring bibliographic listing of references selected in accordance with the predetermined requirements of particular research fields. For example, the library would reach an agreement with representatives in a field of cardiovascular or cancer research on the subject heading structure which covers the literature for the particular field, and would supply a weekly listing of the world's medical literature in that field to the research group for its dissemination, and

(3) An independent search and retrieval capacity to answer on demand queries from individual research installations concerning new publications bearing on their immediate problems.

It is also Public Health Service policy to require adequate and timely planning in connection with the installation of approved computer equipment, including appropriate training of personnel and testing of applications to assure most effective utilization of equipment.

Finally, there is a Public Health Service policy governing the use of computer facilities in the Service to require potential users to consider the feasibility of

obtaining computer services within the Federal Government—giving particular attention first to use of Public Health Service computers—before making any determination to obtain such services under commercial contract.

For future planning purposes the National Institutes of Health have begun a top-level study, as directed by the Director, Dr. Shannon, to attempt to identify electronic data processing problems facing the National Institutes of Health and the actions required to resolve them. Electronic data processing has become a tool of growing importance in research and research administration at the National Institutes of Health and therefore this review is an exceedingly important undertaking and should produce significant results in performance of electronic data processing activities at the National Institutes of Health.

The Service has found the Bureau of the Budget Circular A-54 effective in its policy outlines in regard to acquisition of automatic data processing equipment. The A-54 requirement that careful consideration be given to lease versus purchase of equipment should result in significant savings to the Government. However, the Service does not have enough information or experience in operating under the provisions of Bureau of the Budget Circular A-54 to give a more detailed appraisal of its effectiveness in the Service at this time. The Service currently has seven general-purpose digital computers, of which four have been acquired under the method of lease with option to purchase and three under a straight lease arrangement. Because of unpredictable research aspects and heavily increasing workloads it is difficult to come to a conclusive judgment as to purchase of any Public Health Service computers at this time. However, when reviews of automatic data processing equipment acquisitions are completed in the Service they may well reveal sufficient justification for purchases. The reviews may also show that significant benefits might result from the purchase of more conventional types of data processing equipment, for example, punched card equipment, since long term use of this equipment can be more clearly predicted—thereby clarifying an important consideration essential for a decision to purchase. Also, the obsolescence factor would not be as significant here as it would be in the computer field.

The Public Health Service has problems in recruiting competent programmer personnel to meet its needs in fully exploiting the potentials of computer use in the Service. It is generally known that widespread competition exists among Federal agencies for this talent and this is true also within the Service among its own computer installations. The Service has taken steps to alleviate shortages by attempting to interest Public Health Service personnel in entering the computer programming field. Last year an opportunity was given Public Health Service personnel to take a computer programmer aptitude test with a view to identifying talent in this area. This has been followed up by programmer training courses arranged on both an individual and group basis. In the case of the National Institutes of Health there has been a shortage of programmers competent to use algebraic language applicable to a majority of the research programs. Mathematicians available on the civil service register are not uniformly suited for training in the type of programming required by a medical research organization. Virtually no trained programmers suitable to medical research types of problems are available on the civil service register. Probably the chief problem in the recruitment area is the salary differential between Government and private industry. Computer equipment manufacturers and service bureaus consistently outbid the Public Health Service for qualified trainees, even though college graduates with a degree in mathematics may be hired as mathematician-programmers at the top step of GS-5 (\$5,335) or, if their academic record is sufficiently high, GS-7 (\$6,345). A firm, for example, will pay a starting salary of \$6,600 providing the candidate can pass their written examination. Private industry's salary scales for programmers who have gained any significant amount of experience are likewise too high to enable the Public Health Service to compete for their services.

The National Center of Health Statistics, in converting its application from punched card to computer processing, has attempted to retrain personnel wherever possible for other jobs in the Center and so far has not had to institute a reduction in force for this reason.

The Interagency Committee on Automatic Data Processing has served as a good clearinghouse for the exchange of general types of electronic data processing information, for example, in areas of creating guidelines for feasibility studies, "Automatic Data Processing Glossary of Terms," general policy guidelines, etc. However, information exchanges on a more technical basis have been generally lacking. The Service is looking forward to future reorganizational plans for the

committee which are supposed to take into account the need for more technical exchanges of information and knowledge about specific problems common to more than one agency.

## ELECTRONIC DATA PROCESSING ACTIVITIES, BUREAU OF OLD-AGE AND SURVIVORS INSURANCE

### AGENCY PLANNING PRIOR TO INSTALLATION OF EQUIPMENT

#### 1. *Early studies leading to electronic data processing in the payment centers*

The Director of the Bureau of Old-Age and Survivors Insurance established a special study group, the central study staff, to evaluate the total claims operations, in all its divisional and geographical ramifications, as a unit process. The assignment specified that particular attention be given to investigation of potentials in application of integrated data processing methods and equipment. The study of the claims process by the central study staff resulted in a number of recommendations and actions. There was, however, a single major conclusion and major recommendation. The conclusion was that significant gains in service, accuracy and economy could be made in the old-age and survivors insurance claims process by full exploitation of modern machines, particularly electronic data processing and wire communications equipment. The recommendation was that the Bureau proceed with all possible speed toward the fullest exploitation of integrated and automated data processing equipment and systems and make such changes in process, assignment of functions, and organization as might be necessary and feasible.

#### 2. *Workload factors bearing on the decision to install electronic data processing in the claims process*

It was estimated that the number of persons in current payment status on the beneficiary rolls, old-age and survivors insurance and disability insurance benefits combined would be 20.5 million in fiscal year 1965, 22 million in fiscal year 1970, and 27.8 million in fiscal year 1980. With the growth of the beneficiary rolls, there would be a corresponding growth in the annual workloads of postadjudicative operations. Currently there are approximately 8 million such items annually. By fiscal year 1965, better than 10 million would be expected, 11 million by 1970, and nearly 14 million by fiscal year 1980. Constantly increasing workloads require regular expansions of facilities and personnel to handle them. Confinement of the situation to manageable proportions makes essential the employment of the best available methods and machinery. This indicated the need for electronic data processing equipment in the payment centers.

The decision leading to the acquisition of electronic data processing equipment was deemed to be justified from the standpoint of long-range economic considerations and for the eventual relief of the administrative problems then present. However, an additional consideration of some consequence was the potential ability of electronic data processing in the payment centers to absorb more readily the impact of new tasks which might be imposed by legislation as time progressed.

#### 3. *Selection of a computer system for the claims process*

In May 1960 specifications were delivered to six manufacturers who were the only ones able to make a proposal at that time. The matter was discussed with two additional manufacturers, neither of whom was in a position to make a proposal and so stated. The six manufacturers submitted written proposals in June 1960. Each manufacturer then made a formal presentation of his proposal to Bureau staff members. During the period in which the Bureau evaluated each proposal, the manufacturers were called upon to present additional facts, ideas, arguments, and alternative proposals.

Primary considerations in the evaluation were timely delivery of equipment, costs, expandability, and programing factors. These considerations resulted in the early rejection of four of the submitted proposals.

The two proposals in final contention were so nearly in balance in all respects that the element of cost as projected over the 3-year period for which the systems were expected to be used was the deciding factor influencing the Bureau to select RCA equipment.

As a result of about 2 years' experience with the RCA equipment, the Bureau has decided to redesign the system utilizing available capacity on the central

computer system in the Division of Accounting Operations in Baltimore. The redesigned system contemplates use of wire communications between computers in the payment centers and the central installation. System specifications have been prepared and sent to manufacturers who offer equipment capable of meeting the specifications. The Bureau anticipates that it will be able to install the new system in about January 1963.

#### *4. Problems posed by the impact of legislation pending*

Early in 1958, the major emphasis of the group assigned to study a systems project shifted from the study and definition of requirements of electronic data processing equipment in payment center work to actual assistance in planning for operations involved if legislation pending in Congress were to be enacted. At that time, Congress had before it a bill to increase the benefits of the old-age and survivors insurance payees.

Over 11 million benefit payment records of beneficiaries in current payment status at the time made it apparent that electronic data processing routines would be needed to make timely adjustments to the benefit checks if the legislation were passed. The benefit records were converted from punch cards to magnetic tape and plans, procedures, and programs were prepared to make the necessary adjustments using the electronic computers located in the central office. The programs were formulated and revised in accordance with the benefit provisions in the pending legislation.

On August 28, 1958, the 1958 amendments to the Social Security Act were legislated. Their provisions included the repeal, effective August 1958, of a provision of the 1956 amendments for the offset against disability insurance benefits of certain other periodic disability payments; and an increase in the amount of benefits effective with the January 1959 check, to be issued February 3, 1959. The fact that the file had been converted to tape and that the programs had been developed, resulted in all time schedules being met and increased amounts sent to all eligible beneficiaries effective with the January 1959 check, issued on February 3, 1959.

The success of the 1958 conversion of benefits and the valuable experience gained in the process resulted in a decision to install an experimental electronic data processing system for the disability insurance beneficiary rolls maintained in the Baltimore payment center. Throughout the developmental and succeeding phases of the pilot operations for disability insurance benefits claims in the Baltimore payment center, continual study and evaluation was carried on to determine possible adaptations and applications of the processes to old-age and survivors insurance claims in the other six payment centers. The pilot study provided a base of experience for the application and installation of electronic data processing operations in all of the payment centers.

#### *5. Decisions to shift to new equipment*

The Division of Accounting Operations has made two major shifts and one minor shift in equipment in the past year, and has added one new minor piece of equipment to its system. The first major shift was the replacement of two of the three IBM type 705-III computers with two IBM type 7080. The second major change was the replacement of all off-line (card-to-tape, tape-to-card, and tape-to-print) equipment with the IBM type 1401 systems. The minor shift was the replacement of tape drives in the two 7080 systems with the new higher density (800 characters per inch) IBM type 729-VI drives. The new device added to the electronic data processing system is an IBM type 1922 tape adapter.

The shift to type 7080 reduced machine utilization from a 7-day 3-shift operation to a 5-day 3-shift operation; extended the use of automatic data processing to other areas of work; and improved machine scheduling. In addition, it provided an annual savings in excess of \$400,000 and a buffer of unscheduled machine time if needed.

Prior to the decision to replace two of the 705-III's with two 7080's a thorough study was made of the specifications in relation to each major application. Next, all large-scale computers were considered to determine if there were any potential advantages. In this consideration, such factors as compatibility of data tapes, programs, record formats, and cost of conversion to a different system proved to be extremely important. Cost of conversion from 705-III to 7080 was insignificant since the two systems are completely compatible. Cost of conversion to any other system, using the best techniques available, was conservatively estimated to be in excess of \$3 million. This includes retraining of systems, programing, and operating personnel; complete reprograming and debugging of several

hundred programs; probably replacing of 30,000 reels of magnetic tape, altering the site; etc. The actual shift to the 7080 computers went smoothly according to plan with no difficulty. Performance of the 7080 has been substantially better than expected.

The second major shift involved the replacement of all off-line equipment (except the microfilm printer), consisting of 5 card-to-tape machines, 3 tape-to-card machines, and 5 tape-to-print machines (a total of 13) with 7 IBM type 1401 systems. This shift, too, was preceded by study of the specifications in relation to the needs for off-line operations, competitive equipment offered little opportunity for consideration because of the problem of compatibility. It was estimated that the type 1401 systems, because of greater capacity, versatility, and speeds, would provide an annual savings of over \$250,000 plus certain less tangible benefits such as the automation of some small operations not feasible on the large scale computers. Another advantage is the reduction in time on the 7080 and 705-III resulting from the ability of the 1401 to accept high density tape produced on the computers, and to produce tape for input to the computers.

The new device—an IBM type 1922—was added to one of the type 1401 systems. This device converts magnetic tape data from and to IBM and RCA systems format, within limitations.

It provides a means of communication between the IBM systems used in the Division of Accounting Operations and the RCA systems used in the Division of Claims Control. In addition, it permits the acceptance of employer reports of Federal Insurance Compensation Act earnings on magnetic tape from users of RCA equipment.

A minor change in the equipment was the replacement of all tape drives in the type 7080 systems with the new type 729-VI drives, the latter read and write at 800 cpi densities compared to the former 556 cpi. Thus, on all tape-limited applications, the input-output time and therefore total computer time, is reduced.

#### MANPOWER UTILIZATION

##### 1. *Training of employees*

The Division of Claims Control's basic philosophy of manpower utilization in connection with the conversion to electronic data-processing methods has been to retrain program-indoctrinated employees in the new methods in order to qualify them for the newly developed positions and to retain for the Bureau their program knowledges and skills. This philosophy was made known to all of the Division's operating, supervisory, and administrative employees through a comprehensive orientation program which was instituted within the first few weeks after the award to RCA of a contract for electronic data-processing computer equipment.

Orientation was administered by teams made up of representatives of the manufacturer and of the Bureau. Orientation was given in several phases. First was a seminar for payment center senior staffs, administered in a cycle of visits to the payment centers. This was followed by sessions for headquarters personnel and payment center supervisory staffs. After this, selected payment center trainers were given special training and then made responsible for the general orientation of payment center operating personnel.

The basic philosophy referred to above was put into operation with respect to electronic data processing systems staff at headquarters, and operating staffs in the payment centers. At the outset technical training for systems analysts and programmers, assigned to the Division's central office, and for console operators and supervisory and administrative personnel, assigned to payment center electronic data processing operations, was provided centrally by the manufacturer with administrative and program backup by Bureau personnel. This situation continued for about 18 months, after which a reorganization of the manufacturer's field organization led to the decentralization of responsibility to the payment centers for training payment center personnel, with technical training being provided by the manufacturer's technicians.

Training agreements were negotiated by the payment centers with their respective civil service regions to provide for the training and qualifying of employees lacking some of the formal qualifications requirements for operating and supervisory positions in electronic data processing operations. These agreements were planned to give payment centers the greatest flexibility in selecting personnel by providing alternative trainee level positions for a number

of the target jobs. In a number of instances it was necessary to have trainee positions set up at the same grade level as their target positions to allow consideration of employees who had attained that level in other payment center positions.

The approach taken proved highly successful in the initial recruitment for the payment centers' electronic data processing operators and administrators. The grade structure which has been established, with a complete range of grades from GS-3 through GS-12, has proven itself in operations as providing a logical career pattern for the personnel coming into the electronic data processing operations. The structure established, together with the flexibility for entry in the chain provided by training agreements, provides capacity for absorbing employees displaced from clerical, manual, and electrical accounting machine processes which have been obsoleted or diminished in scope.

### *2. Problems of recruitment and turnover*

There has been normal turnover in all of the Division of Claims Control's electronic data processing related positions. The fact that a number of programmers and analysts have left for employment with electronic data processing equipment manufacturers and other private employers, at salaries well in excess of Federal pay scales, attests to the effectiveness of training received. However, this fact also points to some inadequacy, from the standpoint of retention of experienced personnel, in the grade structure for systems analysts and programmer positions.

In the Division of Accounting Operations recruitment, training, and retention of electronic data processing planning and programming personnel continues to be an acute problem. The staff has grown to 124 and will continue to grow for some time. Losses in trained programmers to industry and Government are also continuing. Conversely, no trained personnel have been recruited from either industry or Government. In the case of industry, the Division cannot equal the pay and other advantages, such as opportunity, location, etc. In the case of other Government agencies, Division pay scales are no better than most and not equal to some. For this reason, untrained personnel are recruited from among the 30,000 Bureau employees. For this purpose, the Division uses an approved and validated test which reveals potential aptitude for electronic data processing programming and systems work. Persons selected on the basis of the test are then further screened through an 8-week training course in programming. Those who successfully complete this course are then entered into a 1-year on-the-job training period.

### *3. Overall effect of automation*

The overall effect of automation on the Division of Accounting Operations has been excellent. The effect of new legislation and growing workloads on Division of Accounting Operations personnel requirements has been largely offset by the use of automatic data processing and, in addition, the Division is giving better service. The Division of Accounting Operations personnel strength over a 10-year period has actually decreased by 16 percent in its proportion of the Bureau total. The additional costs which would have been incurred without the use of automatic data processing would have amounted to many millions of dollars since the introduction of automatic data processing in 1956.

#### EFFORTS TO INCREASE USE OF BYPRODUCT STATISTICAL DATA IN MANAGEMENT DECISIONS WHERE PRIMARY USAGE IS FOR INVENTORY, SUPPLY, FINANCE, ETC.

Our computer usage is almost wholly concerned with program applications to date. We are just starting to place some of our administrative applications upon the computers and do not have enough experience to report at this time.

We do, however, compile many statistical reports as byproducts of our program applications. These reports serve as effective management and staff tools and are used by all our divisions.

A sample of some of the statistics compiled are (1) business births and deaths, (2) work sampling of over age 65 payees, (3) fraud studies, (4) age, sex, and race studies of new accounts established, (5) patterns of incorrect account number reporting by employers, (6) family benefit payee studies, (7) depressed area impact studies, (8) actuarial reduction benefit studies, (9) self-employment, (10) disability, and (11) trends of agricultural employee reporting.

## EFFORTS TO REDUCE AND SIMPLIFY BUSINESS REPORTING REQUIREMENTS

In the area of business reporting requirements, the Bureau has implemented a program for employer reporting of Federal Insurance Compensation Act earnings on magnetic tape. A systematic effort to publicize this program and to encourage and assist employers to report in this manner is being followed. To date, approximately 4 million earnings items quarterly—3 million from the Armed Forces and 1 million from private employers and State agencies are received on magnetic tape. The requirements for magnetic tape reporting are simple and flexible, and for employers with compatible tape equipment—i.e., IBM or RCA—there are some worthwhile advantages. For the Government there is a savings of approximately \$15,000 for each million earnings reports received on tape. In addition, such reports do not contain the inaccuracies which otherwise occur when the employer prepares a listing which must be converted to punch cards and then magnetic tape.

Mr. KELLY. We feel we are one of the explorers among Federal agencies in the development and use of electronic data processing systems. The Social Security Administration was one of the lead agencies in the adoption of electronic data processing and we feel we have made major contributions in this field. We nonetheless feel we have the obligation to be sure that every one of its uses is in the best interest of those public services for which we have responsibility.

Because we are a large and diversified organization, we have made no effort to develop a system of centralization of electronic data processing. We have rather centered our attention on a decentralized plan, but under a policy guidance and review at the Department level.

We have directed all the parts of our Department interested in availing themselves of the use of this equipment to be sure they have given it the most thoughtful and careful kind of study before they even think of the hardware that is necessary to carry out their plans.

I think all of you know there is a great tendency and temptation, as we hear of these developments, to be progressive managers and have flashing red and green lights. They can produce a lot of data you do not want and can never use unless you carefully conceive how the result, both in terms of public service and in terms of economy, compare with what you are now doing or some other method of doing it short of electronic data processing. We review these points before any arrangements are made for acquiring electronic data processing machinery.

Generally speaking we think we have been moving in the right direction. Our hindsight is better than our foresight but generally speaking we are satisfied that we have been walking the right side of the street and that we have been working with our people in the direction of doing adequate systems planning before buying hardware.

We are now concentrating our attention on the establishment of objectives and after they are established we submit proposals as to what is the best equipment to fulfill our objectives and then evaluate them. Here again we think we are making progress in receiving proposals that are responsive to our needs.

We have been much concerned with the personnel aspects of moving to electronic data processing in two ways. One, in the need for well-trained and well-qualified people to make this equipment perform the service for which it was designed; and secondly, to make sure that we have given adequate attention to the problems that will result from doing work in a different way than it has heretofore been done and the dislocation this can have on employees.

In this connection we have been fortunate because we are a rapidly expanding organization and the installation of technological improvements has by and large resulted in adding a lesser number of people to our staff than would have been added had we not had this kind of improvement. For example, the changes in the Social Security Act which have occurred over the last 6 or 7 years have been profound. They have extended benefits to a great many people who otherwise would not have had them, and this has increased the staff. The staff has not been increased as much as it would have been had it not been possible to make improvements through these technological developments.

We have just finished a study of a technique to carry out the payroll operations in a single location rather than at 72 points which we now have. We deferred, for a period of about 60 days, the announcement of the adoption of this central payroll system so that we could make sure all the people now performing payroll work in the 72 locations could be appropriately placed or trained and placed within our organization when their work was removed from the geographical location where they are. We were able to do that to the point the Director of Personnel was able to send out a letter to each payroll employee and assure him his job was not affected by this systems change, that it would be possible to place him in a job to suit his talents or to retrain him and place him in other suitable employment. We think this is a part of our responsibility.

We noted that in your inquiry with respect to these hearings you had an interest in the problem of lease versus purchase. We have indicated to you that we subscribe to the Bureau of the Budget's circular on that. I think our initial reaction was that the technological improvements were developing so rapidly it would be better to lease. But we have gone through probably the most severe technological improvements already. In many instances it would have been preferable to purchase rather than lease, and although many improvements are still occurring, we think the future would make it even a sounder judgment to purchase rather than lease where you have a long-term use. We are now in the process of analyzing every piece of equipment we have to see the soundness of the application of the circular to it.

There are some problems in connection with implementing the circular. They relate primarily to the timetable, the cycle of requesting funds from the Congress, and the cycle involved in the development of systems changes and the elongated process of making feasibility surveys and receiving proposals from manufacturers and then the timelag before installation. When the timetable is not coordinated you can throw 18 months additional in the process, thus, the lease with option to purchase is an escape clause that keeps you from being bound by the timetable until decisions are made about budgetary approval at the executive level and at the congressional level. So we have the problem of how this can be done without having a serious interference in moving forward and fulfillment of a systems change.

We are doing some work on the development of a new plan for submission to the Director of the Bureau of the Budget. We have a feeling that sometimes the decision to purchase versus the decision to lease is at too parochial a level when it is made for an individual agency, because their long-term use may not be as long as the Government's

long-term use. We hope for certain kinds of funds to be available on a governmentwide basis so that the agency would lease, say, from the Treasury Department, and when they have no further use for the equipment the GSA may have the responsibility for its reuse, because the Government's long-term need for this equipment may produce a different result than the individual agency's need. We have not yet, however, presented these views to the Budget Bureau.

Mr. HENDERSON. The subcommittee certainly will be very much interested in having your final recommendations and the response of the Budget Bureau to such views. This is a point we have been very much interested in. We have anticipated that, without some central authority taking an overall look at the feasibility of reassigning the equipment, the decision made at the local agency level might not be in the best interests of the overall Government needs. Certainly your observations on that point would be most helpful to this subcommittee.

Mr. KELLY. I shall be happy to do so.

Mr. HENDERSON. On Wednesday we requested that the Treasury Department bring us up to date on the recommendations made by the Hoover Commission that employers' quarterly Federal tax returns for old-age and survivors insurance, Treasury Form 941, and the annual W-2 income tax form be combined. The subcommittee would appreciate it if you people would get together with the Internal Revenue Service on the report we have requested.

Mr. KELLY. We shall be very glad to do so.

Mr. HENDERSON. We certainly want to commend you for the very fine statement and your cooperation in this matter. We can tell from your off-the-cuff remarks that you have a real appreciation of what the subcommittee is trying to do.

Mr. KELLY. Thank you very much.

Mr. HENDERSON. Our next witness is Mr. Tom Kouzes, Chief of the Division of Management Analysis and Development of the Department of Labor.

**STATEMENT OF TOM KOUZES, CHIEF, DIVISION OF MANAGEMENT ANALYSIS AND DEVELOPMENT, OFFICE OF THE ADMINISTRATIVE ASSISTANT SECRETARY, U.S. DEPARTMENT OF LABOR, ACCOMPANIED BY ABE ROTHMAN, BUREAU OF LABOR STATISTICS, DEPARTMENT OF LABOR; AND BEN BURDETSKY, OFFICE OF THE SECRETARY, DEPARTMENT OF LABOR**

Mr. HENDERSON. Mr. Kouzes it is a pleasure to have you before the subcommittee this morning. We have your prepared statement that you have submitted and it will be inserted in the record in its entirety. (The prepared statement of the Department of Labor follows:)

**PREPARED STATEMENT ON USES OF ELECTRONIC DATA-PROCESSING EQUIPMENT IN THE DEPARTMENT OF LABOR**

**INTRODUCTION**

Automatic data-processing equipment has been used by the Department of Labor for almost 30 years. The largest and earliest user of such equipment within the Department itself is the Bureau of Labor Statistics, which performs a multitude of statistical and economic analysis programs on both conventional

punchcard equipment and computers. State employment security agencies, whose administrative costs are financed completely out of Federal funds, have been utilizing ADP equipment to perform various unemployment insurance claims, benefit payment, and tax functions for more than 20 years. Today, all State employment security agencies have ADP equipment in various stages of sophistication. Statements prepared by the Bureau of Labor Statistics and the Department's Bureau of Employment Security, which has responsibility for assuring proper and efficient administration of State employment security agencies, are attached.

#### RESPONSIBILITY FOR ADP IN THE DEPARTMENT OF LABOR

Until December 1959, the principal control which the Department of Labor exercised over ADP activities being performed by the bureaus and offices in the Department related to budgetary considerations. On December 8, 1959, the Secretary of Labor issued a General Order entitled, "Delegation of Managerial Leadership Authority, Automatic Data Processing (ADP) Program," assigning the Administrative Assistant Secretary of Labor the responsibility for providing leadership and policy direction to the development of the Department of Labor ADP program. The Administrative Assistant Secretary was authorized to take whatever action he felt necessary to assure the efficient development of a strong departmental ADP program, including the issuance of necessary rules and regulations.

In January 1960, with the establishment of a Division of Management Analysis and Development in the Office of the Administrative Assistant Secretary of Labor, responsibility for the staff work required by the Department's ADP program was assigned to that Division. Early efforts of this organization consisted mainly of becoming acquainted with ADP activities being performed in the Department, and through meetings with various departmental officials to stimulate them into giving consideration to various operations which might be susceptible to processing on ADP equipment. Literature was distributed and training opportunities and other general information made available.

On June 1, 1961, the Administrative Assistant Secretary issued an official memorandum developed by the Division of Management Analysis and Development, in which he set forth the Department of Labor's policies and procedures governing the acquisition and use of ADP systems, including proposed modifications of existing systems. A copy of this document is attached. As a result of this publication, and aided materially by the "missionary" work which had been carried out in the prior year, the Division of Management Analysis and Development has assumed staff leadership in the field of ADP in the Department. Below are listed the various new data processing activities which have been initiated within the Department of Labor in the past 2 years with a description of the role played by the Office of the Administrative Assistant Secretary in attempting to coordinate and provide technical direction to the Department.

#### *Bureau of Labor Statistics*

A member of the Division of Management Analysis and Development participated on a task force which studied BLS's data processing requirements and which conducted a study leading to the selection of an IBM 7070 system. The attached Bureau of Labor Statistics statement gives an excellent analysis of the various factors which this task force considered before making the selection.

The final proposal to install an IBM 7070 computer was forwarded to the Division of Management Analysis and Development for its analysis and recommendation to the Administrative Assistant Secretary for approval or rejection. In the course of reviewing the proposal, a phasing-in schedule was developed, cost data was set out in clearly identifiable terms, and provision was made for periodic progress reports and on-the-spot evaluations of the conversion from the existing IBM 650 card computer system to the IBM 7070 tape computer system. Discussions have been held with officials in BLS from time to time to evaluate progress thus far, and to arrange for resolution of additional problems which have arisen, which were not anticipated in the original study. Generally speaking, the conversion is conforming very well to the goals set out in the study, although space to house the computed system presented a problem which we believe is now fully resolved.

#### *Bureau of Labor-Management Reports (BLMR)*

This organization is approximately 3 years old. It has responsibility for receiving and processing more than 55,000 labor-management reports each year.

These are complex financial statements which require considerable technical analysis.

In mid-1961, the Division of Management Analysis and Development proposed that BLMR consider the use of EAM equipment to prepare and process most of its work, with the use of BLS computer facilities for the more intricate financial analyses, which resulted in the establishment of an integrated system to perform—

1. Preparation of address labels for annual mailings of 55,000 report forms and for periodic mailing of special material.

2. Delinquency control wherein reports as received will result in pulling of a punchcard from a control file which would be machine matched against a master file; as of a given cutoff date the remaining cards in the control file will be the delinquents, and the tabulating room will print delinquency notices.

3. Maintenance of a control on reporting units which have submitted deficient reports, and to whom special notices are sent requesting additional information. The controls will be maintained on EAM equipment, and notices will be printed in the Data Processing Branch.

4. Preparation of the Bureau's "Registry of Reporting Labor Organizations," which lists in book form each of the reporting units from whom the Bureau of Labor-Management Reports has the responsibility for securing reports. The Data Processing Branch will be able to produce listings by State, region, union affiliation, etc., within a relatively short period of time after request, and the data will be current.

Each of the above functions in BLMR was being performed by separate units on an individual basis. It was generally agreed that the Bureau needed to update its processing techniques if it was to perform the job in a manner in which the Congress had expected it to.

This project was formally started in February 1962, and is being phased in so that the first step, preparation of address labels, will be started in October 1962, for the 40,000 reporting units to whom blank forms will be sent in mid-December of 1962. Financial data for over 40,000 unions has been punched into cards for machine processing, which will enable the Bureau to analyze the data mechanically, and to make followups where needed without undue delay. As an adjunct to the EAM machine verification of data, a computer application has been developed in cooperation with BLS which will provide BLMR with excellent management reports and statistical analyses.

In order to accomplish the above and to continue to improve other aspects of the Bureau operations which can effectively be converted to ADP equipment, a training program has been undertaken in the Bureau. It is hoped that all of the operating personnel will become fully acquainted with the capabilities, limitations, and expectations of these machines, and that it will enable them to perform their jobs in a more effective manner.

#### *Office of Manpower, Automation and Training*

When the Manpower Development and Training Act of 1962 was enacted in the spring, the Division of Management Analysis and Development worked with the Office of Personnel Administration in developing a system for the systematic control of job applications and related papers pertaining to the staffing of the Office of Manpower, Automation and Training. A system was developed, forms designed, and a punchcard application employed to provide the Office of Manpower, Automation and Training with current lists of eligible candidates by grade, job title, job series, etc. This system has functioned extremely well from its inception, and has enabled the Department to handle this very important staffing project without interfering with normal day-to-day operations.

#### *Mechanization of personnel records*

The Department is currently in the process of developing a system for utilizing ADP equipment in personnel recordkeeping, statistical reporting, and forms processing. This effort is the result of many months of planning, discussion, and investigation of departmental operations and needs. It is hoped that many of the required Civil Service Commission reports will be prepared on EAM equipment as a byproduct of the day-to-day processing of personnel actions. It is planned that up-to-date staffing lists will be printed out for use by various interested officials in the Department, and that the system will help to provide for the rapid, uniform selection of candidates for consideration for promotions, reassignment, etc.

Much assistance has been received from other Federal agencies which have undertaken similar projects. The target date for initiation of this project has been set for November 1, 1962.

#### *Centralized payroll and accounting functions*

Two years ago the Office of the Administrative Assistant Secretary undertook a study to determine the feasibility of centralizing all payroll and accounting operations within the Office of the Administrative Assistant Secretary. Until this time each bureau and office in the Department maintained an independent system utilizing substantially different methods, procedures, and equipment. The study indicated that it would be extremely advantageous to the Department to centralize these functions, not only because of savings of approximately \$125,000 a year when fully implemented, but because it would enable the Department to maintain uniform information and records for all bureaus. In the past when a centralized departmental report was required, it has meant a considerable amount of transcription, interpretation, and adjustment. Under the new system, information for requests from Congress, BOB and departmental officials for information relating to payroll and accounting operations will be readily available on a current basis.

In conjunction with the decision to centralize these functions, the decision was made to perform them on IBM punchcard equipment. This being a small Department, the smallest of all Cabinet agencies, it was recognized that payroll and accounting would not absorb the full time of an EAM installation. However, there were a multitude of potential applications in the area of financial management, and those to which we have made reference previously, which could well use the capabilities of an EAM system. Therefore, an EAM installation was set up in the jurisdiction of the Office of the Administrative Assistant Secretary. The payroll and accounting functions are being phased in at the present time. Concurrently the aforementioned Bureau of Labor-Management Reports project is in full operation, the Office of Manpower, Automation and Training project has been completed, and the mechanization of personnel recordkeeping is in the planning stages.

When all of these functions are being performed in their entirety, it is expected that a higher level of data processing equipment will be required. A feasibility study to determine whether such is the case is planned for early 1963.

#### *Bureau of Employees' Compensation*

This Bureau which has the responsibility for carrying out provisions of the Federal Employees' Compensation Act, maintains a small EAM punchcard installation in Chambersburg, Pa. It performs the Bureau's statistical work, and has recently undertaken a "charge back" operation wherein Federal agencies are charged for benefits paid to their employees under provisions of the act. In addition, this unit will serve as the Department's data processing center in case of emergency evacuation. Under a recent reorganization, the activities of the Bureau have been almost completely decentralized. We plan to work with them in examining other areas in the claims and benefits operations which can benefit from ADP.

#### *Bureau of Employment Security*

This Bureau does not possess any punchcard or computer equipment for its own internal use. From time to time it has designed projects and has used the equipment of BLS or other governmental agencies. It does, however, have the responsibility for assuring proper and efficient administration of 52 jurisdictions (50 States plus the District of Columbia and Puerto Rico). Approximately \$6,500,000 worth of equipment is on rental in State agencies. An additional \$150,000 to \$200,000 is being spent for programing, training, and other auxiliary activities related to EDP. The material submitted in the Bureau of Employment Security statement shows clearly that States are utilizing a wide variety of equipment ranging from modest EAM systems to a large-scale IBM 7080 tape system in the California Department of Employment.

Prior to 1958, BES did not have a program directing itself specifically to ADP activities in the States. Individual technicians in the Unemployment Insurance Service had some knowledge of ADP equipment and techniques, and provided what little technical assistance there was. Therefore, ADP in employment security has been almost 100 percent associated with unemployment insurance claims, benefit and tax functions. We suspect that this very close identification and

association has hindered the exploration of the potential use of ADP by other elements in the employment security program.

In 1958, the Unemployment Insurance Service established a Division of Benefit Operations and Data Processing whose responsibility it was to provide overall coordination and technical guidance to the States on matters relating to ADP. This unit has never been authorized more than two full-time technicians, and as a result, the States have not received the extent of assistance which they need to cope with this very technical, dynamic area.

The Division of Management Analysis and Development has been working with the Bureau in an effort to increase the size and competence of this staff. It has also recommended the establishment of an automatic data processing staff at the bureau level to serve as the focal point for all ADP activities in the Bureau. This includes not only the State employment security programs, but the internal bureau programs as well. This recommendation was accepted, a staff authorized, and recruitment is currently underway.

One of the major functions toward which this technical staff will be asked to address itself pertains to the examination of Employment Service activities, especially those involving the matching of workers and jobs, on both an intrastate and interstate basis. An exploratory study is being conducted at present by the California agency, but the problems involved in expanding into a national job-worker market are numerous, and will require the full-time attention of competent technical and professional personnel. We believe this project to be a monumental one which, if successful, will be of tremendous help to the U.S. Employment Service.

Other areas in BES, relating to the farm labor program in particular, have been investigated and are excellent potential areas for mechanization. For example, in the foreign farm labor programs there is great need to acquire wage and working condition information quickly on a current basis and to process it so that investigators can make on-the-spot field visits to determine if contracts between growers and foreign farm laborers are being adhered to. Methods currently in use make it impossible to make determinations, and effect corrective action within the statute of limitations.

The Division of Management Analysis and Development is also working with the Administration and Management Service in BES, in an effort to determine which other areas in statistical reporting and financial management can benefit from the use of ADP equipment, and with the Bureau's ADP staff in developing an effective program of assistance to State employment security agencies and internal Bureau activities.

#### CONCLUSION

From all that has been said thus far, it is obvious that there is considerable ADP potential in the Department of Labor. It is also obvious that the Department has only scratched the surface in its development of an effective departmentwide ADP program and in providing the kind of leadership which such activities require. Much progress has been made, and we are confident that more will be made in the near future.

We are undertaking a program of ADP orientation and training in several bureaus, and will make such available on as widespread a basis as is possible. Departmental policy clearly recognizes the importance of keeping operating personnel fully informed of all plans to mechanize operations being performed manually, or semiautomatically. Also no worker will lose his job as a result of having his position eliminated or made obsolete as a result of automation. This policy pertains throughout the Department, and is also a prime consideration when State agencies submit proposals to install EDP systems.

On the other hand, there is the problem of securing competent data-processing personnel such as machine operators, console operators, systems analysts, and computer programmers. The Department and the various State employment security agencies which have introduced EDP equipment into their operations have had considerable difficulty in securing and retaining trained personnel in each of these categories. This is partly due to the fact that electronic data processing, as we know it today, is a relatively new and rapidly expanding field. There is considerable mobility of workers which, coupled with greatly increasing use of EDP equipment, has created a most fluid worker-job situation.

Generally speaking, we have found that we are able to utilize personnel from our existing operations in our EDP installations. Various aptitude tests have been developed by EDP equipment manufacturers and test development corporations which are extremely helpful in identifying individuals with the poten-

tial skills and abilities to make successful EDP operators. On several occasions we have been pleasantly surprised to find individuals holding rather obscure positions, who are identified through aptitude tests as having the basic aptitudes required for successful employment in EDP operations. Several of these individuals have been trained and have developed into extremely capable operators.

Overall, it is fair to say that the problem of securing and retaining staff for EDP operations is a serious one, and we do not see an alleviation of this problem within the next 2 or 3 years.

The Office of the Administrative Assistant Secretary will continue to work with all of the bureaus and offices in the Department in an effort to make the most effective use of ADP equipment as is possible, for we feel that only through the effective use of such tools can the Department of Labor carry out its responsibilities.

In closing, we wish to say that the Inter-Agency Committee on ADP, sponsored by the Bureau of the Budget, has been extremely helpful to the Department by providing us with a great deal of valuable information, material, and ideas which have helped to make our own ADP efforts more meaningful and effective.

#### PART I. AUTOMATIC DATA PROCESSING SYSTEMS

##### 1. Purpose

This memorandum announces the Department of Labor policy and procedures governing the acquisition and use of automatic data processing systems (ADPS) or of proposed modifications of existing systems within the Department and its field offices and by the several States for programs funded with Federal grants.

##### 2. Background

New and improved automatic data processing systems have been developed which make possible significant improvements in existing administrative systems set up to originate, process, and use data. The Bureau of Labor Statistics, for example, has utilized an electronic computer for the last few years to process much of its statistical data. To a lesser degree, the Bureau of Employees' Compensation has used conventional electric accounting machines to produce statistical reports for its own use for the Presidential safety awards program. Most recently, the Office of the Administrative Assistant Secretary began a program to mechanically process all accounting and payroll operations for the entire Department. Also, through the Bureau of Employment Security, the Department exercises authority over several millions of dollars of automatic data processing systems employed by State government agencies in their unemployment insurance programs. Furthermore, there have been many indications that other bureaus of the Department have applications which can be considered for conversion to ADPS.

##### 3. Policy

The Department of Labor shall continually explore the potential applications of automatic data processing principles, techniques, systems, and equipment throughout the Department and to capitalize on the advantages of ADPS in those applications where objective systems analysis indicates that they are economically, operationally, and technically feasible. This policy shall be pursued within the framework of a coordinated Department automatic data processing systems program, developed and administered to insure maximum total advantage to the Government, the Department of Labor, and the public. In essence, the Department ADPS program will properly consider the data processing relationships among various functional activities; arrange for their effective integration, where indicated; and include all areas of data origin, handling, processing, and usage. The Department will be especially sensitive to the human implications of automation in its administration of this policy.

##### 4. Definitions of automatic data processing systems

(a) Automatic data processing systems (ADPS) involve the processing of data with and through ADPS equipment.

(b) An ADPS program embraces the planning, development, administration, management, coordination, control, operation, and review and evaluation of all fields of ADPS equipment utilization. For the purpose of reviewing and evaluating ADPS programs and determining and reporting their costs or status, the definition "ADPS program" also embraces all phases and steps toward acquir-

ing and using ADPS equipment, beginning with the initial planning and continuing through all subsequent phases. ADPS equipment operated by contractors solely to process Government data at its expense and similar equipment acquired and operated by State governments, universities, and other institutions with financial assistance through grants-in-aid of Government funds are included in the ADPS program of the Department of Labor.

(c) ADPS equipment includes—

- (1) Electric accounting machine (EAM) equipment used alone or in conjunction with electronic computers;
- (2) Electronic data processing (EDP) computer equipment and the several types of peripheral or auxiliary equipment directly involved in computer utilization;
- (3) Electronic or mechanical equipment in the nature of automatic "input" devices for use in conjunction with EAM and EDP equipment as described above.

(d) ADPS studies involve the analyses required prior to making decisions to acquire and use automatic data processing equipment. For guidance in making feasibility and applications studies, see attachment to Bureau of the Budget Bulletin No. 60-6, dated March 18, 1960, "Guidelines for Studies To Precede the Acquisition of Automatic Data Processing Equipment."

(1) A "feasibility study" identifies various areas of data processing within the organization to determine the impact of ADPS within these areas in terms of operating economies or improved management efficiency.

(2) An "applications study" is an extension of the feasibility study. Guided by the scope, objectives, and general planning framework established by the feasibility study, further detailed study, flow charting, systems design, and documentation are made.

#### 5. Responsibilities

(a) The Administrative Assistant Secretary is responsible for—

- (1) Providing leadership, technical advice and assistance, and promoting the ADPS program.
- (2) Developing, establishing, and issuing departmentwide policies and procedures governing the development and conduct of the ADPS program.
- (3) Reviewing, evaluating, and approving, prior to procurement action being initiated, requests for ADPS services and proposals for new or revised ADP systems for use by the Department, including its field offices.
- (4) Insuring that adequate technical guidance and assistance and leadership are provided and sufficient control is exercised by bureaus concerned with ADPS used by the several States for operations financed by Federal grant funds.
- (5) Evaluating progress made by the Department in its use of ADPS.
- (6) Maintaining and disseminating information on equipment, applications, and methods and techniques.

The Chief, Division of Management Analysis and Development, has been delegated authority for conducting staff activities incident to these responsibilities.

(b) Bureau and office heads: All bureau and office heads are responsible for—

- (1) Providing for guidance, orientation, familiarization, and technical training of personnel under their jurisdiction.
- (2) Keeping abreast of developments in the ADPS field.
- (3) Considering potential uses or modifications to current uses of ADPS among all operations under their jurisdiction, either within the Department and its field offices or among the States performing operations supported by Federal grants administered by the Department.
- (4) Conducting and documenting feasibility studies and applications studies of proposed new or modified ADPS installations. These may involve the purchase or rental of general purpose computers and/or computer systems and of special purpose computers when necessary to insure compatibility with subsequent processing of output data.

(5) Maintaining contact with the Office of the Administrative Assistant Secretary during the course of feasibility and applications studies conducted for proposed installations within the Department and its field offices. This does not preclude contacting and discussing ADPS matters with, or obtaining proposals from, manufacturers for consideration during the conduct of studies.

(6) Submitting to the Administrative Assistant Secretary for review, evaluation, and approval completely documented feasibility and applications

studies prior to initiating procurement action for ADPS equipment for use with any proposed new or modified installation within the Department and its field offices. Review evaluation, and approval of proposals involving State government installations supported by Federal grants is the responsibility of the bureau head administering the State-Federal program.

#### 6. Action

All bureau and office heads shall review current ADP practices prior to the allocation of fiscal year 1962 funds and make adequate provision within their respective organizations for the ADPS program in conformance with the requirements outlined in this memorandum.

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## PART II. PLANNING FOR AND UTILIZATION OF ELECTRONIC DATA PROCESSING EQUIPMENT IN THE BUREAU OF LABOR STATISTICS

This statement has been prepared in response to a request from the Subcommittee on Census and Government Statistics of the Committee on Post Office and Civil Service. It is organized to answer the five points enumerated in the request. Since the various points being presented are related to the data processing activities within the Bureau of Labor Statistics, a background statement, describing in a general way the characteristics of the Bureau's data processing requirements, has been included. A final section deals with some related general comments.

### BACKGROUND STATEMENT

For almost three decades, the Bureau of Labor Statistics has used mechanical aids (machine tabulation) in its data processing activities. During this period there has been a steady growth in the volume of data being processed. This resulted mainly from three factors: (1) The increasing volume of data required in existing programs; (2) the transfer of operations formerly performed by clerks to the data processing equipment; and (3) the expanding functions of the bureau which required additional processing. To take care of this increased volume, the tabulation facilities were increased by adding more equipment with greater processing potential. Even with this growth, as late as the mid-fifties, the BLS tabulation operation was still a relatively small- to medium-size installation in terms of physical size, i.e., volume of data processed, number of personnel, charges for machine rental. It did not have the volume of processing of the Bureau of the Census or the Bureau of Old-Age and Survivors Insurance. However, since the BLS was (and still is) engaged in a large variety of independent programs, its data processing problems are just as complex, if not more so, as those found in much larger installations.

To prepare for its anticipated future data processing requirements, the Commissioner of the Bureau, early in 1956, established a Committee on Tabulation Problems to "reexamine the current and future problems and prospects of the Bureau in its processing of mass data \* \* \* to advise me on any steps which should be taken." The report of the committee (October 1956) recommended the acquisition of a medium-sized computer, an IBM 650 system, to handle the Bureau's workload for the next 5 years. The system was installed in September 1958. In January 1961, to prepare for the additional data processing load resulting from the Consumer Expenditure Survey, a newer model with some additional features was secured and placed in operation.

During this period the programs of the Bureau continued to grow while the experience gained on the medium-sized computer indicated that more and more operations could be and were being transferred to the present system. When it appeared that our requirements would exceed the three-shift capacity of our current system, the Commissioner, in August 1960, established a Committee on Data Processing to examine the Bureau's " \* \* \* requirements for processing of data, to review available systems for the purpose of determining how effectively they can meet our needs, and to advise the Bureau on any steps that should be taken in order that the Bureau \* \* \* may continue to perform its functions in an efficient and expeditious manner." The report of the Committee (August 1961) recommended the acquisition of a large-scale system, an IBM 1401-7070 combination. The peripheral 1401 was secured in November 1961, and is now operating on a two-shift basis. The large central computer, the 7070, is scheduled for installation in September 1962, or shortly thereafter. The highlights of the

studies leading to the recommendations for the more advanced systems is presented in the sections which follow:

#### AGENCY PLANNING PRIOR TO INSTALLATION OF EQUIPMENT

Early in 1956 a Committee on Tabulation Problems was established to re-examine the current and future problems and prospects of the BLS in its processing of mass data. Representatives of the major subject matter organizational units in the Bureau were named as members of the committee. The chairman was attached to the Commissioner's staff. The committee considered the volume and characteristics of the then current and future workload of the Bureau. The committee concentrated its efforts on problems to be faced over an intermediate time span, the next 5 years, even though it felt certain that after that period the Bureau's workload could be greater in volume and more complex in type of operations. At that time, more powerful equipment might be needed. However, considering the personnel needs and training requirements for a transition from a system using only mechanical (conventional) equipment to one using an internally programmed computer, considering the change in breadth of outlook desired when using a computer to process data, and considering the expected increase in the workload over the next 5 years, the most practical approach appeared to be the immediate step of upgrading the Bureau's data processing facilities by adding medium power equipment. Having such equipment would meet the need for additional data processing equipment and would provide the time for the staff to learn, over the next few years, how to effectively organize for and make use of the new type of computers. After then, if needed, the jump to more powerful equipment in the future should be easier and more efficient.

Before embarking on a survey of medium power equipment (systems in an intermediate cost range of \$250,000 to \$500,000), the committee evaluated the importance of the various equipment characteristics and features and selected criteria that should govern its selection. These criteria included—

**Availability of system:** The system should be in production as opposed to a drawing board or an engineering stage. Also, it should be available on a rental basis.

**Cost:** Cost differentials between systems would have to be justified in terms of advantages.

**Physical characteristics:** Size of internal memory should be large enough to handle BLS programs. Internal speed was important but of equal importance was the input-output speeds because of the nature of BLS operations (cooperative arrangements with State offices for use of locally prepared cards).

**Compatibility:** The system should be compatible with other equipment needed in the Bureau's programs. This was important because contractual arrangements with cooperating States provide for the submission of punched cards to BLS; also because a certain amount of conventional equipment would be desirable for processing small, simple tasks. Backup facilities in the area should be available.

**Service and training facilities:** Great stress was placed on the kinds of facilities offered by the manufacturer for training staff, for providing technical guidance in the operation of the equipment, for making available programing aids (software), and for the servicing of equipment.

After evaluating the characteristics of four medium-size systems, the committee, in its final report issued in October 1956, recommended the acquisition of an IBM 650 basic system with card input-output. After the first year of transition, the increased annual cost of the new system was estimated to be about \$50,000 above current levels. For this expenditure, the Bureau would more than double its capacity for calculating operations and, in addition, increase its potential for performing the more complex statistical-arithmetical operations which an internally stored program system performs so efficiently.

The recommended system was acquired in September 1958, and has been used in the processing of data in almost every subject matter area in which the Bureau is engaged. In January 1961, to meet the growing workload resulting from the Bureau's consumer expenditure survey, the system was expanded by the addition of faster card input-output units, index registers, and an immediate access storage unit.

In August 1960, a Committee on Data Processing was established by the Commissioner to examine the Bureau's requirements for data processing, to review available systems, and to advise on any step that should be taken so

that the Bureau may continue to function in an efficient and expeditious manner. Representatives of the subject matter divisions were named as members of the Committee under the chairmanship of a member of the Commissioner's staff. A detailed and extensive analysis was made of the Bureau's past and potential future workload. A goal was established of meeting the volume of processing projected 5 years in the future on a one-shift operation; and to be able to handle future growth (for the following 5 years) without rewriting any computer programs if additional shifts could not handle the workload. Because of the large increase in volume of data processing during the past years, and the potential increase in volume in the future, a large-scale system was recommended. The following criteria were used in evaluating available systems:

**Cost:** The system cost should not exceed a specified limit. The limit originally aimed at was one that would not increase the overall cost of data processing (equipment and personnel).

**Ease of programing:** The large number of separate, one-time Bureau activities to be processed makes it imperative that programing be completed as quickly and efficiently as possible.

**Auxiliary services:**

Availability of programing aids.

Training, facilities—both adequate and timely (on a reimbursable time or on a paid basis).

Maintenance provisions.

Availability of program library routines.

Availability of COBOL language.

**Capacity:** The ultimate system should be able to handle the projected 1965 BLS workload in one shift—and allow for future expansion (1970) without additional reprograming. Tape input and output was a requirement. Memory size and speed should be consistent with the size and type of programs needed by BLS.

**Other:** Ability to simulate 650 programs (needed for transition period). System should be available (at least in prototype form, preferably in actual operation).

During the course of the Committee's discussions (36 meetings were held), the criterion pertaining to the availability of COBOL decreased in importance as some difficulties in its handling were encountered. These include the necessary compiling time and the creation of object programs which are less efficient than either those coded directly or those compiled using the compiler program specially written for a specific system. The criterion of the availability of an IBM 650 simulator program assumed greater importance as the study progressed. Using the simulation procedure, actual tests revealed that the more powerful systems were able to carry out a Bureau problem with great savings in time. The Committee felt it would be a considerable advantage if, through the use of the simulator, some of the existing data processing could be transferred to the newer equipment before programs specifically written for the new system could be prepared.

The data processing workload of the Bureau was analyzed in considerable detail and an estimate projected for the anticipated workload in the year 1965 assuming the present equipment. Since a more powerful system (especially the availability of magnetic tape) would materially affect the manner in which the data would be processed, the projected workload was carefully reviewed to determine the most probable procedures to be used with the new type of systems being considered. Of particular importance was the development of the proper relationship among the various processes (sorting, comparing, adding, multiplying, printing) to be required by the new processing procedures. A "package" of processing was then developed which would approximate the total workload. This was used as a standard which was carefully documented and submitted to 11 equipment manufacturers with a request for a recommended system.

One company failed to respond to our request; another replied it had no system conforming to the Bureau's specifications. The remaining nine replies were reviewed, summarized by each item, and a systematic appraisal made. The highlights of each decision were recorded in the final report of the Committee on Data Processing. Before arriving at a determination, three equipment manufacturers were requested to present to the Committee and to selected Bureau staff (senior programers) a detailed description of their equipment and

to answer questions prepared by the Bureau's staff. Two experiments on the efficiency of the "simulator" program were also carried out.

The Committee recommended the acquisition of an IBM 1401-7070 system with the 1401 part to be secured in 6 months (February 1962) and the 7070 in September 1962, or as soon thereafter as possible. Until this goal was achieved a suggested schedule of operation took account of training of employees, preparing major surveys for the new system, readying the other existing surveys for "simulation" by the new system, and phasing out the conventional-type equipment which would be replaced. Basic to this "phasing in" plan was the use of non-BLS equipment on a reimbursable (cost or time) basis for training and for preliminary preparation and processing of programs.

The final report of the Committee, submitted in August 1961, describes the deliberations and actions of the Committee, presents its recommendations, documents the various records used in the evaluation of the systems, and records many of the problems discussed.

Of particular importance is the cost picture after the transition to the new system is completed. The increase in computer rental costs is expected to be almost entirely offset by decreases in the rental of other equipment and in personnel costs.<sup>1</sup> Were the shift to a new system to result only in a redistribution of costs among personnel and equipment, the merits of such a shift could be questioned. The important point is that at the same cost, the recommended system brings a considerable reserve of power and speed to handle the increased workload that is almost sure to accompany the Bureau's expanding programs. Using past experience as a guide, the Bureau's data processing load can be expected to increase by much more than 15 percent. And, in addition, the new system provides the means by which the Bureau can process its data in a much shorter period of time. This is of especial importance in those repetitive monthly surveys yielding economic indicators which are used to evaluate the current economy and to formulate national plans and policies.

The final report of the Committee on Data Processing was transmitted to the Commissioner of Labor Statistics on August 18, 1961. Shortly thereafter the recommendations contained in the report were accepted. Because several parts of the Bureau's consumer expenditure survey could be processed very efficiently by the new system, the 1401 portion was advanced and acquired in November 1961. It has been in productive operational use since then. Computer programs for the 7070 portion are in various stages of being prepared and tested.

It may be of interest to note that two aspects of the overall plan have already paid large dividends. The "simulator" portion of the plan was mastered very early and since then it has been put to use on another governmental agency's (Treasury) 7070 system to process (seasonally adjust) more than 500 series. This reduced the backlog of work on the Bureau's current equipment. Since the use of the 7070 was on a second or third shift, the rental costs were extremely low, about the same as for our less powerful system. However, since the speed of the 7070 system was about three times as fast (even though a simulation procedure was being used), the cost per series processed dropped considerably.

Additional illustrations of the use of a non-BLS system for productive work using specially prepared computer programs are the processing of BOASI records (on tape) for the selection of a sample of outlets in our price programs; the processing of California unemployment insurance records (on tape) needed in our wage program. Both operations were not only performed faster and at less cost, but they provided an opportunity to assess the training received by our personnel and also to evaluate the potential (speed) of the new system to process data.

The second aspect of the overall plan that may be of interest deals with very long range planning. Since reprogramming is very costly, the Committee favored a system that could be speeded up, if needed, without any reprogramming requirements. (Two manufacturers had such a series of systems.) The system selected, the 7070, was supposed to meet this criterion with its 7072 and 7074 counterparts. During a recent production period by our employees using the Treasury facilities, 156 economic time series were processed on their newly acquired 7074 system, using the identical program which had been running on the 7070. The running time on the 7074 was 15 minutes, or about 45 seconds per series. The running time on the 7070, using the same program, would be 2 minutes—51 seconds per series. Thus, for this type of work which involves a large number of calculations, the 7074 is almost four times as fast. A similar test was

<sup>1</sup> A current (July 1962) review of the estimated overall cost of the new system continues to support the earlier estimates.

conducted on a batch of 62,000 records to be sorted on a 12-digit key. The 7070 required time of 19 minutes was reduced to 7 minutes on the 7074. As a result of the two tests mentioned, it appears that the Committee's recommended plan for insuring reserve power without any reprogramming costs is sound.

#### EFFECTIVENESS OF POLICIES IN BUREAU OF THE BUDGET CIRCULAR A-54

Circular A-54 was issued by the Bureau of the Budget in October 1961. The final report of the BLS Committee was issued in August 1961, the final drafts prepared for review and printing some months before then. It is conceivable, therefore, that some items specified in A-54 might not be mentioned in the Committee's report.

A review of the Committee report will reveal that, except for one exception, it deals with the items enumerated in A-54. The report discusses the delineation of objectives and processing requirements; reveals equal opportunity and appropriate consideration to all manufacturers (written invitations to 11 manufacturers); compares overall costs, including personnel; and is a detailed documentation of the approach taken, the criteria considered, the systems studied, the method used for acquisition, etc.

The only item not covered in the Committee report is the comparison of purchase versus lease. Such a comparison was made in November 1961, a month after A-54 was released. It indicated that purchase costs would be greater than rental costs in the next 5 years (from a maximum of \$833,000 to \$27,000); less than rental costs in the sixth year (\$107,000). Because of the changing nature of the Bureau's programs and its growing requirements for data processing which can be met by updating the system (both central computer and peripheral units), the lease option appears preferable.

In the subsequent consideration of the cost-lease problem, several points were discussed. Some are referred to in A-54, others although undoubtedly considered, are not mentioned. These items are being enumerated should it be desirable to issue a more detailed guiding statement on this aspect.

In the first place, no specific account is taken of the cost of the initial investment. For the BLS system, the use of the excess of purchase costs over rental costs would be about \$65,000 assuming interest at 3 percent per annum. In the second place, the BLS system involves about a million dollars of capital investment subject to accidental loss (such as fire). Although such losses do not occur very frequently, they have occurred in the past; they will probably occur in the future. (This point deals with the loss of the system, not the records involved. The value of the records may be greater than the loss of capital but such loss must be borne under either a purchase or lease plan.) In the third place, data-processing equipment has changed markedly in the past 5 years and changes are still forthcoming. As a general rule, these changes have resulted in more powerful equipment that can perform work at a lower unit cost. It seems that some allowance should be made for the chance of an unusual depreciation of the large capital investment involved. This item is also tied to the rapid rate of obsolescence of such equipment. In a little over 5 years, the most popular system can become so outdated that its manufacture is stopped, the training for its use secured only by making special arrangements. (Obsolescence is referred to in A-54.) A fourth item to be considered is the plan for utilization of the system as the data-processing requirements change. If, within the next 6 years, the growth of data-processing requirements is a significant factor, then either a larger system needs to be purchased at the start (when it will not be fully utilized) or a smaller system must be traded in later for the needed larger system. Such trade-in charges affect the cost-lease comparison. What may be more costly is an unconscious decision for a system which turns out to be too small. The determination of the size of a system for a complex workload involving a variety of operations is neither an easy nor a simple matter. Even under ideal conditions, such determinations may be subject to a wide margin of error since they are based on projected workload estimates and are also dependent, to a rather large degree, on human operators as well as on the characteristics of the electronic equipment. Purchasing a system which turns out to be too small may inhibit the acquisition of a proper system until such time as the purchase cost is depreciated. Leasing a system does not have this danger. (This point is touched upon in A-54.) A fifth item to be considered is the quality of maintenance service under both plans. In fact, will service be as prompt and efficient when the equipment is owned by others and any downtime of the equipment is their cost rather than the manufacturer's?

## MANPOWER UTILIZATION

The study of the BLS data-processing requirements attempted to recognize all aspects of manpower utilization. At the start, a decision was made to select as Committee members those people from the operating organizational units that had an intimate knowledge of the type and volume of data-processing requirements in their subject matter fields and who were also familiar with the various requirements of electronic data processing.

In its report, the Committee stressed the need for emphasis on the Bureau's capability to utilize the more powerful system. An awareness of the requirements of every necessary phase, from initial planning through the final product stage, must be recognized by all levels of management and personnel. That the personnel problems were considered important is indicated by the following excerpt from the Committee report: "The personnel problems involved, also, deserve a second mention. There is the problem of recruiting new personnel to handle the more complex processing situations which will result, and of retraining or absorbing those displaced by the reduction in the use of conventional equipment. Steps should be taken immediately to inform the staff of the Office of Data Processing of the forthcoming change, to make clear our intention to select present employees for additional training, to reassign the others, and to assure all employees that their welfare will be considered and will be of concern to the Commissioner and the rest of the Bureau staff. Divisions should be informed of the Bureau's final decision as soon as possible and arrangements made for training sessions."

Following the recommendation, the staffs throughout the Bureau were kept informed of the Bureau's data-processing plans. People working on conventional data-processing equipment or who were interested in data processing were invited to take an aptitude test. A training schedule was developed and classes were arranged so that personnel throughout the Bureau would be ready to handle the new system. These classes were usually held at the manufacturer's facility. However, on two occasions when these facilities could not handle our needs, arrangements were made to give the training in the Department of Labor building.

In summary, a total of 355 persons (70 from our Office of Data Processing) have been given an aptitude test. Those who passed were or will be given training for the new system. In addition to these, existing programming staff in the subject matter divisions were also scheduled for training classes and as of June 1962, approximately 50 employees have already been given formal training. The schedule for training continues to call for the training of additional people as they can be freed from their regular assignments. In two cases, even though the aptitude test was failed, the applicants were still given training because it was felt these people had some ability and the training would be of value.

During the course of its evaluation, the Committee developed an estimate of the number of personnel involved in our Office of Data Processing as of mid-1961 and the number expected when the new system began operating on a normal basis. It appeared that the 118 positions needed in 1961 would be reduced to 98. To prepare for this potential reduction, separations will not be replaced. Reassignment among remaining jobs should result in no layoff of personnel.

One point should be made regarding the relatively small reduction in the number of personnel. The 118 positions in our Office of Data Processing include all types of positions—card punchers, supervisors, machine operators, and administrative staff, as well as programmers and systems people. Many of these positions are not affected by the change of the main processing system. For example, the administrative staff (8 persons), and the card punching section (51 persons), will be performing the same operations regardless of the system. In addition, the personnel associated with our current computer are affected only in that they will need to be trained for the new system. The bulk of the people to be affected are those associated with the conventional equipment that will eventually be replaced. These are the people who will either be trained or be reassigned. It should be noted that no estimate could be made of the impact of the new system on personnel in the operating subject matter divisions of the Bureau. Although more programmers are needed to prepare programs so that more of the clerical-statistical operations can be performed by the new system, fewer clerical-statistical personnel are needed. However, such clerical-statistical operations are being performed on our present computer to a very large

extent. Hence, there should not be a great impact on personnel. It is expected that the growth in the Bureau's functions and normal attrition will avoid any layoffs and will involve only a limited amount of reassignment.

One point relating to training should be emphasized. Too frequently the equipment manufacturer's training course is considered as the medium for securing adequately trained programmers. This is not so. The product of such training is a programmer who understands enough about the system to begin to train himself by actual operation. He will then write a program, have it reviewed, and attempt to place it on the system. Deficiencies in training, the greater power of the system, and the particular requirements of the system will soon be revealed. The process of self-training, aided by the review of others, may continue for years. The introduction of people into the training stream—school, first application, and self-training—is a continuing operation and will last long after the system has been installed.

Considering the process and cost of developing a well-trained staff, personnel recruitment and turnover may become a very real problem. We have had considerable difficulty in securing trained personnel and had to develop, as fast as we could, a staff of systems analysts, programmers and equipment operators. Because of the demand for these skills, turnover has not been small. Better grades have been suggested as a solution, but whether in fact this will solve the problem is not clear. The successful solution may very well be dependent mainly on time—the time needed for additional people to acquire these skills so that their numbers will match the existing requirements. At present, it appears that such an equilibrium of supply and demand is still in the future.

#### INCREASED USE OF BYPRODUCT STATISTICAL DATA

Although the Bureau's data processing activities are concerned mainly with statistical surveys, several situations have arisen which permit increased use of administrative data or which have resulted in reduced reporting by the business community. These are described below:

As part of the unemployment insurance system, State agencies receive contribution reports from some 2 million employers. Arrangements have been made with the States to supply certain desired information (such as employment in each month of the first quarter of each year, industry code, area code) on punched cards. These are summarized in Washington to provide annual bench marks for use in our employment, hours, and earnings surveys.

In several of the Bureau programs (employment, payrolls, man-hours; labor turnover; industrial hazards) cooperating States contact employers for reports. These reports are then submitted to Washington on punched cards, machine listings, or on the original schedule (or duplicate copy) for compilation into national totals. Thus, a single contact with an employer satisfied both the State and National needs. The magnitude of such dual-purpose contacts is indicated by the 160,000 reports received each month in our employment programs; some 80,000 reports in our annual industrial hazards program.

The availability of data-processing facilities has enabled time-and-cost summaries, by organizational unit and project, to be prepared on a regular basis. Similarly, selected portions of the Bureau's payroll records and the annual income tax withholding forms have been processed. Selected characteristics (classification, grade, organizational unit, employee number, etc.) of employees have been recorded and processed by our equipment.

#### INTERAGENCY COMMITTEE ON AUTOMATIC DATA PROCESSING

A representative of the BLS has been associated with the Interagency Committee for quite some time. He was a member of the task force on the multiple-use of automatic data processing systems (report issued in July 1958). He was also instrumental in making arrangements for the BLS to aid in the preparation, by tabulating equipment, of the interagency's publication, "Inventory of Automatic Data Processing Equipment in the Federal Government."

The Interagency Committee has been valuable as a catalyst in bringing together personnel engaged in ADP. It was the association at such meetings that made possible the successful contact of the Treasury Department installation so that arrangements could be made for its use by BLS when the system was not required by the Treasury Department (mainly on second or third shift, or on Saturday). This has been of great value to the BLS in testing programs for its new system and also in performing production runs when present facilities, op-

erating on a three-shift basis, could not handle the workload. The BLS has been making effective use of available time on the Treasury Department installation for the past 2 to 3 months.

#### GENERAL COMMENTS

In its review of the needs for data processing and in the development of a plan to meet future BLS requirements, the BLS committee faced many problems and discussed many suggested solutions. Several items are of a basic, general nature and appear important enough to be specifically mentioned.

*a. Perspective of ADP in overall statistical programs.*—Publicity and claims (mainly manufacturers) concerning the lightning speed, reliability, and automatic use of computers should not lead one (especially top and supervisory staff) to expect an easy and automatic solution to statistical and mass data-handling problems. ADP has proved to be of tremendous assistance at many stages of a survey, but it provides no simple, automatic solution to many problems. For example, the recognition and definition of a problem, the selection and development of an approach for its solution are time-consuming requirements which precede the use of ADP. For statistical surveys, ADP has limited potential in the design of the survey, the preparation of the necessary collection forms, the mail or field collection and control of the data being secured, and in the analysis and evaluation of the survey results. The masses of data collected can be fed into a computer for digestion, but the results produced will not be better than the raw data fed into the system unless proper safeguards, in the form of editing and screening plans, are built into the procedure to keep control of the masses of data being processed. Developing such safeguards is not always an easy task.

Likewise, it is important to understand that the job of organizing a set of statistical data for processing on a computer and preparing the sequence of instructions to the computer, referred to as a program, is a difficult and time-consuming job. There are standard programs for some of the conventional operations and for some of the more widely used business operations and mathematical-statistical functions. However, in the case of processing of statistical data, the program must usually be tailor made for each project.

While the availability of a computer saves on the data processing phases of a statistical survey, it causes additional work in other phases. More advance planning, rather than less, is required because of the necessity to program the computer, in advance, to handle all of the many unusual conditions and possible types of errors and inconsistencies that may exist in the data. In some cases it may actually appear that the availability of a computer has added to the workload considered on an overall basis. This is because more rigorous logical and statistical tests are employed when a computer is available than would be demanded if the work were to be done clerically. Likewise, more summary tabulations involving more complex classifications and analysis are scheduled too.

*(b) Training of programmers.*—The extended process of training programmers has been presented in the section dealing with manpower utilization. It appears important enough to warrant mentioning a second time. The process of training only begins with the equipment manufacturer's training course. Self-training by actual practice, review of initial work by others, study of available literature and programs written by others, all are important facets of developing a well-rounded, efficient staff. The entire training process is much more time consuming and costly than is generally realized.

*(c) Evaluating future data processing needs.*—The decision to employ a specific data processing system carries with it several long-range implications. Preparation for the use of the system (organizational changes, fund allotments, training people, and writing programs) commits one to a particular course of action for some time in the future. Programs written for one system may not, in general, be used on another system.<sup>2</sup> It is important, therefore, that the decision to use ADP be based on information as accurate as possible. It is also important that the system being developed have some permanence (used for some years in the future).

In some actual situations, such as in the BLS, the type and volume of data processing requirements 5 years in the future are unknown and can be estimated only with some margin of error. The use of imagination in preparing work for the computer is unlimited.

Under such conditions, the selection of a specific system can become a very difficult decision, especially when the varied work program (independent subject

<sup>2</sup> Unless written in a standard or common language.

matter surveys) requires different types of operations. For example, the BLS seasonal factor method requires some 42,000 arithmetical operations for an economic time series (input is on 18 cards), while the employment survey, a much larger program, involves considerable sorting, merging, and comparing. The former is definitely computer limited, the latter, with relatively few arithmetical calculations, may well be input-output limited. How are requirements with such a varying complex of processes to be meshed into the "best" overall estimate of need?

In developing a plan, care must be taken to prevent the variation in ability among systems analysts from affecting the decision. The item to be evaluated is the potential power of the ADP system, not the power of a systems analyst plus the power of the equipment. As an illustration, suppose a problem were submitted to two analysts, each associated with a different equipment system. Let us further suppose that analyst A is excellent and is associated with a system A. Analyst B is not as good as A. However, his equipment system, B, is definitely superior to A. A and B both provide solutions to a given problem. A's solution, because of his imagination and ingenuity, is slightly more economical than is B's. Should the A system be selected? In this simple illustration the answer is obvious. What is wanted is the best equipment system upon which one's own set of personnel will operate. In a large problem, or when a variety of problems are concerned, detecting variations among the capabilities of analysts may not be very easy. The recommended solutions may very well capture the ingenuity of the analyst as well as the computational ability of the equipment.

(d) *Efficiency of data processing equipment for preparing publication copy.*—The following two aspects of data processing equipment systems warrant mention. The first is the ability of such equipment to prepare data for publication. The second deals with the value of promptness of some results.

More than a decade ago, when the BLS revised its Wholesale Price Index, it made plans to capture the information available in its data processing system (punched cards) for the direct preparation of its final releases. These were issued early in 1952. The final publication presented some 170,000 wholesale prices and indexes which were printed from photocopies of tables prepared by the tabulating equipment. Since then, this approach has become standard in order to reduce the cost of preparing a final publication and to speed up its release. The Consumer Expenditure Survey of 1950 resulted in 18 volumes containing some 8,000 pages of such photographed tabular material. The recent (1961) revision of the BLS employment and labor turnover surveys resulted in a bulletin of over 500 pages which presented all the historical data in a single volume. The capabilities of present ADP systems make possible such publications with less effort in a form much neater than the older systems, and at a much greater speed.

The second point being presented is the value of information being made available at an earlier date. Electronic computers, with their ability to process data at incredible speeds, have made it possible to base national and management decisions on much more recent economic data. There is no way of determining the value of such actions at an earlier date. But its value should not be overlooked or underestimated, especially when a decision may affect the lives of millions of our citizens.

### PART III. AUTOMATIC DATA PROCESSING IN STATE EMPLOYMENT SECURITY AGENCIES. PREPARED BY U.S. DEPARTMENT OF LABOR, BUREAU OF EMPLOYMENT SECURITY

#### BACKGROUND

The Federal-State employment security program is administered by the 50 States, the District of Columbia, and the Commonwealth of Puerto Rico, under the general direction of the Bureau of Employment Security in the Department of Labor. The principal activities included in the program are (1) administering State unemployment insurance laws which require tax contributions from 2,365,000 employers and provide wage loss protection to approximately 42 million workers; (2) providing employment placement and counseling and labor market information services through a national network of 1,900 public employment offices; (3) paying unemployment compensation to individuals separated from the armed services and the civilian employment of the Federal Government; (4) certifying areas of substantial and persistent unemployment to the Secre-

tary of Commerce under the Area Redevelopment Act; and (5) determining training needs, providing counseling and placement services related to training programs, and paying training subsistence and other allowances under both the Area Redevelopment Act and the Manpower Development and Training Act. The State agencies have also served as agents for paying readjustment allowances or unemployment compensation to veterans of World War II and the Korean conflict, and extended benefits to the long-term unemployed under the temporary laws of 1958 and 1961. Among its responsibilities, the Federal Bureau of Employment Security determines the amounts necessary to finance the administration of the program by each of the cooperating State agencies; grants the necessary funds out of appropriations by the Congress from the proceeds of the Federal Unemployment Tax Act; and prescribes standards for expenditure of the granted funds. Acquisition of new data processing equipment, or modification of existing systems involving an increase in cost, is required to be approved by the Bureau before a State agency may use granted funds to pay expenses involved.

#### DIRECT DATA PROCESSING ACTIVITIES OF THE FEDERAL BUREAU

Because the major data processing of the employment security program is performed by the cooperating State agencies, the Federal Bureau has not, until recently, concerned itself with automation of its own data processing activities except for one major set of statistics which have been collected from the State agencies on punched cards and processed on electronic accounting machines. A recent reorganization of the Bureau establishes a Division of Data Processing under the Director of the Administration and Management Service. The Division is expected to be activated at an early date and will have as one of its responsibilities formulating policies and studying needs and best methods for automating the Bureau's data processing.

The Bureau's major use of electronic data processing thus far has been in compiling the reports on characteristics of individuals drawing benefits under the Temporary Extended Unemployment Compensation Act of 1961. Two reports have been issued containing some 135 tables; and a series of 10 or 12 reports are planned. Computations and validations have been performed and the tables printed on a small-scale electronic data processing system. The tables were then photographed for offset printing. The programs were written by a member of the staff of the Bureau's Unemployment Insurance Service and the processing was accomplished by use of shared time on equipment rented by the Federal Maritime Commission. Conservatively, the use of EDP will have reduced the probable cost of the project by about \$200,000 through the use of about \$10,000 worth of EDP time.

#### BUREAU SUPPORT OF STATE DATA PROCESSING ACTIVITIES

The Federal Bureau has long encouraged the State agencies to take advantage of advances in machine accounting technology so that they could process widely fluctuating volumes of unemployment insurance claims without undue delay. For the most part, the State agencies have had to depend on their own resources for the technical work of designing machine processing methods.

More recently the Bureau's Unemployment Insurance Service established a Division of Benefit Operations and Data Processing with responsibility for providing general guidance to the State agencies in planning for use of electronic data processing systems. The Division has had two positions authorized for carrying out this responsibility; however, one or both of these have been vacant until within the past few weeks. For fiscal year 1963, three additional analysts are authorized.

Through the efforts of the Division Chief and other individuals who have served on the staff, and with the assistance of its regional offices, the Bureau has been able to give general guidance to State agencies in making feasibility studies and planning for the installation of advanced systems. In addition, a programming technician has checked operational readiness in the last three State installations. When additional staff can be recruited, the Division will undertake more direct assistance in feasibility studies, exploration of more objective methods of evaluating computing systems, and development of a technical exchange of systems information and programs.

## STATUS OF DATA PROCESSING IN STATE AGENCIES

As early as 1937, a few of the State employment security agencies were using punchcard equipment and the number has expanded until all agencies use such equipment for some of their data processing work. The first electronic data processing system in an employment security agency was installed in the California Department of Employment in 1954. Since then, 12 other agencies have installed computers; 6 are preparing for installations during fiscal year 1963; and 7 others are in one stage or another of feasibility studies. Of those which have already installed systems, three States have replaced older vacuum tube computers with solid state machines and two others are expected to do so during fiscal year 1963. The status of electronic data processing in State agencies is summarized in exhibit I.

The rentals of computer systems in State employment security agencies will cost some \$2,100,000 in fiscal year 1963, and one agency has purchased a central processing unit which would otherwise rent at a cost of \$138,000 a year. By July 1963, the annual rental rate will have increased to \$2,500,000 for electronic data processing equipment, or about one-third of total spent for equipment rentals. A table showing equipment rentals for the past 5 fiscal years is attached as exhibit II.

Extreme fluctuations in the volume of unemployment benefit claims, the addition of new wage-loss compensation programs, and the increasing number of functions performed by use of such equipment make it virtually impossible to measure exactly the savings in personnel cost which have been realized through use of electronic data processing systems; however, we would conclude that considerably more than the increase in equipment rentals has been saved in six of the eight States where computers have been in operation for at least a full year. In the other two, newer and better systems have been or will soon be installed with every indication that net savings will be achieved.

Unemployment insurance operations involve large master files—of covered employers, their tax payments, and the benefits charged against them; and of the earnings and benefit claims of covered workers—which are processed daily. Volumes of transactions are at all times substantial and rise markedly in times of economic stress. With the advent of computers oriented to this type of operation, the potential for electronic data processing systems in the employment security field has increased immensely. It is, therefore, the policy of the Bureau of Employment Security to encourage the fullest practical use of electronic data processing by the State agencies.

## PREINSTALLATION PLANNING

The Bureau of Employment Security requires each State agency which wishes to install electronic data processing to complete a feasibility study which includes—

Consideration of proposals by all suppliers of systems in the size range appropriate to the State agency's needs.

A demonstration that the increased equipment rentals will be offset by savings in other categories of expense or that any net increase in costs is fully justified.

Prior programing, including testing and debugging, of the programs necessary to justify the rental costs before the latest date on which the agency can cancel or postpone a scheduled delivery.

Bureau of the Budget Circular A-54 has been circulated to all the State agencies as a guide in making feasibility studies. In addition, the Federal Bureau has supplied a statement of "Considerations which enter into a decision to install electronic data processing equipment" (attached as exhibit III) to interested State agencies. A number of State agencies, and all the regional offices of the Federal Bureau have been supplied copies of the "Guide for the Analysis and Improvement of Data Processing" which was issued by the Office of Management Policy of the Department of Health, Education, and Welfare in May 1961.

Through assignment of national office staff and through its regional offices, the Federal Bureau consults with officials of State agencies in planning and conducting feasibility studies. In addition, the Bureau assigns a programing consultant to check each State agency's completion of necessary programs before final approval is given to proceed with the installation of an electronic data processing system.

During the fiscal year 1962, the Federal Bureau has granted \$588,000 to State agencies to cover the costs of feasibility studies, advanced programing, and other costs preparatory to installing electronic data processing.

#### RENT VERSUS PURCHASE

The Federal Bureau encourages all State agencies to explore the possible advantages of purchasing equipment which would otherwise be continued on rental. Thus far, one State agency has purchased the central processor under terms which will show a saving over rental costs after 47 months and would permit a trade-in, without loss, after 2 years. Another agency has entered into a rental arrangement with an option to purchase the central processing unit under a contract which will complete the purchase through payment of rent for 48 months.

#### MANPOWER

State agencies have been relatively successful, despite some salary disadvantages in recruiting and training necessary programing and operating staff for electronic data processing. To a considerable extent this success has been due to the past degree of mechanization and consequent ability to locate persons with requisite aptitudes among their own personnel.

Practically all displacement of staff has been managed through attrition, including some separations of temporary personnel, most of it occurring in operations which are characterized by high personnel turnover. For the most part, the State agencies have followed a policy of accomplishing the transition without reductions in force (except temporaries); one large agency was able to do so even though the data processing system eliminated 200 jobs. Retraining, where necessary, has been accomplished primarily by on-the-job methods.

#### BYPRODUCT USE

Only two State agencies have so far converted their files of wage records to magnetic tape and only one of these has been in position to accept tapes from employers. This is done now in the case of 3 employers with approximately 75,000 covered employees and will be extended to others who are able to supply compatible tapes. Acceptance of tapes from employers will soon be possible in four additional States.

Few of the State systems have progressed beyond their direct operations and some of the major statistical reports required by the Federal Bureau. The California Department of Employment, with its larger system and longer experience, has probably gone further than any of the others in data recovery and analysis for management uses. To exploit this potential further the California agency is currently carrying out a training program to acquaint all of their supervisory staff with the data processing system and the resources it makes available to them.

#### DEVELOPMENTAL RESEARCH

The U.S. Employment Service of the Bureau of Employment Security is conducting a pilot project in cooperation with the California agency to test the feasibility of using rapid communications and electronic data processing devices in the operations of the Federal-State system of public employment offices.

One of the State agencies is currently exploring the feasibility of optical scanning equipment to read accounting information from records of the benefit checks which are written in its local offices and which now must be transferred to punchcards to provide the input for their data processing system. Several States are studying various devices for writing checks in local offices with equipment which will produce byproduct input in the form of punched cards or paper tape, and one State will shortly complete installation of such equipment in all of its local offices.

*Electronic data processing in employment security—Status as of July 1, 1962*

[(C) = card; (T) = tape; (R) = random access file]

Total	System	Status	Installation date	Applications	Remarks
Region I: Connecticut..... Massachusetts..... New Hampshire..... Rhode Island..... Region II: New Jersey.....	IBM 1401 (T) Univac Step (T) See remarks..... do..... do.....	Letter of intent..... Operative..... do..... do..... Firm order.....	June 1962..... ..... ..... ..... .....	Benefits..... ..... ..... Tax, experience rating.....	Replaced IBM 650 at lower cost. Considering feasibility study. Do. Studying, but primary interest now is in local office check writing. Studying benefit applications. Mar. 6, 1962—began benefit ledger posting and chargeback. Proposal for 1401 (T) to replace 650.
New York.....	IBM 7070-1401 (T)	Operative.....	January 1961.....	Tax, experience rating.....	Interested in study.
Region III: Maryland..... Pennsylvania..... Virginia.....	IBM 650 (C) Univac 409 (C) IBM 1401 (T) See remarks.....	do..... do..... Firm order.....	July 1959..... September 1962.....	Monetaries, experience rating, tax..... Wage record, benefits, experience rating, tax.....	Studying 1401 (T). Proposes conversion to 2 1401's (T) (R) including wage record to replace 650. Programming 1401 (T) including tax, wage record, benefits, experience rating, to replace 305. Do not, but not canceled. Will study feasibility for tax after installation.
West Virginia.....	IBM 305 (R) IBM 650 (T)	Operative..... do.....	July 1959..... October 1959.....	Tax, benefits, experience rating..... do.....	
Region IV: Alabama..... Florida.....	IBM 305 (R) IBM 1401 (T) IBM 1401 (C) IBM 1401 (C) IBM 1401 (T) See remarks.....	Partially operative..... Letter of intent..... On order..... Operative..... do.....	January 1961..... November 1962..... December 1961..... January 1962.....	Tax..... Benefits, experience rating..... Tax, benefits, experience rating..... Tax, experience rating, bank reconstruction.....	Studying scanning of benefit checks. Feasibility study completed. No selection made. Now using 1401 (C).
Region V: Kentucky..... Michigan.....	IBM 1401 (C) IBM 1401 (T)	Operative..... do.....	December 1961..... January 1962.....	Tax, benefits, experience rating..... Tax, experience rating, bank reconstruction.....	Substitute for calculating and tabulating in unit record system at reduced cost. Proposed to replace calculating and tabulating in unit record system.
Ohio.....	See remarks.....				
Region VI: Illinois.....	IBM 1401-1401 (T) IBM 1401 (C)	Programming..... Firm order.....	November 1962..... July 1962.....	Wage record, benefits. Plan tax in 2d phase..... Tax, benefits, experience rating.....	
Minnesota.....	IBM 1401 (C)	Approval requested.....	January 1963.....	Tax, benefits, experience rating.....	
Region VII: Iowa.....	IBM 650 (T) (R) See remarks..... do.....	Operative.....	July 1960.....	Wage record, benefits, experience rating.....	Programming 1401 (T) (R) for July 1962 installation to replace 650. Initial planning for feasibility study. Do.
Kansas.....					
Missouri.....					

## Electronic data processing in employment security—Status as of July 1, 1962—Continued

[(C) = card; (T) = tape; (R) = random access file]

Total	System	Status	Installation date	Applications	Remarks
Region VIII: Louisiana.....	See remarks.....				
Texas.....	Univac III (T).....		April 1963.....	Wage record, benefits, tax, experience rating.....	Has received proposals on 1401 and Univac—Dormant.
Region IX: Colorado.....	IBM 1401.....	Letter of intent.....			
New Mexico.....	See remarks.....				
Utah.....	IBM 1401 (T).....	Programming.....	September 1962.....	Benefits, tax, experience rating.....	Centralization problems delaying action. Feasibility study in progress.
Region X: Arizona.....	IBM 1401 (T).....		July 1963.....	Wage record, benefits, experience rating, tax.....	
California.....	IBM 7080 (T).....	Operative.....	See remarks.....	Benefits, tax, experience rating.....	Has had electronic data processing since 1954. Proposes early conversion to tape.
Hawaii.....	Univac Step (C).....	On order.....			
Region XI: Alaska.....	IBM 1401 (C) (R).....	do.....	July 1963.....	Benefits, tax, experience rating.....	
Idaho.....	Univac Step (C).....	do.....	do.....	Benefits, chargebacks. Plan tax in 21 phase.....	Feasibility study completed and approved.
Washington.....	IBM 1401 (T).....	Programming.....	June 1962.....		

Source: Unemployment Insurance Service, Division of Benefit Operations and Data Processing.

State employment security agencies—Rents, equipment expenditures and estimates, fiscal years 1959-63

	Fiscal year 1959		Fiscal year 1960		Fiscal year 1961		Fiscal year 1962 (estimated)		Fiscal year 1963 (estimated)		Estimated annual rental value of EDP costs as of June 1963
	Total	EDP	Total	EDP	Total	EDP	Total	EDP	Total	EDP	
Total.....	\$5,210,517	\$465,524	\$5,586,343	\$914,337	\$6,412,784	\$1,254,433	\$6,860,381	\$1,576,402	\$7,039,991	\$2,222,619	\$2,530,256
Region I:											
Connecticut.....	88,215		91,492		85,657		84,406		86,772		
Maine.....	17,712		20,319		19,772		20,290		23,995		
Massachusetts.....	289,136	79,435	418,336	79,435	464,124	79,435	506,271	88,436	553,224	86,907	52,800
New Hampshire.....	21,153		20,908		19,117		19,153		22,000		
Rhode Island.....	28,816		46,650		47,805		48,005		47,800		
Vermont.....	16,486		15,565		16,022		19,790		24,936		
Region II:											
New Jersey.....	161,604		165,206		184,259		194,000		108,000		
New York.....	598,309		528,752		635,117	1,141,675	816,536	1,281,970	1,629,798	1,290,520	1,290,520
Puerto Rico.....	420		1,825		16,313	0	41,337		41,196		
Virgin Islands.....	0		0		0		0		0		
Region III:											
Delaware.....	23,237		24,254		27,032		28,104		28,104		
District of Columbia.....	31,881		37,416		39,906		42,292		45,990		
Maryland.....	178,146		265,829		297,915	88,932	284,000	88,932	258,828	88,932	
North Carolina.....	55,879		55,908		57,938		62,962		62,773		
Pennsylvania.....	489,775		427,599		536,337		534,245		513,564		
Virginia.....	47,750		51,572		60,663		63,719		103,023		88,800
West Virginia.....	69,840		80,220		83,501		90,570		84,114		
Region IV:											
Alabama.....	62,176		92,858	55,020	106,080	56,040	107,136	56,040	107,136	56,436	56,436
Florida.....	115,636		193,768	101,700	236,448	135,600	240,214	135,600	236,700	135,120	135,120
Georgia.....	78,194		76,152		119,389	24,510	154,309	60,696	154,110	57,660	57,660
Mississippi.....	52,155		51,922		63,896		66,459		66,582		
South Carolina.....	40,392		40,970		57,149		59,329		64,000	22,072	44,136
Tennessee.....	125,274		127,649		131,270		131,764		131,079		
Region V:											
Kentucky.....	46,199		43,685		59,290		63,667	16,731	64,900	28,732	28,732
Michigan.....	117,348		111,551		122,052		174,585	67,123	194,295	141,180	141,180
Ohio.....	200,619		178,411		221,692		236,517		228,749		
Region VI:											
Illinois.....	315,409		298,319		315,005		310,165	24,000	490,982	255,480	396,000
Indiana.....	82,547		84,300		86,895		90,700	10,185	87,414	40,740	40,740
Minnesota.....	80,851		81,583		86,721		88,900		95,057		
Wisconsin.....	21,352		33,325		76,687		74,840		76,383		

1 Figures include rental value of EDP equipment purchased by the New York agency (\$69,000 in fiscal year 1961, and \$158,000 in each subsequent year).

State employment security agencies—Rents, equipment expenditures and estimates, fiscal years 1959-63—Continued

	Fiscal year 1959		Fiscal year 1960		Fiscal year 1961		Fiscal year 1962 (estimated)		Fiscal year 1963 (estimated)		Estimated annual rate of EDP costs as of June 1963
	Total	EDP	Total	EDP	Total	EDP	Total	EDP	Total	EDP	
<b>Region VII:</b>											
Iowa.....	\$68,237	-----	\$139,519	-----	\$103,243	\$138,451	\$157,854	\$138,451	\$154,626	\$126,048	\$126,048
Kansas.....	40,852	-----	41,169	-----	43,581	-----	45,700	-----	45,850	-----	-----
Missouri.....	98,592	-----	97,279	-----	96,005	-----	101,058	-----	119,968	-----	-----
Nebraska.....	26,469	-----	27,023	-----	30,676	-----	30,862	-----	33,156	-----	-----
North Dakota.....	16,465	-----	16,178	-----	16,300	-----	16,748	-----	22,294	-----	-----
South Dakota.....	9,425	-----	9,438	-----	9,854	-----	11,435	-----	12,340	-----	-----
<b>Region VIII:</b>											
Arkansas.....	46,196	-----	60,860	-----	67,499	-----	74,211	-----	73,314	-----	-----
Louisiana.....	39,249	-----	59,135	-----	59,278	-----	64,332	-----	61,848	-----	-----
Oklahoma.....	75,393	-----	78,334	-----	93,634	-----	103,649	-----	104,347	-----	-----
Texas.....	210,523	-----	217,397	-----	232,028	-----	238,315	-----	297,402	60,000	210,000
<b>Region IX:</b>											
Colorado.....	9,833	-----	10,294	-----	10,528	-----	10,492	-----	10,960	-----	-----
Montana.....	26,406	-----	40,322	-----	42,800	-----	43,068	-----	43,968	-----	-----
New Mexico.....	31,032	-----	31,422	-----	32,971	-----	41,727	-----	47,865	-----	-----
Utah.....	32,302	-----	34,772	-----	37,909	-----	47,400	-----	90,140	61,800	68,760
Wyoming.....	11,888	-----	18,495	-----	19,296	-----	24,631	-----	31,782	-----	-----
<b>Region X:</b>											
Arizona.....	39,953	-----	47,372	-----	51,692	-----	58,185	-----	61,794	-----	-----
California.....	699,879	\$386,089	706,530	\$589,850	864,745	589,850	805,637	589,850	771,895	603,741	603,741
Hawaii.....	16,059	-----	19,563	-----	25,411	-----	33,061	-----	43,325	-----	-----
Nevada.....	15,370	-----	17,183	-----	19,094	-----	20,300	-----	20,538	-----	-----
<b>Region XI:</b>											
Alaska.....	34,418	-----	31,974	-----	34,893	-----	36,025	-----	34,755	-----	-----
Idaho.....	8,852	-----	8,888	-----	9,245	-----	10,850	-----	10,850	-----	-----
Oregon.....	84,517	-----	87,685	-----	99,456	-----	109,639	-----	114,746	-----	-----
Washington.....	111,896	-----	110,218	-----	112,401	-----	122,130	8,388	151,134	100,651	100,651

## CONSIDERATIONS WHICH ENTER INTO A DECISION TO INSTALL ELECTRONIC DATA PROCESSING EQUIPMENT

On March 17, 1961, we sent each State (via general administrative letter No. 555) "Guidelines for Studies to Precede Utilization of Automatic Data Processing Equipment." This document was developed by the Bureau of the Budget to answer essentially the same type of questions which the State agencies ask when they considered studying the use of EDP. This document should be very helpful to any State agency in its preliminary studies.

It should be obvious that one of the first steps an agency must take is for the administrator and his top operating chiefs to become generally familiar with the concepts involved in EDP. This familiarity can be gained through attendance at computer manufacturers executive seminars, orientation classes, or customers administrative classes. The differences between the two major types of processing (sequential and random access) should be understood. There should also be knowledge concerning the classes of equipment which are available from the major manufacturers. The classes of equipment range all the way from card-fed systems, which may rent for approximately \$3,000 a month, to the highly sophisticated equipment containing simultaneous program operations, which will probably cost close to \$25,000 a month.

More detailed information concerning computers will be needed before any firm decision is made concerning equipment to be installed, but for the purpose of deciding whether or not to conduct a feasibility study at least the above information must be available to those who will make a decision on whether the feasibility study will be conducted and, eventually, whether a system will be installed.

There are many factors which must be considered when determining the economic or operational feasibility of electronic data processing systems. Included in such considerations are—

1. A definition of the problem. This involves an examination of the functions being performed in terms of volumes, input data available, and output data created. It also involves considerations of timing and of current costs for performing the operation.
2. An analysis must be made showing the costs for each step in performing the operation under current procedures. This is necessary because only certain portions of any given operation can be improved through the use of EDP. The cost reduction which may be achieved in a given unit time can only be achieved in the areas of that function which are susceptible to machine processing. For this reason we recommend that any State which is even remotely considering the installation of EDP obtain detailed time and cost data covering current operations which might be mechanized.
3. An analysis must be made to indicate the probable cost of performing the function with the proposed equipment. It is at this point that it is necessary to have considerably more information concerning the capacity of the various types of equipment to arrive at this cost figure. While we would not expect this first estimate to be completely accurate, we do recommend that in arriving at the estimate that very conservative machine capacities be used in determining the time which will be required to perform any given function.
4. A comparison must now be made between the present cost of performing the function and the cost which will be achieved with the equipment under consideration. The costs involved will include not only the machine rental but also the costs of personnel needed under the two systems. If the new system is not clearly competitive with existing procedures, any study might well be discontinued at this point. In order to make this cost comparison, it is necessary to apply the unit costs to realistic workload estimates. For functions which are not budgeted on a unit time basis, such as research and statistics, an estimate of the hours required under the current and the proposed method, must be made. In order to arrive at a comparison of the costs it will be necessary for the State to prepare flow charts and block diagrams for present and proposed methods. It has been our experience that most States do not have this job done in the detail necessary to arrive at this decision.
5. If the tentative decision is that a given system would be feasible, a schedule should be prepared indicating the various steps which must be taken from the date the decision is made through the time when the new system will be completely operational. Target dates for the accomplishment of each of the steps are necessary to arrive at the date upon which delivery of the equipment can be accepted. Some of the steps involved include the creation of the organization

which will handle the equipment, the training of programmers and operators, the preparation of the programs for the functions to be performed, the requirements for site preparations, including false floors, air conditioning, humidity control, etc. When an agency attempts to implement this schedule it will find that many adjustments will have to be made. Usually these adjustments are in terms of later rather than an earlier installation of the equipment.

6. At some time during this process, it is highly desirable to inform all agency personnel of what is being contemplated and of what the possible effects might be in terms of new jobs, as well as in terms of displaced employees. Every effort should be made to provide for the orderly reassignment of personnel which will be displaced.

7. Consideration must be given to the availability and the possible recruitment and training of personnel involved in the technical operation of the system. Aptitude tests should be given to the broadest possible groups of agency employees who indicate any interest in the subject. The only positive experience that anyone has had in deciding what types of people are most adaptable to this type of work indicates that there is no single group which dominates the field. Technical competence has been exhibited by personnel ranging all the way from statisticians to messenger boys. Another serious consideration concerning personnel is the ability of the agency to pay sufficient salaries to keep the trained personnel employed by the agency. Special civil service classifications and salaries must be justified in a great many cases.

8. In determining what computer manufacturers' equipment should be installed, there are many subjective considerations which must be weighed before a decision should be made. One consideration is the "software package" which the company has available for the proposed equipment. This consists of "canned" programs for many routine functions. It also includes automatic programming techniques such as Cobol, which make it possible to program the equipment much faster than if this job were done in machine language. Another subjective consideration is the potential of the manufacturer to continue to improve the equipment and to have compatibility between current equipment and future equipment which will minimize the amount of reprogramming which might be required by a change to higher class equipment. The possibility of "backup" equipment in the same town which will be available in case of machine breakdown is another consideration.

Several States have suggested that the above steps are too numerous and time consuming to follow in order to arrive at a decision concerning EDP. Our feeling in this matter is that an intelligent decision cannot be made without going through essentially all of these steps. Any shortcutting which we have seen has tended to create a much more difficult and costly transition than is experienced if these steps are followed.

#### EXPLANATION OF TERMS USED ON WORKSHEET

*Functions affected.*—Enter the time distribution code for the functions to be processed on the system such as monetary determination, benefit payments, employer accounts, research and statistics, etc.

*Workload.*—Use workloads anticipated for nonrecession years and attach an explanation of any departure from recent experience.

*Minutes per unit.*—This figure should be either the unit time allowed in the most recent budget or the State's actual experience unit time, whichever is less.

*Hours required.*—Workload times minutes per unit, divided by 60. Functions not budgeted on a unit time basis should be in terms of the hours actually budgeted or the State's experience whichever is less.

*Savings or loss.*—The difference between the hours required under the old and the proposed system. This will be reflected as either a plus or minus in the number of hours required for the proposed system. The cost difference should be determined by multiplying the hours saving or loss by the cost per operating hour for the types of positions which will be eliminated or added.

*Summary.*—A single worksheet may be prepared if it is expected that all minutes-per-unit adjustments will be fully effective immediately after the end of parallel operations. If conversions are to be phased over a period of more than 3 months or if it is expected that minutes-per-unit adjustments will occur in stages, a separate worksheet should be prepared for each fiscal year or part of a fiscal year (and the period appropriately indicated) including the first full fiscal year in which cost increases or decreases will be fully realized.



over ADP activities until January 1960, when the Division of Management Analysis and Development was established. Prior to this time, individual bureaus and offices had the responsibility for determining their data processing needs and for ordering equipment. The main control which the Department exercised was in the allocation of funds for rental of equipment. There was no central Department ADP program, nor were there departmental ADP experts to analyze proposals to install new equipment or to upgrade existing systems. As the "state of the art" improved, and as the larger users of ADP equipment became more sophisticated in their understanding and use of ADP equipment, individual bureaus consolidated ADP responsibilities in special organizational units for better control. For example, the Bureau of Labor Statistics established an Office of Data Processing in which all bureau ADP activities were centralized and controlled. It also established an advisory committee consisting of experienced individuals from each of the operating BLS divisions. This committee was charged with responsibility for conducting a continuing evaluation of the Bureau's overall data-processing requirements, and to make recommendations to the Commissioner for modifying or changing systems and equipment. It has functioned for approximately 2 years and has made many appropriate recommendations, including a recommendation a year ago to change from a middle-sized card computer system to a relatively large-scale tape computer system.

Another example of a bureau becoming aware of the need for more control relates to the Bureau of Employment Security which, in 1958, established a Division of Benefit Operations and Data Processing in its Unemployment Insurance Service. This division has primary responsibility for coordinating data-processing activities in State employment security agencies, whose administrative costs are financed entirely out of Federal funds. The fact that this responsibility was placed within the Unemployment Insurance Service was largely based on the historical use of ADP equipment in unemployment insurance activities. The major efforts by State agencies over the years to use ADP equipment has been in the processing of unemployment insurance claims, benefit payments, and tax collection activities. Recently, the Bureau recognized that this very close association between the Unemployment Insurance Service, which has authority for the approval of all State agency ADP equipment, and the major functions which the equipment was expected to perform, had a tendency to impede State agency investigation of the use of ADP equipment in other areas of employment security. In addition, the introduction of ADP equipment made the matter of analysis of need and approval of funds very complex. Therefore, the Bureau recently established an Office of Data Processing in its Administration and Management Service about 3 or 4 months ago. One of the responsibilities of this office is the coordination of all data-processing efforts in the Bureau. It has the responsibility for providing operational guidelines to the Unemployment Insurance Service and the U.S. Employment Service concerning the use of ADP equipment in their activities in the States. It will also assist in the identification of potential areas for ADP, and the development and implementation of data-processing programs within internal elements of the Bureau of Employment Security.

We are working closely with the Bureau of Labor Statistics in assuring a smooth conversion from its existing punch card computer

system to a large-scale tape computer system. Preliminary work has been accomplished to achieve this objective. We are also working very closely with the Bureau of Employment Security in an effort to assist them in developing a strong, central, bureau-controlled ADP program which will provide effective guidance and leadership to State employment security agencies, and which will also develop a consciousness on the part of Bureau officials as to the potential uses of ADP equipment in internal Bureau operations.

Assistance has been given to other bureaus and offices in the Department in examining the potential uses of ADP equipment in their operations. One bureau, the Bureau of Labor-Management Reports, which was established late in 1959, is in the process of developing a fully integrated system to audit financial reports it receives from union organizations and to provide a variety of statistical and management reports.

The Office of Personnel Administration will soon implement a mechanized personnel statistics program which will provide it with a variety of reports now compiled on a completely manual basis. This system will evolve in subsequent phases to the point where it will have a capability for providing essential identifying and selection information for employee reassignment, promotion, and career development purposes.

The Bureau of Employees' Compensation has a small punchcard operation at Chambersburg, Pa., on which it processes some of its statistical work relating to the Federal Employees' Compensation Act. This installation will also serve as the Department's ADP center in case of emergency evacuation.

Several other bureaus and offices are currently examining the possible use of ADP equipment in their operations and it is expected that considerable progress will be made by them within the next year or two.

In addition to those activities, which relate primarily to operating programs, the Department is in the process of converting from a diversified manual payroll system to a completely centralized system, utilizing ADP equipment. As this is completed, accounting functions which are likewise being maintained by individual bureaus on a variety of manual and bookkeeping systems, will be centralized on the punchcard system in the Office of the Administrative Assistant Secretary. This unit will also process the aforementioned personnel mechanization work and some aspects of the Bureau of Labor-Management Reports project.

Mr. Chairman, the Department of Labor recognizes the fact that there is a great deal yet to be done in developing a strong, well-controlled ADP program in the Department. We are working toward this end.

One of the stumbling blocks to progress in this area is the lack of expertise in some of the operating bureaus and offices. While we strive to promote the effective use of ADP, we have found it essential to first develop ADP competency within the operating organizations. This permits for better understanding of the problems involved, including the capabilities and limitations of ADP equipment. It also enables operating personnel to perceive areas in their operations which present excellent potential for ADP. It is meaningless to promote ADP programs when you do not have

skilled and experienced people to implement such programs. This way I believe we can avoid some of the problems that have been experienced by other agencies that have jumped in this area.

However, the major problem which the Department faces is securing competent personnel in all aspects of ADP operations. Some of our bureaus and many State agencies have been able to train some of their punchcard personnel to perform computer orientated tasks, but this has not provided them with sufficient quality operators. Since this is still a new, technical field, there is a great deal of worker mobility. We find ourselves training programmers, systems analysts, and console operators for subsequent employment with other Federal agencies and for private industry. In our discussions with ADP people throughout the Federal service, we have found this to be a common problem. Perhaps in a few years employment in the field will stabilize itself, and we will be able to recruit for our needs with no greater difficulty than we do for most occupations.

It is interesting to note, however, that we have found several excellent ADP personnel in areas far removed from ADP. These individuals were generally revealed through the use of aptitude tests. It is encouraging that some of these people have developed into extremely capable ADP technicians. It is now the practice to offer any employee who wishes, an opportunity to take an aptitude test, and to be trained if the test results show promise.

I wish to thank the subcommittee for this opportunity to present the "ADP story" for the Department of Labor, and I also wish to thank the committee's staff assistants who aided us in preparing the material which you requested. If you have any questions, we will be glad to try to answer them.

Mr. HENDERSON. That is a very excellent summary of your full statement.

In regard to the aptitude tests, I wonder if you would inform us more fully about these tests. I am particularly interested in knowing what success you have had, and secondly, what interchange we might have between agencies and departments of Government in this regard. You might enlighten us on these points.

Mr. KOUZES. The tests we have been using are general tests that tell us whether the individuals have inclinations toward this type of work. Since these are mostly applied in the States, I wonder if I could ask Mr. Ben Burdetsky to answer that.

Mr. BURDETSKY. Until recently the primary sources for ADP aptitude tests were individual machine manufacturers. Too often tests were given after the equipment had been selected and often after the equipment had been installed. In such instances individuals are not trained to use the equipment early enough to be of assistance in the difficult conversion period.

The New York agency has developed its own aptitude test and provides us with an excellent example of the use of such tests. One of its messengers who was tested showed the highest aptitude and has developed into an excellent programmer.

Mr. HENDERSON. Do you have copies of the aptitude test given?

Mr. BURDETSKY. I have seen such tests administered. I think we may be able to get a copy for the committee's use. You know, of course, that any widespread publication of such tests has an adverse effect on their validity.

Mr. KOUZES. I might say our Secretary has been most anxious that the minimum harm be done individual workers and he is most anxious that in the conversion to automatic data processing we do all we can to give displaced persons an opportunity to be placed elsewhere. We have bent over backward in this area.

Mr. HENDERSON. As you go into retraining of displaced employees, these aptitude tests may be very helpful. I believe there is a need to disseminate this type of information in regard to aptitude tests. Someone has informed the subcommittee that about the first thing was to start looking for chess players. We hope there are better aptitude tests than that being used.

In your prepared statement you say that if the workload is expected to grow within a period of 6 years, you would have to purchase a computer large enough to handle the workload 6 years later. I could not follow the reasoning on this and I wondered if you would explain it more fully.

Mr. KOUZES. Since this relates to the Bureau of Labor Statistics, I would like Mr. Rothman to answer that.

Mr. ROTHMAN. The Bureau has had a long history with ADP and we have found the requirements have grown over the years. One of the problems we have in our current programs is that they keep on changing and we have found that preparing for these programs takes time. We cannot install a new piece of equipment and expect to run it in the next month or two.

In early 1958 we were aware of the stress on our equipment and we had a committee appointed to see what steps the Bureau should take to be ready for its equipment. In October 1956 a recommendation came for a 650 system. That was for 4 or 5 years. Sure enough, in 1958-59 we were tapping the equipment and we saw we would exceed its capacity and another committee was formed to see what the anticipated workload would be and what steps we could take so we would not go through this costly procedure of getting ready for another system. It was at this time that we projected the current portion of our workload for around 1965. We tried to see what we could anticipate in the program to see what the workload would be. We assumed it would take about 2 years from the recommendation to get ready. So that although we projected for 5 years we had a 3-year reserve. We wanted some piece of equipment we could introduce but that would be with us for some length of time.

We did not want to get too big a piece of equipment or too small a piece of equipment and we wanted to be ready in the longer term because we realized conversion from a 650 to another system would take a great deal of time. So we made a stipulation in our plan that whatever system we had should be able to be updated or made faster without any reprogramming needs.

Here I had best add one thing. We have two aspects of our data processing. First is the regular repetitive work, which we can anticipate pretty well. We have 160,000 reports each month in our employment releases. We know what we have to do with that. We know it has grown over the past years and will continue to grow a little bit each year. We know our labor turnover reports are 80,000 a month. We thought they would grow at a certain rate, but we expanded our program areas and it took a sudden spurt. We have accident statistics,

price statistics, wage statistics. These are the repetitive programs, and you can evaluate them and project.

We have some one-time jobs which are almost not measurable. For example, every 10 years or so we get money to do a consumer expenditure survey. In the last 10 years this has grown. We have more detail, more cities. It is a one-time load, and for that we said we could not estimate. We know it will be there. We want to have some extra reserve to process it, but we could not put it into our expansion of workload on the current basis.

We had the same thing when we adjusted to the standard industrial classification manual. There was a whole retabulation project of our employment reports. We did not know what work the Stigler committee report on prices would do for us. We did not know what this current Gordon committee report on employment and unemployment would do for us. We felt we should have some reserve.

With this background, we said we would take a workload 5 years from the time we started, allowing a year or two for the report, for the evaluation of the report, and for the plan to get the installation.

Mr. HENDERSON. I think that is a very fine explanation, and I think it clears up the question I had in mind on this point.

In the BLS statement you mention future projections on the one-shift basis. Do you mean by this you plan to use the computer for only 40 hours a week? Would you not get reduced rental rates on extra shifts?

Mr. ROTHMAN. This is true. The extra rental goes down to 40 percent, but here again we were planning for the regular repetitive work. We had to have two types of reserve: one for the extra work that comes in periodically, which we could not estimate in terms of time; secondly, the incidence of the work. There are cases when two reports have to come out about the same time. We must work on the second shift. If we plan for two or three shifts, something would have to be phased in and there may be a time delay.

One other thing we thought of on the one shift was the general efficiency. We have a 650, and it has been running three shifts, and we feel it does not run as efficiently as if it had run on the one shift, especially when something occurs in the program and the people running the equipment have to get in touch with the subject matter people. The subject matter people are on only one shift. So, we had thought we would plan for one shift, allowing the second shift for the excess work, allowing the second shift for the growth of the departmental functions since we do a lot of work for the Department and we do not know what that workload will be. So, if we would fully utilize one shift, we would have this reserve power.

The other aspect is one, again, of long-range planning. If we were to plan on two shifts to start with for the regular work, there would undoubtedly be situations when we would have to go into the third shift. If the increases from the Department or from our own programs would be a little greater than we had estimated, then we would be strapped with that piece of equipment.

The question then becomes: How do we take care of the increased workload? Does this mean a complete reprogramming job? There everyone associated with us said we cannot afford, with all the programs we have, to reprogram the various surveys, especially on this monthly time basis that we have to release data.

Mr. HENDERSON. Do you feel from this experience that it would have been helpful to you in your Department planning to have had a central Government ADP operation that could have been considered in your plans, where some of your extra work or second-shift work or overload work could be handled?

Mr. ROTHMAN. We have had some cases where our equipment broke down, where we actually used someone else's equipment. It is not a comparable situation, because the equipment we were using was card equipment, and it was quite burdensome to move the cards in—and in this case we had to get clearance—to run it on someone else's equipment which was not exactly like ours, to make some necessary changes, and then to move the work back again. It was hard and difficult.

Mr. HENDERSON. I was wondering if you had any difficulty in finding out what equipment might be available throughout other agencies.

Mr. ROTHMAN. I have been fortunate in that respect, because, through the interagency committee, I knew people in other agencies. Part of our plan also was phasing in our 7070 in such a way that we would not have any undue faults. The plan calls for picking out our major programs, the repetitive type programs, and getting the program for our 7070 written for us. We would not put it on the 7070 to start. We would get the testing and debugging and even, sometimes, the initial running on someone else's equipment. So we would be building up our file of programs and processing before we got our equipment.

As I said, I was fortunate because I happened to know these other people. I had exceptional luck in getting Treasury's equipment on their second, third, or Saturday and Sunday shifts. As of now, we do not have our 7070, but we have used the 7070 of Treasury for productive runs on a large number of cases, at a cost less than our 650 in some cases, because the processing time was so much more rapid that we could get the second shift on the 7070 at less than it would have cost us on the 650. We have used the 7070 right now for three or four different types of problems, and we are using that as a backstop right now.

Mr. HENDERSON. I think this is a very good illustration of what we on the subcommittee think is the possibility for good coordination between agencies.

Mr. Kouzes, your statement about the Bureau of Employment Security ADP operations in State employment agencies is very significant to me. Of course, as you know, we do not want to encourage you in any way or give you any idea that we want the Department to be intruding into State matters or trying to force ideas on State agencies to conform to our ideas about ADP use and operation, but certainly the effort you have made in the Department to provide guidance and assistance in what we all consider to be a highly technical field is most commendable. We will be very much interested, on this subcommittee, to hear further from you as this is effected and moves forward. We shall be especially interested in the development in the national job market, as referred to in your previously submitted statement, and we would encourage you to keep us fully informed in this regard.

Mr. Udall.

Mr. UDALL. I have no questions, Mr. Chairman. I would compliment the witnesses on a very well-prepared and documented report

and on the helpful way in which they have answered questions here this morning.

Mr. HENDERSON. I think your statement has certainly been one of the finest we have received. I think, at this point, I would like to ask Mr. Mahoney if he has any comments.

Mr. MAHONEY. A point or two. Of course, we are all significantly interested in seeing that the most cooperative joint use and effective use is made of this equipment. In this particular case, the gentleman was able, through his own resources, to make contact with the Treasury Department and they were able to take advantage of the situation where they had some available time. We feel this should be on an organized, effective basis throughout the Government. I think that is the thought you had in mind in your questions, Mr. Chairman, and it is something we shall pursue.

Mr. HENDERSON. Thank you.

We appreciate your appearance this morning and your very fine statement.

Mr. KOUZES. Thank you, sir.

Mr. HENDERSON. Our next witnesses are Mr. Paul N. Schmoll and Mr. W. O. Underwood, of the Veterans' Administration.

**STATEMENTS OF PAUL N. SCHMOLL, ASSISTANT ADMINISTRATOR FOR MANAGEMENT SERVICE, AND W. O. UNDERWOOD, ASSISTANT ADMINISTRATOR FOR PERSONNEL, VETERANS' ADMINISTRATION**

Mr. HENDERSON. It is a pleasure to have you gentlemen with us this morning.

Mr. UDALL. Before the testimony commences, I want the record to show and the subcommittee to know Mr. Schmoll is a former Arizonan. He was director for several years of the veterans' facility at Prescott, Ariz., and did an outstanding job. He was recently promoted and elevated to the important position he has here now. I wanted the chairman to know that I am real proud of him and what he has done, and I am especially pleased to be on the subcommittee and to hear his testimony.

Mr. HENDERSON. Thank you, Mr. Udall. If Arizona would give us more fine men like our colleague, Mr. Udall, it would establish quite a reputation for itself.

Mr. SCHMOLL. I am sure of that.

Mr. HENDERSON. You may proceed. Your entire statement will be printed in the record at this point.

(Mr. Schmoll's prepared statement follows:)

**PREPARED STATEMENT OF THE VETERANS' ADMINISTRATION**

Mr. Chairman and members of the subcommittee, we appreciate the opportunity to relate the Veterans' Administration's electronic data processing experiences and future plans for the use of its ADP systems. For ease of reference, we will briefly describe our electronic computer activities in the following five areas:

## I. PLANNING—EFFECTIVENESS OF FEASIBILITY STUDIES AND BACKGROUND FOR EQUIPMENT ACQUISITION

Each of the decisions to install electronic data processing systems was preceded by a detailed feasibility study. These studies leading to decisions on ADP equipment established clear-cut advantages in efficiency and operational economy. In addition, during the conversion process to the ADP systems, critical appraisals were made of our ability to meet the cost-service objectives for existing and future workloads under the current conversion plans. The following is a summary of our experience to date.

## DISABILITY AND DEATH BENEFIT PROGRAMS—PAYMENT ACCOUNTING AND STATISTICAL FUNCTIONS

This ADP application is processed on a large-scale electronic computer in the VA Data Processing Center, Hines, Ill. The system will process the monthly issuance of approximately 4,600,000 benefit checks to veterans and their beneficiaries. It has been designed to provide check payment data in machine processable form to the Treasury Department for the automatic production of checks and for the presorting of checks by destination code.

The feasibility report (March 1958) for this application contained the basic concepts of the existing compensation and pension ADP system (punched card). The report envisioned—

- (1) Continued decentralized application processing and adjudicative functions.
- (2) Centralized record keeping and disbursing operations and elimination of multiple files by combining in one master file, the payment, accounting, and statistical data.
- (3) Use of Programmatic Flexwriters with paper tape reader and punch attachments to capture, as a byproduct, computer input data from the typing of rating sheets and award letters.
- (4) Greater accuracy in record media by elimination of much of the manual coding and the installation of a comprehensive series of computer edit and audit routines.
- (5) Bi-daily processing of the entire master file to maintain all accounts on a current basis and to insure prompt payments of retroactive amounts due beneficiaries.
- (6) Preparation of accounting, statistical, and management reports.

The computer system was installed January 1960 and faithfully followed the basic principles set forth in the study. Our initial regional office conversions presented many operating problems and temporarily delayed our conversion process. These problems were quickly recognized and corrective action taken. Computer processing runs were modified, combined, and in some instances eliminated. Regional office operations were refined, and where necessary other systems modifications installed. However, none of these modifications resulted in major deviations from the original thinking in the feasibility study. At this point we would be remiss if we did not acknowledge the outstanding cooperation and contributions of the Post Office and Treasury Departments in helping us resolve our "growing pain" problems.

The Treasury Department areas of assistance include—

- (a) As part of the conversion plan, they provided a part of our basic input. They performed preconversion edits and reconciliations on their records. In some cases, systems were changed prior to conversion in order to facilitate those operations.
- (b) Check preparation schedules have been adjusted to meet emergent conditions.
- (c) Significant contributions in the area of VA handling check inquiries, including the furnishing of information on a more complete and timely basis.
- (d) Special handling of returned checks in order to facilitate delivery of checks where the beneficiary had moved or to terminate cases where the payee was no longer entitled.

Similarly, the Post Office Department assistance included—

- (a) Special handling of checks where required through delays in mailing.
- (b) Special attention where required to assure prompt handling of checks requiring redirection.

(c) Development of more useful mail distribution codes.

(d) Determination of those areas requiring special handling because of peculiar transportation problems.

The equipment configuration in the feasibility study contemplated an IBM 705-III system with 40,000 positions of core storage, 11 tape drives and the usual off-line equipment. Monthly prime shift rental on this equipment was estimated at \$40,000. Minor systems modifications were made both before and after installation of the equipment. For instance, additional core memory was ordered before delivery. As operations progressed, additional off-line equipment was installed. Later, off-line equipment was replaced by a 1401 system which was not on the market during the feasibility study. The net result was that the prime shift rental was stabilized at \$48,400 per month.

As the conversion of regional offices progressed, it became apparent that the 705-III capacity could not adequately handle the recurring operations of the increasing compensation and pension workload and the conversion of approximately 250,000 accounts per month. A study clearly indicated the 705-III could be replaced by a faster, transistorized, large-scale computer which would not only provide the required capacity, but would also be more economical. On March 1, 1962, the 705-III system was replaced by an IBM 7080 large-scale computer system. At the same time, a second 1401 system was installed only for the duration of the conversion operation. The prime shift rental on the three systems is about \$58,000 per month. Although prime shift costs are increased, substantial savings have been realized in extra shift charges. These have accrued because of the increased operating speeds of the 7080 system.

For example: Extra shift rental on the original system amounted to almost \$16,000 in January 1962 (master file size 2,225,000 accounts). Extra shift rental on the new system was less than \$3,000 in May 1962 (file size 3,175,000 accounts).

During this period we conducted a study of the long-range requirements of the VA Data Processing Center. The study included the development of equipment specifications, analysis of manufacturers' proposals, and cost comparisons. These comparisons indicated a definite advantage to the VA to continue operating with the present 7080/1401 ADP system. Further, based on expected usage, a comparison of lease versus purchase costs indicated a break-even point in about 3½ years, well within the 6-year range suggested by the Bureau of the Budget. After break even, our savings on prime-shift rental alone will be approximately \$49,000 per month. This system was purchased on June 1, 1962, at a total cost of \$2,374,000. We are happy to announce we have now completed the conversion of our last station, the Veterans' Benefits Office in Washington, D.C. The ADP system has provided improvements in several ways. By reducing the time interval for processing retroactive payments, beneficiaries receive amounts due sooner than heretofore. The extensive audits of payment data and associated statistical information have provided greater assurance of more accurate payments. The combining of three separate files into a single master record consolidated in one location and the expansion of statistical data have afforded a wider variety of accurate management data on a more timely basis. Timely receipt of recurring payments by the recipients is adhered to under the ADP system. This application, in addition to accomplishing their basic system improvements, will reach a break-even point during fiscal year 1966. By the end of fiscal year 1970, the savings will have accumulated to the extent of \$7 million.

Major changes and additions to the ADP system currently being planned are—

(1) A system of cyclical payments whereby the distribution of checks to beneficiaries would be evenly spread throughout the entire month.

(2) A paper tape to magnetic tape procedure, in which the intermediate step of preparing punched cards for computer input data would be eliminated. This would also permit revision of the Flexowriter procedure and removal of the 80-column restriction.

#### VA INSURANCE ADP APPLICATIONS

The establishment and maintenance of the necessary records to service approximately 5.8 million national service life insurance (NSLI—primarily World War II and Korean) accounts and 300,000 U.S. Government life insurance (USGLI—primarily World War I) accounts is the primary function of the large-scale computer system located in the Philadelphia Data Processing Center, Philadelphia, Pa.

The feasibility study and decisions as to the pattern for office organization provided for three insurance offices, with a single IBM 705-III system located at

the Philadelphia Insurance Center. The Denver and St. Paul Centers would transmit input to the computer over leased telephone lines using punched card transmission equipment. Computer output would be mailed to the insured from Philadelphia or returned to Denver and St. Paul via air freight. The order was placed for the equipment on October 28, 1957, based on an installation date of July 1, 1959. Prior to installation, additional functions were added to the system due to newly passed legislation or expansions to the planned system.

Examples of these additions are—

- (1) Conversion of RS term insurance to any of six permanent plans and a 5-year limited convertible term plan. (Legislation passed in 1958.)
- (2) Total disability income provision which made available at an extra premium a benefit of \$10 per month per \$1,000 of insurance. (Legislation passed in 1958.)
- (3) Insurance general ledger accounting.
- (4) Processing automatic surrenders for extended insurance.
- (5) Preparation of security listings of insurance records.
- (6) Development of insurance policy statistical data.

In September 1960, conversion to ADP of the approximately 3.7 million NSLI accounts in Philadelphia was completed. About 300,000 USGLI accounts in Philadelphia remained on a manual EAM system, as did about 1.1 million NSLI accounts in Denver, and 1 million NSLI accounts in St. Paul. Plans for conversion of the Denver and St. Paul accounts were deferred pending a review of Philadelphia's ADP operations and a reexamination of the adequacy of the current conversion plans. Our findings were these:

#### PHILADELPHIA OPERATIONS

Computer program refinements, clerical improvements, and operational experience with the new system provided the ingredients for a rapid recovery from our conversion backlogs and problems. Before the end of 1961 the elapsed processing times for high priority items were equal to or less than preelectronic computer operations. Philadelphia ADP savings would start accruing in fiscal year 1962, recoup all costs—including preparation and installation costs—in fiscal year 1966, and show a cumulative savings through fiscal year 1966 of approximately \$253,000.

#### PRESENT CONVERSION PLANS

The original plan was inadequate and required modification for the following reasons:

- (1) Service to policyholders (daily operations) in western offices would not meet current standards. The card-to-card method of transmission is slow and the volume of data that can be sent limited. The use of air freight (or express) of critical items westward was almost certain to add at least 1 day to the processing cycle of many critical items.
- (2) During conversion, service to policyholders was suspended for 5 days or more—an excessive period of time.
- (3) Present plus planned ADP applications would exceed the capacity of the IBM model 705-III computer.
- (4) Dissimilar management responsibility and operational control between Philadelphia and western offices is undesirable.

Having confirmed the feasibility of ADP, an alternate plan has been adopted. Primarily, this new plan revolves around office organization and multiple small-scale computer installations linked to a large-scale computer in a data processing center through wire transmission of magnetic tape data. Due to its program compatibility and early availability, the overall costs of an IBM model 7080/1401 computer system were significantly lower than the costs of comparable equipment. The concept of this new plan is as follows:

- (1) A data processing center (DPC) has been established. This center is physically located in the Philadelphia Insurance Center and is responsible to the Chief Insurance Director. It acts as a "service bureau" in processing work of the field stations. Control and responsibility for operation of the IBM model 7080 and data transmission is in the DPC.
- (2) An IBM model 1401 and data transmission system will be installed in each of the western offices. All printed and punched output for those offices will be transmitted from the DPC and will be produced in the western offices. The Philadelphia Insurance Center operations will be the same, except that a data transmission system will not be required.

(3) The DPC will maintain a separate master file for each of the three insurance centers. These files will be processed independently for each office. This will permit maximum flexibility in scheduling operations and maintaining jurisdictional responsibility and control.

(4) The computer conversion cycle will be reduced to about 1 day. Thus, service to the policyholder will continue almost without interruption.

The new plan was selected after consideration of many alternate plans. We are confident it will eliminate the inadequacies of our present plan and exceed our cost-service objectives for existing and future workloads. A lease versus purchase study shows that purchase results in the greatest overall advantage. Our plans for acquisition of the electronic computer systems are—

(1) The 7080 system will be leased with option to purchase until such time as funds are available to purchase the equipment.

(2) We purchased one 1401 system installed in the Philadelphia Insurance Center in June 1962 and plan to purchase the second system in fiscal year 1963.

(3) We plan to purchase the recently installed Denver 1401 system in fiscal year 1963.

(4) A 1401 system is currently being installed in the St. Paul Insurance Center. Our plans do not include purchase of this system until we have reviewed our total equipment requirements after completion of conversion.

It is our estimate that under the new plan, savings will start accruing in fiscal year 1964. Beginning in fiscal year 1965, savings will accrue at approximately \$3 million annually and exceed cumulative costs in fiscal year 1966. In fact by 1970, we forecast a cumulative savings of almost \$19 million plus the ownership of one large and three small solid-state computers. The following table and chart present the cost projections and new plan for operations under our automatic data processing system concept.

The IBM 1401 and data transmission systems in Denver have been installed and are operational. Conversion of the 1.1 million NSLI accounts in Denver started September 5, 1962, and will be completed in the current fiscal year. We now plan to begin conversion of the 1 million NSLI accounts in St. Paul early in November 1962, with completion also scheduled for fiscal year 1963.

*Department of Insurance, comparative costs with and without ADP, fiscal years 1959-70*

[In thousands]

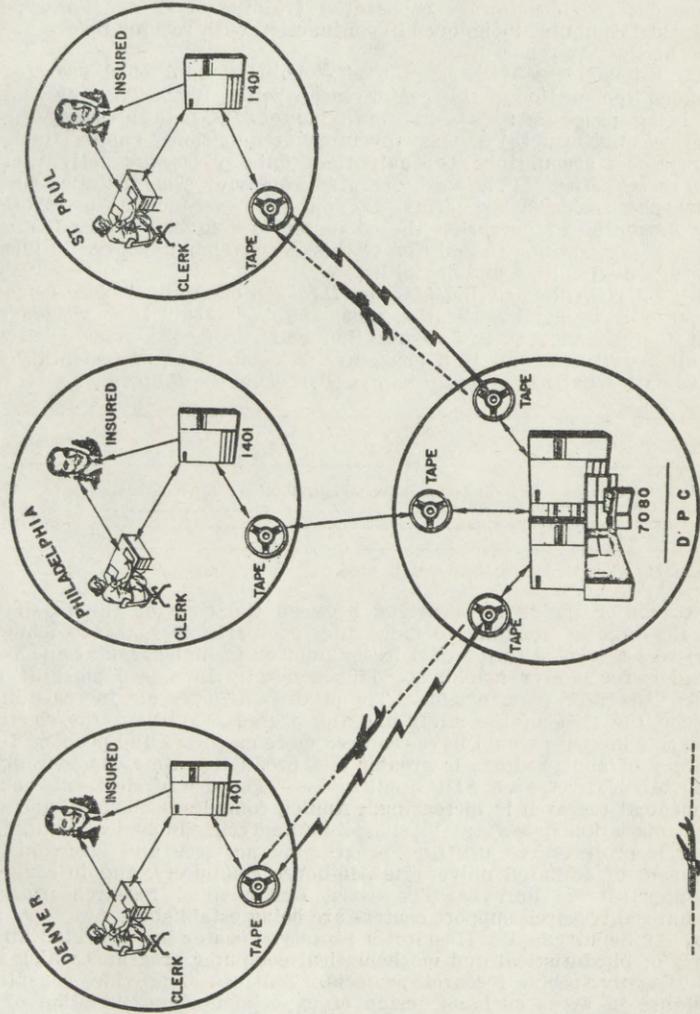
Fiscal year	Workload		Cost		Gain (+) or loss (-) with ADP	
	Number of policies	Percentage decrease	With ADP	Without ADP	Fiscal year	Cumulative
1959.....	6,439	( <sup>1</sup> )	\$24,537	\$23,932	-\$605	<sup>2</sup> -\$721
1960.....	6,363	1.18	25,766	23,678	-2,088	-2,809
1961.....	6,272	2.59	25,939	24,528	-1,411	-4,220
1962.....	6,034	6.29	23,458	23,543	+85	-4,135
1963.....	5,949	7.61	<sup>3</sup> 24,369	22,570	-1,799	-5,934
1964.....	5,870	8.64	19,046	22,142	+3,096	-2,838
1965.....	5,790	10.08	17,932	21,592	+3,660	+822
1966.....	5,681	11.77	17,507	21,222	+3,715	+4,537
1967.....	5,579	13.36	17,175	20,862	+3,687	+8,224
1968.....	5,491	14.72	16,854	20,523	+3,669	+11,893
1969.....	5,404	16.07	16,751	20,343	+3,592	+15,485
1970.....	5,317	17.43	16,531	19,989	+3,458	+18,943

<sup>1</sup> Base year.

<sup>2</sup> Includes prior years costs.

<sup>3</sup> Includes purchase of computers.

NEW PLAN



BACKUP AND PEAK LOADS, LOW PRIORITY OUTPUT  
LOW PRIORITY OUTPUT

## MEDIUM AND SMALL SCALE ELECTRONIC COMPUTER INSTALLATIONS

In addition to the above large-scale computer systems the VA has installed smaller systems. Each of these systems required a full-fledged feasibility study prior to acquisition. The systems are described in the following paragraphs:

(1) *VA hospital, Omaha, Nebr.*—A small scale electronic computer system (IBM 1620) has been in operation at this hospital since November 1, 1960. This computer is of the scientific and engineering type, and is used as a research tool, on-and off-line, with the atomic reactor in use at the hospital. A formal training agreement provides for the cooperative training of 12 Air Force personnel in analytical computer techniques in conjunction with reactor research. This computer has been purchased.

(2) *VA center, Los Angeles, Calif.*—An IBM 1401 card operated computer has been in operation at this center since April 1, 1962. The following activities are being processed: (a) an approximate 6,000-man biweekly payroll; (b) fiscal accounting; (c) supply inventory, requisitions, supply fund, etc.; (d) dietetic cost accounting; (e) outpatient data processing activities; (f) engineering statistics. This card operated computer was installed on an equipment substitution basis. This was purely an economic justification. After only 3 months of operation the computer system has realized a net savings of \$1,421 per month. In addition to this, service has improved in terms of time, accuracy, availability, and flexibility.

(3) *VA central office, Washington, D.C.*—In our central office a medium scale computer has been in operation since October 1958. It is used as a complement to the punched card installation and performs a wide variety of tasks for all department and staff elements. A comparison of feasibility study estimates with what has actually happened reveals the following:

	Estimated	Actual
Installation to breakeven including preparation and installation costs (months).....	18	37
Annual EAM rental reduction.....	\$57,382	\$52,476
Annual operator salary reduction.....	\$46,795	<sup>1</sup> \$76,656

<sup>1</sup> Includes savings through reduced overtime use.

Two major incidents occurring between the time of the feasibility study and the present combine to cloud any comparisons that are made. One of these was the substitution of a lesser number of higher rental and faster EAM machines for slower machines. This generally increased machine rental but reduced operator requirements. The other is a 23-percent increase in workload between the time of the study and the present. Without the electronic computer this increase would have required more machines and people. In addition, accuracy of end products is greater and production time considerably reduced.

(4) *Medical research ADP applications.*—The use of electronic computers in VA medical research is increasing. Analog computers, devices, and converters are in operation in several VA hospitals analyzing biological data. Numerous research projects are utilizing programing services and electronic computer equipment of affiliated universities, in-house computers, and in some instances computer service bureaus. To assist our medical research program three regionalized research support centers are being established.

(a) At Sepulveda VA Hospital a prototype center has collected an extensive library of biostatistical and mathematical computer programs which are adaptable to many specific research projects. This center provides consultation and assistance in areas such as design of experiments and adoption of available electronic instruments. During the past year the center has been involved in one or more phases of more than 75 individual research projects. The ADP systems utilized are tabulating equipment and contractual IBM 7090 scientific type computer services.

(b) A second center is now in process of organization at Hines VA Hospital in Chicago. The emphasis at this center will be on biostatistical data processing with a strong educational program for selected VA medical investigators. This center will utilize an in-house smaller scientific type computer.

(c) A third center at VA Hospital, Washington, D.C., is now organized and deeply involved in analysis of cardiovascular analog data (vectorcardiograph: phonocardiograph) by analog-digital conversion and digital computer analysis utilizing Bureau of Standards equipment (IBM 7090). This center will continue to specialize in analog signal analysis, electronic instrumentation, development of mathematical formulas for reduction and processing of medical data and telecommunications of physiological data.

In addition to the above, a major research and development project investigating the use of electronic computers to automate patient data is under way at the Los Angeles VA Center. We are investigating the use of computing devices to acquire, reduce, store, update, summarize, and display the myriad bits of data generated by a patient in a ward or clinic to serve the immediate needs of the medical team. Our accomplishments to date have included the simulation of a significant portion of a small hospital in the Los Angeles Center's medium scale digital computer. Plans for fiscal year 1963 call for implementation of at least some part of the simulated study into an operational environment.

In the scientific application of electronic computers, the VA is maintaining close contact with other governmental agencies, universities, research and development groups, and the electronics industry. Increased emphasis is being placed on the education of the clinician and other ancillary personnel in our medical care organization to stimulate interest in the understanding and better application of newer electronic instruments including computers.

(5) *Common services.*—We are in the process of designing and testing an agencywide integrated electronic computer pay administration system. As by-products, this system is designed to produce the information required for personnel statistics and updated fiscal records. The computer programs are compatible with the agency's computer equipment at the data processing centers. A test of the system is scheduled for early fiscal year 1963. An integrated system for management of supply and related fiscal data is also being designed for eventual electronic computer processing.

## II. EFFECTIVENESS OF THE POLICIES OUTLINED IN BUREAU OF THE BUDGET CIRCULAR No. A-54

Exhibit A is the revised VA-ADP policy which implemented the provisions of Circular No. A-54. We believe the most effective portion of the circular pertained to the mode of equipment acquisition. The timing of the circular was most opportune for the state of the art had stabilized to a point where a decision could be made between lease versus purchase of equipment. The VA has determined it would be advantageous to purchase its large-scale computers and several of its medium- and small-scale computers.

The sharing of ADP equipment is receiving special emphasis at this time. This not only applies to electronic computer installations but to punched card installations as well. A major study is under way involving the development and implementation of EAM sharing plans. Our objective is to achieve economical and efficient utilization through sharing or through consolidation of existing EAM installations. At the present time we are conducting a test in the San Francisco area, where the San Francisco regional office is providing ADP services to four VA hospitals in the same area. Electronic computer sharing is also practiced in the VA. As previously mentioned, common service applications are being designed to be compatible with the agency's computer equipment. Medical administrative operations and related statistical requirements are currently met at the central office level by programs written for the central office medium scale computer. A magnetic tape file of approximately 40,000 VA cancer cases has been developed for IBM 7080 processing (file maintenance).

This file has been created for the National Cancer Institute end result study of which the VA is a major participant. Our two major computer operations—benefit payments and insurance accounting—continually exchange machine processable (magnetic tape) information. We furnish machine processable data to the Treasury Department for the production of checks on their own ADP equipment. The VA is also participating in the Bureau of the Budget experimental plan for interagency sharing of electronic computer equipment in the Philadelphia area.

## EXHIBIT A

## CHAPTER 3. AUTOMATIC DATA PROCESSING

## 301.01 PURPOSE

This chapter prescribes VA policy on—

- a. The development and application of automatic data processing (ADP) systems to VA operations;
- b. The selection of ADP equipment; and
- c. The determination as to the means whereby such equipment will be acquired.

## 301.02 SCOPE

For the purposes of this chapter, ADP equipment is defined to include the following:

- a. Electronic digital computers.
- b. All peripheral or auxiliary equipment used in support of electronic computers.
- c. All punched-card equipment, irrespective of use.
- d. Data transmission or communications equipment, programmed typewriters, and optical scanners procured primarily for use with an ADP system. (NOTE.—VA policy for telecommunications is prescribed in ch. 6.)
- e. Analog computers are covered only when computers of this type are being used as equipment peripheral to a digital computer. Items of ADP equipment that are manufactured for the Government under a developmental contract are not affected by the policies stated herein.

## 301.03 RESPONSIBILITY

a. The Assistant Administrator for Management Services has the staff responsibility to—

(1) Provide the guidance and coordination of effort to obtain a uniform integrated agency approach in contrast to several separate departmental approaches for processing data on ADP equipment.

(2) Coordinate and where necessary initiate ADP plans and programs affecting areas of common interest; and recommend to the Administrator which department or staff element shall be assigned the responsibility in areas of common interest.

(3) Recommend to the Administrator, as required, action on all proposals for the acquisition of ADP systems.

(4) Continuously review the ADP activities within the VA and appraise their progress and their effectiveness and economy of operation.

(5) Conduct continuing review of the agency organization as affected by existing and planned ADP systems. Recommend to the Administrator such organizational changes which will result in the most effective performance of the VA mission.

(6) Provide adequate research on new developments in advanced techniques in ADP systems and equipment.

(7) Provide the departments and staff elements with the necessary liaison and assistance by providing the means and coordinating the dissemination of information on the current status and future plans of ADP applications in the VA.

b. The heads of departments and staff offices will be responsible for—

(1) Development of ADP programs and plans which will meet the needs of their organization and be consistent with the agency objective of an orderly and time-phased evolution toward an integrated ADP system for the VA.

(2) Conducting continuing review of their organization as affected by existing and planned VA automatic data processing systems—both within and external to their organization—and recommend organizational changes which will result in the most effective performance of their mission and of the agency's mission.

(3) Minimizing the cost of ADP applications. This includes the joint use or time sharing of equipment where feasible, and minimum duplication of applications development, feasibility studies, and equipment selection.

(4) Assuring that proposals for acquisition of ADP systems have valid justification and conform with the policies set forth in this chapter; and that acquisition of equipment is in accordance with agency procurement policies in MP-2, part II.

(5) Continuing review of their existing and planned ADP systems to assure effectiveness and economy of operations.

(6) Keeping current on new developments in ADP equipment and techniques to take full advantage of improvements as they become available.

(7) Providing information to and coordinating actions on current and planned ADP applications with other departments, Assistant Administrator for Management Services, and other concerned staff elements, to insure agencywide completeness and consistency of data processing applications, procedures, and progress in attaining the goal of an integrated agency system.

#### 301.04 POLICIES

a. An agencywide as opposed to an individual department or staff office approach will be made in determining the part electronic data processing systems shall play in VA operations. To facilitate this agencywide approach a VA data processing center was established in Chicago, Illinois. Any other ADP installations are considered as adjuncts to this center.

b. ADP systems shall be used whenever this will result in the most economical or effective operation; or where the use of ADP equipment will produce needed data or information not possible to obtain through other means. Examination of other methods of data processing will be made when analyzing or developing systems to determine whether ADP is best for the purpose.

c. Studies concerning data processing and information needs will give full consideration to agencywide requirements—as well as individual department and staff office needs—and the use of such techniques as integrated data processing, and management by exception.

d. ADP plans and programs will not be restricted by existing organizations. Rather, the VA organization will be continually studied and revised as necessary to provide the most effective performance of the VA mission under changing conditions caused by technological advances.

e. Planning for acquisition of ADP systems will include provisions for orientation and training; operations at alternate locations in the event of emergency or disaster; and that ADP equipment will not be accepted for delivery until it has been determined through a readiness review that the using element will be prepared to employ the equipment productively as soon as it becomes operational.

f. Adverse effects on personnel resulting from installation of ADP systems will be minimized wherever possible through attrition or retraining and reassignment in preference to reduction-in-force procedures.

#### 301.05 FEASIBILITY STUDIES

a. As a feasibility study in a major area of activity can be a prolonged and expensive operation, such studies require the prior approval of the Administrator. Studies leading to a decision on ADP equipment must establish—

(1) The essentiality of the operation to be performed.

(2) That the systems and procedures to be employed are designed to achieve the highest practicable degree of effectiveness with optimum efficiency and operational economy.

(3) That there will be no deleterious effect, directly or indirectly, on the basic VA mission of service to veterans and their dependents.

(4) That the agency's total data processing requirements have been given consideration.

b. Realistic and comprehensive cost estimates must be developed to include present cost and proposed cost together with anticipated savings, if any; and other advantages such as improvements in service, research potential, management information, etc.

c. The scope of a feasibility study must be related to the magnitude of the problem under consideration. A full scale feasibility study is only necessary in a relatively major area of activity. Smaller problems can be dealt with under the principles, though not necessarily all the provisions, of the guidelines.

NOTE.—Guidelines for planning and conducting studies for the development of system specifications and for equipment evaluation and selection are contained in Bureau of the Budget Bulletin No. 60-6, "Automatic Data Processing Program of the Executive Branch: Studies Preceding the Acquisition of ADP Equipment," dated March 18, 1960.

## 301.06 EQUIPMENT SELECTION

a. Selection of ADP equipment includes selection of initial equipment; selection of equipment additional to that installed; selection of replacement equipment; and modification of equipment to increase memory capacity, computational capability, speed of input or output, etc. In all these circumstances, the following policies apply.

b. Equipment shall be shared when, without offsetting disadvantages, this will provide better utilization of equipment and personnel. Every effort will be made to use existing (including on-order) VA equipment and service facilities prior to a decision to acquire additional or new equipment. Feasibility studies will reflect full consideration of the sharing of equipment, for example:

- (1) For operations which cannot justify separate ADP installations;
- (2) Where lower overall costs will result for the work to be performed, or
- (3) Where more powerful equipment would better meet the agency's foreseeable needs.

c. The selection of ADP equipment will not be made until system specifications are available to serve as a basis for selection. The term "system specifications" means (1) the delineation of the objectives which the system is intended to accomplish, (2) the data processing requirements underlying that accomplishment, i.e., a description of the data output and its intended uses, the data input, data files, volumes of data, processing frequencies and timing, and (3) such ADP equipment capabilities as may need to be identified. System specifications will be designed to insure free and open competition among equipment manufacturers.

d. The officials responsible for making decisions on the selection of ADP equipment will assure that the selection process accords equal opportunity and appropriate consideration to all manufacturers who offer equipment capable of meeting the system specifications. In this connection, the selection process may be facilitated by written invitations to manufacturers in accordance with VA procurement regulations (MP-2, pt. II), to submit proposals as a means for obtaining information regarding the capabilities of ADP equipment to meet the system specifications.

e. Two prime factors will be considered in the selection of equipment:

- (1) The capability to fulfill the system specifications, and
- (2) The overall cost in terms of acquisition, preparation for use, and operation.

The term "overall cost" as used in this paragraph, includes such cost elements as personnel, purchase price or rental, maintenance of purchased equipment, site preparation and installation, and programming and training. When ADP equipment of two or more manufacturers meets the system specifications, the equipment which represents the least overall cost to the VA will be selected. Factors which do not relate directly or indirectly to the capability of ADP equipment to meet system specifications or overall costs normally will not be included in the consideration unless a conclusive judgment cannot be made on the basis of the two prime factors.

f. Computability between ADP systems in itself is not a determining factor. Rather, the consequences of incompatibility must be expressed in terms of such costs as will be expressed in terms of such costs as will be incurred and/or impairments to service. These considerations shall be included in the development of overall comparisons:

- (1) For ADP system replacement.
- (2) Where interchange of data with other existing systems is a requirement.
- (3) Where there is involved the question of availability of backup arrangements.

## 301.07 EQUIPMENT ACQUISITION

a. Heads of departments and staff offices are authorized to approve the acquisition of the following types of ADP equipment and services (including those on a service bureau basis) as their needs require and within the stipulation of this directive:

- (1) Punched-card equipment and services.
- (2) Programmed typewriters.
- (3) Analog computers and services.
- (4) Minor changes to a previously approved computer installation where there is not a significant variation in the configuration of the previously approved system (for example, substitution of IBM 1401 series for 705 input/output devices); and where the change will not increase the purchase or rental cost to a point where it is in excess of \$2,000 per month more than it was at the beginning of the fiscal year.

(5) Digital computer services for program testing.  
 (6) Digital computer services that are a necessary part of an approved medical research project, where the funds to pay for the computers or services have been provided in research (program 8200) funds.

b. All other acquisition of ADP equipment or services shall be made with the approval of the Administrator or Deputy Administrator. To expedite staff action and to make use of available technical assistance, a representative of the Office of the Assistant Administrator for Management Services should be requested to assist in the development of the request for approval of electronic digital computers and data communications equipment.

c. Most commercially available ADP equipment can be acquired by purchase or by lease, with or without an option to purchase. All ADP equipment transactions are subject to prevailing VA policies, and laws and regulations governing procurement by Federal agencies.

d. The method of acquiring ADP equipment, where lease and purchase modes are available, will be determined after careful consideration of the relative merits of all methods available (purchase, lease, or lease with option to purchase). The method chosen will be that which offers the greatest advantage to the Government under the circumstances pertaining to each situation. In this connection, the following general guidelines will be taken into account:

(1) The purchase method is preferred when all of the following conditions exist:

(a) The system study which preceded the selection of the equipment has established a reasonable expectancy that the ADP equipment under consideration can be successfully and advantageously used.

(b) A comparative cost analysis of the alternative methods of acquisition indicates that a cost advantage can be obtained by the purchase method in 6 years or less after the date of delivery. The detailed procedure for making such an analysis will be contained in operating instructions.

(c) The capabilities of the ADP equipment will continue to be needed and will be sufficient to satisfy the system requirements, current and projected, for a period beyond the point in time at which the purchase method begins to provide a cost advantage. The possibility that future technological advances will render the selected equipment comparatively obsolete before the cost advantage point is reached should not rule out purchase if the selected equipment is expected to be able to satisfy the system requirements.

(2) The lease with option to purchase method is indicated when it is necessary or advantageous to proceed with the acquisition of the equipment that meets system specifications, but it is desirable to defer temporarily a decision on purchase because circumstances do not fully satisfy the conditions which would indicate purchase. This situation might arise when it is determined that a short period of operational experience is desirable to prove the validity of a systems design on which there is no previous experience, where decisions which might substantially alter the system specifications are imminent, or where there are budgetary limitations.

(3) The lease method without option to purchase is indicated only when it is necessary or advantageous to proceed with the acquisition of equipment that meets system specifications, and it has been established conclusively that any one of the conditions under which purchase is indicated is not attainable.

### 301.08 DOCUMENTATION

System studies (sometimes referred to as application studies, feasibility studies and by other terms), system specifications, and readiness reviews will be fully documented. Decisions on the selection of ADP equipment and on the method of acquisition also will be documented to reflect adequately the considerations taken into account and the basis for the decisions.

## III. MANPOWER UTILIZATION IN THE INITIAL PLANNING INSTALLATION, AND OPERATIONAL PHASES, AND LATER IN CURRENT PLANNING AND ROUTINE OPERATIONS

In personnel matters relating to the use of automatic data-processing equipment in the Veterans' Administration, we believe the intent and spirit of the recommendations of your subcommittee, contained in the August 31, 1960, report of the House Committee on Post Office and Civil Service, are being carried out.

The Assistant Administrator for Personnel has, at all times, been included in the general planning for use of automatic data-processing equipment. Since

mid-November, when the present Assistant Administrator for Personnel entered the position, he has been briefed through the Administrator's top staff meetings, and through individual briefings by Department representatives, on the current status and future plans for automatic data processing in the Veterans' Administration.

In the operating departments, the directors of personnel service, field station personnel officers, and other operating officials having personnel management responsibilities, have played an active role in planning for the personnel adjustments and for the retraining of personnel necessary for automatic data-processing applications, with full regard for the human factors involved in the transition to new modes of operations.

As pointed out at the March 4, 1960, hearing of this subcommittee, personnel policies for conversion to automatic data processing were established for the practical protection of the job security of the regular Veterans' Administration employees who might be affected by the prospective new modes of operation in insurance and veterans' benefits activities. Vigorous and successful efforts have been made to accomplish staff reduction by normal attrition, reassignments, interstation transfers, outplacement (other agencies and private employers), rather than by forced separations.

"Freezes" on hirings were imposed in selected areas for those job categories in which surpluses might develop. There was an effective interchange between stations within departments, and between stations of different departments, regarding employment needs and anticipated needs for finding job opportunities for employees becoming surplus because of changes in workload and modes of operations. Outplacement assistance was furnished employees who could not be reassigned, or were unwilling to accept transfer at Government expense. (The methods used by the Philadelphia Insurance Center in the period from January through April 1962, are an exemplary example of this method.) New appointments, when necessary, were effected on a temporary basis, and terminated when workload conditions permitted. This made it possible to retain the regular force as long as possible, and plan for the reassignment, transfer, and retraining of employees in the regular work force. Where practical, overtime was used in lieu of hiring additional employees in order to complete essential work so that positions might be saved, through normal attrition expectancy, for employees who were in positions that might eventually be surplus to anticipated future needs.

In the Department of Veterans Benefits conversions to automatic data processing have been effected at 66 locations with compensation and pension activities. During the conversion period which extended considerably beyond the original target date, personnel adjustments for employees affected by the conversion were made with virtually no reduction in force. As the first conversion date approached and subsequently, managers of field stations were reminded of the agency personnel policies and their responsibilities for exerting every effort to effect suitable placements of employees. Because of the delay in the conversion schedule, workload increases in some program areas, and changes in functional responsibility between stations and between organizational elements within stations, it was possible to make most personnel adjustments by means other than reduction in force. During the 30-month period since conversion began in January 1960, a saving of 614 positions has resulted directly from our conversion to ADP. This must be, of course, partially offset by a staff of approximately 150 at the Data Processing Center at Hines, Ill. Only three employees were separated by reduction-in-force actions as a result of ADP. Positions were available at other stations for these three persons, but they were unwilling to accept transfer to other locations.

In the case of the Philadelphia Insurance Center, the personnel adjustment problem was of a different order. Employees directly affected were at one location rather than at numerous locations, with a relatively few surplus positions at each. Nevertheless, the objective of maximum avoidance of forced separations was achieved with considerable success, considering the extent of anticipated personnel adjustment that was forecast several years ago. At this location there was a decrease of 816 employees in the period from July 1, 1959, through June 30, 1962. Of this decrease, 398 was the result of automation. The remainder 418 was due to a variety of factors: Declining policy load; the termination of temporary personnel hired for special projects; improvements in procedures and organization; and improved effectiveness.

This reduction of 816 employees was accomplished almost entirely without recourse to "RIF." Only 69 employees—including 10 refusing reassignment to

lower grade—were separated by reduction in force on April 30, 1962. This reduction in force was the result of realignments within the Philadelphia Insurance Center, and stemmed from known and anticipated reductions in continuing workload. Although this reduction in force was not directly attributable to conversion, 90-day advance notices of reduction in force were furnished. The use of temporary employees for special nonrecurring workload projects and additional manpower needed during the parallel operations during the conversion period was a major factor in protecting the job security of the regular work force at the Philadelphia Insurance Center over a 27-month period.

Under agency personnel policies for conversion to automatic data processing, established February 19, 1959, positive steps were taken to insure that field station managers were informed well in advance of conversion plans. The Department of Veterans Benefits and the Department of Insurance have used various media (brochures, films, newsletters, posters, etc.) to convey information about data processing and data processing plans to employees, both non-supervisory and supervisory. In turn, field station managers, following the headquarters example, have used a variety of local media to keep employees informed about general automatic data processing plans at individual field stations and the prospective effects upon staffing plans.

In general, relatively few new employees have been hired for purposes of operating the ongoing automatic data processing systems for compensation and pension accounts at the Hines Data Processing Center, for insurance accounts at the recently activated Philadelphia Data Processing Center, and for miscellaneous data processing operations at the central office. There was recognition at the outset of (a) the dearth of trained people in this field, (b) the close tie-in between knowledge of existing manual and mechanized operations and the changeover to new modes of operations, and (c) the essential need for protecting job security of the regular VA work force. Retraining to equip Veterans' Administration employees for new methods of operations started well in advance of actual conversion; continues as additional conversions are planned; and is extended, as necessary, to keep employees up to date with changes occurring in "hardware" (equipment) and "software" (programming). Recruitment from within the Veterans' Administration has been the primary means of developing systems analysts, programmers, and equipment operators, utilizing the best available screening and selection tools for identifying employees with the aptitudes and potential for such jobs. Expressions of employee interest, abilities, and aptitudes are considered in selecting employees for training and reassignment to supporting operational jobs in functions directly related to automatic data processing applications. From the beginning of feasibility studies through actual changeover to automatic data processing, employees on duty have been given first consideration for new jobs that have evolved.

The gradual phasing-in of automatic data processing applications has provided the leeway—the needed time—for the training and development of personnel on the rolls for these new positions. In this relatively new field of work there is a general shortage of experienced personnel. Private employers, as well as other Government agencies and departments, have generally recognized that persons from within their organizations would have to be trained and developed for the key jobs that are evolving, viz, systems analysts, programmers, and systems administrator. In the light of the vigorous recruitment efforts of other organizations, both within and outside the Government to obtain experienced ADP personnel, the Veterans' Administration has experienced, fortunately, relatively little turnover in these key jobs. This is believed to stem, in part, from the method of filling such jobs from within with employees having "personal investments" in Government career jobs. Another factor believed to be operating is that employers actively recruiting for ADP personnel are seeking persons with a combination of both ADP experience and training in specific professional or scientific fields, whereas, to date, most VA ADP personnel have not been drawn from such fields. Like other employers, the Veterans' Administration, too, experiences difficulties in obtaining such personnel for its scientific and research applications. This is due to the long-standing shortages of scientific and professional personnel, and the respective salary opportunities for such personnel in the Federal Government and the private sector of the economy (industry, universities, research foundations, etc.). As computer applications are advanced at support centers for medical research in the Veterans' Administration, these difficulties are likely to become more acute.

In summary, currently, and over the past several years, the personnel turnover situation for key ADP jobs has been favorable. There is no firm basis upon

which to forecast what our future experience might be. We hope that the challenge of a career job in a relatively new career field, a progressive management climate, and modern personnel administration practices will continue to make the Veterans' Administration an attractive employer for key ADP personnel.

Summing up our total experience with agency policies adapted for coping with the human aspects of the ADP program, we believe those personnel policies have served very well for the various staffing, training, and personnel adjustment problems that have arisen over the past several years. As we proceed with further planning for ADP, it is our intention to continue to emphasize, at all levels of management, the importance of practical planning for protecting the job security of employees in the regular work force. We plan to continue to make maximum use of attrition, reassignments, interstation transfers, and outplacement to minimize the forced separation of competent employees as staffing needs decline in specific program areas, as already indicated by projected workloads in long-range plans.

#### IV. EFFORTS TO INCREASE USE OF BYPRODUCT STATISTICAL DATA IN MANAGEMENT DIVISIONS

VA computer applications have been designed to provide byproduct data for both management and fiscal purposes. Briefly, this was accomplished by building into our ADP master records all available significant data concerning the individual, whether it be required for accounting purposes or whether the data was of statistical significance. In addition, computer programs for updating the master records have the ability to automatically accumulate totals of the various types of change actions. The following are examples of these concepts:

(a) *Disability and death compensation pensions.*—The master records at the Hines, Ill., Data Processing Center combine the payment records and the statistical records previously maintained as separate punched card files. During the conversion period the computer automatically produced statistical information for each converted regional office and in total for all such offices. This information permitted management to take immediate action to resolve out-of-line situations and improve procedures for future conversions. After conversion the Data Processing Center will be a single information point for compensation and pension data. It is pointed out that once the data has been captured in machine processable form it is not a difficult task to generate the data desired as byproducts of routine operations. We now have the ability to economically and quickly develop statistical information; i.e., a breakdown of payments by State of payee residence; or a breakdown of disabilities for which compensation is paid by specific disability, veteran's age, etc.

(b) *Insurance policies.*—The master policy records at the Philadelphia Data Processing Center combine previous manual records of premium payments and punched card records used for premium billing for all policies. They also incorporate the punched card records of policy liens and loans and of dividend deposits for the policies involved. The master records for the converted policies contain the information needed for actuarial computation of basic policy reserves. Because of the complex nature of such computations it was determined not to attempt the use of split information sources during the conversion period; and separate punched card records are being continued for actuarial purposes during that period. Systems studies are now underway with the aim of eliminating the actuarial punched card files for World War II and World War I policies shortly after conversion of each of those policy groups is completed.

(c) *Insurance payments.*—About one-half million monthly payments will be placed on the Philadelphia computer following complete conversion of the World War II policies. The master computer records for the payment process will combine separate punched card files used for payment and statistical purposes in much the same manner as for the compensation and pension payments.

The master payment records will contain information needed for computation of actuarial reserves for disability benefits and for future payments on matured policies.

(d) *Employee payrolls.*—The computer system under study includes master record information which would eliminate the need for the separate punched card "personnel statistics" files now maintained. It is designed to provide byproduct personnel statistical data and updated fiscal records and information.

## V. PROGRESS OF THE INTERAGENCY COMMITTEE ON AUTOMATIC DATA PROCESSING AS A FEDERAL CLEARING HOUSE FOR THE EXCHANGE OF EDP INFORMATION

The Interagency Committee provides a useful communications channel for the interchange of EDP experience, problems, and information between Government agencies. Through presentation, panel discussion groups, and round-table discussions, Committee members have identified and recommended causes of actions to deal with problems of mutual concern. A most important by-product of the meetings and conferences has been the personal contacts that have been made which opened doors for detailed technical discussions on specific problems.

When the Committee was established in 1957, there was little EDP experience in Government or private industry. Committee members were called upon to develop and participate in orientation and training courses. As more agencies gained EDP experience and the Committee membership increased, subcommittees and task forces investigated specific problems and prepared reports as to their findings and recommendations. We have found reports on such subjects as: "Rental Versus Purchase of ADP Equipment"; "Guidelines for Acquisition of Equipment"; "Interagency Sharing of Equipment," helpful and interesting.

As we learn more about electronic computer systems and devices, the need for interchange of ideas and information increases. We believe the Committee will continue to improve as the medium for the exchange of EDP information.

In closing, we want to express our appreciation for the opportunity to appear here today. The VA has learned much from its past experiences and is confident it can effectively apply EDP in the future. It is our conviction that the full value of these powerful tools will be in their application to medical research and clinical evaluation. Success in these areas will benefit not only the VA but ultimately all of mankind.

Mr. SCHMOLL. You have our prepared statement, Mr. Chairman. It certainly is a pleasure for us to be here this morning. I would like briefly, because of the time limitation, to highlight our statement.

First, I would like to comment on our disability and death benefit payment programs, which are a responsibility of our Department of Veterans Benefits. This ADP application is processed on a large-scale electronic computer in the VA Data Processing Center at Hines, Ill. The system was installed in January 1960, and will process the monthly issuance of approximately 4,600,000 benefit checks to veterans and their beneficiaries. It has been designed to provide check payment data in machine processable form to the Treasury Department for automatic production of checks and for presorting of checks by destination code.

Mr. HENDERSON. I might ask Mr. Mahoney if anybody in the Government knows how many checks we are writing every month.

Mr. MAHONEY. We are writing roughly 460 million checks annually. This would be close to 40 million monthly. It is a tremendous amount.

Mr. HENDERSON. About 10 percent is written by the VA.

Mr. SCHMOLL. We determined the advantage of purchase over lease of the equipment we have at Hines, and the purchase was made in June of 1962. We are happy to announce that we have just completed the conversion of our last station, the Veterans' Benefits Office here in Washington, D.C.

This system has provided a great many improvements, and our conversion to automatic data processing has been effected now at 66 locations with compensation pension activities. During the period from January 1960 to June 1962, we realized a net saving of 464 employees, 614 in field stations, offset by a staff of 150 in our data processing center at Hines. In almost every instance it was possible

to make any necessary personnel adjustments by means other than reduction in force. In fact, only three employees in functions directly affected by automation were reduced by reduction in force, and they were offered positions at other stations but declined transfer to other locations. All other adjustments were accomplished through attrition or through placement in vacant positions.

Our savings in this area will begin in fiscal year 1963, our break-even point in fiscal year 1966, and by the end of fiscal year 1970 our cumulative net savings in the Department of Veterans' Benefits will exceed \$7 million.

Next I should like to comment on our VA insurance ADP application. In July 1959, a large-scale computer was installed in the Philadelphia Insurance Center, and by September 1960 conversion of approximately 3.7 million national service life insurance accounts in Philadelphia was completed. About 1.1 million accounts in the Denver office and 1 million in St. Paul remained on a manual EAM system. We had certain difficulties with conversion backlogs and other problems, so we deferred our plan for conversion of Denver and St. Paul accounts pending a review of our Philadelphia ADP operation. We did make some change in plans. We placed in Philadelphia a faster transistorized computer to handle present and planned ADP applications more efficiently and economically, and also made firm plans for the conversion of the St. Paul and Denver accounts.

We have completed training the Denver employees, and the conversion of the accounts there was resumed in September of this year. We are presently training St. Paul employees at the Philadelphia Center in preparation for the resumption of conversion in November. We expect to complete these conversions this fiscal year.

At the Philadelphia Insurance Center there was a decrease of 816 employees in the period from June 1, 1959, through June 30, 1962. Of this decrease, 398 were the result of automation. The remainder, 418, was due to a variety of factors—a declining policy load, termination of temporary personnel hired for special projects, improvement in procedures and organization, and improved employee effectiveness. This reduction of 816 employees was accomplished with minimum recourse to reduction in force. In fact, only 69 employees, including 10 refusing reassignment to lower grades, were separated by reduction in force on April 30, 1962.

Our savings will start accruing in fiscal year 1964, and we estimate a \$3 million annual savings starting in 1965 and will exceed the cumulative cost of this program in fiscal year 1966.

Since our testimony before the subcommittee in March 1960, we have made progress in automation in the Department of Medicine and Surgery. On April 1, 1962, a medium-scale computer system was installed at the VA Center, Los Angeles, Calif., replacing an EAM system. At the present time we have varied activities, such as payroll, fiscal accounting, supply activities, dietetic cost accounting, engineering statistics, and our outpatient fee basis program for that area.

This system has improved service in terms of time, accuracy, availability, and flexibility, and at the same time has allowed us to achieve a savings in equipment rental and operator cost.

We have an ADP system in operation at the VA hospital, Omaha, Nebr. This computer is a small-scale scientific type used as a research tool, on and off line, with the atomic reactor in use at the hospital.

Our Department of Medicine and Surgery is investigating the use of electronic data processing in three general areas: common services agencywide, support of medical research program, and patient data automation.

We are currently in the process of design development and testing of an agencywide EDP pay administration system which will produce as byproducts the information required for personnel statistics and updated fiscal records.

We are also actively exploring other common service areas such as the entire problem of an integrated agencywide supply administration system.

The VA medical research program is largely decentralized, widely diversified, and project oriented. We have 7,000 separate projects, involving approximately 3,500 largely part-time investigators in this area. We are presently organizing three regionalized research support centers as operation elements of our Department of Medicine and Surgery research program. These will be located at the VA hospitals at Sepulveda, Hines, and Washington, D.C.

In addition to providing consultation and assistance in design of experiments and adaptation of available electronic instruments, the research support centers will engage in various types of research. In addition to scientific computers located at specific hospitals, we will, where other research EDP applications evolve on a specific local need basis, utilize programming service and equipment through affiliated universities, other Government agencies, or in rare instances computer service bureaus.

The use of computing devices to acquire, store, update, and display the data generated in a ward or clinic to serve the immediate needs of the medical team is still experimental. However, we are engaged in a major research and development project to this end at the Los Angeles VA Center. Accomplishments to date have included the simulation of a significant portion of a small hospital on a digital computer. Plans for 1963 call for implementation of at least a portion of a simulated study into an operational environment.

Contrary to our experience in the Department of Veterans Benefits and the Department of Insurance, the Department of Medicine and Surgery has experienced no employee displacement as a result of EDP installations to date. On the contrary, in the research area we have experienced problems in recruiting EDP personnel with the desired qualifications and then retaining such employees.

Mr. Chairman, this concludes the highlights of our statement, and Mr. Underwood, the Assistant Administrator for Personnel, has one or two comments he would like to make.

Mr. UNDERWOOD. During the discussion, Mr. Chairman, several references have been made to the point, Do we have examples of net savings as a result of this ADP program? I think it has been pointed out here that in the Insurance Department we have had a net reduction during this period of 816 people, and 398 of these can be directly attributable to ADP in the process. Yet, as has been pointed out, through planning, reassignment, and freezing positions, the use of

temporary employees, occasionally overtime, working with other agencies and through the Federal executive board and other things, we have actually had a very small direct loss of personnel. As Mr. Schmall pointed out, only 69 out of the total of 816 for all reasons actually lost their positions, and all others were taken care of through reassignment and other actions.

In the conversion for Department of Veterans Benefits, we saved a net of 464 people, and because of the distribution from a number of stations and the fact that there were not many lost at any one of the many stations, we lost through reduction-in-force only 3 people who did not have other positions. They were made offers but were not able to accept the offers where the vacancies existed.

Congressman Udall made several expressions of interest concerning the people and whether or not there was adequate consideration in planning to take care of them in this process. I would like to say we have a letter from our station that had the biggest impact, the Philadelphia Insurance Center. It is from the president of the local American Federation of Government Employees there. This letter is dated March 5, prior to the time that this hearing was called. It is addressed to the local manager. So, it was not a part of this hearing. Nevertheless, he commented on the wholehearted endorsement that their membership gave to the planning, to the series of meetings which was held with all the employees, to the understanding they had of the plan, the cooperation of the third civil service region, the salary retention method followed in readjustments and reduction in force. "All these reflect humane concern for the welfare of employees as individuals."

I do not know whether you would want that as a part of the record.

Mr. UDALL. Mr. Chairman, I think the letter is significant, and I would ask unanimous consent that it be made a part of the record.

Mr. HENDERSON. It is so ordered.

(The letter referred to follows:)

VA LODGE 940,  
AMERICAN FEDERATION OF GOVERNMENT EMPLOYEES,  
Philadelphia, Pa., March 5, 1962.

Mr. S. W. MELIDOSIAN,  
Manager, VA Insurance Center,  
Philadelphia, Pa.

DEAR Mr. MELIDOSIAN: At our February meeting of Lodge 940 of the American Federation of Government Employees, a motion was unanimously passed by the body, to extend to you as manager of the office, a letter of thanks for the manner in which you have handled the trying problems connected with the present reduction in force.

In my position as president of the union, I have been personally aware of many factors which would certainly justify my wholehearted endorsement of the motion passed by the membership:

The initial release of your letter to all employees explaining the necessity for the reduction-in-force action cushioned the impact of the adverse action.

The series of meetings conducted with the group of employees personally affected, in which you as manager, the members of your staff, and personnel division participated, gave them a complete understanding of where they stood.

The solicitation of the resources of the third civil service region, to publish the need for cooperation among all Federal agencies in the area, in placing the 120 persons affected.

Acquiring central office endorsement for the use of the salary retention method, to assure maximum salary benefits.

All these reflect humane concern for the welfare of employees as individuals.

We are very pleased that the policy of 90-day notices was continued. This allowed the employee a more reasonable time to find a position. We are confident that this policy of management with vision, will be continued.

Respectfully,

Roy L. Sims, *President.*

Mr. UNDERWOOD. The new conversions as planned in Denver and St. Paul, started last month in Denver and next month in St. Paul, have been reviewed by the Civil Service Commission. This is a recent letter, dated September 10, which the Chairman of the Civil Service Commission wrote our Administrator, Mr. John S. Gleason, Jr., in which he reviewed the advanced planning, the method of keeping the employees informed, and the good employee-management relations that we have for that program. The last paragraph states:

I take this occasion to commend you, the management of the VA Center at Denver, and other members of your staff who were instrumental in the planning of the reorganization.

The program is just beginning there.

On manpower utilization effectiveness rates, which also has been the subject of some of this hearing: Overall for the Department of Insurance in 1958 each employee served an average of 1,385 policies. Now, in 1962, 4 years later, it is 1,760 policies. Of perhaps even greater significance, at Philadelphia, where we have already converted, we have increased from 1,822 policies per employee to now 2,184 policies per employee, an increase of 362 policies. At the other two stations not yet converted, there is an increase of 94 and 81, respectively.

I also have a distribution before and after of the grade structure of employees, indicating roughly that the ADP system has reduced substantially the areas of routine work; in other words, in grades 1, 2, 3, and 4. On the other hand, it increased by 262 the number of positions in grade 5, the reason being that it has taken the routine work out and left only the more complex and difficult assignments that could not be handled routinely in the adjustment clerk division. Therefore, the remaining work is of a little higher level, and those that are retained have more interesting and a little more remunerative positions.

I could leave that pattern, if you wish.

Mr. HENDERSON. Yes. Without objection, it will be included in the record at this point. All of the material will be very helpful to the subcommittee.

(The pattern referred to follows:)

*Philadelphia insurance center grade structure*

	As of Dec. 31, 1959	As of May 1, 1962		As of Dec. 31, 1959	As of May 1, 1962
GS-16.....	1	1	GS-7.....	96	109
GS-15.....	1	1	GS-6.....	102	65
GS-14.....	4	6	GS-5.....	382	644
GS-13.....	10	16	GS-4.....	859	197
GS-12.....	24	22	GS-3.....	606	490
GS-11.....	50	58	GS-2.....	388	230
GS-10.....	9	8	GS-1.....	20	12
GS-9.....	50	40			
GS-8.....	13	7	Total.....	2,615	1,906

Mr. SCHMOLL. Mr. Chairman, I ask your permission to insert in the record a preliminary report on ADP savings in our Department of Veterans Benefits. That shows the impact on the personnel.

Mr. HENDERSON. We shall be very glad to have that, Mr. Schmoll.

Our next witness will be from the AFGE, which you have referred to. We would appreciate very much if Mr. Schmoll and Mr. Underwood might remain in the hearing room for his testimony, and perhaps we will have further questions.

Mr. Udall, have you any questions at this point?

Mr. UDALL. I do not have any of the witnesses. I think their testimony has been most helpful. They have filed a rather extensive report, which I think is good.

I have a general question I would like to address to Mr. Mahoney, one of terminology which bothers me. It may be a minor matter. Throughout these hearings we have seen ADP, which I take to mean automatic data processing, and EDP, which I would assume is electronic. Is there any difference?

Mr. MAHONEY. Yes, Mr. Udall, there is a technical difference, but generally people tend to use them interchangeably. The technical difference is that automatic data processing includes a wider range of equipment, whereas electronic equipment concerns the computer itself. We use it interchangeably. It is no great problem.

Mr. UDALL. It is a minor matter, but you helped dispel the fog surrounding the entire matter.

Mr. HENDERSON. Mr. Schmoll, I might say at this time, certainly your statement submitted to us and your highlights are most informative. We want to commend you in the efforts the Administration has made in the overall savings of dollars. We might look into the impact on the human side of this. We would not want you to think we do not appreciate what we consider to be one of the finest efforts which has been made in our entire Federal system in the savings of manpower and in the interest of more efficient Government operation. Thank you, sir.

Mr. SCHMOLL. Thank you.

Mr. HENDERSON. Our next witness is Mr. John A. McCart, director of legislation of the American Federation of Government Employees.

#### STATEMENT OF JOHN A. McCART, DIRECTOR OF LEGISLATION, AMERICAN FEDERATION OF GOVERNMENT EMPLOYEES

Mr. HENDERSON. Mr. McCart, it is a pleasure to have you officially appear before the subcommittee this morning.

Mr. McCART. Mr. Chairman, I would like first to commend you and the other members of the subcommittee for your continuing interest in a very significant development in the Federal service and throughout our entire economy, particularly for your persistence in continuing these hearings in the last hectic days of the session.

I want you and your colleagues to know that we in the AFGE deeply appreciate the interest of the subcommittee now and heretofore, because in the past I think the subcommittee has shown a very wise perception of the importance of this overall problem.

Mr. HENDERSON. As members of the full committee and the Manpower Utilization Subcommittee, all of our problems interlock. We

certainly wish to commend you and your organization for your cooperation in manpower utilization and in this particular hearing. We know you have rendered a very fine service in bringing personnel problems to us, because we are as interested in that as we are in saving money.

Go right ahead.

Mr. McCART. Mr. Chairman, we have supplied the subcommittee with a prepared statement. With your permission, I would like to request that it be inserted in the record, and I would like to proceed to underline some of the more important ideas and take just a few minutes to extemporize on some of the more important aspects.

Mr. HENDERSON. Without objection, the statement will be inserted at this point in the record.

(Mr. McCart's prepared statement follows:)

PREPARED STATEMENT OF THE AMERICAN FEDERATION OF GOVERNMENT EMPLOYEES  
ON THE EMPLOYMENT ASPECTS OF THE USE OF ELECTRONIC DATA PROCESSING

The inquiry into the use by the Federal Government of electronic data processing equipment, which has been scheduled by this subcommittee, in our opinion fulfills a needed function of assessing the extent to which it may react to the detriment of Federal employees. The American Federation of Government Employees commends the House Post Office and Civil Service Committee for its alertness to the problems which follow the introduction of this equipment. We are hopeful that out of the investigation by this subcommittee will come a reappraisal of governmental policy as it relates to the impact of data processing programs on the men and women whose employment may in any manner be affected.

First, we can stipulate certain of our beliefs with regard to electronic data processing to make it clear that we are not opposed to its use as such. We recognize the advantage to the Government and the benefit to the taxpayer of the introduction of methods which represent a reduction of overhead costs. It is realized also that the Government, as any private business firm, must ever seek to achieve greater productivity in the use of its manpower as well as increasing efficiency of the service which it may be expected to provide the people of this country.

We can support such a program, however, only if the adverse features are effectively controlled. They must be prevented if at all possible, or at most they must be held to an absolute minimum. Unless these harmful effects are properly regulated, the increasing use of automated processes will plague the Government service to an extent which no one wishes to have materialize.

There are various approaches that one may take in considering this problem, but in our opinion the approach from the standpoint of the human values involved should be paramount. Unless EDP is introduced with little regard for its utility and practicality, there is no real problem of business management, of excessive cost, or the misapplication of public funds. The economic advantage may be conceded. But the cost in human suffering and the waste of usable manpower can outweigh much of the potential benefit.

Instances of sizable layoffs which are the direct result of the introduction of electronic data processing are becoming more numerous, and that is why the AFGE welcomes the inquiry being conducted by this subcommittee. In any one locality, the number of employees involved may or may not be great, and so the number that finally becomes unemployed may be relatively small. Everyone will agree, however, that no such effect is so little that it should not rate the earnest attention of legislators and administrators alike. If only a handful of employees lose their jobs at any one time, the loss is nothing short of a tragedy for those individuals, and no effort should be spared to prevent it.

Some of the ill effects are already apparent. So far, such instances among our membership have been relatively small in number, but still sufficiently indicative of what will happen to an increasing degree. The most acute instance involving AFGE members to come to our attention is that of the Veterans' Administration Insurance Center at Philadelphia. During the last 2½ years, 620 positions have been eliminated there. An additional 175 employees were reduced to a lower grade.

The most recent effect of the introduction of automated processes at the VA Center involved 120 employees affected by reduction in force. That number was reduced to 98 and of those 98 employees, 15 individuals were separated at the end of May. The remaining 83 employees were placed in other agencies, many of them at reduced grades. At present there are almost 2,000 employees working at the Center.

A situation such as this one involves in many instances a great deal of hardship for the individual. It also represents a loss to the Government. Persons who have acquired skill in doing a particular job are taken from those positions and forced at best to adapt themselves to new and unfamiliar circumstances. This change has come about not because of any unsatisfactory performance or unfitness for the work, but solely because of decisions which are made quite apart from the employee's desires or capabilities.

In some cases, the individual has no choice but to accept work in a lower grade after building up a record of satisfactory or even outstanding performance of more difficult duties. And such an employee is in a sense one of the more fortunate ones. Others have their employment taken away altogether, perhaps with little chance of finding a job elsewhere. It is at best a frustrating experience.

This example of the undesirable side of EDP points up the need for a new and positive approach to allaying the human loss which it entails. It is apparent that the first measure in the order of urgency is advance planning, but that is only the first measure. Estimates of the number of positions which will be affected and the number of new positions that will be created must be made, but then what? It is most likely that many more persons will be displaced than can be transferred to other positions in the same unit of the agency in which the program is to be installed. Perhaps relatively few of those displaced can be trained for positions in the EDP program, and probably no more than a few can be retrained for other work in the same unit.

The corollary of this situation is that no single unit of an agency can solve the vexing problem of layoffs by itself. Nor can an entire single agency at any one point of time offer a solution for the entire problem then existing. It is a task which requires the coordinated advantages of a Government-wide approach which should be centered in the Civil Service Commission.

It is a tragic situation for scores of Government employees to be laid off and know that at the same time even more persons are being hired in the same or a different Government agency. Of course, new hires will be needed in recruiting for skills which are different from those of the employees separated, but the fact is that recruiting goes on for persons with the same skills. They are brought into the Federal service from private employment when persons who have had as much as 20 years of Government service are failing to find reemployment. The loss of their knowledge of Government service is an important loss in addition to the hardship to which they are subjected and the shabby treatment which they are given after so many years of satisfactory service.

The paramount need in dealing with this unhappy situation is to establish an adequate interagency placement unit in the Civil Service Commission which will deal effectively with this problem of finding other jobs for employees who are displaced by the introduction of technological processes. It can well be made an auxiliary phase of the recently added responsibility of the Commission of reviewing the use agencies are making of their manpower. It is certain that the Government is not making efficient use of its manpower if one agency is laying off experienced employees while other agencies are recruiting persons from private employment for the same type of work.

A unit of the Commission devoted to maintaining employment of all employees affected by EDP would not only be a humane effort but one which would be clearly economical. We have estimated that the average cost of replacing a Federal employee is \$800. This estimate takes into account the value of lost service of a trained employee, and the cost of replacing that employee. There are varied items of cost which must be considered, including examining, interviewing, indoctrinating, and more closely supervising the new employee during the early portion of his service.

To be fully beneficial, the placement unit that should be established in the Civil Service Commission must be given broad authority. It must act as more than a mere clearinghouse or filing system to record vacancies or available personnel. It should have authority to require agencies to submit in advance statements of their needs or of changes in their planning which will result in surplus employees.

The unit also should be empowered to freeze employment in an entire area when it becomes clear that there will be so many layoffs that it will not be possible to place all of the employees who are going to be without jobs. Such a measure is no more than an obvious need when there is a likelihood of unemployment. It is the most practical solution and one which would provide the most direct and effective means of dealing with surplus personnel.

The Government does not have an obligation to keep employees whose services are no longer needed, but it certainly has an obligation to give first consideration to those employees for other vacancies, particularly when they have given more than a few years of service to the Government. This is especially true of the older worker who may find job hunting a frustrating experience.

The interest which this subcommittee is showing in this problem is appreciated, and we thank you, Mr. Chairman, for giving us this opportunity to present our views.

Mr. McCART. At the outset, Mr. Chairman, let me emphasize that we in our federation are not opposed to technological change. We do not feel we can stand far off from these changes in our industries and say they are not going to happen. They are here. Our concern, of course, is over the consequences that these tremendous changes can have on people.

When you realize that there are some 2,300,000-plus employees on the Federal payroll today, I think it is easily recognized that there can be a tendency to lose sight of the value of the individual. This is the role that we hope to play in bringing this particular aspect of the problem to your attention.

In any event, we are not opposed to these advances that are being made, but we are much concerned with their effect on individuals.

In the public sector there is not quite the same situation as there is in the private sector. In the private sector, the motivating factor obviously is price. In the Government service, while the objectives may be equally desirable, they are desirable from other standpoints—the completion of complex tasks in shorter time, the ability to perform tasks that it was impossible to perform before, and savings to the taxpayers.

Parenthetically, Mr. Chairman, I should like to offer this observation. There is a positive and a negative side to this problem. Positively, of course, we have the introduction of highly sophisticated means of doing jobs. Negatively, there is the question of how it affects people. It has seemed to me, with respect to people, we should think also in terms of their ability to participate in the benefits that flow from the introduction of these new devices and these new systems, not solely saving their jobs, but perhaps there is some way we can find to enable them to participate in the benefits that their production is supplying. I have not quite devised the system, but I offer that.

Mr. HENDERSON. Mr. McCart, we hope our agencies have recognized the possibility of retraining and upgrading those employees who do have the capability. Is this not one way the Government could recognize the philosophy you are speaking of?

Mr. McCART. Yes, Mr. Chairman, I agree. Certainly that is another part of the positive side of the picture. I was not able to be present when Mr. Stahl made the presentation in behalf of the Civil Service Commission, but I read Mr. Macy's statement, and I noticed the emphasis he placed on the number of higher grade jobs made available through the introduction of these new systems. Certainly, that is to the good, and it is to the good, also, that these job openings are being made available to Federal employees wherever possible.

On the other hand, Mr. Chairman, I would like to make just one or two comments on the presentation made by the Civil Service Commission several days ago. I think there is quite a contrary experience in the Veterans' Administration testimony.

Mr. Macy alluded to the fact that it has been impossible thus far to separate from the total mission and function of an agency or part of an agency, that part of it which affects the people relative to the introduction of automation. I mention the Veterans' Administration because they have specified the number of people who are affected, but I think for the subcommittee to give any effective consideration to the problem, it is essential that the areas that have caused impact on personnel be identified. I would hope as time moves along the agencies will be able to develop more information along that line so all of us can have a better idea of how it affects individuals.

There was another point raised by the Civil Service Commission which I think is significant. That is the growth in the use of this type of work in the Federal service. This I think highlights even more the importance of the continued observation by the subcommittee of this important development.

Subsequent to previous hearings, this subcommittee has issued several statements outlining the general feelings about the effect of automatic data processing equipment on personnel. This is one of the points to which I alluded earlier. As a result of that, I certainly want to commend the agencies, under the guidance of the Budget Bureau and the Civil Service Commission, on their acceptance of these basic policies. In the case of the Veterans' Administration, I recall in 1958 or 1960 very concerted efforts were made to fully acquaint employees with all aspects of the introduction of the new system.

Gentlemen, in the final analysis, what counts is what it means to individual people. This, I think, is where we encounter our problem.

I was very much pleased to hear Mr. Underwood refer to the letter from our AFGE Lodge 940 on March 5, commending him for the good employee-management relationships with which the current incident was handled. There have been some developments subsequent to March 5, 1962.

Going back to 1959 when the system was first introduced at the Philadelphia Insurance Center, our figures indicate that some 620 people have been affected from that time to now. The VA's figures are some 200 higher. In any event, there is a large number.

In addition to the 620 jobs that were eliminated, 175 employees were reduced to a lower grade or had to accept a lower grade in this process of installing the entire system.

Relative to the incident in the early part of this year, February and March, there was a reduction in force contemplated of 120 employees. Efforts were made by the Insurance Center to place employees, and the number was reduced to 98. Of those 98, 83 employees were placed in other jobs, many of them at a reduced grade level. Our figures differ a little from the Veterans' Administration, to the extent that we find that 15 employees did not have jobs when that particular phase was completed. Conceivably, some of those employees were not willing to accept the offers which were made.

I would add, Mr. Chairman, in fairness this was not done without a lot of effort. This involved our interceding with the Veterans' Ad-

ministration and with the White House. The wheels began turning, and there was some acceleration and intensification of the effort to place some of these folks, which resulted in their not losing jobs.

The point I want to make is that, whether it is 3 or 15 or whether it is 185 people who had to accept lower grades, the fact is there was serious dislocation. If you take the 800 figure, if you take our 620 figure or the 175 figure or the 15 figure, it involves serious dislocations to those employees.

Some months ago I had occasion to talk with an employee who is assigned to an ADP operation in one of the agencies, not the Veterans' Administration. I asked her about the effect of this on her, not so far as her grade is concerned, but how did she feel about being transferred from a manual to an automatic operation. She told me she found it rather debilitating, that the work was not a challenge any more. When she was involved in the manual operation, she said, she was meeting challenges almost daily in her work. This is an intangible, of course. I mention it, though, because it indicates another aspect of the problem which I think works into the total picture.

In truth, we do not have much information about the adverse effect of automation on Federal employees thus far. However, within the past couple of weeks I have had occasion to receive information of this kind: At the Brooklyn Army Terminal in Brooklyn, N.Y., formerly a Transportation Corps activity, there was recently installed a 7070 ADPS machine. The installation has been advised that it will be necessary to eliminate 128 jobs this fiscal year. I raised the question with my informant, "Can you trace these 128 jobs to the introduction of ADPS?" In other words, were the 128 people to be affected, those who formerly performed this work on a manual basis? He could not. He said the 128 jobs will probably be lost throughout the entire installation, including blue-collar and white-collar employees.

I mention this, Mr. Chairman, to show and to emphasize that this can have far-reaching effects, not just solely on the individuals who performed the work previously, but it is like the pebble in the pond. It can have effects that expand.

I might add, just in passing, that I was told several months ago relative to the Brooklyn Army Terminal operation that it was necessary to spend in excess of a million dollars to prepare for the introduction of this machinery, not the cost of the equipment, but to undergo serious modifications in the structure of the building, and that sort of thing.

These may seem to be random comments, but I think they are aimed at having you recognize that this is not solely a matter of how many people lose their jobs. Certainly, efforts have been made to retrain and to upgrade the people for higher jobs where those higher jobs exist, and this is all to the good.

In conclusion, Mr. Chairman, I would like to suggest for your consideration that you and/or the staff might want to maintain a close liaison with the Department of Labor and the Bureau of Labor Statistics. As I recollect it, some time ago then Secretary of Labor Goldberg appointed a special committee to study the effects of automation. In the Bureau of Labor Statistics, as I recollect it, there has been established an advisory committee on this particular subject.

While this was directed at the effects of automation in the private sector of our economy, I think you might find some of their work and their findings useful in carrying on your activities.

In summary, Mr. Chairman, I want to repeat our thanks. I want to encourage the subcommittee to continue its work in this field because, as has been indicated now, in the Veterans' Administration initially there was no effect on people as such. No one lost their jobs. But now, some 3 or 4 or 5 years after the introduction of these new systems, we find they are having an effect. For that reason, Mr. Chairman, in addition to saying a very sincere thank you, we want to encourage the committee in its further study of this important subject.

Mr. HENDERSON. Thank you, Mr. McCart. Certainly you have presented one side that we are most interested in.

Getting back to the situation up in Philadelphia, it seems to me at the point the letter was written, a very good job had been done of informing your people. This indicates preplanning which we think is absolutely necessary.

As I see your position, there were some difficulties that arose, and those were worked out. I think we can expect this to be a part of the process of converting to computer type operations. We appreciate your final analysis of the impact, even if it is only on one employee.

Are you able to tell us anything specifically you know that the Veterans' Administration might have done that they did not do?

Mr. McCART. I cannot speak specifically to the point. This was ultimately accomplished—the amelioration of the effect on the number of people involved.

Overall, then, we do have a proposal to make. We would suggest that the Civil Service Commission establish a unit, or intensify the work of its present placement operations, to take care specifically of situations resulting from the introduction of the computer operations.

Also, that the Civil Service Commission, if it needs such power, be empowered to declare a moratorium on employment in certain occupations in an entire area while there are capable employees who face separation available to fill those jobs.

Mr. HENDERSON. Is this a type of freezing the subcommittee recommended in its report about 2 years ago?

Mr. McCART. That is correct.

In some cases, I might add, agencies have done that within an agency. We feel it could be extended to other agencies.

One of the problems, as you no doubt know, is that because of the large operations of our Federal Government in a given locality, we can find certain agencies employing people, recruiting and employing people in given occupations, while in other agencies in that same general area we find agencies conducting reductions in force and employees in the same occupations losing their jobs or accepting lower rates.

It was with this kind of thinking in mind that I suggested an intensification of the Civil Service Commission's placement efforts and a concentration, particularly in this field, where technological change displaces workers.

Mr. HENDERSON. Mr. McCart, I would like to conclude my comments on this by saying I appreciate very much your attitude and testimony here this morning and assure you of our concern. I think oftentimes we have people from agencies that come before congressional committees with a fear we are trying to dig in and give them a hard time; we discourage them from laying the facts before us, as the Veterans' Administration has today. Certainly in a new area such as this, it is most important we take our experiences, good and bad, for the total good of the Federal service.

With regard to the specific case, my feeling is we have accomplished a great deal in getting this matter into the record and getting members of the committee informed. Certainly we will continue to look at both sides of this problem, particularly with regard to such recommendations as this subcommittee can make throughout the Federal agencies to avoid problems in the future.

Mr. UDALL. I join in the observation the chairman has made. I think these hearings, while they may have seemed unimportant to some people, will result, when the record is printed, in a collection of information and suggestions and data about this whole field that will be invaluable. We will have in one place the experiences, the comments and ideas of many different agencies of the Government.

I think the attitude of Mr. McCart's organization has been constructive, and we will have something that will be of great use. I think you have a casual interest in the Federal pay raise bill. I know you would not want us to be late.

Mr. McCART. No, sir.

Mr. UDALL. How many members do you now have in your organization?

Mr. McCART. 110,000.

Mr. UDALL. Are these concentrated in one or two agencies?

Mr. McCART. No, sir. They are not concentrated in one or two agencies from the standpoint that we have members in all the agencies. Obviously we will have many more in the Defense Establishment than the Veterans' Administration, or the Commerce Department.

Mr. UDALL. That is all.

Mr. HENDERSON. Do you have a general breakdown of how many of your members are in the Defense Department?

Mr. McCART. I do not have a specific figure. My recollection is it is approximately 50 percent.

Mr. HENDERSON. We certainly appreciate your appearance this morning, and your continuing cooperation.

Mr. McCART. Thank you, Mr. Chairman.

Mr. HENDERSON. Our next witness is Mr. Vaux Owen, president of the National Federation of Federal Employees.

It is always good to have you appear before our committee or the subcommittee.

**STATEMENT OF VAUX OWEN, PRESIDENT, NATIONAL FEDERATION  
OF FEDERAL EMPLOYEES**

Mr. OWEN. Thank you, Mr. Chairman.

I would like to say we are interested in the pay bill that Congress is considering.

First, I want to say we very deeply appreciate your interest and effort as chairman of the committee in having these hearings during the last days of the Congress.

Mr. HENDERSON. Proceed.

Mr. OWEN. I have submitted a statement and I would like for it to appear in the record. I shall not read it.

Mr. HENDERSON. It will be inserted in the record at this point.

(The prepared statement of Mr. Owen follows:)

PREPARED STATEMENT BY VAUX OWEN, PRESIDENT OF THE NATIONAL FEDERATION OF  
FEDERAL EMPLOYEES

I am Vaux Owen, president of the National Federation of Federal Employees. Our headquarters office is located at 1737 H Street NW., Washington, D.C.

The members of our organization are vitally interested in automation and the effect of automation on their job security. I am using the word "automation" as a general term to include automatic data processing, cybernation, and similar terms.

As the chairman of this subcommittee stated to me in his letter dated May 28, 1962, we testified on this subject at hearings held March 2 and 4, 1960. At that hearing I suggested an outline of some protective measures for Federal employees. The outline is quoted below for ready reference.

"1. Thorough and definite planning ahead should be expected of all departments and agencies prior to adoption of automated procedures.

"2. Retraining programs should be provided for employees before they are displaced by automation so they may be qualified for reassignment to other positions.

"3. Positive reassignment procedures should be established so that employees can feel some assurance they will get reassignments in their own or another Federal agency, when they learn they are going to be pushed out of their jobs by machine.

"4. Definite placement programs should be developed to place in suitable jobs in private industry those who cannot be reassigned in the Federal service.

"5. Advance information should be given employees about plans for installing automated procedures, and just which categories of employees, and how many will likely be affected, and when. The Veterans' Administration has done this and is to be commended for it."

The steps I suggested at the hearing in March 1960 were included in substance in the recommendations of the subcommittee in its "Report on the Use of Electronic Processing Equipment in the Federal Service" dated August 31, 1960.

It is believed that the recommendations in that report regarding planning personnel matters, and use of equipment have been given consideration and have generally been followed by the Federal agencies. In the Internal Revenue Service, for example, there has been abundant evidence of long-range planning and consultations which have shown a disposition to protect employees whose job security may be endangered by machines.

As the members of this subcommittee well know there still exists the broad problem of job opportunity in relationship to the problem of unemployment which will tend to become more acute as job opportunities diminish.

As the juggernaut of automation moves across the land in both Government and private industry, it is not enough to snatch from its path those in immediate danger of being crushed. One also must think of the resulting wreckage of destroyed job opportunities which will be viewed by those seeking work and not able to find it.

Somehow, the people of the country must so order the operation of their Government as to promote opportunities for employment if they are to con-

tinue to possess the unalienable rights of life, liberty, and the pursuit of happiness which governments among men are instituted to secure.

This means something more than the mere efficiency sought by the businessman or the job security for which the labor union strives. The children of both the businessman and the labor union member, although such children have not yet entered the business world or joined a union, are going to be looking for job opportunities when they leave school. There ought to be a job opportunity for each person who needs it and is willing to work, whether such person's father was a businessman, a professional man, a union member, or a nonunion member.

There is an inherent trait in automation that would destroy job opportunities. This, added to the constant hue and cry in both Government and industry that the number of employees should be reduced, creates a problem about which everybody should be deeply concerned. It is the big problem for the people of the United States. Our millions of unemployed are evidence of it.

It has also been shown that our rate of unemployment is much higher than in any other industrialized free world nation except Canada. The statistical basis for the comparative rates have just been justified by a 412-page report by the President's Committee To Appraise Employment and Unemployment. The 1960 jobless rates for eight industrialized nations, adjusted by the Bureau of Labor Statistics to conform to American definitions, are as follows:

	Percent		Percent
United States	5.6	Great Britain	2.4
Canada	7.0	Italy	4.3
France	1.9	Japan	1.1
West Germany	1.0	Sweden (1961)	1.5

While the committee turned aside the theory that automation and technological advance are to blame for the higher American rate, there can be no denial that automation was a contributing factor. In its consideration of the report the Congress can hardly be oblivious of this fact.

The people of the country are most certainly going to become aware of the relatively fewer job opportunities available to their children, unless more jobs or possibilities for self-employment can be brought into existence.

Whatever may be done about mechanical machines the people need to so direct the machinery of Government as to promote employment—not unemployment. Full employment means better business, increasing markets, a growing economy, and more tax revenues. Federal employees are interested, not only in the security of their own jobs, but in job opportunities for their children. This is an interest I think they share with all the thinking citizens of our country.

I thank you, Mr. Chairman, and the members of the subcommittee for such consideration as you may care to give the statements I have made on this very important subject.

Mr. OWEN. I would like to say in passing, in reference to Mr. Udall coming from Arizona, we held our national convention in Phoenix this last month, in the beautiful State of Arizona, and we enjoyed it very much there.

You are from Tucson?

Mr. UDALL. That is right.

Mr. OWEN. I had the pleasure of visiting your city. I have some friends there.

Mr. UDALL. I hope to visit it one of these days myself.

Mr. OWEN. I just want to comment on a few things and make some observations.

In our appearance before this committee in March 1960, we made certain suggestions, and they in the main were followed by the subcommittee, together with a number of other recommendations the committee made.

It has been our observation that generally there has been a disposition on the part of the departments and agencies to follow the recommendations the committee made.

I want to get away from the technicalities and call attention to one or two sentences in my prepared statement.

As the members of the subcommittee well know, there still exists the broad problem of job opportunity in relationship to the problem of unemployment which will tend to become more acute as job opportunities diminish.

As the juggernaut of automation moves across the land in both Government and private industry, it is not enough to snatch from its path those in immediate danger of being crushed. One also must think of the resulting wreckage of destroyed job opportunities which will be viewed by those seeking work and not able to find it.

Somehow, the people of the country must so order the operation of their Government as to promote opportunities for employment if they are to continue to possess the inalienable rights of life, liberty, and the pursuit of happiness which governments among men are instituted to secure.

This means something more than the mere efficiency sought by the businessman or the job security for which the labor union strives. The children of both the businessman and the labor union member, although such children have not yet entered the business world or joined a union, are going to be looking for job opportunities when they leave school. There ought to be a job opportunity for each person who needs it and is willing to work, whether such person's father was a businessman, a professional man, a union member, or a nonunion member.

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ment—not unemployment. Full employment means better business, increasing markets, a growing economy, and more tax revenues. Federal employees are interested, not only in the security of their own jobs, but in job opportunities for their children. This is an interest I think they share with all the thinking citizens of our country.

I have two or three points that have been commented on by witnesses and I would like to make a comment on them.

I have been very much interested in the comments by Mr. Mahoney, particularly comments made day before yesterday, to the effect that there is a decrease in employment, that is, there are fewer people employed as the result of the use of machines.

I would suggest to the committee not all of the costs in connection with the installation of automatic data processing is taken into consideration. There was some testimony by GSA to the effect that 10 percent of the Government-owned machines are now available for transfer or sale. There will be a loss on that undoubtedly.

Has that loss been counted in the cost?

Then we have an enormous number of committees and a great many conferences and getting together of employees and Government officials. How much of that cost is taken into consideration? How much is taken into consideration in this whole problem of data processing?

I was struck with the comment of one witness to the effect that you have machines now in the Government service that have been used but now they have become obsolete, and the question is Should we dispose of them and buy the more modern machines that will be more productive?

The gist of the testimony was we should continue to use these old machines as long as we can.

Mr. UDALL. Perhaps we could retrain them.

Mr. OWEN. There could be something said along that line, but they are not subject to retraining very well.

It raises this point in my mind—if there is concern about keeping the old machine, although they may not be as productive as new machines that might be bought, how does that fit in with the idea of keeping old employees, although they may not be as productive as the obsolete machines?

I would not go all the way on that by any means. I am not standing in the way of automatic savings or the savings that can be brought about in Government service, but if the point is made with reference to machines, it could very well also be made with reference to human beings.

The big concern is the erosion of jobs, the opportunity not only for Federal employees, but throughout the economy. The relationship to the overall problem we have to unemployment in this country is involved.

There are continuing indications, Mr. Chairman, that businessmen, as well as leaders of various organizations, are concerned with this problem. If I may, I should like to call attention to an editorial that appeared in a financial magazine this week, October 3, the *Financial World*. It is under the heading "Mark of Freedom."

While this may be in the nature of a general comment, the general problems involved are the real problems, and there is a question as to whether we are proceeding too fast. In that connection, I call to

the chairman's attention a statement made by some celebrated gentleman, Lord Chesterfield, I am not sure, that goes something like this—be not the first to adopt the new, nor the last to lay the old aside.

That is a general statement. It might have application here. If we were not the first to adopt the new, nor the last to lay the old aside, it might be that we could have trained technicians in this automatic data processing coming into the Government from private industry, rather than the Government training them and private industry taking them away from us. I think we might have something to consider there, Mr. Chairman.

If the Government gets so far ahead of private industry in training technicians, we lose them. There has been considerable testimony to that effect, not only in these hearings, but the hearings on the pay bill. The Federal Government is losing people it trains. Since they are a higher level of people generally, automatic data processing tends to upgrade the remaining employees and the cost of retraining, or training replacements, becomes greater than it would be with the lower grade employees.

What I am getting at is the effect on the overall economy. This is being viewed, I think, in a greater degree by businessmen. This statement does not relate directly to automatic data processing, but the thinking back of it does.

If I may, I will read:

Business today is faced with increasing distrust of the profit motive and with the puzzling proposition that a strong and aggressive external economy can emerge from a confused and weakened internal economy.

Herbert Buetow, president of Minnesota Mining & Manufacturing Co., said he found this situation not only puzzling but extremely frightening. The Three M's chief was addressing the recent 10th annual marketing conference of the National Industrial Conference Board.

"Free enterprise cannot exist without free marketing," he said. "Thus restriction of marketing becomes restriction of free enterprise." Enlarging upon this theme, he termed industry primarily a "customer-satisfying process" and explained that "the marketing effort is a consequence not of the seller but of the buyer."

"Without effective marketing, our economy can smother in the fruits of its productivity, for," he added, "an unsold product is not an asset but a liability."

Mr. Buetow addressed the problem of unemployment—jobs not only for the hard core of jobless but also for the 26,000 youths entering the labor market every week. To provide this work, he said, "consumption must be stepped up \* \* \* and that can only be accomplished by better distribution and by increased stimulation of the consumer."

He was directing his remarks toward advertising. It is significant he placed emphasis on the buyer. The man without a job is not a buyer. It is an inherent trait of these machines, that is what they are employed for, to put people out of work; that is, to have less people working. That is the object of the machine.

There is the other side of the coin. There is the story, the assertion, the argument, that automation brings a great group of new jobs into being. It can bring a great group of new jobs into being, but it depends on how it is implemented, and the direction in which we go.

Also in not traveling too fast in the right direction.

If I may, I anticipate that the committee might ask some questions about what would you do about the situation. I would offer these comments for the committee to consider.

First, we in this country should place more emphasis on creating jobs. It is a habit of thinking we should place more emphasis on creating jobs, not just the profit motive. Then in the end, profits are going to grow and people are going to have jobs. I think a great deal depends upon our attitude of thinking about it.

Mr. Chairman, I believe that thinking businessmen and thinking leaders in all walks of life are very much concerned about this problem, as I know the members of the subcommittee are. I think it is an attitude of mind too, that more encouragement be given to small business. This week I had a notice on my desk that a very large company privately owned was merging with another company. I daresay that is going to result in loss of jobs.

We have an opportunity to, I believe, encourage more jobs by encouraging more small business.

Another step that could be considered is earlier optional retirement so the man who is eligible for retirement pay on which he could obtain the necessities of life could step out of the field of employment and make a job available for someone else.

Another comment—reduce overtime work, both compensated and uncompensated and use overtime compensation to hire new employees.

Mr. Chairman, I really believe, in spite of all that has been said about overtime, there is a great deal of overtime work being performed in the Government service today.

Another suggestion is that effort be made to hire the capable person in need, without income, in preference to the one who has some income, or the affluent person.

Mr. Chairman, I appreciate the opportunity of being permitted to make these remarks. I want to commend the chairman and members of the committee again.

Mr. HENDERSON. Thank you, Mr. Owen. You certainly highlighted some problems and philosophy that concerns all of us. I certainly will agree the testimony we have heard through these hearings gives us all reason to believe that improvement can be made all along the line. We are delighted to have you conclude our hearings this morning.

Mr. UDALL. Just for the record, could you tell us how many Federal employees are in your organization?

Mr. OWEN. Approximately 50,000.

Mr. UDALL. I want to compliment the gentleman from southern North Carolina for the very able way in which he has conducted the hearings. I think he has done a fine job. The hearings have moved along and covered a difficult and complex field very well in the limited time the subcommittee had.

Mr. HENDERSON. I appreciate that very much.

Inasmuch as I do not have opposition this fall, I am certainly looking forward to working with you next fall.

Mr. OWEN. If I may, on page 101 of the current issue of the Reader's Digest, there is a very interesting article entitled "Automation—Friend or Foe?" If there is no objection, I would like to ask that be included in the record.

Mr. HENDERSON. If there is no objection, it will be.

(The article referred to follows:)

[Reprinted from October 1962 issue of Reader's Digest]

## AUTOMATION—FRIEND OF FOE?

A new breed of "intelligent machines" is having a profound effect on this country. Our jobs, our leisure time, our education, our entire economy will have to adapt and respond to the challenge

(By Lester Velie)

I have just come from a journey into tomorrow that is already here.

In the control room of a 20-story petroleum-distillation tower at Whiting, Ind., a refinery engineer introduced me to a new species of white-collar worker: an automatic typewriter hooked up to an electronic computer.

Did the engineer want an analysis of the gasoline and other products flowing from the tower? He had only to punch keys on a console with a nervous system of several hundred instruments that "sensed" heat, pressure, flow; the computer had the necessary facts to calculate the answer. With its voice, the typewriter, it could speak. Clickety, click, clack. Out zipped the typed information in numbers and in words.

But this system does far more than relay data to human beings. The robot keeps unsleeping vigil over the automatic manufacturing operation, scans the instruments and compares the readings with what its built-in memory says they should be. If more heat is needed, or less flow, the computer pulses the correcting order. In an emergency, it would set up an urgent clickety clack for help—telling a maintenance man precisely where the trouble lay.

Here, I realized, was a tireless white-collar worker that could inspect, analyze, calculate, keep records, give orders—and not haggle over fringe benefits. The computer, with the other new technology, had drastically changed the lives of the human workers around it. More than a third of the 6,500 men and women who worked at this American Oil Co. refinery 6 years ago had lost their jobs—to the machine. (The company scoured the Midwest for other work for them.) Eighty percent of those who stayed on exchanged their unskilled work for jobs that required more skill, by taking full-time company training courses.

The new machines had also brought into the world new men. I talked to four—all in their twenties—who were checking and servicing the computer. As mechanically minded youngsters, they once would have finished their education at high school, gone into some skilled craft, worn dungarees at their work. Now, they worked in white shirts for a salary rather than wages. They had on-the-job training, the equivalent of 2 years of college, and were called maintenance engineers.

This short, short story of change in one refinery is part of an upheaval that is already affecting the lives of millions of Americans. New machines that produce more goods with less human assistance have always been a necessary part of our economic growth. They have created new industries and jobs; have fed, clothed, and housed a rapidly growing population at an ever-rising standard of living.

Automation—in which machines give orders to other machines—is sometimes said to be just more of the same old mechanization. But it is a big step beyond that. The first machines simply replaced men's muscles. The new computer-directed machines replace men's brains and nervous systems as well. The promise of the intelligent machine is tremendous. It makes possible the fulfillment of man's dream: abundance for all and the banishment of poverty.

But there is never a change to the new without disruption of the old, and this changeover promises to alter our leisure, our job training, our education, more profoundly than anything else in our national experience.

Name a human chore, and chances are there is already an intelligent machine that does it:

Banking? At one of New York City's biggest banks, I tried to follow the course of a check through an automatic reading, sorting, and bookkeeping device. Impossible. The human eye isn't up to it. Within 6 hours the checkreader and computer handle 600,000 transactions—accomplishing what some 700 human bookkeepers used to need an entire day to do. These 700 are being replaced by 90 programmers, maintenance men, and others—servicing the machine.

Recordkeeping? In Washington, intelligent machines are leveling, in hours, mountains of paper that brigades of Government workers once took months to do.

For example, computers keep track of every one of the shells, boots, jeeps, and 2 million other items stored by the defense supply system in 150 depots. By keeping a daily count of military gear scattered around the globe, computers prevent overbuying, and so have cut military procurement by \$2½ billion yearly.

Warehousing? In the cavernous Johnson & Johnson warehouse at New Brunswick, N.J., I had the spooky experience of watching cases of babyfood, toothbrushes, and surgical gauze flowing out to loading docks with only one man in sight—the human attendant of the computer console that ran the place. If you want a half dozen cases of medicated plasters, a case of toilet tissue, and one of shampoo, you just put a punchcard into the computer; it searches its memory for the chute on which the item is stored, then opens a gate sending a case sliding to a conveyor belt.

Ironmaking? At the Indiana Harbor Works of Inland Steel Co., a computer directs and controls a blast furnace—reading instruments at the rate of 20 measurements a second and giving the necessary orders to keep the automatic furnace on course.

Computers translate Russian documents into English for the Central Intelligence Agency, guide the flow of traffic on Sunset Boulevard in Los Angeles, pay off horse bets at Hialeah Race Track in Miami, Fla. Other intelligent machines are being taught to analyze medical data—symptoms—and to give a medical opinion. Still others will soon store the contents of whole law libraries in their memories and cite you a precedent faster than a lawyer can say “irrelevant and immaterial.”

While it took the old industrial revolution some 150 years to unfold, giving men time to adjust, the new age of automation bears down on us with the speed of a rocket. For great forces are at work to stir the winds of change. One is the cold war. The search for new weapons and now the race to the moon are pursued with wartime urgency. This has spawned a new \$13 billion industry called research and development. It employs some 1,300,000 scientists and engineers and their supporting technicians, and mass produces but one product: technological change.

While government supports 60 percent of this, private industry has its own urgent reasons for innovation too: rising labor costs and foreign competition. Particularly in the basic industries, the American talent for innovation has become a passion. There is change at every turn.

There is vibrant change in cities such as Dallas, Tex., where new industries clamor for men. There is tragic change in older industrial centers such as Lowell and New Bedford, Mass., where manufacturers have shut down plants to rebuild new, automated ones elsewhere. Here, mature men, once secure in a skilled trade they had plied for years, endure agonizing idleness, and the whole town must somehow adjust.

And there is mixed change in areas such as southern California, where the Federal Government is pouring millions into the new space industry and filling the landscape with great complexes of plants. Here, jobs hunt for men. But because the once busy airplane plants have virtually suspended operations, men also look for jobs.

The Autonetics Division of North American Aviation, Inc., south of Los Angeles, scoured 125 colleges last year but could obtain only about one-third of the 1,500 professional men it needed. But Autonetics last year also turned away 137,000 job applicants who lacked the required education or skills.

The thought of a robot directing a factory stirs among many of us the specter of jobs destroyed. Yet, as we know, machines—given the golden gift of time—have always created more jobs than they displaced. In 1919 it took 26 million workers to grow the food, dig the metals and fuels, build the houses and make the goods that 105 million Americans needed. Today, there are almost 190 million of us, but it still takes only 26 million workers to supply us. And they work a shorter week.

Where did the new jobs come from for the 77-percent rise in population? They came from the higher standard of living that machines created, from additional services that Americans could afford. Four decades ago only 14 million Americans worked in service industries: sold goods, moved and stored them; taught, nursed, doctored, entertained, handled our money. Now 35 million work in these fields—and new ones such as air transport, motels, and marinas.

Today's new machines are also producing new industries. The space industry pours \$8 billion into the economy yearly. By 1970, it will mushroom to an estimated \$20 billion. The invention of the transistor has created a \$500 million semiconductor industry. A growing army of men and women is needed to produce, maintain, sell and operate the new computers. Just as the automobile brought the tire factories and the roadbuilding industries, the computer spawns a giant new communication and information industry. And the service sector of the economy will continue to grow rapidly, according to the Department of Labor.

But, meanwhile, the birth pains of the new automation era, unless attended to, can develop into catastrophic social illness. In the great job upheaval, the burden of the transition falls heavily on the older worker whose skills are no longer needed. But the cruelest burden of all is being visited on a segment of the young—those boys and girls aged 16 to 21 who dropped out before they finished high school. Uneducated and untrained, they are, increasingly, the Americans nobody wants. Dr. James B. Conant, distinguished educator-statesman, told a conference on unemployed youth last year that in one big-city slum area he had found 70 percent of such youngsters unemployed.

These youths, along with the older idle, add up to a human fever chart that measures a new social malaise: structural unemployment—idleness due to basic changes in industry. As of last mid-July, this chart stood at 5.5 percent of our 72-million-man labor force. In some depressed areas the rate is as high as 25 percent. Moreover, because we now make far more goods with far fewer workers, the unemployment fever chart goes even higher with every recession but bounces back only partly when recovery comes. "Each month," says Dr. Seymour Wolfbein, head of the Labor Department's new Office of Automation and Manpower, "I triumphantly announce new peaks of employment. Then my jaw drops as I have to tell reporters that unemployment, too, is reaching new peaks."

Dr. Wolfbein has even more reason for uneasiness. Within the next decade new job hunters will enter the labor force at a greater rate than ever before—29 million in all, or 56,000 each week.

We face, then, a challenge within a challenge.

First, we must ease the transition suffering of the displaced and, by retraining, match our workers with available jobs. The want-ad sections of our newspapers team with urgent appeals for engineers, for fiber technologists, for opticians, data-systems analysts, programmers. But what use are these to a man who knows only welding?

Second, we must take a hard look at our higher education, what our high schools teach—and how long our children stay in school. For every new engineer who goes to work in industry three new technicians are needed as backup support. These are the men—like the computer-maintenance engineers—whose training is slightly below college-degree level but higher than that of the old skilled worker. Some 200,000 of these technicians are needed yearly. Only an estimated 15,000 are being supplied.

Subsequent articles will report on the great job upheaval, on what is being done and what remains to be done in worker training, in education and in forging Government policies to encourage a high level of business activity and employment.

One thing is certain. Properly handled, the new automation of the intelligent machine is a benefactor that will help us grow and help our way of life to survive.

Mr. HENDERSON. At this time, I would like to announce that the subcommittee record will be held open for 1 week to receive supplemental material from any of the witnesses, or other interested persons.

I would also like to announce that, without objection, statements that have been submitted by agencies that have not appeared at our hearings and other pertinent information will be included in the record of these hearings.

In conclusion, I would like to ask Mr. Mahoney to submit any additional comments he may have at this time and certainly feel free to contact the subcommittee members personally. I know you will con-

tinue to work with the staff. We are very appreciative of your being with us, and certainly hope you will relay to General Campbell our sincere appreciation for your appearance.

(The statements and material referred to above follow:)

PLANNING FOR AND UTILIZATION OF ELECTRONIC COMPUTING EQUIPMENT AT THE BUREAU OF THE CENSUS—STATEMENT OF THE BUREAU OF THE CENSUS, DEPARTMENT OF COMMERCE

Electronic computing equipment and associated auxiliary electronic devices are extensively used in the processing of statistical data in the Bureau of the Census. The Bureau's 11 years of experience with electronic data processing have encompassed initial transition from manual or punched card methods to electronic devices for one after another of the large-scale components of the Bureau's work and a transition from the first computers ever used for non-military applications, Univac I, to a "second generation" system utilizing the more advanced and larger Univac Scientific 1105 machines. The Bureau now is engaged again in preparing for the acquisition of new, advanced, larger and more powerful Univac 1107 computing equipment to prepare itself for the data processing workload it faces in the middle 1960's. Until this new equipment is in full operation 18 months from now, we anticipate difficulty in satisfying all of the demands made on our facilities unless we succeed quickly in acquiring additional stopgap Univac 1105 capacity which we now are in process of attempting to arrange.

EQUIPMENT EVALUATION STUDY

The Bureau of the Census anticipates an increasing volume of data processing workload for its electronic computer system. During the next few years, peaks of demand will be substantially higher than any level of utilization yet achieved, and subsequent demands will be even greater. At the present time, existing temporary arrangements for expanded system capacity are terminating. These arrangements had been made to accommodate the peak which arose from superimposing processing of the 1960 Censuses of Population and Housing on the balance of the Bureau's workload. Thus, prompt steps were needed to increase capacity in order to have the equipment needed for performance of the Bureau's future work.

In recognition of this situation, the Bureau began an intensive study in January 1961 of its future needs and of alternative capabilities for meeting these needs. The study dealt with the nature, effectiveness, and characteristics of applications for which the Bureau has used electronic computing facilities, detailed projection of future utilization requirements, and the characteristics and relative merits and costs of various types and makes of electronic equipment potentially useful for Bureau processing needs.

The nature of the study, methodology employed, and results for each phase of the evaluation are described in detail in the documentation that resulted from the study. This documentation was generally organized in accordance with the guidelines outlined in the Bureau of the Budget Circular A-54.

Essentially, this study involved the following:

(a) *Examination of the characteristics of Bureau of the Census use of electronic computing equipment.*—This examination required an intensive analysis of actual computer work performed on all Bureau equipment during the 18-month period July 1, 1959, through December 31, 1960. This study was a starting point for evaluating the effectiveness of computer use and projecting the characteristics of work to be done in future years. It provided the framework within which comparative evaluation of various equipments could be related to actual job requirements for Bureau work.

(b) *Projection of workload and system capacity.*—The major data processing programs of the Bureau of the Census already employ electronic data processing methods. Consequently, the approach to projection of workload was based largely on actual experience with Bureau applications, as modified by expected changes to be made in the scope and content of these activities. Program by program estimates of projected workload supported the figures which are summarized below. The estimates of system capacity were obtained through intensive studies of expected performance of new equipment, assuming a 24-hour day 5-day week operation, with weekend operations to be available as reserve.

The following tabulation summarizes workload estimates and indicates their relation to our present capacity as it will be affected by a reduction in, and even-

tual elimination of, our entitlement to time at the University of North Carolina and the Armour Research Foundation:

*Projected workload and capacity for Bureau of the Census electronic data processing systems—fiscal years 1963-70*

[All figures are in terms of equivalent hours of Univac 1105 computer time]

Fiscal year	Existing capacity	Deficit to be provided for	Total	Major censuses	Requirements		
					Current programs	Work for others	Expected new applications
1963.....	24,700	2,250	26,950	8,750	15,000	3,200	-----
1964.....	15,000	14,850	30,450	7,450	16,000	3,000	4,000
1965.....	13,200	23,350	41,550	16,500	17,200	1,850	6,000
1966.....	13,200	23,550	36,750	7,750	18,500	1,500	9,000
1967.....	13,200	19,600	32,800	900	19,400	1,500	11,000
1968.....	9,600	32,300	41,900	8,000	20,400	1,500	12,000
1969.....	9,600	38,900	48,500	13,500	21,500	1,500	12,000
1970.....	9,600	35,800	45,400	9,200	22,700	1,500	12,000

(c) *Consideration of alternatives available to meet anticipated future needs.*—We considered three principal alternatives: (1) Purchase of two modern large-scale computers; (2) purchase of one computer, with rental of such capacity as is needed in excess of the potentiality of one computer; and (3) meeting our requirements by expanding the existing Univac 1105 system by increasing the configuration of present equipment to its full potential scale, purchasing such additional numbers of Univac 1105 computers as are economically justified by the workload, retaining our Univac I systems in service, and renting such additional Univac 1105 capacity as would be needed in peak years. These alternatives were carefully costed out in all their aspects prior to arriving at final recommended action.

(d) *Comparative costs for purchase versus rental of computing equipment.*—Studies of the comparative cost of rented versus purchased equipment indicated that, with the scale of use contemplated by the Bureau, purchase of necessary equipment was far more economical than rental. A comparison of rent versus purchase for only those costs associated with having the equipment available, paying for its maintenance and paying the salaries of its operators is shown below:

	Purchase of 2 Univac 1107 computers		Rental of 2 Univac 1107 computers	
	Yearly operation and maintenance	Cumulative investment and operation and maintenance	Yearly rental and operation	Cumulative investment, rental and operation
Original investment.....		\$8,395,700		\$861,000
1st year cost.....	\$480,000	8,875,700	\$2,640,000	3,501,000
2d year cost.....	480,000	9,355,700	2,640,000	6,141,000
3d year cost.....	480,000	9,835,700	2,640,000	8,781,000
4th year cost.....	480,000	10,315,700	2,640,000	11,421,000
5th year cost.....	480,000	10,795,700	2,640,000	14,061,000

(e) *Productivity and cost comparisons for alternative computers.*—For productivity and cost comparisons, the work performed by the Bureau of the Census with computers was analyzed and classified according to the type of computer use involved (e.g., sorting, merging, editing, tabulation, etc.). A set of model problems reflecting instruction sequence patterns characteristic of those types of applications was constructed in such a manner that each problem could be weighted to represent its proper proportion of the total computer workload. These problems were programed for each of 11 different computers that were regarded as eligible for consideration, and timed to produce weighted estimates of the effectiveness of each computer for performing census work. The six manu-

facturers involved reviewed, checked, and assisted in the problem programing and timing.

Subsequently, prices were solicited from each manufacturer for a standard configuration of equipment. Although the final choice of a computer and configuration of equipment to be acquired was to be built around the most effective combination of features available with that particular machine, it was helpful for the productivity and cost comparisons to restrict the cost comparison to a standard configuration or "common denominator" of equipment available from a substantial number of different manufacturers. No manufacturer's equipment was excluded from consideration because of inability to furnish a particular configuration feature or for lack of some specialized facility limited to a single or restricted number of makes. All aspects of this evaluation process were carefully documented.

(f) *System configuration requirements.*—The system configuration used for comparative computer cost analysis was specified in such a manner as to provide a valid means for comparing relative capital investment and other costs involved in different computing systems. Having determined by such analysis which computing system represented the most economical choice for Bureau of the Census work, the precise configuration to be recommended for purchase became a matter of selecting such features available with that computer as would (1) perform the known future workload most effectively, (2) provide facilities to further develop the systemization of programing and computer operation processes, and (3) provide some capacity and flexibility for unforeseen changes in the nature of computer applications the Bureau might find it necessary or highly advantageous to develop.

(g) *Programing aids ("software").*—Improved utilization of computer systems by the Bureau of the Census is heavily dependent on the availability of adequate general-purpose computer programs for generating and compiling specific programs, controlling parallel computer operations, debugging and testing computer programs, and providing the service programs and facilities necessary to support computer production and testing operations.

To make it possible to utilize a computing system when it is placed in operation, most of this "software" must have been previously planned, developed, and tested. Study of the record of computer manufacturers generally in supplying such facilities when needed convinced us that a concerted, determined, adequately staffed advance effort on the part of the Bureau would be required in the area of computer programing aids. It would be necessary to include in any purchase contract effective provisions to insure that the manufacturer would provide at least a minimum of the critical components of a "software" system at the necessary time and in the necessary form.

Concurrently, continued adequate effort must be exercised by Census staff (1) to monitor the manufacturer's progress and (2) to develop those tailored or additional features of the "software" system needed to implement the planned Bureau utilization methods and schedule for the equipment.

In addition to considering and exploring the foregoing factors, our feasibility study developed expected cost data and a time table and plan for implementation of the final recommendations. The feasibility study was completed in January 1962, and effort shifted to the implementation of preliminary steps.

#### DIRECTION OF STUDY AND MANPOWER INVOLVED

In our initial approach to the installation of new electronic data-processing equipment, problems of manpower utilization in all phases of the planning and its implementation were dealt with.

The first investigatory work of identifying and quantifying needs, studying alternative ways of meeting these needs, evaluating different makes and combinations of electronic equipment, and conducting other phases of the feasibility study was directed and reviewed by a working group of responsible officers representing the various areas of the Bureau's program that will be affected by the proposed changes. This group consisted of the Assistant Bureau Directors for Operations and for Research and Development, and the Chiefs of the Bureau's operations divisions and of the Data Processing Systems Division, the Budget and Management Division and the Administrative Service Division. In addition the Bureau obtained the assistance of a panel of disinterested outside advisers consisting of Government and non-Government experts in the use of large-scale data-processing equipment.

The specific research and planning assignments required at various stages of the consideration and preparation for installation of equipment required full-time assignments of varying duration for key members of our staff who were familiar, or who made themselves familiar, with the particular areas in which study was needed. For the recently completed study of equipment needs, 15 to 20 persons had one or more assignments of significant duration. In addition to our own programmers, engineers, and management personnel, we used specialists from other agencies for phases of the work that required an impartial external review of critical assumptions and calculations. We estimate that, over a period of 1 year, the cost of the time of the individuals having specific feasibility study assignments totaled no less than \$60,000. Some of the analytical studies undertaken were, in themselves, computer processing jobs involving the collection and review of data, preparation of machine input, and the programming and execution of machine manipulation and analysis of the data.

#### TRAINING AND RECRUITMENT OF STAFF

Upon completion of the feasibility study, approximately 18 months in advance of the expected installation date for the new equipment that was selected, the planning of specific preparatory steps began. It was estimated that, beginning 1 year prior to installation and continuing for 1 year after installation, some \$500,000 would be required for training of personnel and various preparatory and conversion activities. Time schedules were laid out for the selection and training of engineering staff to maintain the new equipment, equipment operators and managers, and programmer and systems analysts required to plan and program applications for the new machines. Approximately 50 man-years of training and related preparatory activity have been planned to retrain present staff and develop new staff for the new computing systems.

As of the time of this report, within a year of the expected installation date for the new equipment, large-scale formal training plans have been initiated following several months of detailed planning and layout of the various pre-installation stages.

Training of personnel for a large-scale electronic computing system is one of the critical manpower problems that must be dealt with at all stages of planning, installation, and operation of the equipment. Formal training in three general categories of skill is required—engineering, programming, and equipment operation. In the past we have called on the equipment manufacturers for the initial training for our key staff in each of these three areas. We have found it necessary, however, to establish as quickly as possible our own training program and facilities to carry on the training activities for the bulk of the personnel needed to operate, maintain, and program our systems and for replacements resulting from turnover.

There is a wide demand for the key skills required at an installation of electronic data processing equipment. As yet there is a limited supply of persons qualified in the various specialties that are needed. Accordingly, recruitment and turnover are major problems requiring an aggressive search for qualified candidates and a positive program for retention of trained personnel. We have been able to deal with these problems in part by the establishment of an adequate grade structure, arrangement of training agreements permitting accelerated advancement of qualified employees, establishment of incentive pay plans of various types, and a continuing program of recruitment of replacements. Despite these efforts we find that one of our major problems is that of obtaining, training, and maintaining trained personnel adequate to our requirements in the engineering and programming occupations.

We have not been faced, at the Bureau of the Census, with the problem of displacement of existing personnel by the automation of operations. Generally we have been able to apply electronic data processing to our work in such a manner as to substitute use of electronic equipment for the hiring of large numbers of temporary employees as we have prepared to undertake major censuses, new programs, and expansion of existing programs. At the present time, as a case in point, although we are operating eight electronic computers of various types for a total of 36,000 machine-hours per year and are continuing to apply this equipment to new areas of work as rapidly as the planning and programming can be completed, we still have serious shortages of card punchers, tabulating equipment operators, and project planners needed to handle our current workload of applications for punched card equipment.

The overall effect of automation on manpower of the Bureau of the Census has been to level out to some extent the wide fluctuation of personnel otherwise inherent in the periodic programs of the Bureau, to reduce the need for new hiring of large temporary forces, and to substitute a demand for smaller numbers of highly trained, skilled employees needed to operate, maintain, and program electronic computing equipment. Use of electronic computing equipment has brought, of course, a dramatic increase in manpower productivity as measured in terms of statistical output of the Bureau in relation to man-hours of input of human effort.

#### CONTRIBUTIONS OF ELECTRONIC EQUIPMENT TO IMPROVED PERFORMANCE

The expectation we reported in 1960 that through use of Fosdic and other electronic equipment " \* \* \* for the first time in our Nation's history the final official counts \* \* \* on the basis of which the seats in the House of Representatives will be apportioned will be the product of automated tabulation" have been realized. It required approximately 28,000 man-days to convert to magnetic tape through the use of microfilm and Fosdic the information collected by our enumerators for the 1960 Censuses of Population and Housing. Ten years earlier at the time of the 1950 censuses, 200,000 man-days were expended in the preparation of punched cards for tabulation of census results. This reduction to less than one-seventh of the human effort necessary to prepare a tabulation input medium was a major factor in accelerating the timeliness with which we published results.

Appended to this report are two tables comparing the page counts and publication dates for the major reports of the 1950 and 1960 Censuses of Population and Housing. Table 1 indicates that the number of pages published for the 2 censuses rose from 73,200 for 1950 to 139,800 for 1960. At the same time (table 2), better than a year, on the average, was gained in publishing the major population reports of the 1960 census, as compared with 1950, and substantial gains were also made in releasing the basic housing series.

We are, at the Bureau of the Census, proud of the success we have achieved in the exploitation of electronic data-processing equipment to do much of our work. We are, however, always mindful of the fact that our main responsibility is the collection and distribution of statistical data which the Congress has decided is of sufficient general value and utility to assemble at public expense. To the extent that electronic equipment can contribute to reduced costs of processing, improved timeliness, or increased utility of our statistical output, we endeavor to employ it.

Significant shares of our budget are expended in the original collection of the source data we process through our facilities. These source data are collected not only for the major censuses we are required to take quinquennially or decennially but also for the current statistical programs which constitute a continuing responsibility of the Bureau. A census of population, housing, manufactures, business, agriculture, or State and local governments constitutes a major addition to our regularly continuing work, for which temporary additions to our staff are necessary. The major additions are often in short-term employees who are on the rolls for only a few months or less during the collection of source data. Our use of electronic equipment has had little or no effect on the use of temporary fieldworkers. Electronic data processing equipment has, however, had a significant flattening effect on the peaks of temporary employees engaged in the processing of the data once they have been collected.

#### INCREASED AVAILABILITY OF UNPUBLISHED MATERIAL

It is almost never possible to satisfy in our published reports all of the special interests and requirements for statistical arrangements of the information we collect. It is our policy to present in our publications those tabulations which are deemed to be of widest interest and utility based on the best advice we can get from the consumers of our product.

Electronic data-processing has enabled us to increase the utility of our information significantly by reducing the charges we assess for special-purpose assemblies of statistical information in our files.

The possibilities for broadening the supply of unpublished data from the 1960 census have proved to be great.<sup>1</sup> The list of unpublished data is increased by

<sup>1</sup> A booklet, "Availability of Published and Unpublished Data," has been prepared which describes in outline form the various 1960 population data which were compiled.

the tremendous expansion in amount of data available for the separate small enumeration districts (ED's). These data are summaries of the information collected in phase I of the 1960 census which was an enumeration of basic population and housing characteristics for 100 percent of the people and their homes. For each of the 272,000 ED's in the United States, data can be made available in unpublished form showing substantially all of the complete-count population and housing data tabulated for the purpose of publication for larger areas. This list covers age by sex and color, including single years of age for persons under 21, household composition, marital status, and color or race. The list also includes occupancy and tenure of housing units, condition and plumbing, size of household, number of rooms, and (in the larger cities) value of owner-occupied property and contract rent. These data are being furnished as special printouts or as copies of magnetic tape. A large public utility firm and a large marketing survey organization have each purchased a set of magnetic tapes for the entire country.<sup>2</sup>

The publications presenting data collected in phase II of the census from a 25-percent sample of households provide statistics on a wide variety of social and economic characteristics. We have, for these materials, established cutoffs for the size of city or metropolitan area to be published. Nevertheless, the tabulation procedure used on the electronic computer has in many cases produced the full range of information for a considerable number of areas smaller than those included in the published volumes and these data have been retained on magnetic tape. A number of research organizations have made arrangements to purchase copies of these magnetic tapes, which they will use to extract the unpublished data for smaller areas for analyses of the structure and composition of small areas throughout the country.

#### INITIATION OF NEW CONTRACTUAL ARRANGEMENTS TO INCREASE AMOUNT OF PUBLISHED MATERIAL

Early in the planning stages of the 1960 tabulations, it became apparent that the feasible publication program of the Bureau of the Census would not be extensive enough to meet all the needs envisioned for market research purposes. Specifically, an association council on the population and housing censuses, a nonprofit organization representing a number of industry groups with extensive interests in the appliance field, began to examine the possibilities for certain county tabulations of equipment and population and housing characteristics which they believed would have important uses for market planning. They felt that it was not possible to meet their needs if the special tabulation were delayed until the Census Bureau had completed its regular tabulations. The difficulty of such an arrangement would have been the very considerable delay in the availability of the tabulations and the consequent reduction in the value of the results.

When the problem was studied in detail, it was determined that the chief obstacles to earlier tabulation and publication were problems of supplying the necessary supervisory planning as well as programing and machine time in the Census Bureau, and the lack of advance orders sufficient to cover the full cost of the project. It was determined, however, that a special tally tape involving no disclosure of original data could be readily prepared and sold. In order to carry out the project from this point, it was necessary for the association council to find an organization to prepare the programs and have the final tables run for publication and to assume some entrepreneurial risk. It turned out that the S. J. Tesaro Co. of Detroit was equipped to handle this operation and a special contract was signed with that company. As a result there is available for the use of marketers and others some 15,000 pages of special tabulations which will meet a number of important specialized needs. Regardless of the possibility that experience may provide the basis for some changes in this form of Government-industry joint effort, it is believed that it constitutes an important precedent for broadening the supply of census statistics.

<sup>2</sup> These summaries contain no individual identification.

## PRODUCING, FOR GENERAL USE, A NEW NATIONAL SAMPLE OF ONE PERSON IN A THOUSAND

We are planning to make available in the form of magnetic tapes and punch-cards for general use detailed information on a population sample of one person per thousand for the entire United States. The information on the record will comprise substantially all the characteristics enumerated in the 1960 census. The confidentiality provisions of census laws are fully observed, because the omission of names and details of place of residence and some other characteristics will make it impossible to identify any person from this record. The record will contain not only the characteristics of the individual but also a selection of the characteristics of the household, the family (or subfamily), and the housing unit in which he lives. The record will also contain a few of the characteristics of an "associated person" such as the spouse of a married adult or the parent of a child. It is believed that this file will be useful for many marketing purposes because it will permit the detailed study of inter-relationships on a basis tailored especially to the needs of particular organizations. Sets of these data will be made available on a subscription basis at cost.

The same kind of ability to provide specially processed data from our activities in foreign trade statistics, economic censuses, and current business surveys is evidenced by the 1,200 hours of electronic data processing time we have already charged in fiscal 1962 to such Federal Government organizations as the White House, the Department of Health, Education, and Welfare, the Tariff Commission, the Federal Reserve System, the Department of Agriculture, and such other groups as Sylvania Electric, the National Biscuit Co., Grace Lines, the Port of New York Authority, the Printing Paper Manufacturers Association and the Chicago Department of City Planning.

## DATA PROCESSING SERVICES

Another area in which electronic data processing facilities at the Bureau have proved valuable to the Government concerns service to other agencies whereby our equipment is used to process the user's data as contrasted with special processing of census data. An illustration is the national fallout shelter survey conducted by the Department of Defense. This was a cooperative arrangement involving the Army Corps of Engineers, the National Bureau of Standards, and the Bureau of the Census. The physical characteristics of structures were recorded by architects and engineers under contract to the Department of Defense on documents suitable for Fosdic processing. This information was transcribed to magnetic tape by the Bureau of the Census using the Fosdic machines that had contributed to processing of the 1960 censuses. The magnetic tapes were processed by the facilities at the National Bureau of Standards to compute protection factors for each structure surveyed. It was about September of 1961 that Defense Department officials first consulted Census about the possible integration of Fosdic processing into this activity. By December 1961 the first of the schedules for over one-half million buildings were being transcribed to magnetic tape by Fosdic and by early June of 1962 this phase of the work was virtually complete.

## THE INTERAGENCY COMMITTEE ON AUTOMATIC DATA PROCESSING

Representatives of the Bureau of the Census have participated in meetings of the committee since its establishment. They were, in fact, active members of the informal gatherings of Government workers interested in electronic data processing which met from time to time and from which the present committee with a Bureau of the Budget secretariat is an outgrowth.

We believe the committee has done well in bringing the agencies concerned with automatic data processing into closer contact and in working out guidelines for the handling of complex problems of equipment evaluation and use. The committee has been particularly successful in encouraging the effective exploitation of automatic data processing techniques in agency work without restricting the ability of agencies to explore and experiment with these techniques in adapting them to their own work.

TABLE 1.—1960 and 1950 censuses of population and housing, number of pages in major publications, by 1960 series designation

[Asterisk (\*) indicates estimates given for series for which publication has not been completed. Use of high-speed printer copy for most tabular material in 1960 accounted for an increase in pages of about 20 percent over 1950. Figures rounded to nearest 100]

Census and report series	1960	1950
Total, both censuses.....	139,800	73,200
<b>Census of population:</b>		
Preliminary reports.....	500	400
Advance reports.....	1,300	2,100
Supplementary reports.....	300	200
Final reports:		
PC(1)-A Number of inhabitants.....	1,900	1,800
PC(1)-B General population characteristics.....	5,700	5,700
PC(1)-C General social and economic characteristics.....	8,700	7,700
PC(1)-D Detailed characteristics.....	13,700	
Vol. I, pt. A, number of inhabitants.....	1,400	1,400
Vol. I, pts. 1-57, characteristics of the population.....	*28,000	14,700
Vol. II, subject reports, PC(2).....	*8,500	3,000
Vol. III, selected area reports, PC(3).....	*500	
Vol. IV, summary and analytical report.....	*600	
Total.....	71,100	37,000
<b>Census of housing:</b>		
Preliminary reports.....	100	100
Advance reports.....	2,000	1,300
Final reports:		
HC(1) State and small areas.....	7,600	5,400
HC(2) Metropolitan housing.....	*7,600	4,700
Vol. I, States and small areas.....	*5,800	4,800
Vol. II, metropolitan housing.....	*4,900	3,800
Vol. III, city blocks, HC(3).....	18,000	8,000
Vol. IV, components of inventory changes, HC(4).....	1,600	
Vol. V, residential finance.....	*500	1,500
Vol. VI, rural housing.....	*800	300
Vol. VII, housing of senior citizens.....	*300	
HC(S1) Special reports for local housing authorities.....	2,000	2,200
Total.....	51,200	32,100
<b>Censuses of population and housing:</b>		
PHC(1) Census tracts.....	17,500	4,100

TABLE 2.—Comparison of publication dates of major report series 1960 and 1950 Censuses of Population and Housing

Series No. and title	Number of reports	1950 series No.	Publication dates				Improvement (number of months) 1960/1950
			1960		1950		
			1st report in series	Last report in series	1st report in series	Last report in series	
Census of population:							
PC(1)-A Number of inhabitants.....	57	P-A	September 1960.....	June 1961.....	July 1951.....	September 1952.....	10
PC(1)-B General population characteristics.....	57	P-B	(November 1960.....	September 1961.....	March 1952.....	November 1953.....	16
PC(1)-C General social economic characteristics.....	53	P-C	(August 1961.....	June 1962.....	December 1952.....	December 1953.....	9
PC(1)-D Detailed characteristics.....	53	P-C	March 1962.....	December 1962 1.....	December 1952.....	December 1953.....	112
Census of housing:							
HC(1) States and small areas.....	52	H-A	December 1961.....	May 1962.....	June 1952.....	May 1953.....	6
HC(2) Metropolitan housing.....	202	H-B	July 1962 1.....	October 1962 1.....	December 1952.....	June 1953.....	15
HC(3) City blocks.....	421	H-E	April 1961.....	November 1961.....	October 1951.....	August 1952.....	6
Censuses of population and housing:							
PHC(1) Census tracts.....	180	P-D	October 1961.....	July 1962 1.....	January 1952.....	February 1953.....	3

1 Estimated.

## STATEMENT OF THE COAST AND GEODETIC SURVEY, DEPARTMENT OF COMMERCE

*1. Agency study of future requirements*

Early in fiscal year 1962 the Coast and Geodetic Survey initiated a comprehensive study of its future requirements for scientific and engineering computing and data processing. An IBM 650 calculator was being used in the computing unit with a monthly production record of 250-300 hours. Preliminary results of this study indicated the need for more aggressive action by the Bureau in the development of its electronic computing facilities. The applications in geodetic, photogrammetric, geomagnetic, seismic, cartographic, and oceanographic scientific and administrative data processing will more than double in the next 2 or 3 years.

*2. Feasibility study for immediate needs*

The Advanced Research Projects Agency had previously assigned the major responsibilities of the Vela Uniform program to Coast and Geodetic Survey. The volume of scientific computing in connection with this seismic work and the urgency of the work justified the acquisition of an additional computer as soon as possible.

After a feasibility study was made of several types of medium sized computers, a recommendation for the purchase of an IBM 1620 computer with 100,000 decimal storage was submitted to and approved by the Budget and Management Office of the Department of Commerce.

The feasibility study was based on the policies outlined in Bureau of the Budget's Circular A-54. Earlier in the year, the Bureau had purchased the IBM 650 calculator at a reduced rate because of the rent-purchase option (the 650 had been used by the Bureau approximately 4 years). The acquisition of the second computer, much larger with respect to storage and yet fully compatible with the 650, represents the first major step in the expansion of computer facilities.

*3. Program development and personnel assignment*

Program development proceeded at an accelerated rate and several programs have been tested and found to be satisfactory for operation so that when the computer is installed during the week of June 25, 1962, a satisfactory production schedule may be maintained.

A reorganization within the Bureau establishing an Electronic Computing Division was made effective June 1, 1962. An organizational chart and a roster of personnel already employed by the Coast and Geodetic Survey are attached. A hard core of 22 employees had been engaged in this type of work for many years. This group provides the nucleus for the expanded facility through the reorganization from a section to division status. Recruitment and selection of employees for the additional positions have been carried on at an accelerated rate and a reasonable degree of success is being made in obtaining competent individuals for the particular positions within the new organization. Some in-service training will be necessary in order to obtain a full complement.

A copy of a report prepared for an International Cartographic Conference in which the electronic computing activities of the Bureau are described is also attached.

*4. Increased usage for management*

The studies initiated in 1962 will continue. Simultaneously the financial management improvement program for fiscal year 1963-64 will be coordinated with proposed revisions in data processing. A more inclusive pay and leave recording system has been developed. (Coast and Geodetic Survey employees include classified, wage-board, commissioned officers, and seamen.) Production control and inventory systems for the Bureau are being revised and broadened. Byproducts of these systems move directly into cost accounting for the Bureau.

*5. Interagency Committee participation*

The Interagency Committee on Automatic Data Processing has served as a source of information on management techniques and problems. However, because of the size of the committee, the meetings have been limited, for the most part, to formal presentation with little opportunity for open discussion on current problems and developments. The major contributions are coming from the task forces established under the Committee. The proposed reorganization of the Interagency Committee, that is, the establishment of a separate advisory council, should provide the necessary environment for open discussions on current problems.

## U. S. DEPARTMENT OF COMMERCE COAST AND GEODETIC SURVEY

### ELECTRONIC COMPUTING DIVISION

Plans, coordinates, and directs the application and operation of electronic computing systems for the Bureau's scientific, engineering, research, and administrative functions and the processing, analyzing, and summarizing of statistical and technical data. Includes the preparation of mathematical programs, and the processing and preparation of accounts and other administrative data.

#### Planning Branch

Assists the Bureau's scientific, engineering, research and administrative functions in planning, developing, and evaluating the application of electronic computing systems to their needs. Determines the equipment, space, personnel, programming, and operating requirements for new applications. Coordinates and schedules systems time to achieve optimum utilization of equipment and economy of operations. Coordinates and schedules current systems applications for efficient and economical utilization of equipment. Revises the utilization of the equipment with respect to current and future requirements. Prepares feasibility studies and justifications for securing additional equipment. Provides advice on the capability and limitations of available equipment and current methodology. Maintains cost data on the electronic computing function.

#### Programming Branch

In accordance with the general requirements determined by the Planning Branch, analyzes specific systems applications and develops the computer programs. This includes the preparation of decision flow charts, machine instructions, testing routines, and operator instructions. Coordinates with personnel of other divisions in the development of unique computer programs and procedures. Revises the accuracy, adequacy, and efficiency of the programs.

#### Operating Branch

Operates electronic computers and peripheral equipment in accordance with job schedules established by the Planning Branch and program instructions furnished by the other divisions. Coordinates with other divisions in the preparation of input material and in the verification of final results.

## ELECTRONIC COMPUTATION IN SURVEYING AND MAPPING

Presented by U.S. Delegation to the Third United Nations Regional Cartographic Conference for Asia and the Far East Held at Bangkok, Thailand, October 27–November 10, 1961

(By Charles A. Whitten, Chief, Triangulation Branch, Division of Geodesy, Coast and Geodetic Survey, U.S. Department of Commerce, Washington, D.C., United States of America)

## ELECTRONIC COMPUTATION IN SURVEYING AND MAPPING

Federal agencies engaged in surveying and mapping are making excellent use of the rapid development in the field of electronic computers. The development in the computer industry has been so rapid that it has been difficult to select a type of computer best suited for this particular type of work. "Obsolescence" is a common term when discussing this electronic equipment and we have learned to be somewhat philosophical about the matter. We can be thankful that the same term does not find common usage as applied to our own human endeavor in the field of surveying and mapping.

It was almost 20 years ago that the Coast and Geodetic Survey made its first studies in the application of punchcard equipment to geodetic computing. However, it was not until after the end of World War II that machines of this type were acquired and techniques developed for making geodetic calculations on them. As experience was gained in the use of this type of calculator it was learned that many additional phases of the work in a surveying and mapping organization could be applied to them. The result was the acquisition of a larger and more advanced type of computer. At the present time we are using an IBM 650 magnetic drum calculator. I wish to take this opportunity to describe to you in considerable detail the types of problems that are being processed with this equipment and mention some of the techniques used in the solution of these problems.

The major portion of the work relates to the adjustment of triangulation. I do not need to tell you of the tedious and voluminous computations required when large networks of triangulation are adjusted, but you will be interested to know that practically all of these computations are now being made on this medium-sized electronic calculator.

The classical method of adjustment by variation of coordinates on the ellipsoid has been adopted as the basis for most of the work. The only information needed as "input" are the geographic positions of the fixed or previously adjusted control points, lists of observed directions, and approximate geographic positions of the new points which are to be adjusted. Values determined from field computations are generally adequate for use as these approximate positions.

The 650 calculator is not large enough to accept these input data and then furnish "output" of adjusted positions, lengths, and azimuths in a single operation. It is necessary to use a series of programs to determine the final values. Some of the individual steps take only a few minutes of time while one or two of the major steps may require hours or even days for a very large adjustment.

The most time consuming part of any adjustment is the solution of the network of normal equations. The mathematician in charge of the project endeavors to plan the work in such a way that the number of multiplications or steps required in the solution of the normal equations will be a minimum. Because of the characteristics of a computer being able to follow instructions in numerical sequence the mathematician must select and predetermine the order in which equations are to be solved. A number code is used for the unknowns. The digit 2 in the units position represents the "z" or rotation unknown, the digit 3 represents the latitude unknown, and the digit 4 the longitude unknown. Other digits can be used for special purposes and certain significance, as I will explain later.

The 10, 100, and 1,000 place digits are available for station numbers. For example, the three unknowns for the first point will be 12, 13, and 14, the three unknowns for the second point will be 22, 23, and 24, etc. Thus by the assignment of numbers to individual points the mathematician establishes the order in which the unknowns will be eliminated in the solution of the networks of equations. These same numbers for station identification will be used in all later steps, whether referring to positions, directions, lengths, or azimuths or corrections to any of these quantities.

These numbers must be assigned to these individual points by carefully inspecting a sketch of the survey and considering the interrelationship of points. Equations will contain coefficients of unknowns of points that "see each other." Judgment and experience are required in this step and as yet we have not attempted to program this operation for an automatic computer.

After the station numbers have been assigned, these numbers are placed in the lists of observed directions adjacent to the conventional station name. Now the data may be key punched, with each observation being punched in an individual card with a "from" and "to" station number identification. These cards will serve to activate other programs.

In the adjustment by variation of coordinates it is necessary to have a computed network of azimuths that is mathematically consistent within itself with a computed azimuth for each observed direction. This mathematically consistent network may be formed by making indirect or inverse computations between preliminary assumed geographic positions and whatever previously adjusted points are to be held in the computations.

These cards which were prepared from the lists of directions automatically indicate the lines for which inverse azimuths are needed. The "from" and "to" station designations indicate the geographic positions which must be paired for computing inverse azimuths, lengths, etc.

After studying several different types of inverse computation the Gauss mid-latitude method as modified by Rainsford of the British Overseas Survey and Meade of the Coast and Geodetic Survey was applied to the computer. This method is accurate for lengths ranging from a few meters to 600 miles. Briefly, it is an application of series expansion with latitude, and the differences of latitude and longitude as input. It is relatively simple to change the program for computing on different ellipsoids.

The next program in the general series computes the absolute term of each observation equation by comparing the computed azimuths of the lines with the observed direction of the line. Another small program selects the proper absolute terms needed to compute triangle closures. A tabulation of these triangle closures enables the person in charge of the adjustment to determine the overall accuracy of the field work and to stop any blunders which might have developed in the handling of input material. When the preliminary inverse computations have been made, the "output" includes the functions which can be used in the computation of the coefficients in the observation equations. The next program in the series takes care of this step. This same program performs all of the cross multiplications which are needed when observation equations are normalized.

After the cross multiplications have been made within the observation equations, a program designed to select, sort, and add these products together will produce the normal equations.

The matrix arrangement of the drum in the calculator is particularly well adapted for the storage of normal equations. The drum has an arrangement that can be described as 100 columns and 20 rows. We cannot use the entire drum for storing the matrix because the instructions for solving the equations require a considerable portion of the drum. However, we can load a matrix which has 48 columns and 16 rows. If a matrix is wider than 48 columns the program may be modified to load a matrix 96 columns in width but the number of rows is reduced to 8. This same process could be used to take care of even larger matrices.

The Gaussian elimination method is used with the modification proposed by Cholesky, who was an officer in the French Army in World War I. This Cholesky modification is particularly suitable for electronic calculators because each term in the reduced normal equation is the geometric means of the two terms with which you are familiar in the standard Gauss-Dolittle technique. The use of the Cholesky method cuts in half the number of figures which must be stored within the computer or, in other words, twice as many equations can be loaded at one time.

The use of this modification did present an interesting problem to our programmers. In the Cholesky method, the square root of the leading or diagonal term in the normals must be calculated. When we insert condition equations for length, azimuth, or position into a set of normals, the leading term, when reduced by the effect of preceding equations, will become negative. The square root of this quantity is imaginary. By using a coded number 5, 6, or 7, in the units position for these condition equations the calculator can detect the imaginary number and go into a subroutine for the proper calculation.

With a large network of equations, it is necessary to subdivide into small blocks or partitions. Each block is solved as a unit but while the numbers are in the computer all sums of cross multiplications needed in the reduction of the following blocks are punched on cards as output. Later these quantities become input with the proper block. The operator must exercise some care to see that the blocks are arranged properly but the program includes a technique for checking mishandling by the operator.

The back solution or substitution technique is carried out on another program in much the same manner as the previously described forward solution.

After the unknowns of the adjustment have been computed, they are substituted in observations equations for the computation of the residuals. These same unknowns are also used to correct the preliminary geographic positions and then final inverse computations made for all the lines of the network.

An additional program selects the residuals that are needed to compute corrections to angles in each triangle as well as the triangle closure. A tabulation of these quantities will show any place in the network where the observations might have been distorted in the process of the adjustment. This problem of distortion is very important in a network such as we have in the United States. In a structural sense, the area networks are stronger than the arcs which surround them, yet the arcs were adjusted first. Now we are endeavoring to fit the nets to them. Experience has shown that unless we have accuracies approaching one one-hundred-thousandths for the arcs, we will find rather severe distortion problems in the nets. I merely point out this problem to you to emphasize the purpose we had in making the recent revision in our basic specifications in which the fundamental minimum accuracy requirement for first-order triangulation was increased from one twenty-five-thousandths to one fifty-thousandths.

These same techniques which I have described for adjusting triangulation have been modified to include observation equations for length so that combined networks of triangulation, trilateration, and traverse may be adjusted simultaneously.

The Coast and Geodetic Survey cooperated with the Government of Ethiopia in establishing fundamental horizontal and vertical control in the Blue Nile region. The network of triangulation consisted of 252 primary points, 118 supplemental points, 9 invar baselines, 7 tellurometer base nets, and 11 LaPlace azimuths. The adjustment of this large net was completed using the computer programs just described.

The programs that I have described thus far do not make use of any direct method for the computation of geographic positions. However, there are programs for several different types of geodetic and cartographic work which require the use of the direct method. The basic program for this calculation is a modification of the method developed by Simmons of the Coast and Geodetic Survey some 20 years ago. This method makes use of a precomputed meridian arc. On the electronic calculator, the values for the meridian arc are computed as needed by a series expansion. There is a free interchange between latitude expressed in radian measure and meridian arc expressed in meters. We have not made any effort to compute a maximum length of line by this method but rather we use an iterative technique of extending lines in units of 100 kilometers or less. I might mention that for all types of geographic position computation, direct or indirect, we use a standard practice of working to the fifth decimal place, of seconds of position, third decimal place of azimuth, and millimeters in length.

Each of the 50 States of the United States has an individual coordinate system. For the larger States several zones may be required. Three different types of projections are used: Lambert, transverse mercator, and oblique mercator. Programs have been developed for the transformation of geographic positions to any of these coordinate systems or vice versa, i.e., transformation of plane coordinates to geographic positions. These programs are series expansions with only six or eight constants for an individual zone. A similar program computes UTM coordinates. In connection with our cooperative survey program in Ethiopia we found it necessary to compute tables for the computation of geographic positions when using desk calculators. Tables for both natural and logarithmic functions were computed on the calculator and the tables printed by photolithography from tabulations from punched cards. This program is one that will not be used very often but it will be retained so that if any agency wishes tables of this

type on any previously accepted ellipsoid or any new ellipsoid, the tables can be readily computed and published.

The routines that were developed for the state plane coordinates, UTM, latitude functions, etc., were drawn upon to develop a program for computing the micrometer settings for the ruling machine used in drawing meridians, parallels and grid lines on base mapping sheets at any given scale. While this problem may not seem difficult to a cartographer it does become rather complex when one must consider the mathematical interrelationship of the grid of the ruling machine, the rectangular grid of the ground, the framework of meridians and the parallels and the scale of the map sheet so that all drafting may be done without removing or shifting the base sheet during the operations of drafting.

A few years ago Brig. Martin Hotine, Director of the British Overseas Surveys, proposed the use of 3-dimensional techniques in adjusting triangulation. Considerable research and some actual adjustments have been made using this technique. We are not using the procedure on routine work but we are continuing our studies in its general application.

It is interesting that the programs we have developed and are working on at the present time for the adjustment of aero-triangulation make use of the mathematical techniques required in the 3-dimensional adjustment proposed by Brigadier Hotine. Our first approach in the photogrammetric technique was to adjust a strip of photos by a cantilever method. Third degree equations were used along the axis of flight with second degree equations transverse to the axis of flight. The same basic program can be used for either horizontal or vertical adjustment. No attempt has been made as yet to combine and make a simultaneous horizontal and vertical adjustment by this cantilever method.

Within the past year techniques have been perfected for the analytical adjustment of aero-triangulation. Other reports presented at this meeting will contain descriptions of the instruments being used to develop the digital information required for this analytical treatment. The final phase of this work which will include a grand adjustment of adjacent strips, referred to as "block adjustment," will be completed in the near future.

Data processing techniques have been applied to the reduction of geomagnetic observatory records. The Coast and Geodetic Survey maintains seven permanent magnetic observatories. The observations which are recorded hourly are processed and prepared for publication. An automatic magnetometer has been designed for installation at an observatory and will produce continuous records of the variation in the earth's magnetic field. A computer program is being developed which will process this material. The volume of computing and data processing will be extremely large but the final data will show a great deal more detail than has been available in the past years, when only hourly values were recorded.

The Coast and Geodetic Survey has been processing the geomagnetic data used in the construction of world isogonic charts. The next series to be published will be on a epoch of 1965. Some of the preliminary work involving these calculations is underway.

Another unique application in the field of geophysics is the computation of epicenters of earthquakes from arrival time data submitted by seismological stations from all over the world. Several hundred epicenters are calculated each month and the results published for distribution to seismologists throughout the world.

Every Federal organization has responsibilities in the fiscal and budget area of administration. This has been rather facetiously described as a house-keeping operation. I do not want to predict or forecast that every home will require an electronic calculator for balancing personal budgets. In an agency where several different types of employee classifications exist, Federal tax deductions and even State tax deductions are made along with insurance, bonds, allotments, and many other items to consider as well as the maintaining of cost records for projects and functions, you can readily appreciate that data processing on electronic equipment has become an efficient method of keeping records both as regards accuracy and the urgency of timeliness of reporting.

At various times we have received requests for copies of these programs. Perhaps some of you in this group have sought this type of information. Our general policy has been to assist Federal agencies of other countries or of our own United States or State and municipal agencies engaged in this type of work in every way we can. We do not have the resources to prepare complete brochures on each of the programs with full instructions so that the uninitiated

might be able to perform some type of computing in a robot manner. Our basic philosophy is that the computer is merely a tool used by experienced technicians and that an agency should not try to use a tool of this type if it does not have experienced personnel. We welcome visitors and are always glad to demonstrate the methods we are using. We have found that when experienced people have visited our shop they do not find it necessary to ask for a "canned" program. They would rather develop their own programs using routines and techniques familiar to their own group.

This entire field of computer development and computer application is changing constantly, but that fact should not dissuade any group from becoming interested and actually using this new tool. It is quite essential that those of us who are in surveying and mapping activities make the best possible use of these new techniques in computing, and be alert to the broader applications which we are confident can be made in the future.

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#### STATEMENT OF THE MARITIME ADMINISTRATION, DEPARTMENT OF COMMERCE

During 1960, the Maritime Administration conducted an agencywide study to determine the economic and operational feasibility of installing an electronic computer system. The study was made by a data processing study group composed of personnel from the management staff and the interested operating offices of the agency, with technical advice and assistance furnished by the National Bureau of Standards. The areas selected for the study were the statistical operations, operating-differential subsidy rate calculations, and engineering and scientific calculations. As a result of this study, it was concluded that—

1. The operations of the Maritime Administration were of insufficient volume or insufficiently adaptable to electronic computer techniques, to permit the design of an integrated computer system which would yield a profitable installation of such a system in this agency.

2. The marine engineering and ship design area includes problems of a mathematical nature which might be programmed for computer application. Other organizations, both in Government and private industry, have put similar type problems on a computer. It was therefore decided that computer systems available on a service basis from manufacturers or other Government agencies, should be utilized in this area as the need arises.

3. There was a need for more modern tabulating equipment, with greater speed capacity and flexibility, to meet the increasing demand for more timely and complex data, and to permit the mechanization of certain operations which were performed largely by hand because of the inadequacy of the existing equipment.

In connection with item 3 above, the tabulating equipment of the Maritime Administration was converted from a conventional electric accounting machine system to an IBM 1401 card-input, card-output system. This conversion was accomplished in October 1961, at no additional cost, and with a minimum of interruption in work, by placing the new equipment in operation immediately upon delivery. This was possible through the training of selected personnel and developing appropriate programs in advance.

The equipment presently used in the system is on lease from the manufacturer. A comparative cost study, of lease versus purchase, of the equipment is being conducted as required in Bureau of the Budget Circular A-54.

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#### STATEMENT OF THE NATIONAL BUREAU OF STANDARDS, DEPARTMENT OF COMMERCE

The activities of the National Bureau of Standards in the field of electronic data processing are manifold. They include:

- (1) Support to the scientific and technical missions of the Bureau;
- (2) Support in the administrative area of the Bureau;
- (3) Research in the use of electronic data-processing equipment in relation to its applicability to existing and proposed problems of Government;
- (4) Research in the design of electronic data-processing equipment components, and development of special equipment to meet unique needs of Government;

(5) Specialized data-processing and computation services for other agencies; and

(6) Consulting and advisory services to other agencies of the Federal Government.

The National Bureau of Standards has made important contributions to the development of electronic digital computers, and to the mathematical techniques for the formulation and programing of the increasingly complex problems on which computers are used. References have been made in previous subcommittee hearings to the Bureau's contribution to the electronic data processing programs of the Bureau of the Census and to the Social Security Administration, among others. At the present time National Bureau of Standards staff members are either acting as consultants to, or actively participating with, other Government agencies in such elaborate undertakings as automation of the Post Office and automation of the searching techniques in the Patent Office. At the other extreme, one of the smallest projects recently undertaken was calculation of the tax depreciation tables in the program announced by the President just a few months ago.

The Bureau attempts to maintain current awareness of new electronic data processing equipment developments and techniques, and provide consultation to other agencies in the preparation of feasibility studies and in the selection of equipment best suited to their needs. In cooperation with the National Science Foundation, National Bureau of Standards maintains a Research Information Center and Advisory Service on Information Processing which provides a central source of information concerning the expanding research and development activities in the field of scientific information processing and retrieval.

The following comments are directed to the five subject matter areas mentioned in the subcommittee's letter of May 28, 1962, to the Secretary of Commerce.

#### 1. *Agency planning prior to installation of equipment*

In recent years, the Bureau has been engaged in three large in-house computer projects:

(a) Conversion from an IBM 704 to an IBM 7090/1401 system and its anticipated updating to an IBM 7094/1410 system;

(b) Conversion from an IBM 650 to a CDC 1604/IBM 1401 system at the National Bureau of Standards Boulder Laboratories and planning for the possible updating of that facility; and

(c) Construction of the pilot data processor designed as a research tool for experimental investigation of data-processing problems of special importance to agencies of the Government.

The need for converting from an IBM 704 to another computer was based on the fact that the scientific and technical problems which the National Bureau of Standards staff was formulating were exceeding the capacity of the machine. Data on the technical characteristics of equipment proposed by various manufacturers were evaluated in terms of relative capabilities to solve a variety of typical problems. On the basis of such comparisons, as well as such other factors as delivery date, unit cost of computation, the cost of necessary improvement to the site, etc., an IBM 7090/1401 system was selected. Similar procedures were followed in the selection of the CDC 1604 computer for the Boulder Laboratories.

The Bureau's special mission to conduct research in the applicability of electronic data processing type equipment to proposed problem areas and in the design of electronic data-processing equipment components underlies its continuing effort in support of the pilot data processor. The National Bureau of Standards staff has long recognized the need for a machine whose internal structure is more logically sophisticated than any that exists today. This need has been felt from many sources. The need to analyze, synthesize, and ultimately control traffic flow both on the ground and in the air is one example. The need to study communications between computers is another. Many others could be cited, but let it suffice to say that the design of the computers of today are entirely inadequate when placed into juxtaposition with the control and communication problems which are threatening to inundate us. The National Bureau of Standards is working to improve this situation.

Through its consulting services to other agencies which are planning computer installations, the Bureau has become aware of the difficulties which many encounter in attempting to apply existing planning guidelines to specific situations. It is believed that a series of well documented and carefully analyzed case history reports of successful prior planning activities with suggestions concerning

the time, effort, and money which might appropriately be expended in comparable situations would do much to reduce confusion on this point.

### *2. Effectiveness of policies in Bureau of the Budget Circular A-54*

The National Bureau of Standards recently has completed a review of its EDP equipment as prescribed by the Bureau of the Budget Circular A-54. It is believed that the Bureau's practices are in general agreement with the policies set forth in the circular. However, an important distinction should be noted between the stable repetitive types of EDP operations to which these policies are readily applied and the relatively unpredictable experimental operations which constitute a substantial part of the use to which EDP equipment is placed in a research organization such as the National Bureau of Standards. In situations where EDP equipment is used primarily as a tool applied to constantly changing problems of increasing complexity rather than as a production element, increased emphasis must be given to the availability of a flexible, capable machine without undue delay. This is an important consideration in regard to both planned utilization and long-term usefulness of the equipment. It would be helpful, therefore, if circular A-54 gave more specific recognition to the special problems associated with experimental and other nonroutine classes of EDP activities. One step which might help to implement the purchase-rather-than-rent aspects of circular A-54 is the development of more suitable procedures for the disposal of surplus EDP equipment. Some sort of secondhand market within Government is needed to capitalize on the savings inherent in ownership.

With regard to interagency use of equipment, NBS has a long history of sharing both its facilities and its technical staff. Two recent examples may serve to indicate the scope and flexibility of these cooperative arrangements. While the Weather Bureau was converting to its present EDP system, the National Bureau of Standards made its physical facilities available to Weather Bureau operators who ran their problems on National Bureau of Standards equipment. As a byproduct of this cooperation, it was demonstrated that a microwave link could be used effectively in the transfer of data between computing facilities.

NBS frequently provides both equipment and technical staff in cooperative programs. In one such case, the NBS Radiation Physics Division formulated a mathematical model to calculate the protection factor against radioactive fallout of a shelter within a building of known physical characteristics. Under the leadership of the Office of Civil Defense, the Army Corps of Engineers and the Navy Bureau of Yards and Docks arranged for the collection of pertinent data on all major buildings in the United States. The Bureau of the Census prepared these data for insertion into the NBS computer. NBS prepared all of the codes necessary to insure the quality of these input data, to calculate the protection factors, and to produce summaries of the distribution of these shelters throughout the United States.

### *3. Manpower utilization*

The Bureau's experience in connection with the staffing of its EDP facilities in recent years is considerably more favorable than that reported by many other agencies. Since emphasis at NBS is upon research and development activities, it is possible to offer diverse and interesting problems which challenge the ingenuity and imagination of the staff. On this basis, the Bureau has been relatively better able to attract and retain a programming staff of high quality in the face of attractive offers from industry at higher salaries. Even so the rate of loss of high quality, experienced individuals is frequently discouraging. The present situation will most probably deteriorate unless prompt action is taken to provide salaries more comparable to those offered skilled programmers in industry. The importance of this problem to the Government as a whole cannot be overemphasized. In its role as an adviser to other agencies of Government, NBS has found that the problem of obtaining appropriately trained manpower is perhaps the most serious single limitation in the EDP field at the present time.

In contrast to its unusual experience with programmers, the Bureau has experienced considerable difficulty in attracting and holding scientists and engineers qualified for research, design, and development of EDP equipment and systems. In this area an interesting program does not seem sufficient to offset the very substantial salary gap which exists between Government and industry.

### *4. Use of EDP data in management and simplification of reporting requirements*

While the principal use of the major EDP facilities of the National Bureau of Standards is to support its technical mission, the Bureau also has been alert to the opportunities for use of this equipment in its administrative operations.

At present EDP equipment is used in variety of accounting and inventory control operations including such diverse things as auditing of annual and sick leave records, posting of retirement records, production control in the Shops Division, inventory control, and reports on sales of standard sample materials, maintenance of space records, and preparation of fiscal reports to the many other agencies of Government which transfer funds to NBS. The Bureau recently mechanized its personnel records and is producing in this way some special statistical studies of interest to NBS management in addition to the numerous personnel reports required by those outside the Bureau. In the near future, records concerning the testing and calibration services offered by the Bureau and the billing of fees charged for these services will be mechanized.

##### *5. Progress of Interagency Committee on Automatic Data Processing*

The Interagency Committee on Automatic Data Processing has considerable potential for promoting more effective utilization of EDP facilities through the exchange of information. It might provide important guidance, for example, in the selection, documentation, and analysis of the typical "case histories" of planning efforts suggested under item 1.

A serious limitation on the effectiveness of the committee at present is the lack of adequate resources to fully explore and evaluate many of the suggestions which evolve from committee activities. The nature of the field is such that substantial time, effort, and money are required for many such studies and individual agencies seldom have resources which they can afford to use in this way. It seems appropriate that agencies with central responsibilities in the field, such as the National Bureau of Standards, should provide this kind of assistance.

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#### STATEMENT OF THE PATENT OFFICE, DEPARTMENT OF COMMERCE

The Patent Office commenced use of electronic data processing equipment in April 1959. In IBM RAMAC system has been employed since that date as a research tool in support of the effort to mechanize searching of patent literature.

Since this equipment has been used for experimental work rather than to provide an operational data processing system, the Patent Office can relate its experience to the specific areas of interest expressed by the committee only to a limited extent. The comments which follow are responsive to the outline of major topics.

(1) *Agency planning prior to installation of equipment.*—Pursuant to a recommendation of the Advisory Committee on Application of Machines to Patent Office Operation which was headed by Dr. Vannevar Bush, a research and development unit was established in the Patent Office in 1955. This group immediately directed its attention to the machine search problem employing specially designed punchcard handling equipment in its earlier experimental work. Having established the feasibility of mechanized searching in a very limited area of inventive art, it became apparent that the research effort required electronic data processing equipment to aid further experimentation. A tentative conclusion was reached that parallel access searching facility offered significant advantages over serial searching methods formerly used. However, prior to selection of EDP equipment a committee of scientists from the Massachusetts Institute of Technology was asked to review the conclusion of the Patent Office that parallel-access searching held sufficient promise to justify the purchase or lease of a machine. When this committee confirmed the earlier conclusion of the Patent Office, steps were taken to secure a system which provided for parallel-access searching by providing random access storage facility. The IBM RAMAC met the need for a small computer with random access storage. Accordingly, such a machine was obtained on a lease basis. In view of the anticipated need for larger and more advanced equipment for use in the future, there was no reasonable basis upon which a purchase justification could have been developed.

(2) *Effectiveness of the policies outlined in the Bureau of the Budget Circular A-54 and agency compliance therewith.*—Since the IBM 305 RAMAC was secured prior to the issuance of the Bureau of the Budget Circular A-54, the Patent Office has had no occasion to test the full effectiveness of the policies outlined therein. The Patent Office currently has a study in progress to determine the feasibility of the use of electronic data processing facilities for administrative operations.

However, it has moved only through the point of documenting present practices and procedures. The critical phase of developing system specification and selecting equipment has just begun.

(3) *Manpower utilization in the initial planning, installation and operation phases and later in current planning and routine operations.*—Since the IBM 305 RAMAC is used as an experimental machine on a single shift basis, the manpower requirement is only about 1½ man-years devoted to programing test runs and console operation. With such a small personnel complement, we have had no problems relating to training of employees, recruitment, or turnover. Since the machine has been used as a research tool, there has been no displacement of personnel.

(4) *Efforts to increase use of byproduct statistical data in management decisions.*—Due to the nature of the 305 RAMAC operation, the Patent Office has had no opportunity to use byproducts of its EDP operations. However, the practice of generating byproduct information in machine language has been followed by the Patent Office through its source data automation program. For example, as notification of personnel actions are typed, paper tape is automatically punched which contains data that is subsequently automatically reproduced into tabulating cards from which personnel statistics reports are generated.

(5) *Progress of the Interagency Committee on Automatic Data Processing as a Federal clearinghouse for the exchange of EDP information.*—The Patent Office has found the Interagency Committee on Automatic Data Processing useful to the extent that its meetings have been informative as to new developments and current trends in the data processing field.

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## STATEMENT OF THE BUREAU OF PUBLIC ROADS, DEPARTMENT OF COMMERCE<sup>1</sup>

### I. AGENCY PLANNING PRIOR TO INSTALLATION

#### A. *Extent of feasibility study*

In July 1956, as a means of expediting the administration of the enormous Federal-aid highway program, a decision was made by top management of the Bureau to augment the then existing electric accounting machine (EAM) facilities with a medium size digital computer which would be compatible with punch-card systems. However, the group assigned to the task of studying the problem in more detail soon discovered that, in the automatic data processing program of the Federal Government as a whole, there was little, if anything, in the way of guidelines or criteria with respect to conducting feasibility and application studies. Thus, in considering the upgrading of the punched card tabulating facilities, top management reached a decision to add a compatible medium-scale card operated computer on the basis of internal needs and trends only. It was considered that in supplementing existing EAM equipment in this manner, it would be possible to begin a logical transition to electronic data processing with a minimum initial increase in total cost and a maximum potential for greater savings in the cost of advancing the greatly enlarged highway program. Following this decision, a medium size computer was installed in July 1958.

By 1959, the Bureau of Public Roads faced a growing need to update its ADP equipment in order to progress in integrated data processing in keeping with the growth of its highway programs. However, it was recognized that updating existing equipment to the largest possible computing system available would not automatically fill this need. Much study and planning must go into the successful expansion of any computer operation, regardless of the type or size of equipment ultimately put into use, since it is essential that equipment be updated only to the degree that the organization serviced can effectively utilize the new system. Therefore, Public Roads management determined that an extensive study was necessary before arriving at a new system that would economically meet the Bureau's short-range goals while allowing for future expansion to keep current with developing program needs and long-range program goals.

On May 11, 1959, the Administrator of Public Roads appointed a top management person from each office to serve on a newly established Automatic Data Processing Advisory Committee. Under the Commissioner as Chairman, the

<sup>1</sup> Secs. I and IV of this statement are largely derived from the recently prepared publication entitled "Automatic Data Processing in Highway Engineering," which is printed in its entirety following this statement.

Committee was charged with providing leadership and coordination of the Public Roads ADP program, with developing a master plan for integration of closely related processing procedures, with providing a recognized channel of clearance of ADP applications proposed by separate offices of the Bureau, and with serving as a means of communication among these offices to promote maximum integration of data processing systems.

An ADP subcommittee was formed in each office and was headed by the member of the ADP Advisory Committee. Surveys were then initiated to promote the increased use of advanced computer methods and techniques generally and specifically to determine the need for updating the Washington office computing facilities. Technical assistance in conducting these studies was provided by personnel of the Office of Administration's Data Processing Branch and of the Electronics Branch, Division of Development, Office of Operations.

Preliminary findings of the subcommittees indicated that the existing computing system was inadequate for the Bureau to accomplish its objectives in EDP. It was apparent that a tape system would be required to allow reasonable expansion of EDP operations and that these operations, to keep pace with the advancing highway program, should be placed into effect prior to fiscal 1962. Several alternatives relating to EDP equipment available or soon to become available were considered.

Surveys of the Office of Research and the Office of Administration were completed by December 1959. These offices had been the major users of the data processing services currently available within Public Roads. To insure that new equipment would be adequately considered, machine specifications were developed based on these surveys and four equipment manufacturers were invited to separate briefing sessions beginning January 25, 1960.

The ADP Advisory Committee completed an inventory of present and potential EDP and EAM applications on May 10, 1960. The Commissioner of Public Roads then directed the members of the Committee to review the inventory of applications with those persons responsible for the program areas which would be affected by a conversion to automatic data processing. The results of these reviews were embodied in subcommittee reports from which evolved short-range and long-range ADP planning data as to benefits to be derived, workload and employment statistics, and equipment requirements.

To provide for the most comprehensive analysis of the manufacturers' equipment proposals, the Committee studied the proposed computer systems in the light of Public Roads present and planned EDP workload. A comparison of equipment costs was made and analyzed for the equipment proposed; and the 5-year costs were estimated and summarized for each data processing system.

Based on the findings of the several subcommittees and the careful study of proposals by equipment manufacturers, the ADP Advisory Committee recommended that Public Roads replace its card-operated IBM-650 computer in the Washington office with an IBM-1401 computer system with 4 magnetic tape units and 8,000 characters of memory storage. It was further recommended that this equipment change take place as soon after April 1, 1961, as possible and that the memory storage be expanded to 16,000 characters in the fall of 1961. These recommendations were approved and a purchase order was issued for the new equipment on December 16, 1960. The new system was installed in March 1961.

The Bureau's regional office in Portland, Oreg., which has responsibility for direct construction activities in Washington, Oregon, Idaho, and Montana, has been a leader in use of electronic data processing in highway engineering. In late 1955 the staff in region 8 conducted preliminary investigations on a program developed by the State of Oregon for computing construction earthwork quantities.

This was followed in early 1956 by meetings with Washington office staff with regard to engineering methods study and application of electronic computers. Regional staff attended a manufacturer's course to learn programming on electronic computers. In April of 1956 the first computer program for clearing and grubbing was completed by the regional staff.

During the next several months additional construction engineering programs were developed and tested and distributed to several State highway departments and other Bureau offices. In November 1956 the Bureau secured time on an IBM-650 belonging to the Corps of Engineers and began doing all computing operations in the customhouse in Portland.

When machine time reached a full shift on the Corps of Engineers computer, regional personnel conducted numerous studies of various manufacturers' systems, the cost of a Public Roads installation as compared with rental of time on the Corps of Engineers equipment, and the degree of service that could be expected from Bureau equipment versus service provided through use of equipment of another agency. A feasibility study was developed and reviewed and approved by the ADP Committee, resulting in authorization to region 8 to rent an IBM-650 card computer which was installed in the Bureau's Vancouver, Wash., design office in October 1959.

Subsequent study by the region led to a determination that the 650 should be replaced with a more powerful medium scale card computer. This recommendation was reviewed and approved by the ADP Advisory Committee, and an IBM-1401 card computer was delivered in February 1962 and is now in operation.

The regional office at Denver has responsibility for direct construction activities in Wyoming, Utah, Colorado, and New Mexico. ADP activities in this region were started in January 1959 and considerable progress has been made. Fourteen highway engineering applications and two highway administration applications are being processed on a computer.

The highway engineering ADP activities are very closely related to aerial survey activities. The survey and design section of the region uses a Kelsh Plotter with an Auto-trol Scaler attachment to digitize terrain data directly to punchcards. The punched cards are then utilized in ADP highway design computations. Approximately 95 percent of preliminary location and design work is accomplished with photogrammetric and ADP methods.

Region 9 in the past used a commercial IBM 650 computer located 8 miles from their office. They have also used a computer of the National Bureau of Standards located 30 miles distance and the facilities of the Colorado Highway Department located 13 miles distance. Due to the distances involved and the expanding ADP activities of region 9, a feasibility study was developed and a recommendation for a computer system to be installed in fiscal year 1962 was made to the Chairman of the ADP Committee. The ADP Advisory Committee reviewed the feasibility study and approved the recommendation which proposed the rental of an IBM 1620 computer with peripheral equipment to be acquired in fiscal year 1962. The equipment was installed in January 1962 and placed in operation in February 1962.

#### *B. Background of decision to shift to new or different equipment*

One year after the new 1401 tape computer was installed, utilization had reached 100 percent of first shift, 100 percent of second shift and additional time on third shift and weekends. This utilization compared with 76 percent of first shift time predicted in the Report of ADP Feasibility Study dated November 1960, and resulted from (1) greater volume of work on known applications at an earlier time than anticipated, and (2) the processing work of the National Driver Register Service which developed since the original study was made. On April 6, 1962, the Director of the Office of Administration directed a communication to the Chairman of the Bureau's ADP Committee in which he outlined the critical situation in connection with the demands of the Washington offices for service which could not be filled because of limitation of available time on the computer and recommended that a second 1401 with additional tapes be acquired.

The Bureau's ADP Committee met on April 26, 1962, and on May 4, 1962, recommended that certain EAM equipment be replaced with a 4K-1401 computer and one magnetic tape unit, and that the present 16K-1401 be replaced with a 40K-1410 computer and one additional tape unit. This recommendation was consistent with the findings in the "Report of ADP Feasibility Study." Departmental approval of the Bureau's equipment recommendation was received on May 29, 1962, and a letter of intent was forwarded to the manufacturer on June 1, 1962.

## II. EFFECTIVENESS OF POLICIES OUTLINED IN CIRCULAR A-54

### *A. Utilization of equipment*

During fiscal year 1960 the last full year of operation of the 650 card computer in the Washington office, the Bureau averaged 219 hours utilization per month. The 650 computer in region 8 was utilized on the average of 200 hours per month. During the first 11 months of fiscal year 1962 the 1401 tape computer utilization has averaged in excess of 300 hours per month. It is estimated that the 1401 computer to be installed in the headquarters office will be utilized 350 hours per month and the 1410 approximately 300 hours per month. The utiliza-

tion of computers in regions 8 and 9 is estimated at 200 and 180 hours respectively in fiscal year 1963.

*B. Lease versus purchase*

A comparative cost analysis of lease versus purchase was made for all EAM and ADP equipment for the field regions. These analyses indicated that a substantial cost advantage to the Government could be obtained by purchase. Regions 8 and 9 were instructed on January 22, 1962, to amend their purchase orders for new equipment to provide for purchase rather than rental.

The Bureau has not completed an analysis of cost benefits of purchase versus lease for the Washington office equipment. In the event that this analysis indicates a benefit to the Government through purchase, a line item will be included in the 1964 budget. The decision to purchase the Washington office equipment will, of course, depend on the availability of appropriations.

*C. Interagency arrangement for machine use*

The Bureau has long recognized that upgrading equipment to meet the needs of all operations for all users is not feasible. Equipment requirements must be weighed with cost and utilization to achieve the best possible balance.

For this reason there were some programs in the planning and research area that could not be accommodated on our past and our present equipment. The proposed new 1410 computer likewise will not have sufficient memory capacity or computational capability to perform all projects in these areas.

It is the Bureau's intention to continue, as we have done in the past, to use computer facilities of other Government agencies to the extent possible for those projects that cannot be accommodated on the proposed equipment.

On the other side of the ledger, the Bureau has for the past 6 months, been processing the payroll for the Office of the Secretary of Commerce and from time-to-time has made its computer facilities available to other agencies of Government on a reimbursable basis.

III. MANPOWER UTILIZATION

In the 10-year period from 1952 to 1962 there was both rapid expansion and improvement of the data-processing industry and of Public Roads data-processing facilities, operations, and personnel. In fiscal year 1953 the Bureau had 19 employees engaged in EAM operations.

The Bureau began recruiting personnel for ADP operations in October of 1957. At the time the 650 card computer was delivered, seven programmers or systems analysts had been recruited and trained. This staff had been expanded to 10 by March of 1961 when the 1401 was delivered. During fiscal year 1962 8 additional programmers or systems analysts were placed on the rolls and the appropriation request for fiscal year 1963 would provide for a total staff of 30 by June 30, 1963.

The staff presently engaged in EAM activities numbers 34 and if the appropriation request for fiscal year 1963 is approved the staff will increase to a total of 40. There will be adjustments in the makeup of this staff after the new 1401 and 1410 computers are installed through a reduction in tabulating equipment operators and an increase in key punch operators to handle the anticipated key punch workload.

The Bureau has made wide use of the manufacturers' training facilities. The following table reflects the number of Bureau headquarters personnel who have attended various training courses since 1958:

Fiscal year—	Number of personnel trained
1958.....	9
1959.....	31
1960.....	17
1961.....	12
1962.....	15
Total.....	84

The Bureau has encountered difficulty in the past in recruiting qualified systems analysts and programmers and has had to recruit these types of personnel at the training level. While production is low at the start, our experience has shown that once oriented, usually in the span of 3 or 4 months, these trainees are able to produce a reasonable volume of acceptable work.

It should be noted that the critical recruitment area at present is key punch operators.

The following table reflects the accessions and losses since fiscal year 1958 separately for the Bureau's EAM and ADP sections:

Fiscal year	EAM		ADP		Total	
	Gains	Losses	Gains	Losses	Gains	Losses
1958.....	3	4	5	-----	8	4
1959.....	5	3	2	-----	7	3
1960.....	10	7	3	2	13	9
1961.....	5	6	3	-----	8	6
1962.....	7	7	8	4	15	11

In February of 1962 the Automatic Data Processing Branch of the Budget and Management Division was elevated to division status in recognition of its increasing responsibility for highly complex and technical electronic computer services. Under the reorganization this division was assigned responsibility for providing technical assistance to the executive and operating staffs in developing electronic methods and designing EDP systems, conducting feasibility and application studies, and in the planning and conversion to EDP or EAM processing those operations which can be performed more efficiently and economically in such a manner.

A classification survey was conducted and in recognition of the increased responsibilities assigned to this Division the grade structure was revised.

The new grade structure now provides a career ladder which would enable an employee to begin at the entrance level (GS-5) and eventually under the right set of circumstances rise to division chief.

The Bureau has not encountered any problems in job opportunities for employees displaced by automation. Generally those displaced are in the low grade clerical area where there is a high turnover rate. The use of computers for location and design of highways in our direct construction regions has not created a problem of displacement of engineers and engineering aids. This type of personnel is in short supply and those who were formerly engaged in hand computations for location and design are now free for assignment to the construction phase of the highway project. Through the use of the computer in our Portland, Oreg., office, the region was able to accomplish a much larger construction program with but little increase in engineering manpower.

#### IV. Use of byproduct statistical data in management decisions

During the first 6 years of the highway program (1917-22) appropriations totaling \$350 million were made for Federal-aid highways. Of that amount, a cash balance of \$178 million remained at the close of fiscal year 1922. At that time Public Roads recognized that it was confronted with a financial management problem in administering a long leadtime public works program.

With respect to the methods to be used for financing this program, the Congress expressed its intent in the Post Office Appropriation Act of June 19, 1922, which provided contractual authority for fiscal years 1923, 1924, and 1925. The act provided that the sums authorized would be apportioned among the States by the Secretary and for the appropriation of actual amounts of cash needed each fiscal year to make payments to the State highway departments. This method of financing proved to be successful and has been used since that time.

This development created a need for information which management could use in measuring the progress of the program; in controlling obligations within the Secretary's apportionments; and in developing estimates of the amounts which would be required each fiscal year for payment to the State highway departments of the Federal share (grant) for the cost of work performed and billed for by the State during that year. To provide this information a punchcard system was designed to record transactions at successive stages during the life of each highway project. By analysis of these transactions (aided by machine tabulating processes) obligations incurred are related to disbursements made. On the basis of past experience, and taking into account the use of obligational authority and other pertinent financing factors, it is possible to forecast future requirements accurately.

The creation of the highway trust fund (Highway Revenue Act of 1956) is an illustration of "other pertinent financing factors." The preparation of reliable expenditure estimates for the highway trust fund requires suitable methods for accurately estimating program requirements for the current and the budget years as well as long-range estimates through completion of the Interstate System. In the past, Federal-aid highway program estimates have been found to be extremely accurate when based on the timelag from cumulative program obligations to cumulative project payments, so long as the program was fairly uniform in size and was not expanding rapidly.

In order to obtain a more reliable yardstick for use in connection with the rapidly expanding interstate program, a procedure utilizing linear programming techniques was developed to relate the actual rate of payout on Federal-aid projects to the time of initial obligation of the funds. The Federal funds are obligated when the State is given the green light to proceed with work. Since payments are made only for work that has been done, the time thus measured includes (1) time following the go-ahead signal until the work is actually started, and (2) time following accomplishment of the work required for preparation and submission of vouchers, reviewing and approving of vouchers, and their passage for payment of the Federal share. This covers the various kinds of work—preliminary engineering, and right-of-way acquisition, as well as actual construction.

The first step in developing the relationships was to assemble and collate Federal-aid project obligation and expenditure information, separately for the ABC program and for the interstate program. The dates and amounts of project obligations were related to the ensuing dates and amounts of project payments, to determine the months of elapsed time from obligation to payment.

Payment data were summarized to show the portions of the total obligations that were paid 1, 2, 3, and so forth, months after the date of obligation. The curve obtained by plotting the cumulative payments following date of obligation against elapsed time in months from obligation to payment has a characteristic elongated S-shape, rising (for the A-B-C program) to approximately 54 percent by the end of 12 months, 84 percent after 24 months, 94 percent after 36 months, 98 percent after 48 months, and 100 percent after 60 months. Corresponding amounts for the interstate program are approximately 35, 71, 88, 95, and 100 percent, respectively.

A check made by applying these rates against actual obligations has produced estimated expenditures that were accurate within 0.6 percent of the actual in total for the fiscal years 1957-60, inclusive, for A-B-C funds, and within 1.5 percent for interstate funds.

Through the use of the computer, expenditure projections for any given set of obligations can be developed within a very short period of time. Without this computer program, the Bureau would be unable to meet the extremely short deadlines established by review agencies and the Congress to determine the effect of various apportionment and obligation assumptions on the expenditure requirements from the highway trust fund.

Personnel ADP accounting system is mechanized and centralized. The responsibility for certain personnel functions is decentralized among 10 field regions. Initial documents of personnel actions are prepared at stations throughout the United States, Central America, and various foreign countries. In lieu of SF-50, Notification of Personnel Action, a special form PR-750 is used which is only a slight modification of the SF-50. The principal feature of PR-750 is an extra data-processing copy. This has special provisions for coding data which cannot be transcribed directly by the key punch operators. Except for this provision, the form PR-750 is prepared in exactly the same manner as the SF-50. By this means, the problems inherent in decentralized operations and centralized data processing are solved.

In addition to providing information for personnel management and reporting, the system is also useful to management for other purposes, particularly the budgetary processes. An illustration of one such use is the Federal-aid salary projection. This process is a means of projecting personal services and related costs into future budgetary periods during the current year and the budget year. These projections are based upon personnel "onboard" at the end of each month and are computed on the basis of the current salary rate, taking into consideration the effect during the remainder of the current year and during the budget year of known factors which affect salaries, such as periodic step increases.

After exhaustive tests of this procedure which confirmed its accuracy, the Bureau was able to discontinue allotments of funds for personal services and

related costs to the regional and Washington offices and control this portion (approximately 79 percent) of our administrative budget centrally.

This centralized allotting has led to better utilization of funds and a substantial reduction in paperwork.

#### AUTOMATIC DATA PROCESSING IN HIGHWAY ENGINEERING

##### I. THE HISTORY OF MECHANICAL DATA PROCESSING IN THE BUREAU OF PUBLIC ROADS

###### A. *The Formative Years, 1893-1920*

The development of the Bureau of Public Roads mechanical data processing is closely related to the Bureau's increased participation in this Nation's expanding highway program.

The Bureau of Public Roads had its origin in 1893 as a small subdivision of the Department of Agriculture. The Bureau had an original appropriation of \$10,000 with its entire staff consisting of an engineer, a special agent, and a small clerical force. It was directed: "to make inquiries in regard to the system of road management throughout the United States, to make investigations in regard to the best methods of roadmaking and to prepare publications suitable for disseminating information on this subject." At the time of its formation, only New Jersey and Massachusetts had highway departments, these having been recently created.

In these early formative years, the Bureau's work was limited to investigation and education. This situation prevailed until 1912 when the Bureau was authorized by Congress to administer a \$500,000 rural post road construction program. The work performed in administering this program gave Public Roads excellent training for the additional work entrusted to them by the Federal-Aid Road Act of 1916 and the Federal Highway Act of 1921.

The Federal-Aid Road Act of 1916 was the basic highway development act of the Federal Government. It laid the foundation for the cooperative Federal-State highway program in use today. To provide for State control of the highways, the act provided that each State must have a State highway department before it would be eligible to participate in Federal funds for that program. This act also established the apportionment formulas for the allocation of Federal grant funds to the various States.

As a result of this act and the subsequent Federal Highway Act of 1921, the Bureau of Public Roads suddenly found itself with a rapidly increasing paperwork burden. The old manual methods of operations were insufficient to meet the added workload.

###### B. *The "out-of-the-mud" years, 1921-30*

The early Federal highway acts prohibited the expenditure of Federal funds for improvements in urban areas. The principal reason for this was that the cities had all-weather street surfaces while farm roads were mud. These acts provided ever-increasing sums to be used primarily for the improvement of rural and post roads.

To keep pace with the expanding program, the Bureau in the fall of 1921 began to install its first mechanical data-processing system. This was originally a one-man operation, and the first equipment obtained was the Hollerith tabulating machine. In addition to the tabulator the necessary auxiliary equipment was also obtained. This included the following items:

1. A mechanical key punch, for punching the holes in the punchcards.
2. A vertical sorter, for arranging cards in a selected group which utilized the punched cards to add totals.

These machines could only add, and had the additional burden of being very slow and cumbersome. Some of the operations still had to be performed by manual methods. Since the original punched card contained space for only 45 columns of information, the amount and type of information which could be placed upon these cards was restricted.

The primary functions of this first tabulating unit pertained only to highway research and Federal-aid program reporting. But as the work of the Bureau increased in scope and complexity, the equipment and functions had to change accordingly.

The Bureau's needs for improved equipment benefited greatly from new developments by manufacturers; for example, its work was made considerably easier by the development of a new horizontal sorter around 1925. Another

big improvement was introduced in 1928 when the punchcard capacity was increased from 45 to 80 columns of information, almost doubling the amount of information which could be stored on punchcards. This additional capacity also greatly increased the number of uses to which the machines could be adapted. These changes were gradual over a period of years, and the tabulating section experienced the same gradual increase in functions and personnel. In this period the section's staff fluctuated around six or seven people.

#### *C. The prewar years, 1931-40*

During this depression period, the Bureau administered large sums of emergency funds for highway and grade crossing work. These funds were outright grants to the States to help provide employment in depressed areas. In addition the Bureau helped administer other types of assistance relating to: (1) work-relief highway projects, (2) loan-and-grant highway projects, and (3) repair and reconstruction of roads and bridges damaged by floods, hurricanes, earthquakes, and landslides.

To provide the officials of the organization with current data for administrative control of financial operations, necessary statistical records of accomplishment, and the other related records and reports, the Bureau began to procure the more advanced tabulating and sorting equipment as it became available.

The acquisition of improved tabulating equipment around 1932 greatly increased the Bureau's data processing capacity. The versatility of the new machines further increased the number of applications which could be utilized. The big improvement of this tabulating equipment over its predecessor was its ability to handle alphabetic information to process business accounts. For the first time, numbers and letters were linked together in practical punchcard accounting and other related work. Also, the new machines could add, subtract, and print at greatly increased speeds over the old machines. Thus, the greater overall versatility of these machines greatly increased the amounts and types of work which could be applied to them.

As the more sophisticated tabulating equipment became available the Bureau designed other business-type applications for it to process. In 1936 the first steps were taken to utilize the equipment for the personnel accounting system. This was followed in 1937 by adding the payroll system to the work schedule of the tabulating unit.

#### *D. World War II and the postwar period, 1941-50*

The advent of World War II suspended the normal Federal-aid program late in 1941. Instead, most of the work of the Bureau related to the construction of access roads to military establishments, war industries, and sources of raw material. In addition to these access roads, it was necessary to correct certain weaknesses in the Federal-aid system included in the strategic network.

The biggest project in this period was the construction of the Alaska Highway in 1942-43. This work was performed in cooperation with the Army Engineers. The construction of this 1,420-mile highway was considered so important that every available man in the organization was sent to the Northwest woods to help in its construction.

To help expedite the Alaska work, three separate tabulating sections were established in Whitehorse, Yukon territory; Fort St. John, British Columbia; and Gulkana, Alaska. With the completion of the Alaska Highway in October 1943, these tabulating sections were disbanded, and the personnel returned to their respective posts.

During and after the war, new tabulating equipment remained in short supply within the Bureau. Therefore, when the 1950's began, tabulating equipment in use needed considerable updating.

#### *E. The years of expansion, 1951-62*

During this period, there was rapid expansion and improvement of public roads data processing facilities, operations, and personnel. To illustrate: (1) the Washington office unit grew from 19 employees in 1953 to 50 in May 1962. In keeping with developments, the tabulating operation evolved into an electrical accounting machine (EAM) activity. These EAM facilities are now augmented by an automatic data processing (ADP) system utilizing an electronic computer using magnetic tape. (2) The direct construction regions developed in this field from rental of electronic computer services to the acquisition of a card operated medium-scale computer in region 8, Portland, Oreg.

During this period the prime mover for growth in public roads was the expansion of the Federal highway program. The Federal-Aid Highway Act of 1956 authorized the building of a national system of interstate and defense highways—a 41,000-mile network of broad, modern freeways that will connect virtually every U.S. city of more than 50,000 people and completely revolutionize travel and transportation as we know it today. At the end of March 1962, less than 6 years after construction started, 30 percent is open to traffic. Target date for completion: 1972. Total cost: \$41 billion, of which \$37 billion will be in Federal funds.

The interstate program, when added to the already considerable ABC program which now approximates \$1 billion in Federal expenditures each year, resulted in an impressive increase in engineering workload. And yet, due in part to the utilization of ADP methods, the modest increase in public roads field engineering manpower between fiscal years 1956-61 was an apparent refutation of "Parkinson's law". (See following chart.)

#### *F. Factors influencing ADP in the highway program of the sixties*

In 1944, a Bureau of Public Roads' report to Congress on "Interregional Highways" recognized that conditions had changed. "With congestion of the trans-city routes replacing rural highway mud as the greatest of traffic barriers," it said, "emphasis needs to be reversed and the larger expenditures devoted to improvement of city and metropolitan sections of arterial routes." In the years which followed, the "interregional" system became the National System of Interstate and Defense Highways and the emphasis was indeed changed. According to present estimates 42 percent of the cost of completing the system will be for urban highways. Thus, in the urban-oriented Federal-aid highway program which resulted from the Federal-Aid Highway Act of 1956, the problems of developing facts regarding the effecting adequate coordination of efforts relating to the planning and development of the Interstate System are of unprecedented variety and scope. Since the same traffic flow frequently runs through three jurisdictions—city, county, and State—with the Federal Government an active partner of the State highway departments in developing the highway system, the preparation of a transportation or urban arterial highway plan must be based on facts which relate to the needs of all jurisdictions and which form a sound basis for the determination of trends, estimates of future conditions and the reconciliation of divergent views. This fact gathering involves complex studies of street use, travel habit, land use, existing traffic service, existing transit service, and the physical street system; the assembly and analyses of elaborate financial data; and the development of facts about transportation facilities and habits. These facts, comprising the foundation on which the planner can build, are beyond human evaluation and utilization by purely manual means within the time schedules of the Federal-aid highway program. ADP is the only practicable means by which the planner can digest these mountains of data and reduce them to understandable facts for immediate use.

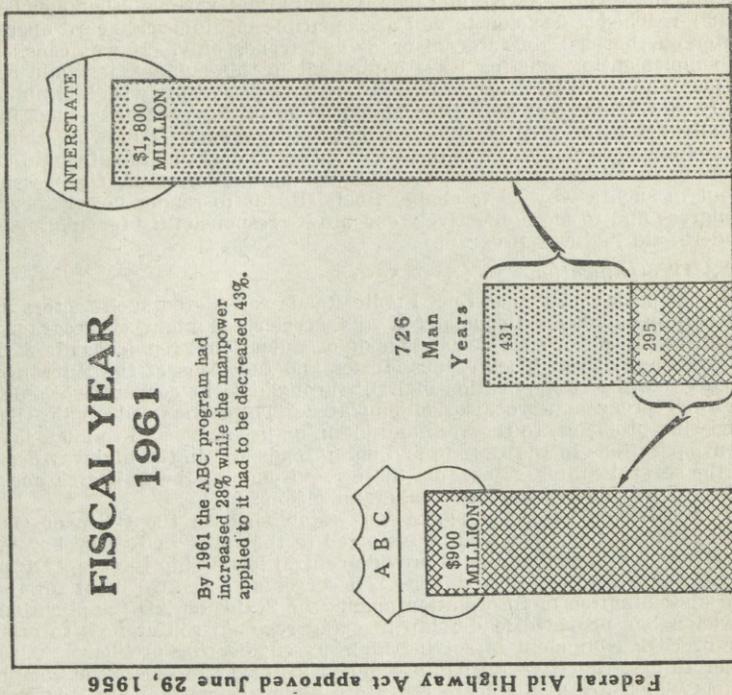
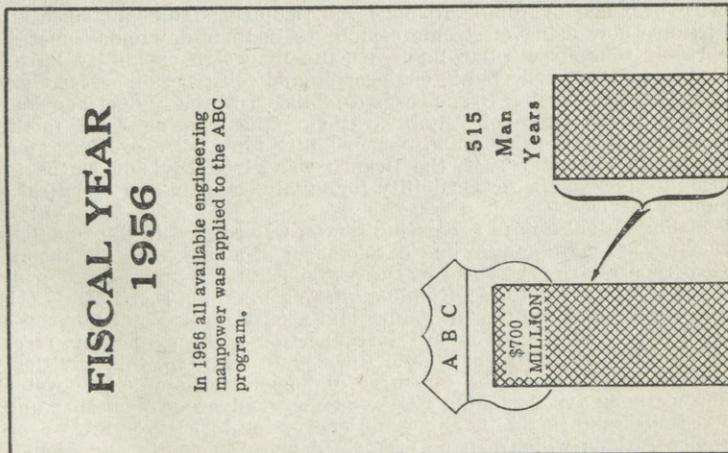
A second factor influencing advanced data processing programs in the Bureau of Public Roads during the sixties has been Public Law 86-660. Enacted by the 86th Congress and approved by the President on July 14, 1960, this law provides that the Secretary of Commerce establish and maintain a national register containing the name of each individual reported as one whose motor vehicle operator's license or permit has been suspended, denied, or revoked because of (1) driving while intoxicated, or (2) convicted of a violation of a highway safety code involving loss of life. The Secretary of Commerce assigned to the Bureau of Public Roads the responsibility for providing this National Driver Register Service, and a position of Director was established in mid-October 1960 to implement and operate this new Bureau function. Since the Driver Register involves the continuous inflow and outflow of data pertaining to drivers licensed by the States, a complex and highly active automatic data processing operation has been implemented.

## II. ADP PLANNING

### *A. The first computer*

In July 1956, as a means of expediting the administration of the enormous Federal-aid highway program, a decision was made by top management of the Bureau to augment the then existing electric accounting machine (EAM) facilities with a medium size digital computer which would be compatible with punch-card systems. However, the group assigned to the task of studying the problem in more detail soon discovered that, in the automatic data processing

# UTILIZATION OF FIELD ENGINEERING MANPOWER



program of the Federal Government as a whole, there was little, if anything, in the way of guidelines or criteria with respect to conducting feasibility and application studies. Thus, in considering the upgrading of the punched card tabulating facilities, top management (including the Commissioner of Public Roads, the several Assistant Commissioners, and various other members of the staff) reached a decision to add a compatible medium-scale card operated computer on the basis of internal needs and trends only. It was considered that in supplementing existing EAM equipment in this manner, it would be possible to begin a logical transition to electronic data processing with a minimum initial increase in total cost and a maximum potential for greater savings in the cost of advancing the greatly enlarged highway program. Following this decision, a medium size computer was installed in July 1958 at an annual rental of \$49,296, thereby resulting in another step toward upgrading of data processing equipment in such a way as to enable Public Roads to render better service to the Congress and to more effectively execute its responsibility for administering the Federal-aid highway program.

### *B. ADP organization*

In its initial ADP planning, Public Roads considered such factors as the increased demands of the enlarged and accelerated highway program, and the resulting impact of such demands upon organizational requirements with respect to ADP activities. The responsibilities and functions of the Bureau of Public Roads relating to application of EDP throughout the cooperative Federal-State highway program were also contemplated. These included applications to engineering problems, to research and planning problems, and to financial management operations in the Bureau of Public Roads and in the highway departments of the several States. Based on these requirements, the following actions were taken to provide an adequate ADP organization:

1. A Division of Development was established in the Office of Operations. This Division has since been transferred to the Office of Research. A primary function of this Division is to provide central leadership for the ADP programs of the State highway departments. It serves as a central point for the receipt and dissemination of information among the States on ADP applications. This Division has provided leadership in many regional conferences to promote the use of EDP equipment in solving highway engineering problems. Also, among other things, the Division has assembled a library of electronic computer programs which are available to the State highway departments. At the present time, this library includes over 400 programs covering a wide range of applications to highway and bridge engineering design and traffic problems. The service provided by Public Roads is particularly significant since all but two States are now using electronic computers in their day-to-day operations with the result that spectacular improvements in design capability have occurred, which in turn are reflected in engineering and construction cost savings.

2. A Data Processing Branch was established in the Budget and Management Division in the Office of Administration. The existing EAM facilities were transferred to this branch and responsibility for ADP operations was assigned thereto. In February 1962, the Branch was given Division status in recognition of its increasing responsibility for highly complex and technical electronic computer services.

Washington office data processing services as related to the functions of data gathering, file maintenance and development of management, financial, and statistical reports are performed by the Automatic Data Processing Division which is located in the Matomic Building, in Washington, D.C. The Division now utilizes electric accounting machines and a medium-scale tape-driven electronic computer (see II. F., following) in connection with engineering, research, and administrative activities of Public Roads. In addition, this Division provides technical assistance to the executive and operating staffs in developing electronic methods and designing EDP systems, conducting feasibility and application studies and in the planning and conversion to EDP or EAM processing of those operations which can be performed more efficiently and economically in such a manner.

### *C. Growing ADP needs*

With the intent to utilize modern ADP equipment and methods as a means to assist management in performing its designated duties in the most expeditious and economical manner practicable, the basic objective of Public Roads was and is to strive for integrated data processing services to all Bureau activities that

lend themselves to ADP methods. It is imperative to efficiency that overlapping or semiparallel data processing operations not be allowed to develop and that supervisors and executives be furnished with the proper quantity and quality of data needed to effectively perform their duties. As an example, Public Roads has achieved excellent results in the integrated processing of data relating to financial management and personnel programs and has performed machine computations and analyses of highway engineering and research problems commensurate with equipment capabilities.

By 1959, the Bureau of Public Roads faced a growing need to update its ADP equipment in order to progress in integrated data processing in keeping with the growth of its highway programs. However, it was recognized that updating existing equipment to the largest possible computing system available would not automatically fill this need. Much study and planning must go into the successful expansion of any computer operation, regardless of the type or size of equipment ultimately put into use, since it is essential that equipment be updated only to the degree that the organization serviced can effectively utilize the new system. Therefore, Public Roads management determined that an extensive study was necessary before arriving at a new system that would economically meet the Bureau's short-range goals while allowing for future expansion to keep current with developing program needs and long-range program goals.

#### *D. The ADP Advisory Committee*

On May 11, 1959, the Administrator of Public Roads appointed a top management person from each office to serve on a newly established Automatic Data Processing Advisory Committee. Under the Commissioner as Chairman, the committee was charged with providing leadership and coordination of the Public Roads ADP program, with developing a master plan for integration of closely related processing procedures, with providing a recognized channel of clearance of ADP applications proposed by separate offices of the Bureau, and with serving as a means of communication among these offices to promote maximum integration of data processing systems.

An ADP subcommittee was formed in each office and was headed by the member of the ADP Advisory Committee. Surveys were then initiated to promote the increased use of advanced computer methods and techniques generally and specifically to determine the need for updating the Washington office computing facilities. Technical assistance in conducting these studies was provided by personnel of the Office of Administration's Data Processing Branch and of the Electronics Branch, Division of Development, Office of Operations.

#### *E. The feasibility study*

Preliminary findings of the subcommittees indicated that the existing computing system was inadequate for the Bureau to accomplish its objectives in EDP. It was apparent that a tape system would be required to allow reasonable expansion of EDP operations and that these operations, to keep pace with the advancing highway program, should be placed into effect prior to fiscal 1962. Several alternatives, relating to EDP equipment available or soon to become available, were considered.

Surveys of the Office of Research and the Office of Administration were completed by December 1959. These offices had been the major users of the data processing services currently available within the Bureau of Public Roads. To insure that new equipment would be adequately considered, machine specifications were developed, based on these surveys, and four equipment manufacturers were invited to separate briefing sessions beginning January 25, 1960.

The ADP Advisory Committee completed an inventory of present and potential EDP and EAM applications on May 10, 1960. The Commissioner of Public Roads then directed the members of the Committee to review the inventory of applications with those persons responsible for the program areas which would be affected by a conversion to automatic data processing. The results of these reviews were embodied in subcommittee reports from which evolved short range and long range ADP planning data as to benefits to be derived, workload and employment statistics, and equipment requirements.

To provide for the most comprehensive analysis of the manufacturers' equipment proposals, the Committee studied the proposed computer systems in the light of the Bureau of Public Roads present and planned EDP workload. A comparison of equipment costs was made and analyzed for the equipment proposed; and the 5-year costs were estimated and summarized for each data processing system.

*F. The second computer*

Based on the findings of the several subcommittees and the careful study of proposals by equipment manufacturers, the ADP Advisory Committee recommended that the Bureau of Public Roads replace its card-operated IBM-650 computer in the Washington office with an IBM-1401 computer system with 4 magnetic tape units and 8,000 characters of memory storage. It was further recommended that this equipment change take place as soon after April 1, 1961, as possible, and that the memory storage be expanded to 16,000 characters in the fall of 1961. These recommendations were approved and a purchase order was issued for the new equipment on December 16, 1960. The new system was installed in March 1961.

The new equipment configuration, including the additional memory storage anticipated for fiscal year 1962, costs \$167,292, or \$34,476 more than the previous equipment. This increase in equipment rental costs is more than offset by the estimated ultimate dollar savings of \$56,637 for new highway program analysis and payroll applications. Further, as indicated through experience gained on the previous equipment, it is reasonable to expect additional dollar savings over a period of time as proposed research and engineering projects are programmed for the new tape equipment.

*G. Mechanization of the driver register service*

In order to determine if the Driver Register Service would operate best and most economically by a manual or ADP system, a feasibility study was conducted for this activity in January, February, and March 1961. Proposals were received from equipment and service suppliers for four different manual systems, three different EDP service bureau-type services, and seven different EDP systems to be operated by the Bureau. In addition, 19 meetings were held with representatives of firms that submitted proposals to assist in clarifying and evaluating their system.

After comprehensive analysis of the proposals, the EDP method was chosen over the manual method. It was concluded that while the manual method possibly would have been the more economical at the outset, it would soon become more expensive than an EDP system. The EDP method also allowed more flexibility for varying work volumes and fewer problems in maintaining an adequate work force. From analysis of the seven proposed EDP systems, it was decided to perform the register on the new IBM-1401 system installed in the Washington office. By utilizing this equipment an extra shift, Public Roads completed formulation of the system procedures, placed the register into operation with Bureau facilities on July 1, 1961, and effected the least expenditure of Bureau funds in the implementation stage. Also, to facilitate the growing needs of the Driver Register Service, authorization was secured to add two additional magnetic tape units to the 1401 system as needed.

*H. The third computer*

The 1401 computer with five tape drives was installed on March 19, 1961, and within a year, utilization had reached 100 percent of first shift, 100 percent of second shift, and a part of the third shift and weekends. This utilization compares with 76 percent of first-shift time predicted in the report of ADP feasibility study dated November 1960, and resulted from (1) greater volume of work on known applications at an earlier time than anticipated, and (2) the processing work of the National Driver Register Service which developed since the original study was made.

On April 6, 1962, the Director of the Office of Administration directed a communication to the Deputy Administrator, in his capacity as chairman of the Bureau's ADP Committee, in which was outlined the critical situation in connection with the demands of the Washington offices for computer services which could not be filled because of limitation of available time. The memorandum recommended that a second 1401 and additional tapes be acquired to meet the mounting workload.

The Bureau's ADP Committee met on April 26, 1962, and on May 4, 1962, recommended that certain EAM equipment (tabulators, reproducing/summary punches, collator and sorter) be replaced with a 4K-1401 computer and one magnetic tape unit, and that the present 16K-1401 be replaced with a 40K-1410 computer and one additional tape unit.

This decision is consistent with the Bureau's report of ADP feasibility study which stated, "It is our plan to update present equipment only to the degree that we can effectively utilize the new system. We are therefore interested in

a new system for the Washington office that will economically allow us to meet our short range goals, but a system that can be expanded in the next few years to keep current with our progress and needs in meeting long range goals."

Departmental approval of the Bureau's equipment recommendation was received on May 29, 1962, and a letter of intent was forwarded to the manufacturer on June 1, 1962, with delivery anticipated in early December.

### III. ADP PROGRESS IN PUBLIC ROADS FIELD REGIONS

#### A. Region 8, Portland, Oreg.

The Bureau's regional office in Portland, Oreg., which has responsibility for direct construction activities in Washington, Oregon, Idaho, and Montana, has been a leader in use of electronic data processing in highway engineering. In late 1955 the staff in region 8 conducted preliminary investigations on a program developed by the State of Oregon for computing construction earthwork quantities.

This was followed in early 1956 by meetings with Washington office staff with regards to engineering methods study and application of electronic computers. Regional staff attended a manufacturer's course to learn programing on electronic computers. In April of 1956 the first computer program for clearing and grubbing was completed by the regional staff.

During the next several months additional construction engineering programs were developed and tested and distributed to several State highway departments and other Bureau offices. In November 1956 the Bureau secured time on an IBM-650 belonging to the Corps of Engineers and began doing all computing operations in the Customs House in Portland. In the original use of the Corps of Engineers computer, the Bureau was scheduled one morning a week and one afternoon a week for a total of 6 hours per week. As new programs were developed utilization increased to one full shift operation.

During this period, seminars and group discussions were held for all engineering personnel in the region where electronic computations in general were discussed and the Bureau's electronic computations of highway engineering problems were covered in detail. This stimulated computer usage and acceptance, increasing the demands made upon Corps of Engineers equipment.

When machine time reached a full shift on the Corps of Engineers computer, regional personnel conducted numerous studies of various manufacturers' systems, the cost of a public roads installation as compared with rental of time on the Corps of Engineers equipment, and the degree of service that could be expected from Bureau equipment versus service provided through use of equipment of another agency. A feasibility study was developed, resulting in authorization to region 8 to rent an IBM-650 card computer which was installed in the Bureau's Vancouver, Wash., design office in October 1959.

Subsequent study by the region led to a determination that the 650 should be replaced with a more powerful medium scale card computer. This recommendation was reviewed and approved by the ADP Advisory Committee, and an IBM-1401 card computer was delivered in February 1962 and is now in operation.

#### B. Region 7, San Francisco, Calif.

The Bureau's regional office at San Francisco has responsibility for direct construction activities in California, Arizona, and Nevada. Since 1957 approximately half of their survey and design mileage approximating 200 miles has been processed on a computer belonging to the California State Highway Department.

Service on the State's computer left much to be desired, so the regional office has entered into an agreement with the Forest Service to rent time on service bureau equipment in San Francisco. Under this arrangement it is expected that additional highway engineering work will be processed by computers thus improving the utilization of engineering personnel and reducing cost of design and construction engineering on direct construction projects.

#### C. Region 9, Denver, Colo.

The regional office at Denver has responsibility for direct construction activities in Wyoming, Utah, Colorado, and New Mexico. ADP activities in this region were started in January 1959 and considerable progress has been made. Fourteen highway engineering applications and two highway administration applications are being processed on a computer.

The highway engineering ADP activities are very closely related to aerial survey activities. The survey and design section of the region uses a Kelsh Plotter with an Auto-trol Scaler attachment to digitize terrain data directly to punchcards. The punched cards are then utilized in ADP highway design computations. Approximately 95 percent of preliminary location and design work is accomplished with photogrammetric and ADP methods.

Region 9 in the past used a commercial IBM-650 computer located 8 miles from their office. They have also used a computer of the National Bureau of Standards located 30 miles distance and the facilities of the Colorado Highway Department located 13 miles distance. Due to the distances involved and the expanding ADP activities of region 9, a feasibility study was developed and a recommendation for a computer system to be installed in fiscal year 1962 was made to the chairman of the ADP Committee. The ADP Advisory Committee reviewed the feasibility study and approved the recommendation which proposed the rental of an IBM-1620 computer with peripheral equipment to be acquired in fiscal year 1962. The equipment was installed in January 1962 and placed in operation in February 1962.

#### IV. ADP APPLICATION EXPERIENCE FOR FUNCTIONS OF THE BUREAU OF PUBLIC ROADS

##### A. Direct construction applications

As noted previously, the Bureau's direct construction regions in the West have been leaders in the use of ADP methods in the location, design, and construction of highways and bridges with resulting substantial savings in engineering manpower and construction costs and more economical design of highway facilities. The following are examples of application experience in the direct construction area:

1. *Field preliminary location survey.*—The ground control is accurately computed and the topography taken is checked while the field crew is on the project site. Errors are corrected and any additional data needed are secured without the need to return a field crew to the project site.

2. *Aerial photogrammetry.*—The ground control is accurately computed while the field crew is on the jobsite. The accuracy of the aerial photogrammetry is rapidly checked by the ADP method.

3. *Reconnaissance earthwork computations.*—Use of aerial photogrammetry and data processing in preliminary route analysis allows the route selection to be based on computed alignment, and grade and earthwork quantities instead of rough estimates. Due to the speed of ADP, and broad coverage of aerial photogrammetry, many route possibilities are considered that could not be economically analyzed by conventional methods. The most practical and economical route selection is better insured when these methods are used.

4. *Highway design.*—Use of data processing in highway design is estimated to yield a 10-percent savings in construction earthwork quantities. These applications also provide a more economical grade and alignment for the highway and result in savings to the highway user for the life of the facility. The overall design time is reduced, necessitating less leadtime.

5. *Construction engineering computations.*—Machine computations expedite progress and final payment to contractors and reduce the cost of computing the quantities involved. Field engineering costs are reduced due to more complete data being immediately available or being furnished faster as needed, thus requiring less field personnel.

6. *Bridge design.*—More types of structures can be analyzed due to ADP speed and the designs can be refined, allowing the most practical and economical structures to be selected. The overall design time is reduced necessitating less leadtime. The field engineers are furnished more data, thereby resulting in less field control costs, particularly for complicated interchanges.

##### B. Research applications

The Office of Research is responsible for physical, economic, and related research in the interest of improved highway design, construction, reconstruction maintenance and modernization, and for technical research in the areas of driver behavior, vehicle design and performance, traffic controls, highway safety, and highway costs and financing, including amounts of Federal taxes to be imposed for an equitable tax burden distribution among users of and those otherwise benefiting from Federal-aid highways. In addition to independent research, joint research is carried on with other Federal agencies, State and

local governments, private business, educational and research organizations, and recognized highway transportation experts.

Much of the research work is done with a view toward determining and increasing the knowledge of the many factors that result in a need for more and improved highway facilities, including means for financing such facilities, and improvements in the traffic operational usage of the facilities. Each phase of research requires the analysis of very large volumes of data. These analyses are, for the most part, complex since they involve abstract and theoretical aspects of highway problems, the interrelation of many factors, and the need to assure steady, continuous progress toward the research objectives involved. The utilization of ADP equipment and methods provide the essential "short cut" to the accumulation and utilization of the vast variety and tremendous volumes of data involved. To illustrate, the continuing search for improvement in the processes presently available and used by the engineering profession in traffic assignment to proposed major highway facilities, the determination of hydraulic capacity requirements, the determination of the suitability of materials in highway construction, and studies of the economic costs and benefits of highways, are all a substantive part of the research program and are all dependent to a large extent on ADP. Because of the volume of data which must be processed and the complexities of the analyses, it would not only be extremely inefficient but in most instances impossible to carry out this research without the modern equipment and techniques available in the realm of automatic data processing.

The following are typical past applications in the research area :

1. *Cost allocation study.*—The cost allocation study was directed by section 210 of the Highway Revenue Act of 1956. The purpose of this study was to make available to the Congress information on the basis of which it may determine what taxes should be imposed by the United States, and in what amounts, in order to insure, insofar as practicable, an equitable distribution of the tax burden among the various classes of persons using the Federal-aid highways or otherwise deriving benefits from such highways.

In developing this study, programmers in the Data Processing Branch prepared 66 separate programs and utilized the existing computer for more than 1,000 hours, at times necessitating around-the-clock operations for extended periods. It is conservatively estimated that the cost of this work on Bureau equipment was about 10 percent of the cost had the operations been performed at a service bureau. The following are indicative of the types of computations required in connection with this study :

Phase I: Two projections of a traffic sample, based on trends, to coincide with the 1964 estimated needs for vehicle-miles and axle-miles.

Phase II: Cost allocation distributed by various vehicle types, by registered weight, operating weight, axle weight, class of operation and fuel for three separate methods; incremental solution, ton-mile solution and cost function solution.

Phase III: Benefit study attached a monetary value to improvements on a vehicle-mile basis. These benefits were applied to the 1964 traffic estimate and accumulated to show benefits derived by vehicle type for each improvement. Benefits were: time, fuel, accidents, and impedance.

2. *Trip trace program.*—This program involves accumulating information on the flow of traffic through a given area, usually a city. The trip trace program for Phoenix, Ariz., would have required 30,000 man-hours using a desk calculator at an estimated cost of \$67,000 compared with a cost of about \$900 for the computer.

3. *Speed and placement studies.*—This program simulates in the computer, traffic recorded at roadside by a mechanical timing device. The present program can handle three lanes of traffic; computes the speed of each vehicle; determines the relative position of each vehicle to all surrounding vehicles; computes the forward and lateral clearances and differences in speeds, and classifies each situation (free moving, trailing, adjacent or adjacent and trailing).

#### C. *Planning applications*

An Office of Planning was established in December 1961. Highway planning activities formerly in the Office of Research were broadened and increased and the new Office is embarked upon a nationwide program to promote and participate in the accumulation, analysis and use of engineering, research and other data in current, long-range, urban and other highway planning and programing.

As in the case of the Office of Research, ADP is an essential element in assuring a balanced and timely program of data collection, analysis and utilization. The volumes and varieties of data used in evaluating and determining the highway needs of the several States and their local jurisdictions and in developing sound, orderly and well-considered highway plans and programs are such that their accumulation and analysis by manual methods would be almost impossible.

#### *D. Administration applications*

The Office of Administration has long recognized the economies and efficiencies possible through use of data processing equipment and has been the major user of data processing services that have been available in the Bureau. To illustrate:

1. *Program analysis.*—During the first 6 years of the highway program (1917–22) appropriations totaling \$350 million were made for Federal-aid highways. Of that amount, a cash balance of \$178 million remained at the close of fiscal year 1922. At that time Public Roads recognized that it was confronted with a financial management problem in administering a long leadtime public works program.

With respect to the methods to be used for financing this program, the Congress expressed its intent in the Post Office Appropriation Act of June 19, 1922, which provided contractual authority for fiscal years 1923, 1924, and 1925. The act provided that the sums authorized would be apportioned among the States by the Secretary and for the appropriation of actual amounts of cash needed each fiscal year to make payments to the State highway departments. This method of financing proved to be successful and has been used since that time.

This development created a need for information which management could use in measuring the progress of the program; in controlling obligations within the Secretary's apportionments; and in developing estimates of the amounts which would be required each fiscal year for payment to the State highway departments of the Federal share (grant) for the cost of work performed and billed for by the State during that year. To provide this information a punch-card system was designed to record transactions at successive stages during the life of each highway project. By analysis of these transactions (aided by machine tabulating processes) obligations incurred are related to disbursements made. On the basis of past experience, and taking into account the use of obligational authority and other pertinent financing factors, it is possible to forecast future requirements accurately.

The creation of the highway trust fund (Highway Revenue Act of 1956) is an illustration of "other pertinent financing factors." The preparation of reliable expenditure estimates for the highway trust fund requires suitable methods for accurately estimating program requirements for the current and the budget years as well as long-range estimates through completion of the Interstate System. In the past, Federal-aid highway program estimates have been found to be extremely accurate when based on the timelag from cumulative program obligations to cumulative project payments, so long as the program was fairly uniform in size and was not expanding rapidly.

In order to obtain a more reliable yardstick for use in connection with the rapidly expanding interstate program, a program was developed to relate the actual rate of payout on Federal-aid projects to the time of initial obligation of the funds. The Federal funds are obligated when the State is given the green light to proceed with work. Since payments are made only for work that has been done, the time thus measured includes (1) time following the "go-ahead signal" until the work is actually started, and (2) time following accomplishment of the work required for preparation and submission of vouchers, reviewing and approving of vouchers, and their passage for payment of the Federal share. This covers the various kinds of work—preliminary engineering, and right-of-way acquisition, as well as actual construction.

The first step in developing the relationships was to assemble and collate Federal-aid project obligation and expenditure tabulating cards, separately for the ABC program and for the interstate program. The dates and amounts of project obligations were related to the ensuing dates and amounts of project payments, to determine the months of elapsed time from obligation to payment.

Payment data were summarized to show the portions of the total obligations that were paid one, two, three, etc. months after the date of obligation. The curve obtained by plotting the cumulative payments following date of obligation against elapsed time in months from obligation to payment has a characteristic elongated S shape, rising (for the ABC program) to approximately 54 percent by the end of 12 months, 84 percent after 24 months, 94 percent after 36 months, 98 percent after 48 months, and 100 percent after 60 months. Corresponding

amounts for the interstate program are approximately 35, 71, 88, 95, and 100 percent, respectively.

A check made by applying these rates against actual obligations has produced estimated expenditures that were accurate within 0.6 percent of the actual in total for the fiscal years 1957-60, inclusive, for ABC funds, and within 1.5 percent for interstate funds.

Through the use of the computer, expenditure projections for any given set of obligations can be developed within a very short period of time. Without this computer program, the Bureau would be unable to meet the extremely short deadlines established by review agencies and the Congress to determine the effect of various apportionment and obligation assumptions on the expenditure requirements from the highway trust fund.

2. *Payroll.*—One of the first computer applications for the Office of Administration involved payrolling approximately 3,000 personnel in the eastern regions and the headquarters office. Through the use of the computer the Bureau has, over the past few years, been able to absorb substantial workload increases in payroll operations such as deductions for Government life insurance, retirement and social security, health insurance, and State and local taxes. The Bureau is currently withholding taxes for 27 States which together with the other deductions completely utilize the memory capacity of the existing computer. Any additional deductions will require another computer program and an additional pass of the payroll cards through the equipment in order to process the payroll.

3. *ADP personnel accounting.*—The present system, insofar as data processing and report preparation is involved, is mechanized and centralized. The responsibility for certain personnel functions is decentralized among 10 field regions. Initial documents of personnel actions are prepared at stations throughout the United States, Central America, and various foreign countries. In lieu of SF-50, Notification of Personnel Action, a special form PR-750 is used which is only a slight modification of the SF-50. The principal feature of PR-750 is an extra data processing copy. This has special provisions for coding data which cannot be transcribed directly by the key punch operators. Except for this provision, the form PR-750 is prepared in exactly the same manner as the SF-50. By this means, the problems inherent in decentralized operations and centralized data processing are solved.

The source data is transcribed into two punchcards: Personnel forms No. 7 and No. 8. Card No. 7 contains the dynamic data which is used daily and monthly for recurring reports. Card No. 8 contains static information, such as the date of birth and service computation date, which is not used too frequently in recurring reports and which is not subject to frequent change. These punchcards contain essentially the same data that is recorded on the forms SF-7, service record cards. They are not designed to replace the SF-7 records, but rather as a means of making available the data contained therein for machine processing periodically, particularly at the end of each month.

The punchcards referred to above are used in the preparation of practically all of the reports which the personnel office is required to furnish, such as the SF-113, Monthly Report of Federal Civilian Employment; other reports related to personnel statistics that may be requested from external or internal sources; and for reporting personnel data to interested officials in the Bureau. With respect to the SF-113, which is prepared in the central office for the entire Bureau, considerable use can be made of ADP capabilities. For instance, as a byproduct of another run, the necessary computations to produce the print-out for lines 1 through 11 can be accomplished in less than 5 minutes. The remainder of the report is prepared by transcription, with a minimum of manual computation, from machine tabulations produced from the No. 7 cards.

Another illustration of the versatility of this system is that since useful pertinent data has been incorporated into the No. 7 and 8 cards, materials such as retention registers and other infrequently required reports can be extracted by an analysis of the report requirements related to the availability of source information.

One internal report which is useful to the responsible officials of the Bureau, both in personnel management and in budget formulation and execution, is the monthly personnel roster. This report, in effect, is an extract of the SF-7 record at the end of the month, and furnishes details with respect to the most commonly used items related to personnel. A copy of the total roster is used

by top management on a day-to-day basis. The advantage of this system is that data are made available in a usable form which, under orthodox methods, can only be extracted by personnel specialists. Because the latter is such a cumbersome and time-consuming process, top management frequently cannot be furnished this information as needed. Secondly, since the personnel record-keeping is decentralized, it is the only record from which information relating to all employees of Public Roads can be derived.

4. *Budgetary processes.*—The ADP personnel accounting system described above is useful also to management for other purposes, particularly the budgetary processes. Since these needs were contemplated when the system was designed, it is possible to develop internal budget schedules which, with slight modification and analysis, can be used by the regional and division engineers in the formulation and submission of their annual budget requests for allotment of funds. Also, from this same record, it is possible to develop budget schedules such as the detail of personal services, which is required in the budget submissions to the Bureau of the Budget and to the Congress. These schedules require entries for each position, whether filled or vacant, for the past year, the current year, and the budget year. The data for each year must report the annual salary that the incumbent of each position earned for the greater portion of the past year, and will earn for the greater portion of the current year and the budget year. Normally, some 95 percent of the positions reported in the position schedule are filled. It is possible to convert the annual rate contained in the punchcard record to the proper step in grade by machine processing through the use of the code for numbering pay periods shown on the fiscal timetable. Vacant positions are reported at the applicable entrance step in each grade.

In addition to the benefits to be derived from the integrated ADP systems as discussed above, conceptual planning will make it possible to provide management with information not possible at all through conventional methods. An illustration of one such management tool, which relates to ADP personnel accounting, is the Federal-aid salary projection. This process is a means of projecting personal services and related costs into future budgetary periods during the current year and the budget year. These projections are computed on the basis of the current salary rate, taking into consideration the effect during the remainder of the current year and during the budget year of known factors which affect salaries, such as periodic step increases. This projection is directly related to the personnel roster referred to above and is furnished to the same Bureau officials. Again, each of these operating officials is able to use current information in the budgetary execution processes, supplementing these data with information available only to him with respect to future plans in his area of operations. The Budget Office, which has the same information available for the whole operation, is able to analyze and evaluate very quickly requests for operating officials, since both are working from the same source information. Virtually all of the arithmetic has been accomplished by machine, thus the budget examiners are freed to devote their time to true budget analysis.

#### V. PROPOSED APPLICATIONS FOR NEW EQUIPMENT

##### (a) *Direct construction*

New applications in the design and location of direct Federal highways and the design of structures are being constantly developed. The tape computer has greatly increased the ability to handle present and proposed workloads and to develop more sophisticated approaches to the design problems. Some of the principal new applications planned are point plotting of cross sections, profiles and mass ordinates and linear methods of grade and alinement design. High-speed printers on line with the computer, faster computing speeds, and more economical data storage make these applications practicable.

##### (b) *Research and planning*

An analysis of planned work for the Office of Research and the Office of Planning indicated 86 studies requiring computer use. Of these studies, 61 can be processed, and part of the balance can be partially processed on the medium-sized tape computer. While it is difficult to develop cost benefits in this area, it is known that because of the volume of data and complexities of analysis it would be extremely inefficient, and in most instances impossible, to conduct planning and research studies without modern high-speed computing equipment.

*(c) Engineering*

There are 22 applications for the Office of Engineering that are being planned for the computer. These applications include design of bridges, hydraulic and hydrological computations, bid tabulations and bidding trends, right-of-way acquisitions, utility relocations, and labor and materials used in highway construction.

*(d) Financial management*

1. *Managerial accounting.*—The system of managerial accounting or program analysis that was established in the early 1920's is described in paragraph IV-C above. This system has been in operation continuously for almost 40 years and, while the basic principles of the system have remained constant, procedural improvements have been made through the years as requirements expanded and equipment capabilities improved. In the meantime the Federal authorizations for highways increased from \$75 million in 1921 to about \$3.6 billion in 1963.

The similarity of Public Roads program analysis system to budgetary procedures (identified parenthetically) recommended for adoption by the Hoover Commission in 1955 is quite apparent in that the estimate for grants for construction is based on highway systems (activities) which in turn are based on subsidiary data by project (performance budget); these estimates are formulated on the basis of grants to be paid for the cost of work performed and billed for by the States (cost-based budget); and appropriations are made to liquidate contractual authority ("accrued expenditure appropriations" and "supplementary congressional authorization" for long leadtime programs).

The program analysis procedure is a large volume data handling system. Prior to installation of the 1401 information relating to active projects was recorded in more than 90,000 punchcards. This procedure was restudied and redesigned to provide information more responsive to management needs and to exploit the capabilities of improved equipment. The new tape-driven data handling system has resulted in streamlined reporting, improved fiscal controls, the integration of obligations and expenditures in a single project record, and the inclusion in the project record of information relating to location and description of the project and character of the work. Besides contributing to the improvement of financial management, the new procedure has resulted in annual savings approximating \$47,000.

2. *Payroll.*—The new computer equipment has enabled the Bureau of Public Roads to make one of many gains in the accuracy of file processing. The computer makes checks at many points in processing to insure that all data and results are correct, presenting summary totals at critical points for control of processing. While it is accomplishing this, it processes at a great rate of speed. These advantages have facilitated several shortcuts in the overall payroll procedure since the computer can process the payroll, creating 3,900,000 characters of vital, controlled information for 3,000 employees, in 4 hours. The usable detail, especially in history files, is an important gain. The easily accessible magnetic tapes store huge volumes of data in far less storage area than would be used by the simplest manual system. Thus, for each employee, information on each pay period is recorded on tape in detail and is available for special and yearend reports. As a byproduct, costs to the Bureau are automatically calculated and presented to the accounting system in the required form each pay period; employee bond purchase, leave, and Federal, State, and city taxes are automatically calculated and summarized; and the major gain in the memory capacity of the system facilitates expansion of the system to provide for additional payroll deductions as they materialize. Finally, the annual cost of preparation of Bureau payrolls has been reduced by approximately \$10,000.

*E. The National Driver Register Service*

1. *Explanation of the activity.*—Many problem drivers who lose their licenses apply for a new one in a different State, omitting information about their previous State of residence or driving history. To aid in solving this problem, Congress established the National Driver Register Service to help States and territories compare records on drivers whose privileges have been suspended or withdrawn because of (1) drunken driving or (2) involvement in a fatal accident. Responsibility for this service has been vested in the Bureau.

Many States have been exchanging driver records with their neighboring States. The National Driver Register Service now makes this exchange nationwide and complements the license records in the 55 jurisdictions. It establishes and maintains a central file where a driver's history may be quickly checked.

The major functions of the National Driver Register Service are—

- (a) To maintain a file or register of suspended or withdrawn driving privileges reported.
- (b) To update the register daily on the basis of new withdrawals and reinstatements reported from States and territories.
- (c) To search the register promptly on request and report the result.

The driver register furnishes prompt and reliable data compatible with State procedures and records. The Service is effective to the extent that States, territories, and the Bureau cooperate.

2. *How the Service operates.*—States and territories send reports of withdrawals of driving privileges to the Service. These reports are processed through the computer system into the register (magnetic tape record), which is updated daily as additional data are received.

The States and territories may request a search of the register for withdrawals a driver may have had in another jurisdiction. Each request for search is entered into the computer system and when a report is found that might be the same driver, a probable record "match" is made. Several matches may be found for any search made (for example, there are many John Smiths); but specially trained employees screen the computer matches and select the most probable matches.

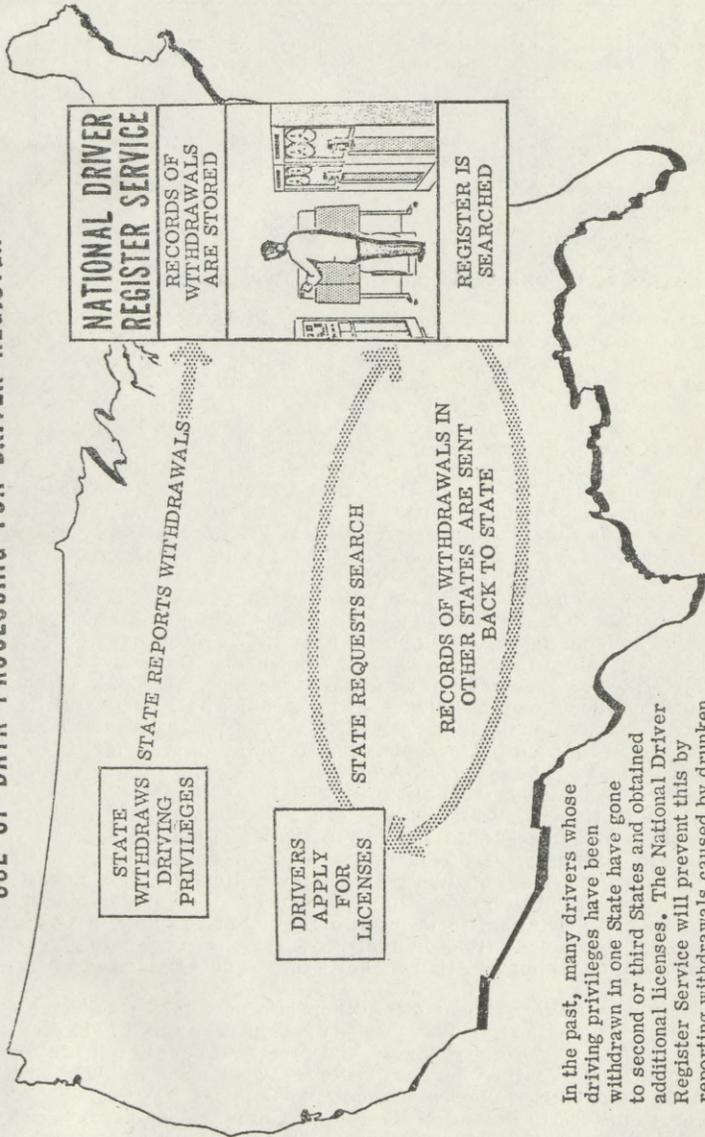
The most probable matches are then reported to the inquiring State or territory. With this information the State or territory can contact the jurisdiction that reported the withdrawal of the driver's privilege and obtain its summary of the driver's history. In this way, complete information can be readily obtained regarding the status of this driver's operating privileges—such as additional revocations, suspensions, records of convictions, accidents, wanted by police, etc.

If desired, the Service sends to the State or territory which withdrew the driving privilege a copy of the match that is sent to the jurisdiction which requested the search. The withdrawal State then can immediately forward the summary data on the subject driver to the inquiring jurisdiction.

The National Driver Register Service accepts all media of data transmission, including manually prepared forms, punched cards, punched paper tape, magnetic tape, and machine listed reports. The media for each State or territory is negotiated to arrive at the least cost to the participating jurisdiction and the Bureau.

3. *Magnitude of the Service.*—While this activity is wholly dependent upon voluntary participation by the States and territories, the current indications are that this will be a major ADP application. By June 1962, 46 States, 4 territories, and the District of Columbia had agreed to participate in the Service. At the end of its first year, the register contains approximately 175,000 records, makes approximately 3,000 daily searches, and is expected to grow to 2 million records at the end of 6 years.

USE OF DATA PROCESSING FOR DRIVER REGISTER



In the past, many drivers whose driving privileges have been withdrawn in one State have gone to second or third States and obtained additional licenses. The National Driver Register Service will prevent this by reporting withdrawals caused by drunken driving or fatality accident in other States when drivers apply for new licenses.

*Bureau of Public Roads computing facilities in use or planned for fiscal year 1963*

Location of unit	Type of equipment	Date of operation	Monthly rental	Average hours utilized per month
<b>Equipment in place:</b>				
Headquarters office.....	1401 16K memory, 5-tape units...	Mar. 19, 1961	\$9, 910	1 311
Region 8, Vancouver, Wash.	IBM card 1401 12,000 K memory storage.	Apr. 20, 1962	2 268, 910	2 200
Region 9, Denver, Colo....	IBM 1620 card computer 40,000 K memory storage.	Jan. 1, 1962	2 207, 815	2 180
<b>Equipment planned:</b>				
Headquarters office.....	1401 4K memory 1-tape unit.....	Jan. 1, 1963	5, 185	2 350
Do.....	1410 40K memory 6-tape units....	.....do.....	15, 630	2 300

<sup>1</sup> Actual, fiscal year 1962.

<sup>2</sup> Purchase price.

<sup>3</sup> Estimated, fiscal year 1963.

## STATEMENT OF THE WEATHER BUREAU, DEPARTMENT OF COMMERCE

1. The Weather Bureau uses EDP equipment in four areas: Weather predictions, meteorological research, climatology, and weather satellite data processing. Planning prior to installation and related feasibility studies have been effective in areas where EDP is currently being used. The Bureau's EDP systems' products have developed as expected and no major problems have occurred in any aspect that would indicate inadequate planning or study in the initial stages of EDP use. However, it might be mentioned that in the areas now being served by EDP installations, large amounts of data and the complexity of the operations required preclude any other than EDP methods. The Bureau's planning prior to installation has therefore involved primarily extensive investigation of methodology and available equipment. System studies of the capability of various computers are thoroughly investigated, both by in-house efforts and in some cases by systems design contractors.

(a) *Weather prediction.*—The need to process large amounts of highly perishable weather data in order to make useful weather predictions. It has been estimated that it would take 70,000 people using desk calculators to perform the computations required to make a 24-hour hemispheric forecast before the fact.

(b) *Meteorological research.*—Operations on meteorological data utilizing very complicated mathematical techniques (which could not practically be accomplished using manual methods) to improve forecasting techniques, basic knowledge, operational information, and planning for future research.

(c) *Climatology.*—The National Weather Records Center card library contains weather observations from all corners of the earth, and goes back, in some instances, more than 75 years. There are 300 separate card decks covering different types of climatic data ranging in size from a few thousand cards to more than 70 million cards. This vast amount of data is being utilized, via electronic data processing, in the area of applied climatology, to assist workers in many fields: agriculture, aviation, atomic energy, community planning, communications, transportation, to mention a few. For example, over 20 million marine observation cards have been analyzed using electronic data processing for the preparation of "Climatic Atlas of the Oceans" and a "Mariner's Atlas of the Oceans."

(d) *Weather satellite.*—About 400 million bits of data are collected on each satellite orbit (approximately 105 minutes apart). The satellite electronic data processing system must receive, digest, and process this data quickly for distribution to National Weather Service, Defense Department establishments, and to the International Meteorological Community.

2. Policies outlined in Bureau of the Budget Circular A-54 are being observed, and the guidelines provided therein have been helpful. We have no suggested changes to offer at this time.

The Bureau shares the use of its computers with other agencies wherever possible on a reimbursable basis. This, in some instances, has enabled the Bureau to utilize its computers at a higher capacity, resulting in more economical rental rates.

Standby arrangements have been in effect for the past 2 years, whereby the Bureau can share the use of the Bureau of Standards computer facilities at its headquarters in Washington in the event of a breakdown of the Weather Bureau computer at Suitland, Md. This arrangement has proven to be essential for

continuity of the daily forecast and weather-warning services and was accomplished through installation of a microwave radio relay circuit between the Suitland and Bureau of Standards computer complexes.

3. The Weather Bureau's manpower utilization problems, in connection with electronic data processing, have been limited to problems of recruiting and retaining qualified programmers. It has proved difficult to employ top-level programming supervisors who could take charge of major programming jobs. Likewise, it is difficult to employ outstanding men in the younger age group, simply because they lack the number of years experience to justify a Government salary near what they are receiving from industry. In general, the grade structure for programmers is too low for the Bureau to compete with non-Government employers. The Weather Bureau has so far been able to absorb, into other Bureau programs, employees whose positions have been supplanted by conversion to electronic data processing, and no problems in this connection are anticipated.

4. The Weather Bureau is not using electronic data processing in its business-type operations such as inventory, supply, finance, or similar activities. However, the possibilities of utilizing electronic data processing methods to improve these operations and enhance the Bureau's management decisionmaking process are being considered. Preliminary studies are now underway in several administrative areas. Where the preliminary studies indicate a possible benefit from electronic data processing utilization, it is planned to conduct detailed application studies. This will probably result in the application of electronic data processing methods, to some extent, within the next few years.

5. We have no comments to offer concerning the interagency committee on automatic data processing.

#### DEPARTMENT OF JUSTICE—FEDERAL BUREAU OF INVESTIGATION AUTOMATIC DATA-PROCESSING CENTER

##### HISTORY

The FBI first obtained tabulating equipment in 1932. This equipment was used in the compilation of crime statistics and consisted of key punch machines and a sorter-printer. In 1941, a tabulator and a summary punch were added to the equipment and statistical items related to internal operations were automated. In 1946, a full-scale tabulating unit was established consisting of tabulators, reproducers, sorters, collators, as well as key punch and verifying machines. At this time, budgetary and accounting reports were placed on the equipment. An electromagnetic calculator was added to the equipment in 1949 to facilitate the computations of extensive cost and production records. This calculator was replaced by an electronic calculator in 1950 for economic reasons. In 1955, following several years' study of computer systems, the FBI obtained its first electronic computer, a card-operated IBM 650, which resulted in the discontinuance of the electronic calculator and several tabulators. There followed a considerable expansion of automated functions, including the full mechanization of payrolls. In 1957, an IBM tape 650 system replaced the card-operated computer. Due to continued expansion of work converted to data-processing equipment, it was necessary in April 1961 to replace all data-processing equipment with a dual IBM type 1401-7070 system.

The work presently done on the data-processing equipment installed in the FBI consists of the following:

(1) Financial accounting; (2) payroll; (3) civilian personnel statistics; (4) supply management; (5) cost and production records; (6) crime statistics; (7) investigative matters; (8) certain security work.

##### FEASIBILITY STUDY METHODS

In considering the acquisition of any data-processing equipment, new or replacement, the FBI has always first made a careful study of the need for and the economic advantage of obtaining the equipment. Once this has been established, a careful study of available equipment has been made to determine which would best be suited to the Bureau's work from the dual standpoint of efficiency and economy. A conservative approach is always followed, and equipment is not obtained merely to accommodate work that might be automated in the future unless it is determined that such automation is desirable and can be accomplished upon installation of the equipment. While this results in rather frequent changes as to the type and amount of equipment in use, it is an economical policy.

All feasibility studies are made by the Bureau's trained data-processing staff and evaluated by the inspection staff. Full justification for any change or acquisition in equipment must be made to Bureau officials.

Trained analysts continually make comprehensive studies of Bureau operations to determine whether it is feasible and economical to convert any operation to the data-processing system. Suggestions are encouraged and carefully evaluated. Data-processing representatives appear before divisional conferences and in-service schools explaining the equipment and its use; however, no function is placed on the equipment, however well suited it might be for automation, unless there is a definite economic advantage or some overriding advantage such as time element, work deadlines, etc. The inspection staff of the Bureau periodically checks into operations of the data-processing center, requiring full justification of the use of equipment installed and of the operations placed thereon.

#### UTILIZATION OF EQUIPMENT

At the present time, the type 1401 computer system is in use about 280 hours per month, and the type 7070 about 100 hours per month. However, the 1401 is essentially an input-output medium for any operations on the type 7070. Skeleton shifts of operating personnel are available outside the prime shift from Monday through Friday. These operators complete deadline work remaining at the end of the prime shift and handle specials coming in at night. The use of these skeleton shifts cuts down on the need for extra equipment and is an economic advantage.

#### MANPOWER UTILIZATION

All personnel assigned to the FBI Automatic Data-Processing Center (ADPC) have been recruited by the Bureau from its own staff. Aptitude tests are given any employee so applying. Those employees passing the aptitude test are placed on an eligibility register and as personnel are needed in the ADPC they are selected from this register on the basis of their overall performance record. Employees so selected are given formal training at the manufacturer's school and on-the-job training at the Bureau. Turnover has been low and has been no problem. Grade structure is comparable to other Government agencies and is adequate. Employees in those units whose jobs have been eliminated because of automation have been transferred into other units where their services could be utilized, in lieu of recruiting new employees. The overall effect of automation has not been unfavorable.

#### LEASE VERSUS PURCHASE

All data-processing equipment installed in the Bureau is leased. Periodic studies are made of the desirability of purchasing equipment rather than leasing; however, leasing provides an overall economic advantage in view of the changing nature of the data processed through the equipment. Equipment is obtained on a tight schedule basis for current need and not for anticipated need. Equipment has been discontinued or changed at frequent intervals resulting in economies which would not have been possible had the equipment been purchased.

#### INTERAGENCY USE OF EQUIPMENT

Since equipment is obtained only as needed for current use, utilization is very high and it has, therefore, not been possible to make this equipment available to other agencies on a regular basis. Arrangements have been made with the Treasurer's Office for mutual use of equipment on a standby basis in the event of breakdown, temporary overloading, etc. However, no occasion has yet arisen in either agency where it was necessary to use this arrangement.

In a majority of cases, it is probable that the interagency use of equipment will not prove practical since each installation normally adds certain specific devices and attachments to solve specific problems peculiar to that installation. To attempt to have equipment in two different installations completely compatible would result in additional expense to both agencies that usually could not be justified.

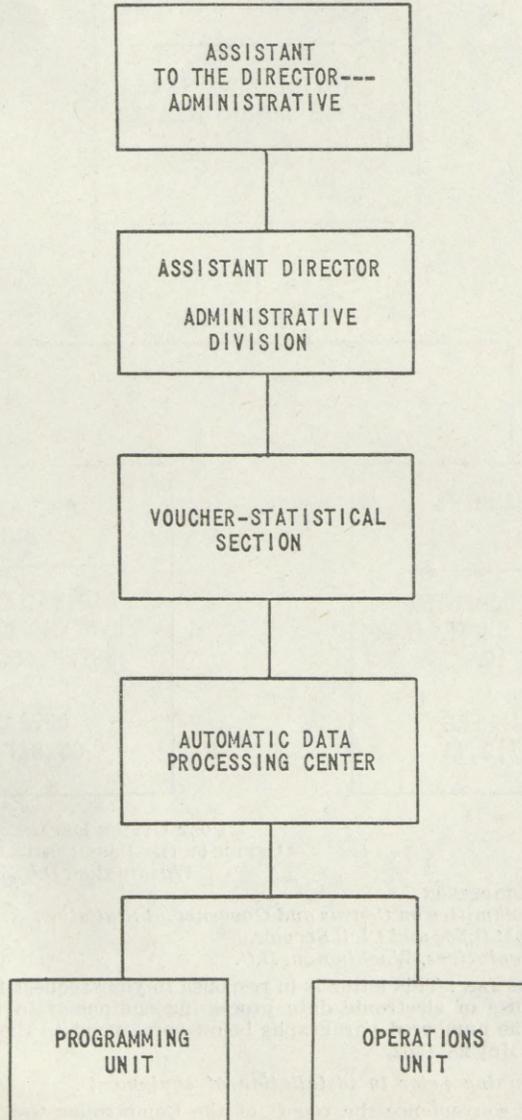
#### SIGNIFICANT ACHIEVEMENTS

According to the General Accounting Office, the Bureau was the first Federal agency to fully mechanize payroll procedures and the first to use computer equipment in such mechanization.

Bureau has been able to use its data-processing equipment to assist its agents in the investigation of accounting and related matters by the analysis of documentary matters. In several cases, experts from the ADPC have introduced in court tabulations prepared on data-processing equipment.

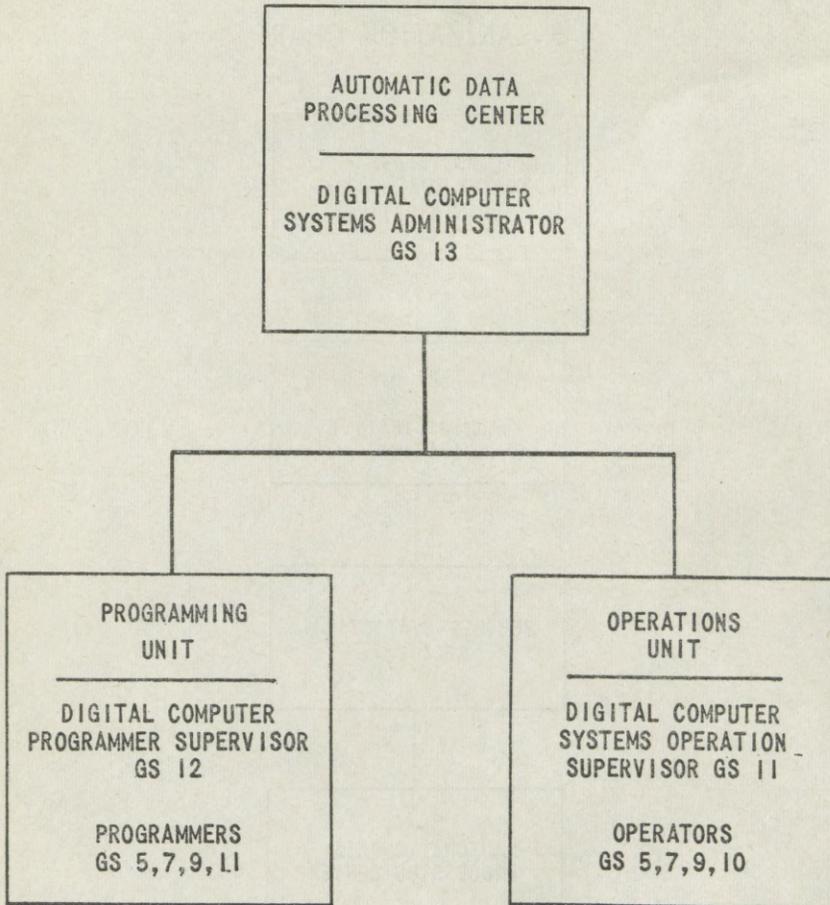
FEDERAL BUREAU OF INVESTIGATION  
 AUTOMATIC DATA PROCESSING CENTER

ORGANIZATION CHART



FEDERAL BUREAU OF INVESTIGATION  
AUTOMATIC DATA PROCESSING CENTER

PERSONNEL CHART



POST OFFICE DEPARTMENT,  
OFFICE OF THE POSTMASTER GENERAL,  
Washington, D.C., June 28, 1962.

HON. DAVID N. HENDERSON,  
*Chairman, Subcommittee on Census and Government Statistics,  
Committee on Post Office and Civil Service,  
House of Representatives, Washington, D.C.*

DEAR CONGRESSMAN: This letter is in response to your request for information concerning the use of electronic data processing equipment in the Post Office Department. The numbered paragraphs below correspond to the topics covered in your letter of May 28, 1962.

(1) *Agency planning prior to installation of equipment*

(a) For your convenience the report of the Comptroller General concerning review of ADP activities of the Post Office Department is enclosed as exhibit

A.<sup>1</sup> This report documents the prior history of the selection and installation of ADP equipment in the Department. Although the situation described in the report indicates that the equipment selection techniques used were not the most effective, it would be only fair to state that the Department at that time saw the problem primarily as one of mechanizing and installing a new system for payroll rather than selecting the optimum equipment to do the job.

(b) As a result of internal review of the Department's data processing program and with the assistance of the guidelines provided by your committee report ("Report on the Use of Electronic Data-Processing Equipment in the Federal Government," Aug. 31, 1960) the Department assigned responsibility for the ADP program to the Office of the Deputy Postmaster General (exhibit B, see p. 265). This staff published a handbook on "ADP Policies and Feasibility Studies," exhibit C,<sup>1</sup> which has been issued and will be followed in all subsequent ADP investigations and procurements.

(c) Continuing review of equipment utilization and ADP costs has revealed that today's workload can be processed on the newer medium scale computers faster and more economically than it can be handled by presently installed equipment. Moreover, the urgent requirement for operational reports and services described more fully in paragraph 4 below makes it imperative that the capability of our data processing installation be improved significantly. For these reasons, and also to investigate the possibility of consolidating some regional data processing centers, a regional data processing improvement project was initiated in January 1962, exhibit D, see p. 265. The basic guideline for this study has been the "Policy and Feasibility Study Handbook," exhibit C. The study team has thoroughly documented the equipment, costs, and procedures used in virtually all applications presently handled on ADP equipment in the regional data processing centers, exhibit E.<sup>1</sup> The purpose of such extensive documentation is threefold: (1) to provide a ready reference for use in procedure revision and for indoctrination of new personnel; (2) to provide all prospective vendors with a complete description of the procedures used so that no unfair advantage would accrue to the present supplier of equipment; and (3) to provide a base to calculate savings and system improvements after the new equipment has been in use for a reasonable period of time.

The project is presently in the equipment selection stage. A copy of the report of the study team will be sent to you upon completion.

(2) *Effectiveness of BuBud Circular A-54*

The Post Office Department is complying fully with the policies outlined in the BuBud Circular A-54. The equipment selection process has been described in paragraph (1)c above; determination of the method of acquisition of equipment will be in accordance with the policies outlined in Circular A-54. Moreover, the Department is presently investigating the economic feasibility of purchasing all or part of the presently installed electric accounting machines. Final determination in this area, of course, depends on the selection of computer equipment and the resultant release of punched card equipment.

(3) *Manpower utilization*

(a) The policy of the Post Office Department has been to standardize equipment configurations at regional data processing centers and retain a strong central control over systems design and programing at the headquarters. In this manner, programing staffs at the regional level have been minimal while still allowing maximum flexibility in the use of personnel in developing and implementing new applications under coordination of the headquarters staff.

(b) It is becoming increasingly difficult to recruit and retain technically qualified personnel in the regional data processing centers due to the mushrooming of data processing installations, both commercial and Government. This has been partially alleviated in the past through on-the-job training of Post Office employees. This kind of training is inadequate if we are to provide data processing services to the major substantive areas described in exhibit F.

(c) In the past, the grade structure in the data processing series has not been adequate enough to retain qualified technicians much less recruit them from other sources. Recently established plans for internal reorganization together with a more definitive statement of program objectives may temporarily solve this problem. However, the Department finds itself in the position of not having a sufficient number of personnel fully qualified in the areas of system analysis and

<sup>1</sup> Retained in subcommittee files.

design and the use of advanced programing techniques. To rely on outside contractors to provide data processing advice and service only solve emergent problems on a short-range, expensive, one-time basis. More comprehensive and worthwhile improvements in management control based on computer technology requires an in-house capability in mathematical and statistical techniques, management control procedures, and information systems development. We find it virtually impossible to recruit personnel skilled in the above areas at salaries we can offer. The long-range interests of the Department and the entire Federal establishment demand that a strong career opportunity, adequately supported by a competitive salary structure be established.

(d) The basic policy of the Department concerning displacement of employees by automation is that there will be no reductions in force as a result of mechanization. While this may occasionally result in short term administrative problems, good employee relations and the success of the mechanization program in the long run more than compensate for any lost efficiency. In respect to displacement of employees, the Post Office Department is in a particularly fortunate position. The normal source of personnel and route of advancement for office employees in the Postal Field Service is the work force which processes the mail. Since the impact of ADP is almost exclusively on the indirect office positions, displaced employees find a ready source of employment in the area of direct mail operations. Our manpower requirements for processing the mail historically have grown at a much faster rate than any ADP program could possibly displace employees.

(e) The overall effects of automation associated with data processing equipment are still not known. Our initial experiences and immediate plans promise better control over operations, more reliable information on which to base decisions and a net reduction in the overhead cost of data processing. We do not anticipate serious disruptions in the personal lives or careers of our personnel.

#### *(4) Use of byproducts*

(a) The current system development efforts of the Post Office Department are directed toward integrating all data gathering efforts so that initial source information which is required for day-to-day management of operations will be used to create operating reports for management and as a byproduct produce summary statistical and accounting reports for fund control and long-range analysis. We expect that as system development and equipment capacity progress, we will be able to prepare regional reports for local usage and create a summary machine tape which will be sent to headquarters for computer analysis and report preparation.

(b) Because of the size and nature of the Postal Establishment, an unsuccessful attempt at mechanization would be extremely expensive. For this reason, the Department has adopted a prudent approach to innovation and intends to adopt mechanized techniques only after adequate systems planning and prototype testing has indicated that substantial benefits will occur and that successful implementation is likely.

#### *(5) Progress of the Interagency Committee*

The Post Office Department has devoted considerable effort to the work of the Interagency Committee. A member of our headquarters staff is Chairman of the Technology Subcommittee and a member of our regional ADP staff has worked for many months on a special task force. As an indication of the progress being made by the Interagency Committee let me cite two significant examples of activities in which our people have participated; the experimental regional sharing plan (electronic computers) and an information retrieval symposium:

(a) *Experimental regional sharing plan (electronic computers).*—The joint use of computer equipment by all Federal agencies in the Philadelphia area promises to open new avenues of operational efficiency. The growth of Government computer installations in the last 5 years has been paralleled by greatly increased machine capabilities. Many computers have not been fully utilized while others have expended every available hour. The experimental sharing plan intends that there can be full machine utilization with resultant economies to both the sharing and using agencies. Our Philadelphia regional office will act as the sharing exchange while the project is getting started. I am most pleased to have the Post Office Department participate in this pioneering effort in computer sharing.

(b) *Information retrieval.*—A half day symposium on this topic was recently held (May 31) under the auspices of the Interagency Committee. Four of the most knowledgeable people in the field described: The information system study; indexing techniques; an information retrieval application; and document storage and retrieval. A distinguished panel of experts commented on each presentation and later the audience joined in on the questions. The proceedings of this meeting will be published and then distributed Government-wide. This is, I believe, effective work in the exchange of technical information.

(c) *Other effects in shared data processing.*—Although not pursued as a project of the Interagency Committee, the Post Office Department has cooperated with the Treasury Department in developing a new system for postal money order reconciliation which will save approximately \$650,000 per year. On June 23, 1962, the prepunching of money orders at the post offices was inaugurated in the Atlanta and Denver regions. Some 59,000 special money order punch machines have been procured to provide equipment for all post office money order issue points. Testing and debugging operations for automatic data processing functions are presently underway and early implementation of the system on computers operated by the Treasury Department is anticipated. A copy of the preliminary report on this project is attached as exhibit G.

I would like to point out at this time that the Post Office Department is making a concerted effort to insure that the ADP program is effective. We have recently consolidated the data processing functions in the headquarters and intend to strengthen the field program in the near future. Exhibit G reflects the new headquarters functional organization.

Further than this, I have approved the basic principles outlined in exhibit H to serve as a guide in the administration of the ADP program. While exhibit H was developed as an internal document for planning and discussion within the Department, it describes the scope and nature of our current approach to ADP.

I will be most pleased to answer any questions that your committee may have concerning the information provided in this letter.

Sincerely yours,

J. EDWARD DAY, *Postmaster General.*

#### EXHIBIT B

[Post Office Department, Headquarters Circular No. 61-6, Mar. 1, 1961]

#### ORGANIZATIONAL CHANGES

##### I. PURPOSE

To realine headquarters and regional office relationships and to revise the organizational structure of the Office of the Deputy Postmaster General and the Bureaus of Operations, Finance, and Personnel as they are affected thereby.

##### II. ACTIONS

The following actions are effective March 15, 1961:

\* \* \* \* \*

1. A function of departmentwide direction and leadership for the automatic data (ADP) program of the Department is established in the Office of Management Services in the Office of the Deputy Postmaster General.

\* \* \* \* \*

#### EXHIBIT D

#### IMPROVEMENT OF REGIONAL DATA PROCESSING FUNCTIONS

A preliminary study indicates that we can save at least \$1.5 million annually by replacing outdated ADP equipment with improved models and by consolidating regional data processing activities. A feasibility study must be made to develop the ADP equipment specifications and selection justification and to determine the final practicability of regional data processing activity consolidation. This latter includes developing necessary reporting procedures between regional data processing centers and regional management where they would

be located in separate cities, and for realining organization staffing and functional statements.

There are several computers on the market which can give us more capacity and faster speed for each equipment expense dollar than our present systems. Major regional offices with improved ADP equipment will not only be able to accomplish their present data processing workload much faster and better, but will have unused computer time which can be used to advantage to process their neighboring region data processing requirements.

The preliminary studies indicate that we should equip major regional accounting offices with modern medium-scale computers. In addition to the responsibility for handling the data processing workload for the region in which they are located, some regional accounting offices would be charged with the responsibility for processing data for neighboring regions.

Within the accounting office, the settlements, payroll, and accounting functions are closely related and intermingled with those performed by the data processing section. In consolidating data processing activities, it will be necessary to transfer all accounting office functions and responsibilities along with the data processing activities.

All 15 regional offices would continue to include the regional controller and his staff (without the regional disbursing officer and disbursing staff at the non-accounting-office regional offices) to provide the controllership aspects of regional management. The regional controller at each of the non-accounting-office regions would be provided with a position on his staff to serve in lieu of the accounting officer as a technical accounting adviser. His duties would be to participate in developing controllership policy, principles, and standards which govern accounting, costing, budget administration, and financial reporting; to provide technical assistance and guidance concerning accounting and financial matters to postal installations in the region; and, to provide necessary liaison between his regional management and the data processing activity in connection with accruals, obligations, and management data reporting.

The separation of data processing activities from regional management offices will require the development of comprehensive reporting procedures in order to minimize the need for special reports and make available management data on a timely basis. Technically qualified and knowledgeable individuals will be selected and assigned to develop such comprehensive management data reporting procedures.

Also, a work group of technically qualified individuals will be selected to develop and document the new ADP equipment feasibility study and equipment selection.

The tentative implementation of this improvement and consolidation program is to complete the feasibility study and equipment selection justification by May 1962. If the findings of the preliminary study are confirmed, transfer of the data processing activities and workload would be made beginning with fiscal year 1964.

The employees in the regional accounting offices should be advised that the Department will apply every available administrative remedy to protect their employment in fiscal year 1964 in the event the full-scale studies terminate in the finding that the consolidation is in the best interest of the postal service. This advice should minimize any adverse effects these studies may have on employee morale.

## EXHIBIT F

[Post Office Department, Headquarters Circular No. 62-20, May 29, 1962]

## REALIGNMENT OF ADP FUNCTIONS

## I. PURPOSE

To realine certain automatic data processing functions in headquarters to serve more effectively the needs of postal management.

## II. ACTIONS

The following actions are effective immediately:

A. An ADP Management Division is established in the Office of Management Services with responsibility for the development and technical direction of a departmentwide ADP program.

B. All functions, personnel, and positions of the Data Processing Methods Branch, Systems and Procedures Division, Bureau of Finance, are transferred to the ADP Management Division.

## III. POSITION DESCRIPTIONS TO BE CHANGED

Position descriptions will be written or amended, as necessary, to reflect the above changes.

## IV. POSTAL MANUAL TO BE AMENDED

The Postal Manual will be amended to include these changes.

H. W. BRAWLEY,  
*Deputy Postmaster General.*

## ADP MANAGEMENT DIVISION

Provides departmentwide direction and leadership for the automatic data processing (ADP) program as follows:

(a) Develops and coordinates the design and directs the installation of ADP systems for bureaus, regional offices, and other field units.

(b) Provides continuing technical services for data processing units.

(c) Conducts research in data processing, including simulation, and formulates ADP systems concepts for developing departmentwide plans using ADP technology.

(d) Conducts ADP feasibility studies; approves proposals and plans to study or test new types of ADP equipment, and coordinates such tests.

(e) Determines the need for ADP contractual services and evaluates proposals for such service; determines the optimum data processing methods.

(f) Determines need for procurement or release of ADP equipment in headquarters, regional offices, and other field units.

(g) Evaluates, with Bureau of Finance, proposals which involve major changes in data processing workload in the headquarters installation or in regional data processing centers.

(h) Approves technical competence of all professional and supervisory ADP personnel selected for headquarters, regional offices, and other field units; establishes performance standards for and evaluates the effectiveness and need for improving ADP operations.

(i) Provides an ADP consultant and advisory service for bureaus and offices, including the analysis of data problems to determine whether manual, electrical, or electronic processing is required.

(j) Initiates proposals for educational activities designed to update ADP knowledge of departmental and field officials; approves or disapproves headquarters and field ADP training proposals; evaluates availability and quality of facilities for ADP training; and makes recommendations to Assistant Deputy Postmaster General.

(k) Develops ADP programs for the support of departmentwide statistical procedures.



## BACKGROUND

Since the enactment of the Post Office Department Financial Control Act in 1950, one of the important fields of work in the Post Office Department has dealt with streamlining and improving operations relating to the issuance, payment, and reconciliation of more than 275 million postal money orders issued annually by approximately 35,000 postmasters.

As an initial step, the money order document was converted from paper to a punch card form in 1951. At that time, arrangements were made with the Federal Reserve banks, acting as fiscal agents of the United States, to receive, key punch, and verify all money orders cashed by commercial banks and postmasters. Coordinate with this change, the Post Office Department established 12 regional centers to receive money orders from the Federal Reserve banks and to reconcile the amount of such money orders with issue data reported by the various postmasters.

In 1955, the Post Office Department, in the interest of economy, took another major step in the processing of paid money orders. This resulted in the establishment of a Money Order Center at Kansas City, Mo., and the development of mechanized procedures whereby all paid money orders were reconciled with postmasters' issues thus eliminating less unified reconciliation operations then being performed in the 12 regional centers. This change in procedure resulted in reducing the overall cost by approximately \$650,000 annually.

In the spring of 1954, the Post Office Department designated a liaison representative to work with the joint committee of the Treasury, Bureau of the Budget, and General Accounting Office which was then studying the feasibility of utilizing electronic equipment in the processing of Government checks, for the purpose of keeping abreast of the potentials for applying similar techniques to money orders. Early in 1955, the Post Office Department initiated a feasibility study of converting its money order procedures to electronic techniques. It received a definitive proposal from a manufacturer for the utilization of a system similar to the one selected by Treasury. An analysis of this proposal indicated that the adoption of electronic techniques for this function, by itself, would not result in any economies.

## ESTABLISHMENT OF JOINT COMMITTEE

In March 1960, Mr. Hyde Gillette, Assistant Postmaster General, and Mr. William T. Héffelfinger, Fiscal Assistant Secretary of the Treasury Department, agreed to initiate a joint study to determine whether it would be feasible to expand the check payment electronic installation in the Office of the Treasurer of the United States to provide facilities for final processing of the money orders presented by the Federal Reserve banks and reconciling them with the accounts of the issuing postmasters.

The following representatives were designated to serve as a Joint Committee to study this matter:

Mr. Gordon Crowder, Assistant Controller, Post Office Department.

Mr. Harold Marks, Finance Officer, Post Office Department.

Mr. Willard Scott, Assistant Deputy Treasurer of the United States.

Mr. George F. Stickney, technical assistant to the Fiscal Assistant Secretary, Treasury Department, Chairman.

Scope of assignment: The Committee was assigned responsibility to:

1. Conduct a feasibility study to determine the practicability of integrating the postal money order processes with the check operations performed by the Office of the Treasurer of the United States.
2. Develop recommendations with respect to (a) type of organization best suited to carry out the combined operations and (b) the principles of procedures which should be observed.
3. Present a course of action, including a timetable and financial considerations.

The Committee established the following work program:

1. Develop in detail the present requirements for the verification and reconciliation of money orders and establish the extent to which the principles of procedure for money orders differ, if at all, from those applicable to the payment and reconciliation of Government checks.
2. Develop cost factors to determine whether it would be economical to extend the existing electronic techniques in the Treasurer's Office to the processing of postal money orders.

3. Establish liaison with the Federal Reserve System.
4. Determine whether existing internal controls on postal money order operations need improvement and the potentials for such improvement through electronic processing techniques.
5. Submit a report of recommendations.

To facilitate review, this report is presented in four parts as follows:

- Part I: Summary of Major Recommendations.
- Part II: Improvements in Controls and Service.
- Part III: Estimated Savings and Budgetary Requirements.
- Part IV: Course of Action and Timetable for Conversion of Present Procedure to Electronic Processing.

#### PART I: SUMMARY OF MAJOR RECOMMENDATIONS

There follows a summary of the Committee's major recommendations regarding the processing of postal money orders:

Recommendation No. 1. The electronic facilities in the Office of the Treasurer of the United States for the payment and reconciliation of Government checks be expanded to include the processing of postal money orders.

Comment. The principles of procedure for receiving, proving Federal Reserve bank charges in the Treasurer's account, servicing inquiries, and reconciling paid items with the accounts of the issuing officers are, for all practical purposes, the same for money orders as for Treasury checks. Therefore, the usual problems of overall systems design for electronic application to money orders will not be present.

Recommendation No. 2. Installation of the new system be accomplished through a conversion program carried out in three phases, beginning January 6, 1962.

Comment. To provide an orderly transition with adequate time, for the necessary preparatory work, it is recommended that the first phase commence on January 6, 1962.

Phase I would cover about 12½ percent of the national annual volume. All post offices within a postal region or a combination of regions representing this workload would begin issuing a new form of postal money order (51-column card with a distinctive X-punch and a new series of serial numbers) on that date.

Phase II of the conversion would cover an additional 37½ percent of the total national volume effective with the issues of the postal quarter beginning March 31.

Phase III, the final step, would cover the remaining 50 percent, to begin with money orders issued on and after June 23, 1962.

We believe it is extremely desirable that the entire conversion program be organized in such way that the new print-punch equipment for inscribing and punching money order amounts will have been installed in each post office prior to the conversion with respect to each office. Under the new plan, the general public and the commercial banks will not be affected. Beginning in January 1962, money orders received by Federal Reserve banks will include those issued in the new format by the post offices in phase I as well as the old-style money orders issued by all other post offices. In each successive phase there will be fewer old-style money orders and within 9 to 12 months after phase I starts practically all of the money orders received at the Federal Reserve banks will be on the new form. All of this is designed to facilitate the mechanical separation of the money orders in the Federal Reserve banks, so that the new forms will be forwarded to the Office of the Treasurer of the United States in Washington for electronic processing whereas the old forms will continue, for some time, to go to the Kansas City Money Order Center for processing under the existing system.

Recommendation No. 3. The Post Office Department establish an organizational unit to carry out the following responsibilities relating to the change in the system for handling money orders: (a) the receipt and control of issue data reported by approximately 35,000 postmasters through the 15 regional offices, (b) liaison and correspondence with the public and within the Post Office Department concerning all types of transactions on postal money orders including final reconciliation, and (c) correspondence and control with Federal Reserve banks relating to charges in the Treasurer's account for money orders received by them from commercial banks and postmasters.

Comment. In the course of our study it became apparent that the most efficient way to carry out these operations would be to establish a post office

departmental unit to maintain appropriate internal control over all types of transactions regarding the issue, payment and reconciliation of postal money orders. More specifically, issue data reported by some 35,000 post offices are a part of each postmaster's accountability and we believe this should continue to be an integral part of the accounting controls established and maintained by the Post Office Department rather than the Treasurer's Office. In essence, the Treasurer's facilities will provide a service with respect to the processing of the transactions and the Post Office Department will have the overall controls. This new Post Office departmental organizational unit would have reciprocal relationships with the 15 regional offices of the Post Office Department and the electronic facilities of the Office of the Treasurer of the United States. Likewise, the results of the payment and reconciliation operations of the Treasurer's electronic organization, including all types of reports, would be furnished to this departmental unit of the Post Office Department. A reciprocal accounting relationship would be maintained between the Federal Reserve banks and the Office of the Treasurer of the United States by the same Post Office departmental unit. In conclusion, we believe that the best know-how for carrying out these control functions is presently available in the Post Office Department. Moreover, considering the very important objective of job security, this organizational approach, together with the gradual phasing approach, should go a long way toward cushioning the impact of reduction in force in the Kansas City Money Order Center.

Recommendation No. 4. Postal regulations be amended to provide for having duplicate money orders issued with the same serial number as the original in lieu of the present practice of issuing a substitute money order with a different serial number.

Comment. While this recommendation is not vital for handling duplicate money orders under the electronic system, it will provide for better controls and preclude considerable work presently required in transferring the amount of each unpaid money order (for which a duplicate is to be issued) from the original account of issue to the special account from which the duplicate is issued. The same simplification was adopted for Treasury checks on January 1, 1958 (Public Law 85-183, dated August 28, 1957).

Recommendation No. 5 Arrangements be made for the custody of all paid money orders by the General Services Administration.

Comment. Presently, paid Treasury checks are transferred to the custody of the General Services Administration for the required time period. GSA services the Treasurer's Office in withdrawing checks needed for claims and other actions. This recommendation contemplates the same arrangements for paid money orders in a relationship between the Treasurer's Office, GSA, and the proposed Post Office departmental unit referred to in recommendation No. 3.

Recommendation No. 6. The total cost (personnel, equipment rentals or appropriate charges on owned equipment, supplies, etc.) incurred by the Office of the Treasurer of the United States for each function that is common to Government checks and postal money orders be distributed (by accounting period or quarter) equitably on the basis of volume of postal money orders and Treasury checks, for reimbursement by the Post Office Department for its portion to the Office of the Treasurer of the United States.

Comment. We believe the similarity of procedures is such that equitable and sound unit cost data can be established covering all cost factors, such as personnel, machine rental, supplies, etc. Such a system would develop a unit cost for those operations which are similar in the processing of money orders and Treasury checks. It is pointed out that under such a plan prime shift rental and the reduction of machine rental for second shift operations (which is 40 percent of the prime shift) would be equally distributed to each Department on the basis of workload, thereby providing a more accurate cost relating to the processing of both money orders and Treasury checks.

The estimates used in this report do not take into account, at this time, a distribution of general administrative overhead of the Treasurer's Office allocable to the postal money order operation (personnel services, administrative accounting, methods and procedures, general services, etc.). Such allocation, which would be in the neighborhood of \$25,000 annually, does not affect the estimate of overall savings from integration of the operations, but only a distribution as between the two Departments.

Recommendation No. 7. The Treasury Department and the Post Office Department confer at top level with the General Services Administration for the purpose of obtaining about 10,000 square feet of space on the first floor

of the GAO Building in Washington, D.C., where the Treasurer's facility is housed.

Comment. Under the proposed plan, additional space will be required for the following:

(a) Receipt and temporary storage of paid money orders. More than a million money orders will be received from the Federal Reserve banks daily and in order to provide a continuing flow of work it will be necessary to hold approximately a week's receipts (6 or 7 million paid money orders) in space contiguous to the computer installation.

(b) The Post Office departmental unit discussed in recommendation No. 3 will need approximately 67 employees. This unit should be at the site of the electronic facility for an efficient, integrated operation.

We understand there are approximately 10,000 square feet of space adjacent to the space presently allocated to the Office of the Treasurer of the United States for electronic processing of Treasury checks in the GAO Building. This space is presently occupied by the Labor Department. In view of the above-cited imperative needs, we believe it is essential that arrangements be made to acquire that adjacent space as soon as possible. It would be highly impractical to consider any other space for the temporary storage of 2 or 3 million paid money orders and the housing of the Post Office departmental unit. To house these activities in space other than adjacent to the present facilities would result in additional operating costs, would lessen operating efficiency, and would not make for optimum service in handling claims, investigations, etc. This is by reason that their work and responsibilities will require continuous personal contact and liaison with the computer installation.

Recommendation No. 8. We recommend that first-class post offices report their issue data to the appropriate regional office on an accounting period (4 weeks) basis and second, third and fourth class continue on their quarterly basis. We further recommend that the 15 regional offices assume the responsibility of preparing the necessary input data (punchcards) to the electronic system for all issue data.

Comment. Presently all post offices report issue data on their quarterly basis and the Kansas City Money Order Center prepares punchcards for such issue data. The recommended change to accounting period reporting for first-class offices will result in savings in the electronic processing of money orders. This will be achieved because, generally speaking, the majority of blocks of money orders issued during an accounting period by a post office will be received within 90 days and be ready for automatic reconciliation with issue data. If issue data are not available, blocks of paid money orders must be retained on magnetic tape until such data is received. The accounting period reporting by first-class offices (which issue approximately 68 percent of the total money orders) will result in much earlier reconciliation with a substantial reduction in the size of the tape file and related processing requirements than would be in the case of quarterly reporting.

## PART II: IMPROVEMENTS IN CONTROLS AND SERVICE

This part of our report discusses our findings and conclusions regarding improvements in controls and services which will be achieved under the proposed plan.

*Serial number control.*—The system will lend itself to the establishment of controls for each money order from the time it is manufactured until it is destroyed. It will be impossible for any money order to be paid a second time and go undetected. If, for example, a paid money order is renegotiated in some manner and is presented for payment through banking channels, the item will be detected, possibly the day it is entered into the system but in no case longer than 5 days thereafter. This is because the system will not accept two items bearing the same serial number. Likewise, the system will detect a counterfeit if the serial number is not within the range of numbers distributed to postmasters. If the serial number of the counterfeit happens to be within the range of serial numbers issued, it will be detected within 5 days if the original valid item had already been paid, or, if unpaid, as soon as the original is received or the block is reconciled, whichever occurs first.

*Accountability for unissued and issued money orders.*—The proposed plan will have controls, by serial number, over all money orders manufactured and such controls will be maintained as money orders are distributed to postmasters, by serial number blocks. When issue reports are received from postmasters cover-

ing blocks of numbers issued they will be audited against the tape file record of blank stock distributed to postmasters for the respective serial number blocks. Controls will continue to be maintained on tape for paid money orders, according to issuing postmaster, up to the point of final reconciliation. The system will produce reports showing the range of unissued as well as issued money orders for any post office as of the close of any accounting period for which issue information has been received. This type of information will be available without delay and should prove to be extremely helpful in any case where the inspection service or any other auditing or management activity of the Post Office Department desires to determine the accountability of any particular post office with respect to unissued and issued money orders.

*Reconciliation with postmasters' accounts.*—The present reconciliation with the postmasters' accounts is usually completed in 5 to 7 months after the close of postal quarterly accounting periods. Under the new plan, for first-class offices, this will occur on an accounting period (4 weeks) basis and should be completed in about 90 days after the close of each such period. With respect to second-, third-, and fourth-class offices, it is proposed that the reconciliation be performed on a quarterly basis with the same 90-day timelag.

*Control over outstanding money orders.*—The Post Office Department's unit referred to in recommendation No. 3 would have the responsibility of handling accounting data with respect to all transactions relating to money orders. Independent of the Treasurer's electronic computing facility, the Post Office unit will receive reports of (1) issues directly from the 15 regional offices and (2) payments directly from Federal Reserve banks. All adjustments affecting postmasters' accounts and charges in the Treasurer's account made by Federal Reserve banks will be initiated by this unit. Hence, this unit will have the responsibility and means to establish and maintain an independent control over all transactions affecting outstanding money orders. This type of control can be established and maintained by region if desirable.

In summary, we believe that accountability control over money order transactions will be improved over present controls without the necessary of incurring considerable additional cost which we believe would be the case under present procedure. Money orders paid will be reconciled on tape rather than held in open files.

Briefly, the controls of accountability over unissued, issued, and paid money orders, maintained by serial numbers and post offices, will be substantially improved under the proposed system.

*Improved public services.*—Under the present system, inquiries regarding the status, i.e., payment or nonpayment of money orders, are processed as follows:

Generally, inquiries are not searched until 60 days after day of issue. The present system involves a manual inspection of paid money orders. This manual searching, many times, involves special sorting runs and sequential searching from block to block depending on the status of the work. In other words, under present procedures, at no point of time are all the paid money orders in a complete sequential order.

The electronic system will automatically process all inquiries. Each day's inquiries introduced into the system will automatically search (1) today's payments, (2) the cumulative paid file (i.e., all money orders paid prior to the day), and (3) subsequent receipts. In no case, will it take longer than 5 working days to determine the status of any money order. On the average, it will be about 2½ days. In many cases, the status of the money order will be determined on the same day the inquiry is received. Also, in special cases where it is important, it will be possible to determine the status of a single money order or a block of money orders the same day the inquiry is received. Earlier knowledge of cashing stolen money orders coming through banks will be made possible.

### PART III: ESTIMATED SAVINGS AND BUDGETARY REQUIREMENTS

This part of our report deals with the budgetary requirements under the proposed plan and the savings which we believe will be realized after conversion.

After the new system is completely operational, we estimate that it will result in recurring annual savings of \$539,532 to the Post Office Department and \$150,000 to the Office of the Treasurer of the United States. There follows a summary estimating the annual costs to the Post Office Department under the present methods of operation, the annual requirements under the proposed consolidation, resulting savings, and additional savings to the Office of the Treas-

urer by reason of the consolidation. These matters are discussed in detail hereinafter and supported by schedules 1-7 appended to this part of our report.

Post Office Department:	<i>Item</i>	<i>Amount</i>
Present costs	-----	\$1,720,232
Less annual requirements	-----	1,180,700
Savings to Post Office Department	-----	539,532
Treasurer of the United States: Savings to Treasurer of the United States	-----	150,000
Total estimated savings	-----	689,532

(Additional direct costs of \$35,000 to GSA for file maintenance of money orders are not included in the computed savings of \$689,532.)

#### 1. BUDGETARY REQUIREMENTS FOR CONVERSION—FISCAL YEAR 1962

The requirements for fiscal year 1962 will fall into two categories. First, the costs for (1) magnetic tape, converter ribbons, cards, paper, and other supplies, (2) programing, which may entail 6 or 7 man-years of the Treasurer's programing staff, (3) assistance in systems design by two Post Office Department analysts, (4) training of key personnel for the new Post Office departmental unit, and (5) possible relocation of a small number of personnel from the Kansas City Center to Washington, D.C.

Secondly, the conversion costs beginning January 6, 1962, will include the cost for personnel (including the possible relocation of an additional number of employees), supplies, and equipment rental which will build up gradually for a period of time. Equipment rental costs beginning July 1, 1962, will be fairly stable if the final 50 percent of the volume is converted to the system on that date. The personnel costs in the new Post Office departmental unit will continue to increase until about December 15, 1962, at which time the unit should be at full strength.

There follows a statement of the estimated budgetary requirements for the Post Office Department for the fiscal year 1962:

	<i>Item</i>	<i>Amount</i>
Preinstallation costs (prior to Jan. 6, 1962):		
1. Supplies, magnetic tape, etc	-----	\$30,000
2. Programing	-----	<sup>1</sup> 60,000
3. Systems analysis	-----	20,000
4. Training	-----	25,000
5. Relocation of personnel	-----	7,000
Total	-----	142,000
Conversion costs (Jan. 6-June 23, 1962):		
1. Personnel	-----	<sup>1</sup> 130,000
2. Equipment rental	-----	<sup>1</sup> 100,000
3. Supplies	-----	20,000
4. Relocation of personnel	-----	18,000
Total	-----	268,000
Total estimated requirements through June 23, 1962	-----	410,000

<sup>1</sup>The amount of reimbursement to the Treasurer of the United States is estimated to be \$230,000 consisting of \$60,000 for programing, \$70,000 for personnel, and \$100,000 for equipment rental.

(NOTE.—All preinstallation costs are nonrecurring.)

## 2. ANNUAL BUDGETARY REQUIREMENTS BEGINNING FISCAL YEAR 1963

As stated previously in this report, phase III, the final step, will begin with money orders issued on and after June 23, 1962. Therefore, by the beginning of the second quarter of fiscal year 1963, practically all of the money orders presented for payment will be on the new form.

Thus, if the conversion program is accomplished as recommended, the new system will be in operation with regard to all postmasters in the first quarter of fiscal year 1963. In determining the budgetary requirements for the Post Office Department for fiscal year 1963, these factors have been taken in consideration.

(a) The Kansas City Money Order Center will continue to operate on a declining basis until about March 31, 1963, to perform the work relating to the present style money orders. On that date, the records relating to the present style money orders (not including the orders themselves) will be transferred to the new departmental unit in Washington for the processing of subsequent transactions. Consequently, from January 6, 1962, until March 31, 1963, both systems (present and proposed) will be in operation. Also, two employees will likely need to remain at Kansas City to search the present style money orders in claims cases until the destruction of all such orders is completed about June 30, 1964. We estimate that \$1 million will be needed to phase out the old money order center activities in fiscal year 1963 and \$11,000 for salaries for the two searchers in fiscal year 1964.

(b) The Post Office departmental unit in Washington will reach its full operating strength about December 15, 1962. Some additional funds will be required in fiscal year 1963 to complete the transfer of employees from Kansas City to Washington. We have estimated its operational costs for 1963 at \$388,000 and thereafter at \$451,700, including personnel, equipment rental (to be used for issuing duplicate money orders), and supplies.

(c) The considerations entering into reimbursable costs to the Treasurer of the United States are expected to remain fairly constant after July 1, 1962. Reimbursements to the Treasurer for personnel and equipment rental costs during fiscal year 1963, computed on a unit cost basis as described in recommendation No. 6, will likely total about \$729,000. Subject to experience with the new system in actual operation, it is reasonable to expect that the annual reimbursable cost level thereafter will be about the same amount.

We have therefore arrived at the following budgetary requirements for the Post Office Department based on the present rates of compensation and fringe benefits and anticipated rates for equipment rental:

Item	Fiscal year 1963	Fiscal year 1964	Future re- quirements
Kansas City Money Order Center (old items)-----	\$1,000,000	\$11,000	-----
Washington departmental unit (new items):			
Personnel-----	375,000	438,000	438,000
Relocation of personnel-----	25,000		
Equipment and supplies-----	13,000	13,700	13,700
Totals, departmental unit-----	413,000	451,700	451,700
Reimbursements to Treasurer (new items):			
Personnel-----	245,000	245,000	245,000
Equipment rental-----	484,000	484,000	484,000
Total reimbursements-----	729,000	729,000	729,000
Grand totals-----	2,142,000	1,191,700	1,180,700

## 3. SAVINGS RESULTING FROM CONSOLIDATING THE OPERATIONS

Following is a detailed discussion and justification of our findings with respect to the estimated personnel and equipment requirements and resulting savings for operating the new system after phase III of the conversion program has been completed. A recapitulation of the estimated requirements and savings is shown in schedule No. 1 attached.

I. *Personnel of the Post Office Department*

The Money Order Center at Kansas City now has 285 employees at an annual personnel cost of \$1,465,232. Under our proposed plan, this center will be closed down when the work relating to the old (present) style money orders is completed. A post office departmental unit will be established in lieu thereof (see recommendation No. 3) to maintain appropriate internal control over all types of transactions regarding the issue, payment, and reconciliation of the new style money orders. This departmental unit will require 70 employees (including a contingency provision of 3 employees) at an annual cost of \$438,000.

The following compares the requirements of the present money order center with the proposed departmental unit. The word "present" refers to the money order center and the word "proposed" refers to the departmental unit. Schedule No. 2 attached compares the number of personnel and costs under the present and proposed procedures and schedule No. 3 also gives a comparison by salary grades.

## (a) Office of the Manager:

1. Present: Two employees at a cost of \$19,855.
2. Proposed: Same.
3. Net change: None.
4. Comments: The new system does not contemplate any changes in the work of this office.

## (b) Accounting Control Section:

1. Present: Seven employees at a cost of \$48,593.
2. Proposed: Seven employees at a cost of \$48,763.
3. New change: Increased cost of \$170.
4. Comments: The new system does not contemplate any significant changes in the work of this section; however, one PFS-4 position is being substituted for a PFS-3 position.

## (c) Money Order Settlements Section:

1. Present: Six employees at a cost of \$39,498.
2. Proposed: Seven employees at a cost of \$47,666.
3. Net change: One additional employee and additional costs of \$8,168.
4. Comments: The increased costs are attributable to the need for one additional PFS-4 stenographer and reclassification of two supervisory positions.

## (d) Administrative Office:

1. Present: 21 employees at a cost of \$115,715.
2. Proposed: 18 employees at a cost of \$98,381.
3. Net change: Three fewer employees at a savings of \$17,334.
4. Comments: The establishment of the new departmental unit in Washington with a much smaller labor force than is presently employed in Kansas City will appreciably reduce the amount of administrative services required.

## (e) Federal Reserve Reconciliation Section:

1. Present: 29 employees at a cost of \$161,709.
2. Proposed: 15 employees at a cost of \$93,445.
3. Net change: 14 fewer employees at a savings of \$68,264.
4. Comments: This section receives money orders from the Federal Reserve banks and reconciles the payments to charges made by the presenting banks. Under the new system, the Treasurer's Office will receive the orders and will perform the tabulating work at much higher speeds by converting the money orders to magnetic tape. A force of 15 employees should be sufficient to handle the remaining reconciliation operations.

*(f)* Processing and Holding Section :

1. Present : 155 employees at a cost of \$732,105.
2. Proposed : None.
3. Net change : A reduction of 155 employees at a savings of \$732,105.
4. Comments : This section sorts, merges, and searches paid money orders and holds them in a file aggregating about 120 million orders. Replacement cards are also punched here. Under the new system, the Treasurer's Office will punch the replacement cards, and retain information relating to paid money orders on magnetic tape. The sorting, merging, and searching operations will be performed electronically. The paid orders themselves will be transferred to the General Services Administration after converting to magnetic tape for holding until destruction. Consequently, the section will be abolished in its entirety.

*(g)* Postmasters Reconciliation Section :

1. Present : 65 employees at a cost of \$347,757.
2. Proposed : 18 employees at a cost of \$109,235.
3. Net change : 47 fewer employees at a savings of \$238,522.
4. Comments : This section reconciles paid money orders to issue information furnished by the postmasters through the regional controllers. The new system will perform this reconciliation electronically. Reports of out-of-balance blocks and outstanding money orders will be reported to an audit group in this section for handling.

*(h)* Summary :

1. Present : 285 employees at a cost of \$1,465,232.
2. Proposed : 67 employees at a cost of \$417,345.
3. Added for contingencies (approximately 5 percent) : 3 employees at a cost of \$20,655.
4. Net change : 215 fewer employees in the Post Office Department at a savings of \$1,027,232.

*II. Personnel of the Treasury Department*

Our recommendation No. 1 provides for expansion of the electronic facility in the Office of the Treasurer to include the processing of postal money orders. In recommendation No. 6 we suggested that the Post Office Department reimburse the Office of the Treasurer for the costs of processing money orders, on the basis of an equitable distribution of the total costs of the functions common to both money orders and Government checks. The following is a detailed explanation of our estimate of \$245,000, representing the services of 43 employees, and which the Post Office Department will reimburse to the Office of the Treasurer annually for the latter's personnel requirements. (See schedules Nos. 2 and 3.)

## A. Receiving Branch :

1. Proposed procedure : 5.8 employees at cost of \$28,380.
2. Comment : This provides for five employees and 40 percent of the time of each of two supervisors, to receive postal money orders from the Federal Reserve banks and branches.

## B. Electric Accounting Branch :

1. Proposed procedure : 14.6 employees at a cost of \$65,213.
2. Comment : This provides for the equivalent of 13.8 employees and 40 percent of the time of each of 2 supervisors, to perform the punching and tabulating operations relating to 15,000 mutilated money orders and 1,500 stop payment requests each day.

## C. EDP Branch :

1. Proposed procedure : 20.6 employees at a cost of \$139,373.
2. Comment : The services of the employees of this branch are divided as follows :

*(a)* Conversion operations : This will require the services of eight employees and 40 percent of the time of each of two supervisors at a total cost of \$46,718. These employees will man two daily shifts engaged in converting the data punched into money orders onto magnetic tape.

(b) Computer operations: This will require the equivalent of 3.6 employees and 40 percent of the time of each of three supervisors at a total cost of \$34,973. These employees will man two daily shifts engaged in processing the reels of magnetic tape through the computers for the purposes of paying and reconciling the money orders.

(c) Programing: We are allocating \$42,217 to the money order operation representing 50 percent of the services of the 10 employees (8 programers and 2 systems analysts) now employed in the check operation. This allocation is made on the basis that the programing workload for money orders will be the same as for checks, for all practicable purposes, and that an equal division of the costs will be equitable.

(d) Branch administration: We are equally dividing the costs of the four employees who comprise the office of the branch chief, resulting in a charge of \$15,465 to the money order operation.

D. Summary:

1. Proposed procedure: 41 employees at a cost of \$232,966.
2. Added for contingencies: 2 employees at a cost of \$12,034.
3. Total estimated increases: 43 employees, at a cost of \$245,000 to the Post Office Department.

III. Equipment and supplies

The present costs of the money order center at Kansas City for equipment and supplies is \$255,000 per year, consisting of \$225,000 for rental charges for tabulating equipment and \$30,000 for supplies. We estimate that under the proposed procedure these costs to the Post Office Department will increase to \$497,700. Of this amount, \$13,700 would be directly paid by the Post Office Department, and \$484,000 would be paid out by the Office of the Treasurer for equipment rental and be reimbursed to that office by the Post Office Department.

A comparative statement of the costs of equipment and supplies under the present and proposed procedures is shown in schedule No. 4 attached. Following is a detailed description of the equipment and supplies needed.

A. *Equipment in the Post Office Department.*—The Post Office Department will have a small amount of key punch equipment, consisting of a card punch and a key verifier, in its departmental unit at Washington for the issuance of duplicate money orders (see recommendation No. 4). The annual rental will be about \$1,020. The costs for supplies are estimated at \$12,000, mainly for the purchase of magnetic tape, converter ribbons, tabulating cards, and paper. An amount of \$680 has been added for contingencies, bringing the total to \$13,700.

B. *Equipment in the Office of the Treasurer.*—A small portion of the total of \$484,000 is rental on tabulating equipment required in the handling of mutilated money orders and stop payment requests. The remainder is the rental costs of the electronic equipment which will assume most of the operations now being performed by the money order center and a contingency factor of about 5 percent.

1. Electric Accounting Branch: Additional equipment to punch and tabulate cards relating to 15,000 mutilated money orders and 1,500 stop payment requests daily will be required. The rental of such equipment is estimated at \$7,440 per year.

2. EDP Branch: Three converters will be needed, for two full shifts daily, to convert the data punched into money orders onto magnetic tape. Each unit will therefore be used 352 hours per month, with the first 176 hours charged at prime shift rates and the next 176 hours at second shift rates (40 percent of prime shift rates). The total rental costs for converters will be \$185,472 per year, computed as follows:

Prime shift	-----	\$132, 480
Second shift	-----	52, 992
Total	-----	185, 472

Sufficient time will be available on the Office of the Treasurer's model 7074 computer to enable both the check and money order operations to be done within two shifts daily. The costs of prime shift rental and second shift rental (40 percent of prime shift) for the model 7074 computer can therefore be distributed between the two operations on a volume basis (40 percent for money orders and 60 percent for checks for the purposes of our computations). However, it will be necessary for the Treasurer's Office to acquire an additional

model 1401 computer since each operation will consume more than prime shift time (176 hours) each month.

The reimbursable costs for processing money orders on the computers in the EDP Branch are as follows:

Model 7074 computer:	
Prime shift.....	\$139,680
Second shift.....	55,872
Subtotal.....	<u>195,552</u>
Model 1401 computer:	
Prime shift.....	70,260
Second shift.....	2,460
Subtotal.....	<u>72,720</u>
Total.....	<u>268,272</u>

3. Contingency factor: A contingency factor of approximately 5 percent amounting to \$22,816 is being added to the Treasurer's Office.

C. Summary.—

1. Present procedure: Costs of supplies and equipment, \$255,000.
2. Proposed procedure: Costs of supplies and equipment, \$497,700.
3. Net change: Increase of \$242,700 to the Post Office Department.

IV. Savings to the Treasurer's Office

The expansion of the check payment and reconciliation facilities in the Office of the Treasurer to include the payment and reconciliation of postal money orders will produce total savings of about \$150,000 per year in personnel and equipment rental costs to that office. This amount is supported by schedule No. 5 attached.

Personnel: The proposed plan contemplates that the money order operations will not require that any additional organizational units be set up within the Treasurer's Office but that existing units handle both checks and money orders. The supervisors who would normally be required for the check operations will, therefore, oversee the combined operations. Because of the similarities in the programs which will be used in both operations, the additional workload can be absorbed by the present programing staff in the Treasurer's Office. Since the Post Office Department will reimburse the Treasurer's Office on an equitable basis for the Department's share of the costs, this utilization on the combined operations of the supervisory and programing personnel who would otherwise be needed on the check operations will result in a direct savings to the Treasurer's Office. We have estimated these savings at \$70,500 (including a contingency reduction of \$3,421) representing the services of nine employees.

Equipment rental: The assumption of the money order operations will require the Treasurer's Office to obtain some additional equipment over its needs for the check operations alone. The one model 7074 computer which the Treasurer's Office will have, however, will be able to handle the combined operations by increasing the second shift usage. We estimate that the check operations will require an average of 9.6 hours daily on the model 7074 computer and the money order operations an average of 6.4 hours daily, for a total of 16 hours or two full shifts. If checks were the only items processed through this computer, the Treasurer's Office would have to bear the costs of a full prime shift and a small amount of second shift. (Second shift rates are 40 percent of prime shift rates.) Under the proposed plan, the Post Office Department will pay its pro rata share of equipment rental and thus will assume its share of both prime shift and second shift rental costs. We estimate that this arrangement will reduce the annual costs to the Treasurer's Office for the model 7074 computer, as follows:

Decrease in prime shift rental.....	\$139,680
Increase in second shift rental.....	<u>-55,872</u>
Net total.....	83,808
Less approximate 5 percent contingency factor.....	<u>4,308</u>
Net savings.....	<u>79,500</u>

## 4. METHOD OF COMPUTING COSTS AND SAVINGS

This section explains the method of arriving at our estimates as to the costs and savings under our proposed plan and the two bases from which we started. Schedule No. 6 appended hereto supports this section.

The first basis was the present costs of processing money orders at the Money Order Center in Kansas City. These are actual costs as supported by financial data in the Post Office Department and thus provide a firm base against which the costs of our recommended procedure can be weighed and the savings computed. Following is a breakdown of the costs of the Money Order Center.

Personal services.....	\$1,465,232
Equipment rental.....	225,000
Supplies.....	30,000
Total.....	1,720,232

For the second basis, we computed certain costs to the Treasurer's Office for its processing of approximately 400 million checks in fiscal year 1960 and adjusted these costs upward to include the pay raise and hospitalization benefits which went into effect in July 1960. These costs were developed for the payment and reconciliation operations, omitting operations of the nature which the Post Office Departmental Unit would perform for money orders under our recommendation No. 3. Since these costs, amounting to \$1,315,747, were arrived at by using known factors, they represent a valid base for computing related costs under the three alternative procedures described below which we considered.

*I. Paying and reconciling money orders in a separate organization and using present electronic equipment*

The annual volume of money orders issued is about 275 million and it was therefore necessary that we make proportionate downward adjustments of the costs to the Treasurer's Office for paying and reconciling 400 million checks. Such adjustments were made only in those individual cost items which would be affected by a lower volume of work, so that the results were the projected costs of processing 275 million checks. More specifically, the results also represented the costs of paying and reconciling 275 million money orders in a separate organizational facility set up to perform such work, using the present system for paying and reconciling checks and a type 705 model 2 IBM equipment. The service of 62 employees would be required.

The costs under this alternative are as follows:

Separate organizational facility.....	\$1,135,000
Post Office Departmental Unit.....	460,000
Total.....	1,595,000

In comparison with the present system at the Money Order Center, this plan, utilizing present type of equipment under a separate organization, would result in annual savings of about \$125,232.

*II. Paying and reconciling money orders in a separate organization and using more modern electronic equipment*

The next projection we made was the costs and savings for paying and reconciling 275 million money orders annually in a separate organizational facility, but using the new IBM Series 7000 electronic equipment of the type which the Treasurer's Office will obtain to replace its present electronic installation. This more modern equipment has greater capacity, greater density on the magnetic tape, and a higher processing speed, and with these capabilities has an economic advantage over the present equipment.

If the more modern equipment were to be obtained for the payment and reconciliation of money orders and placed in a separate organizational facility, we

estimate that three-card-to-tape converters and two computers (one type 7074 and one type 1401) with their components would be required. The equivalent of 54.4 employees would be needed. However, because of the greater capabilities of this equipment, the rental costs would be \$107,000 per year less and supplies \$8,300 less than for the present type 705 model 2 equipment. Personnel costs would also be less by \$53,000. Thus, the savings attributable to the increased efficiency of the newer equipment would total about \$168,300 per year.

The costs under this system are as follows :

Separate organizational facility.....	\$975,000
Post Office Departmental Unit.....	451,700
Total.....	1,426,700

In comparison with the present system at the Money Order Center, this plan would result in annual savings of about \$293,532.

*III. Paying and reconciling money orders in a merged organization and using more modern electronic equipment*

After taking into account the benefits arising from using more modern equipment, we determined that additional savings could be obtained by paying and reconciling both money orders and checks in a single organizational facility in the Treasurer's Office using the same equipment and the same personnel for both functions to a large extent.

The Treasurer's Office would have to obtain three additional card-to-tape converters and another type 1401 computer to handle both checks and money orders in the same installation, since sufficient time would not be available on the equipment the Treasurer's Office will use for its check operations. However, sufficient second shift time is available each day on the one type 7074 computer, which is the most expensive unit in the electronic installation to handle both checks and money orders. The net result is a savings of \$161,500 in the amount the Post Office Department would pay annually for equipment rental, by processing checks and money orders in a merged facility rather than in separate facilities.

Although the Treasurer's Office would need an additional 34 employees to handle the combined operations, as detailed in schedule No. 7, there would be no need to increase the programming personnel, the personnel in the offices of the Branch Chiefs affected, or the supervisors over the converter operations. The additional 34 employees would, however, include another supervisor to oversee the operations on the additional type 1401 computer required.

By sharing the personnel costs with the Treasurer's Office under this procedure, the Post Office Department would reimburse the Treasurer's Office for the equivalent services of 43 employees, or 11.4 less than required in a separate organization handling money orders on the more modern equipment. This represents a savings in personnel costs of \$84,500 or a total savings of \$246,000 including equipment rental.

The costs under this system are as follows :

Treasurer's Office (reimbursable).....	\$729,000
Post Office Departmental Unit.....	451,700
Total.....	1,180,700

In comparison with the present system at the Money Order Center, this plan would result in annual savings of \$539,532 in the Post Office Department. The merger of the two operations within the Treasurer's Office would produce additional savings of \$150,000 to that Office. The total savings thus would amount to \$689,532. Since it offers the largest amount of savings and we cannot foresee any significant disadvantages, we recommend this plan.

## SCHEDULE No. 1

*Recapitulation of comparative statements of number and costs of personnel and of equipment and supplies under present and proposed operations for the payment and reconciliation of postal money orders*

	Personnel		Equip- ment and supplies	Total
	Number	Amount		
I. Present operations:				
A. Post Office Department:				
1. Money Order Center, Kansas City..	285	\$1,465,232	\$255,000	\$1,720,232
Total, present operations.....	285	1,465,232	255,000	1,720,232
II. Proposed operations:				
A. Post Office Department:				
1. Departmental Unit, Washington....	70	438,000	13,700	451,700
B. Treasury Department (reimbursable):				
1. Office of the Treasurer.....	43	245,000	484,000	729,000
Totals, proposed operations.....	113	683,000	497,700	1,180,700
III. Net change:				
A. Post Office Department:				
1. Money Order Center, Kansas City..	-285	-1,465,232	-255,000	-1,720,232
2. Departmental Unit, Washington....	+70	+438,000	+13,700	+451,700
Total, Post Office Department....	-215	-1,027,232	-241,300	-1,268,532
B. Treasury Department (reimbursable):				
1. Office of the Treasurer.....	+43	+245,000	+484,000	+729,000
Net total.....	-172	-782,232	+242,700	-539,532

NOTE.—Additional direct costs of \$35,000 to GSA for accessioning and searching the money orders are not included in the computed savings of \$539,532.

## SCHEDULE NO. 2

Comparative statement of the number and costs of personnel required under present and proposed procedures for the payment and reconciliation of postal money orders

Department, operation, and item	Present procedure		Proposed procedure		Net change	
	Number	Costs	Number	Costs	Number	Costs
<b>I. PRESENT OPERATIONS</b>						
A. Post Office Department:						
1. Money Order Center, Kansas City:						
(a) Office of the Manager.....	2	\$19,855	-----	-----	-2.0	-\$19,855
(b) Accounting Control Section.....	7	48,593	-----	-----	-7.0	-48,593
(c) Money Order Settlement Section.....	6	39,498	-----	-----	-6.0	-39,498
(d) Administrative Office.....	21	115,715	-----	-----	-21.0	-115,715
(e) Federal Reserve Reconciliation Section.....	29	161,709	-----	-----	-29.0	-161,709
(f) Processing and Holding Section.....	155	732,105	-----	-----	-155.0	-732,105
(b) Postmasters Reconciliation Section.....	65	347,757	-----	-----	-65.0	-347,757
Total, present operations.....	285	1,465,232	-----	-----	-285.0	-1,465,232
<b>II. PROPOSED OPERATIONS</b>						
A. Post Office Department:						
1. Post Office Departmental Unit, Washington:						
(a) Office of the Manager.....	-----	-----	2.0	\$19,855	+2.0	+19,855
(b) Accounting Control Section.....	-----	-----	7.0	48,763	+7.0	+48,763
(c) Money Order Settlement Section.....	-----	-----	7.0	47,666	+7.0	+47,666
(d) Administrative Office.....	-----	-----	18.0	98,381	+18.0	+98,381
(e) Federal Reserve Reconciliation Section.....	-----	-----	15.0	93,445	+15.0	+93,445
(f) Postmasters Reconciliation Section.....	-----	-----	18.0	109,235	+18.0	+109,235
Total.....	-----	-----	67.0	417,345	+67.0	+417,345
Add 5 percent contingency factor (approximate).....	-----	-----	3.0	20,655	+3.0	+20,655
Total, Post Office Department.....	-----	-----	70.0	438,000	+70.0	+438,000
B. Treasury Department (reimbursable):						
1. Office of the Treasurer:						
(a) Receiving Branch.....	-----	-----	5.8	28,380	+5.8	+28,380
(b) Electric Accounting Branch.....	-----	-----	14.6	65,213	+14.6	+65,213
(d) EDP Branch:	-----	-----	-----	-----	-----	-----
(1) Conversion operations.....	-----	-----	8.8	46,718	+8.8	+46,718
(2) Computer operations.....	-----	-----	4.8	34,973	+4.8	+34,973
(3) Programming.....	-----	-----	5.0	42,217	+4.0	+42,217
(4) Branch administration.....	-----	-----	2.0	15,465	+2.0	+15,465
Total.....	-----	-----	41.0	232,966	+41.0	+232,966
Add 5 percent contingency factor (approximate).....	-----	-----	2.0	12,034	+2.0	+12,034
Total, Treasury Department.....	-----	-----	43.0	245,000	+43.0	+245,000
Total, proposed operations.....	-----	-----	113.0	683,000	+113.0	+683,000
Net total, all operations.....	285	1,456,232	113.0	683,000	-172.0	-782,232

SCHEDULE NO. 3

Comparative statement of the number, grades, and costs of personnel required under the present and proposed systems for the payment and reconciliation of postal money orders

	PFS grades											Contingency factor	Total number of employees	Amount				
	2	3	4	5	6	7	8	9	10	11	12				15			
<b>I. Present operations:</b>																		
A. Post Office Department:																		
1. Money Order Center, Kansas City:																		
(a) Office of the manager.....																2.0	\$19,855	
(b) Accounting Control Section.....		1	2	1	1	1			1	1	1					7.0	48,593	
(c) Money Order Settlements Section.....			3	3	1	1	1	1	1	1						6.0	39,498	
(d) Administrative Office.....	2	7	5	3	1	1	1									21.0	115,715	
(e) Federal Reserve Reconciliation Section.....	2	10	12	1	2	1			1	1						29.0	161,709	
(f) Processing and Holding Section.....	60	82	7	3					1	1						155.0	732,105	
(g) Postmasters Reconciliation Section.....	2	27	29	3	1	1			1	1						65.0	347,757	
Total, present operations.....	66	127	58	12	6	3	1	1	2	4	4	1				285.0	1,465,232	
<b>II. Proposed operations:</b>																		
A. Post Office Department:																		
1. Post Office Departmental Unit, Washington:																		
(a) Office of the Manager.....				1													2.0	19,855
(b) Accounting Control Section.....			3	1	1												7.0	48,703
(c) Money Order Settlement Section.....			4	1	1												7.0	47,606
(d) Administrative Office.....		5	10	1		1											18.0	98,381
(e) Federal Reserve Reconciliation Section.....			10	1	2												15.0	83,445
(f) Postmasters Reconciliation Section.....			13	2													18.0	109,235
Total.....		5	40	6	4	2		1	1	3	4	1				67.0	417,345	
Add 5 percent contingency factor (approximate).....																3	20,655	
Total, Post Office Department.....		5	40	6	4	2		1	1	3	4	1				70.0	438,000	

	GS grades																
	1	3	4	5	7	8	9	11	12	13							
B. Treasury Department (reimbursable):																	
1. Office of the Treasurer:																	
(a) Receiving Branch.....		5.0		0.4	0.4												5.8
(b) Electric accounting Branch.....		13.8		.4	.4												14.6
(c) EDP Branch:																	
(1) Conversion operations.....				8.0	.8	0.8	2.8	1.2									8.8
(2) Computer operations.....							4.0	1.0									4.8
(3) Programming.....																	5.0
(4) Branch administration.....		0.5	.5														2.0
Total.....	.5	18.8	.5	8.8	1.6	.8	2.8	5.2	1.5	.5							41.0
Add 5 percent contingency factor (approximate).....																2	2.0
Total, Treasury Department.....	.5	18.8	.5	8.8	1.6	.8	2.8	5.2	1.5	.5							43.0
Total, proposed operations.....																	113.0
Net total.....																	-172.0
																	28,380
																	65,213
																	46,718
																	34,973
																	42,217
																	15,465
																	232,966
																	12,094
																	245,000
																	683,000

## SCHEDULE No. 4

*Comparative statement of costs of equipment and supplies under present and proposed procedures for the payment and reconciliation of postal money orders*

	Present procedure	Proposed procedure	Net change
<b>I. Present operations:</b>			
<b>A. Post Office Department:</b>			
1. Money Order Center, Kansas City:			
(a) Tabulating equipment.....	\$225,000	-----	-\$225,000
(b) Supplies.....	30,000	-----	-30,000
Total, present operations.....	255,000	-----	-255,000
<b>II. Proposed operations:</b>			
<b>A. Post Office Department:</b>			
1. Post Office Departmental Unit, Washington:			
(a) Tabulating equipment.....		\$1,020	+1,020
(b) Supplies.....		12,000	+12,000
Total.....		13,020	+13,020
Add 5 percent contingency factor (approximate).....		680	+680
Total, Post Office Department.....		13,700	+13,700
<b>B. Treasury Department (reimbursable):</b>			
1. Office of the Treasurer:			
(a) Tabulating equipment.....		7,440	+7,440
(b) Electronic equipment:			
(1) Converters.....		185,472	+185,472
(2) Computers and components.....		268,272	+268,272
Total.....		461,184	+461,184
Add 5 percent contingency factor (approximate).....		22,816	+22,816
Total, Treasury Department.....		484,000	+484,000
Total, proposed operations.....		497,700	+497,700
Net total, all operations.....	255,000	497,700	+242,700

## SCHEDULE No. 5

*Analysis of savings to treasurer's office (giving effect to increased efficiency from merged facility)*

Branch, operation cost item	Personal services	Equipment rental	Total
Receiving branch:			
Receiving money orders for payment:			
Personal services, supervision.....	\$4,709 (0.8)	-----	\$4,709
Branch total.....	4,709 (0.8)	-----	4,709
Electric accounting branch:			
Punching and tabulating operations:			
Personal services, supervision.....	4,709 (0.8)	-----	4,709
Branch total.....	4,709 (0.8)	-----	4,709
EDP Branch:			
Conversion operations: Personal services, supervision...	5,031 (0.8)	-----	5,031
Computer operations:			
Personal services, supervision.....	1,790 (0.2)	-----	1,790
Equipment rental, prime shift.....	-----	\$139,680	139,680
Equipment rental, second shift.....	-----	-55,872	-55,872
Programing: Personal services.....	42,217 (5.0)	-----	42,217
Branch administration: Personal services.....	15,465 (2.0)	-----	15,465
Branch total.....	64,503 (8.0)	83,808	148,311
Total, all branches.....	73,921 (9.6)	-83,808	157,729
Less 5 percent contingency factor (approximate).....	-3,421 (0.6)	-4,308	-7,729
Net total.....	70,500 (9.0)	79,500	150,000

## SCHEDULE NO. 6

## COMPUTATION OF COSTS UNDER ALTERNATIVE PROCEDURES

PROJECTION I.—On basis of paying 275,000,000 money orders in a separate facility under present system for paying checks and using present equipment

Cost item	Current annual costs of paying checks	(-) Adjustments (voluntary reduced items)	Net totals—Current costs of paying 275,000,000 items		
			Personal services	Equipment and supplies	Total
<b>I. Treasury Department:</b>					
<b>A. Receiving Branch:</b>					
<b>I. Receiving money orders for payment:</b>					
(a) Personal services, direct costs.....	\$32,828 ( 6.9)	\$0, 157	\$25, 671 ( 5.0)		\$23, 671
(b) Personal services, supervision.....	11, 772 ( 2.0)		11, 772 ( 2.0)		11, 772
Branch total.....	44, 600 ( 8.9)	9, 157	35, 443 ( 7.0)		35, 443
<b>B. Electric Accounting Branch:</b>					
<b>I. Punching and tabulation operations:</b>					
(a) Personal services, direct costs.....	1 60, 504 (13.8)		60, 504 (13.8)		60, 504
(b) Personal services, supervision.....	11, 772 ( 2.0)		11, 772 ( 2.0)		11, 772
(c) Equipment rental, prime shift.....	7, 440			\$7, 440	7, 440
Branch total.....	79, 716 (15.8)		72, 276 (15.8)	7, 440	79, 716
<b>C. Electronic Data Processing Branch:</b>					
<b>I. Conversion operations:</b>					
(a) Personal services, direct costs.....	86, 515 (13.0)		55, 291 (10.0)		55, 291
(b) Personal services, supervision.....	12, 580 ( 2.0)	31, 224	12, 580 ( 2.0)		12, 580
(c) Equipment rental, prime shift.....	149, 100			149, 100	149, 100
(d) Equipment rental, second shift.....	55, 534	36, 403		19, 131	19, 131
<b>2. Computer operations:</b>					
(a) Personal services, direct costs.....	72, 047 (10.7)		48, 108 ( 7.3)		48, 108
(b) Personal services, supervision.....	25, 183 ( 3.0)	23, 939	25, 183 ( 3.0)		25, 183
(c) Equipment rental, prime shift.....	418, 800			418, 800	418, 800
(d) Equipment rental, second shift.....	256, 306	134, 206		122, 100	122, 100
<b>3. Programming: (a) Personal services.....</b>	84, 435 (10.0)		84, 435 (10.0)		84, 435
<b>4. Branch administration: (a) Personal services.....</b>	30, 931 ( 4.0)		30, 931 ( 4.0)		30, 931
Branch total.....	1, 191, 431 (42.7)	225, 772	256, 528 ( 36.3)	709, 131	965, 659
<b>Total.....</b>	1, 315, 747 (67.4)	234, 929	364, 247 ( 59.1)	716, 571	1, 080, 818

Contingency factor (approximately 5 percent).....				35,929	54,152
Total, Treasury Department.....			18,253 ( 2.9)	752,500	1,135,000
II. Post Office Department:					
A. Departmental unit:					
1. Personal services.....					
2. Equipment and supplies.....			417,345 ( 67.0)	21,020	417,345
3. Contingency factor (approximately 5 percent).....			20,655 ( 3.0)	980	21,635
Total, Post Office Department.....			438,000 ( 70.0)	22,000	460,000
III. Grand total.....			820,500 (132.0)	774,500	1,595,000

<sup>1</sup> Computed on basis of 275,000,000 items.

## PROJECTION II.—On basis of paying 275 million money orders in a separate facility and using new equipment

Cost item	(-) Adjustments of projection I (giving effect to increased efficiency from new equipment)			Adjusted total (costs of paying money orders in a separate facility using new equipment)		
	Personal services	Equipment and supplies	Total	Personal services	Equipment and supplies	Total
<b>I. Treasury department:</b>						
<b>A. Receiving Branch:</b>						
1. Receiving money orders for payment:						
(a) Personal services, direct costs.....				\$23,671 ( 5.0)		\$23,671
(b) Personal services, supervision.....				11,772 ( 2.0)		11,772
Branch total.....				35,443 ( 7.0)		35,443
<b>B. Electric Accounting Branch:</b>						
1. Punching and tabulation operations:						
(a) Personal services, direct costs.....				60,504 (13.8)		60,504
(b) Personal services, supervision.....				11,772 ( 2.0)		11,772
(c) Equipment rental, prime shift.....					\$7,440	7,440
Branch total.....				72,276 (15.8)	7,440	79,716
<b>C. Electronic Data Processing Branch:</b>						
1. Conversion operations:						
(a) Personal services, direct costs.....	\$13,604 (2.0)		\$13,604	41,687 ( 8.0)		41,687
(b) Personal services, supervision.....				12,580 ( 2.0)		12,580
(c) Equipment rental, prime shift.....		\$16,620	16,620		132,480	132,480
(d) Equipment rental, second shift.....		-33,861	-33,861		52,992	52,992
2. Computer operations:						
(a) Personal services, direct costs.....	20,678 (3.3)		20,678	27,430 ( 4.0)		27,430
(b) Personal services, supervision.....	16,232 (2.0)		16,232	8,951 ( 1.0)		8,951
(c) Equipment rental, prime shift.....		-660	-660		419,460	419,460
(d) Equipment rental, second shift.....		119,640	119,640		2,460	2,460
3. Programming: (a) Personal services.....				84,435 (10.0)		84,435
4. Branch administration: (a) Personal services.....				30,931 ( 4.0)		30,931
Branch total.....	50,514 (7.3)	101,739	152,253	206,014 (29.0)	607,392	813,406
<b>Total.....</b>	60,514 (7.3)	101,739	162,253	313,793 (51.8)	614,832	928,565
Contingency factor (approximately 5 percent).....	2,486 (0.3)	5,261	7,747	15,767 ( 2.0)	30,668	46,435
<b>Totals, Treasury Department.....</b>	53,000 (7.6)	107,000	160,000	329,500 (54.4)	645,500	975,000
<b>II. Post Office Department:</b>						
<b>A. Departmental Unit</b>						
1. Personal services.....				417,345 ( 67.0)		417,345
2. Equipment and supplies.....		8,000	8,000		13,020	13,020
3. Contingency factor (approximately 5 percent).....		300	300		21,335	21,335
<b>Totals, Post Office Department.....</b>		8,300	8,300	438,000 ( 70.0)	13,700	451,700
<b>III. Grand total.....</b>	53,000 (7.6)	115,300	168,300	767,500 (124.4)	659,200	1,426,700

PROJECTION III.—On basis of paying 275,000,000 money orders in a merged facility

Cost item	(-) Adjustments of projection II (giving effect to increased efficiency from merged facility)		Adjusted total (costs of paying money orders in a merged facility using new equipment)	
	Personal services	Equipment and supplies	Personal services	Equipment and supplies
<b>I. Treasury Department:</b>				
<b>A. Receiving Branch:</b>				
1. Receiving money orders for payment:				
(a) Personal services, direct costs.....			\$23,671 ( 5.0)	
(b) Personal services, supervision.....			4,709 ( 0.8)	
Branch total.....	7,063 ( 1.2)		28,380 ( 5.8)	
<b>B. Electric Accounting Branch:</b>				
1. Punching and tabulation operations:				
(a) Personal services, direct costs.....			60,504 ( 13.8)	
(b) Personal services, supervision.....			4,709 ( 0.8)	
(c) Equipment rental, prime shift.....				\$7,440
Branch total.....	7,063 ( 1.2)		65,213 ( 14.6)	7,440
<b>C. Electronic Data Processing Branch:</b>				
1. Conversion operations:				
(a) Personal services, direct costs.....			41,687 ( 8.0)	
(b) Personal services, supervision.....			5,081 ( 0.8)	
(c) Equipment rental, prime shift.....				132,480
(d) Equipment rental, second shift.....				52,992
2. Computer operations:				
(a) Personal services, direct costs.....	3,198 ( 0.4)		24,282 ( 3.6)	
(b) Personal services, supervision.....	-1,790 ( 0.2)		10,741 ( 1.2)	
(c) Equipment rental, prime shift.....		\$200,530		209,940
(d) Equipment rental, second shift.....		-65,872		58,332
3. Programming: (a) Personal services.....	42,218 ( 5.0)		42,217 ( 5.0)	
4. Branch administration: (a) Personal services.....	15,468 ( 2.0)		15,465 ( 2.0)	
Branch total.....	66,641 ( 8.4)	153,648	139,373 ( 20.6)	453,744
Total.....	80,767 ( 10.8)	153,648	232,966 ( 41.0)	461,184
Contingency factor (approximately 5 percent).....	3,733 ( 0.6)	7,852	12,034 ( 2.0)	22,816
Total, Treasury Department.....	84,500 ( 11.4)	161,500	245,000 ( 43.0)	484,000
<b>II. Post Office Department:</b>				
<b>A. Departmental unit:</b>				
1. Personal services.....			417,345 ( 67.0)	
2. Equipment and supplies.....				13,020
3. Contingency factor (approximately 5 percent).....			20,655 ( 3.0)	680
Total, Post Office Department.....			438,000 ( 70.0)	13,700
<b>III. Grand total.....</b>	84,500 ( 11.4)	161,500	683,000 ( 113.0)	497,700

## SCHEDULE 7

*Schedule of employee services required in the Office of the Treasurer to handle money order operations under proposed plan, according to (1) services of employees on the rolls, and (2) services of additional employees needed*

Branch, operation, cost item	Services of employees already on the rolls		Services of additional employees needed		Total employee services	
	Number	Cost	Number	Cost	Number	Cost
Receiving branch:						
Receiving money orders for payment:						
Personal services, direct costs.....			5.0	\$23,671	5.0	\$23,671
Personal services, supervision.....	0.8	\$4,709			.8	4,709
Branch total.....	.8	4,709	5.0	23,671	5.8	28,380
Electronic accounting branch:						
Punching and tabulating operations:						
Personal services, direct costs.....			13.8	60,504	13.8	60,504
Personal services, supervision.....	.8	4,709			.8	4,709
Branch total.....	.8	4,709	13.8	60,504	14.6	65,213
Electronic data processing branch:						
Conversion operations:						
Personal services, direct costs.....			8.0	41,687	8.0	41,687
Personal services, supervision.....	.8	5,031			.8	5,031
Computer operations:						
Personal services, direct costs.....			3.6	24,232	3.6	24,232
Personal services, supervision.....	.2	1,790	1.0	8,951	1.2	10,741
Programming: Personal services.....	5.0	42,217			5.0	42,217
Branch supervision: Personal services.....	2.0	15,465			2.0	15,465
Branch total.....	8.0	64,503	12.6	74,870	20.6	139,373
Total, all branches.....	9.6	73,921	31.4	159,045	41.0	232,966
Add contingency factor.....	-.6	-3,421	2.6	15,455	2.0	12,034
Net total.....	9.0	70,500	34.0	174,500	43.0	245,000

PART IV: COURSE OF ACTION AND TIMETABLE FOR CONVERSION OF PRESENT PROCEDURE TO ELECTRONIC PROCESSING

In part I of this report, we recommend that conversion to electronic processing be installed in three phases beginning January 6, 1962. If this recommendation is approved, it will be necessary to take action on a number of matters prior to phase 1.

In this part of our report, we discuss the matters on which action should be taken as soon as possible.

1. *Matters requiring attention prior to installation of phase 1*

There follows a brief outline of the various matters requiring action prior to January 6, 1962. Each of these matters is discussed in more detail hereinafter.

- (a) Obtain space in General Accounting Office Building.
- (b) Design and procurement of new format of money order.
- (c) Design and programming of money order system.
- (d) Selection and training of key personnel for Post Office departmental organizational unit.
- (e) Revision of necessary regulations.
- (f) Establishment of working relationship with Federal Reserve System.

(a) *Obtain space in General Accounting Office Building.*—In recommendation No. 7, we pointed out the desirability of obtaining approximately 10,000 square feet of space in the General Accounting Office Building adjacent to the electronic facility of the Office of the Treasurer. We believe it is extremely important that this matter be given priority because all planning is dependent on the resolution of this matter.

(b) *Design and procurement of new format of money order.*—Responsibility should be assigned within the Post Office Department for the development of the new form of money order. In the design of the new format there are two points which should be kept in mind and which have a bearing on conversion to electronic processing. First, the new format should contain some form of pre-

punching which will permit automatic segregation during the payment process between those issued prior to January 6, 1962, which will be handled under present procedures and those issued subsequent to that date which will be handled under the electronic system. This can be handled by a distinctive punch in one column. In this connection, columns 1 and 2 should be blank. This will permit punching of a two-digit transaction code in all duplicate money orders which we recommend to be issued under the same serial number as the original. The punching of the transaction code in duplicates is required in electronic processing in order that the duplicate may be paid over a stop payment which would be retained in the system to intercept the original if presented for payment. Also, consideration should be given to feasibility of having a different color for the new money order form. Second, under the new system, the prefix to the serial number designating the post office region will, of necessity, have to be recorded as a two-digit numerical code. This is by reason that the card-to-tape conversion equipment is strictly numerical and in order to record the region, two numerical digits will be required. In this connection, we believe procedures should be developed whereby numerical regional codes used as a prefix to the serial number of a money order should be changed when the initial supply of money orders has been used. More specifically, code 01 would designate region 1 until all the supply of money orders having serial numbers of 00,001,000 to 99,999,999 was depleted. This prefix then could be designated as 21. This will provide a basis for never having duplicate numbers in the electronic system.

(c) *Design and programing of money order system.*—The procedure for processing money orders will be similar to that used in processing Government checks. This will facilitate programing. The present staff of systems analysts and programers in the Office of the Treasurer is, in our opinion, well qualified to perform this function. However, the Post Office Department should assign at least two persons who are well versed in the present processing, accounting, and reporting requirements, to work full time with the Treasurer's programing staff. This will provide the necessary understanding of the systems requirements regarding accounting, reporting, and processing of all types of transactions, including the handling of error conditions which may be encountered in paying and reconciling money orders. We believe this project should be given top priority, starting early in the spring of 1961.

(d) *Selection and training of key personnel for the new Post Office departmental unit.*—The Post Office departmental unit (see recommendation No. 3) will, we believe, eventually build up to about 67 employees. Plans should be made to begin the selection and training of the key personnel for this organizational unit in the fall of 1961. These key personnel will have to become familiar with the accounting, reporting, and handling of adjustments relating to both issue data and money orders paid in the electronic system. They also will have to undergo training to be acquainted with the data they will receive from the electronic system on all types of transactions in money order processing. While we have no real guide to estimate how quickly this unit will reach the full strength of approximately 67 people, we believe that an initial force of about 10 people will be sufficient for the first calendar quarter of 1962. Further increases in this force will depend on the timelag for reconciliation of postmasters' accounts. The first increase will occur about midyear of 1962 and the last in December 1962.

(e) *Revision of necessary regulations.*—It appears to us that only Post Office regulations will require revision and we foresee no urgency or problems in this area. We merely mention it as one of the things which will have to be taken care of prior to installation of phase 1 of the new system.

(f) *Establishment of working relationship with Federal Reserve System.*—On September 29, 1960, Mr. J. H. Marks, finance officer, and member of this committee, forwarded a letter (see exhibit 1) to Mr. M. A. Harris, Vice President of the Federal Reserve Bank of New York and Chairman of the Subcommittee on Collections of the Federal Reserve System, informing him of the study to determine the feasibility of converting the verification and reconciliation operations for postal money orders to electronic processes. Mr. Harris advised the committee that he had arranged tentatively for a meeting to be held in Chicago in the middle of November 1960, at which time discussions will be held as to the effect of the change in procedure on Federal Reserve bank operations. We believe that this relationship should be continued until the procedure is completely converted to electronic processes. This, of course, will be the responsibility of the Post Office Department and we foresee no problems that

cannot be worked out mutually among the Treasury, Post Office Department, and the Federal Reserve System.

EXHIBIT No. 1—POSTAL MONEY ORDERS

SEPTEMBER 29, 1960.

Mr. MARCUS HARRIS,  
*Vice President, Federal Reserve Bank,  
New York, N.Y.*

DEAR SIR: There follows a brief outline of a proposal to convert the verification and reconciliation operations for postal money orders, presently being conducted at the Money Order Center at Kansas City, to electronic processing.

The proposal is based on expanding the present facilities of the Office of the Treasurer of the United States at Washington, D.C., covering the payment and reconciliation of Treasury checks to include the verification and reconciliation of postal money orders.

It is proposed that the conversion program would commence on January 1, 1962. The initial phase would cover approximately 12½ percent of the estimated annual volume to be issued. To this end, all post offices within a region or a combination of postal regions, which would approximate 12½ percent of the total volume, would begin issuing a new form of postal money order (51-column card with a distinctive X-punch and a new series of serial numbers). All such money orders would be inscribed and prepunched with the amount by use of new equipment being purchased for each postal window. More specifically, the entire conversion program will be coordinated in a manner whereby the new print-punch equipment will have been previously installed for each post office prior to conversion.

There will be no change involved insofar as the public and commercial banks are concerned. This means that, beginning in January 1962, postal money orders which are received by Federal Reserve banks will include those being issued in the new format by the post offices included in the initial conversion as well as those that are scheduled for conversion at a later date. The number of postal money orders to be processed electronically will gradually increase over a 9- to 12-month period at that time, for all practical purposes, all money orders received by Federal Reserve banks will be processed electronically at Washington, D.C.

In order to establish a plan for orderly transition to the new process, it is desired that arrangements be concluded with Federal Reserve banks whereby money orders in the new format will be forwarded to Washington, D.C., for verification and reconciliation while those under the old format will continue to be forwarded to the Money Order Center at Kansas City. One way in which this can be accomplished is to reactivate the sorting mechanism on the 808 proof machines whereby the new postal money orders, with a distinctive X-punch, would be sorted into one pocket and those without the X-punch would be sorted into another pocket. Consideration also should be given to what type proof listing will be made by the Federal Reserve banks in light of the decision to install print-punch equipment at each post office window.

We would like for you to set a time and place for a meeting on the proposal and suggest the following agenda, together with any items that your committee may wish to add.

1. Review development of proposal for integrating the processing of postal money orders with Government checks.
2. Review status of the Post Office Department's program for installing print-punch equipment at each post office.
3. Discuss proposed plan for conversion to electronic processing.

The members of the Treasury-Post Office Committee working on this project are:

Mr. G. F. Stickney, Technical Assistant to the Fiscal Assistant Secretary,  
Chairman.

Mr. Gordon Crowder, Assistant Controller.

Mr. J. Harold Marks, Finance Officer.

Mr. Willard E. Scott, Assistant Deputy Treasurer.

Sincerely yours,

J. H. MARKS, *Finance Officer.*

## EXHIBIT H

## THE AUTOMATIC DATA PROCESSING PROGRAM, MAY 1962

## I. INTRODUCTION

(a) The Post Office Department is one of the largest industrial-type complexes in the world. Our "mail factories" turn out a staggering number of items every day. Our materials handling operations dwarf virtually all commercial operations. Our transportation network is probably unrivaled anywhere in the world.

(b) Management at all levels has the problem of organizing enormous quantities of workload, man-hours, dollars, and time in a manner that provides the best service at the least cost.

(c) With increasing frequency, managers of large-scale operations have been applying developments in the computer sciences in order to secure management control over their operations. The military services have pioneered the development of systems for command control, industrial management, and intelligence evaluations. Such large enterprises as Boeing, General Precision, Librascope, and Sylvania have installed data handling equipment in an effort to get on top of multiplant operations and minimize the voluminous mass of paperwork which consumes so much valuable executive time.

(d) Similar management programs must be adopted by the Post Office Department if we are to obtain and exercise control over the Department's operations.

## II. OBJECTIVES OF THE ADP PROGRAM

The prime function of the ADP program is to serve the operating requirements of the postal service. This means—

(a) Firstline supervisor assistance by providing information to manage workload and to get the most out of man-hours.

(b) Transportation program support for optimum scheme development; vehicle utilization and control; minimum in-transit time.

(c) Facilities planning assistance by making possible detailed analysis of alternate proposals on size, location, and mechanization.

(d) Operations coordination of facilities, transportation, workload, and man-hours within the very rigid time limitations placed on us so that patron service can be maintained and efficiency achieved.

(e) Headquarters staff services improvement by providing comprehensive statistical analyses and timely reports on financial, personnel, and R. & E. programs.

## III. BASIC ELEMENTS OF THE PROGRAM

The following program elements must be developed, implemented, and coordinated in order to progress toward an integrated management information and control system.

*(a) Management information system*

1. Mechanized work measurement support system which captures data at the working level and makes it available on a timely basis to all levels of management. Data concerning the generation of workload and the availability and use of man-hours by operation (work center) is required within the framework of the present work measurement system.

2. Sectional center workload forecasting system which will enable postal management to predict more precisely the transportation and manpower requirements of major postal installations.

3. Air and surface scheme development system which will automatically take maximum advantage of all possible transportation routes and facilities in order to advance the mail at minimum cost.

4. Postal operations simulation model which will make available the time and money savings techniques of system simulation to postal management so that improved mail handling techniques and corrective action can be "implemented" without major risks of money and without interfering in day-to-day operations.

*(b) Management support system*

1. *Data processing capability*.—The Department must be assured of sufficient capacity, both in professional skills and equipment prowess, to handle on an integrated basis the known or anticipated workload both in the headquarters and in the field.

2. *Comprehensive data gathering ability.*—In order to minimize errors, improve responsiveness, and gain efficiency, a data gathering system must be developed, oriented toward mechanizing workload, payroll, and financial information as close to the source as possible. Such a system would make use of source data automation (SDA) equipment interconnected where necessary with data transmission equipment.

3. *Standard POD statistical investigation procedures.*—A general method using standardized statistical investigating techniques is required to make possible reliable statistical studies within the Postal Establishment in a routine manner.

#### IV. IMPLEMENTATION

(a) An orientation program is required to acquaint the several levels of management with automatic data-processing plans and concepts.

1. Top staff at the Department and regional offices.
2. Middle management.
3. Management control staff (postmaster, superintendent of mails, chief accountant) at major post offices.

(b) Organizational rejuvenation of the diverse segments participating in the ADP program is necessary in order to recruit and retain competent personnel, insure continuity of data-processing operations, and to improve accuracy and timeliness of present operations.

1. Transfer ADP systems development from the Bureau of Finance to the Office of Management Services.

2. Transfer headquarters data-processing operations from Accounting Division to a new Data Processing Division. When the nonfinancial application workload represents a significant proportion of capacity, transfer the installation management function to the Office of Management Services.

3. Strengthen the systems design and policy planning functions at headquarters and at regional data-processing centers.

4. Transfer the Chief, Data Processing, from the Accounting Division and create the position of data-processing officer.

(c) Improve data-processing capability: Coordinate the headquarters data-processing requirements with the existing equipment replacement program of regional data-processing centers; provide for intermediate (approximately 2 years) upgrading of equipment and for a significant increase in computational ability within 5 years.

(d) Begin a prototype postal operations management system which will test the operational feasibility of the mechanized work measurement support system and produce operational management byproducts.

(e) Initiate a systems simulation development contract which will provide for continuing in-house capability in this area and a description of the total postal system which must be formalized.

(f) Coordinate POD statistical procedures development: The development of such procedures should be the joint responsibility of the Statistics and Economics Division, Bureau of Finance; National Bureau of Standards, O.R. & E. and, when necessary, professional consultants.

(g) Establish a Joint Data Processing Orientation Council chaired by the Director of Data Processing with membership from each bureau. The functions of the Council to be to assist in the general orientation program and to search out and recommend significant organizational components which require specialized training and orientation.

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#### STATEMENT OF WARNER H. HORD, CHIEF, OFFICE OF CARRIER ACCOUNTS AND STATISTICS, CIVIL AERONAUTICS BOARD

The Board has just completed installation of an IBM 1401 four-tape drive electronic processing facility with an 8-K memory unit. The facility was installed in the latter part of May, and as of this date very little production experience is available. However, the facility is being used on a two-shift basis testing and debugging programs which will become operative beginning in August, and continuing thereafter as rapidly as the testing phases can be completed.

This statement will, therefore, be directed toward describing the manner in which the Board has approached the general problem of converting to an EDP facility and in describing in some detail the preparatory work which has been done, as well as the individual steps taken from the initial stages in the con-

sideration of the conversion problem to the completion of the installation of the facility itself.

#### NEED FOR IMPROVED ADP FACILITY

The first utilization by the Board of automatic data-processing procedures was accomplished through arrangements with the Bureau of Census in 1948 for the specific purpose of processing the passenger origin and destination surveys. There were two of these surveys, one for the international operations of the air transport industry, and the other for the domestic operations. Because of the large masses of data included in these surveys, it was not practicable to process them manually.

In 1950, the Board found it more feasible to establish its own punchcard facility than to continue to process the surveys on Census equipment. This change in procedure was possible without increased cost to the Board, and also provided additional capacity over and above that necessary to process the surveys for use in other areas of the Board's statistical program. However, the rapid growth of the air transport industry resulted in continuous expansion of both the domestic and the international passenger origin and destination surveys. The growth of the industry was likewise reflected in the expansion of the financial and traffic statistics collected from the industry through the form 41 report. Accordingly, the need grew on all sides for additional machine-processing capacity, but the growth of the surveys more and more monopolized the machines.

By 1956 plans were initiated for the conversion of the domestic passenger survey from a semiannual sample taken during the months of March and September to a continuous 10-percent sample. When finally the survey was revised on this basis, it became apparent that the publication frequency should be increased to a quarterly basis with an annual summary. This program was introduced on January 1, 1959.

With this conversion and expansion of the domestic surveys, the Board's own machine facility was wholly inadequate to meet the expanded processing load and other alternatives had to be found.

#### EXPERIMENTAL USE OF EDP

Various alternatives were explored by which to provide the additional processing capacity required, including the acquisition of an EDP facility. Preliminary studies made at this time, however, indicated that electronic equipment then available was too large and too expensive for practical use by the Board. After rather extensive survey of facilities available within the Government, an arrangement was finally worked out with the Bureau of Standards by which the domestic survey and competition study could be processed on its IBM 704 electronic computer on a sufficiently reliable time schedule to meet the requirements of the Board.

A contract was, therefore, entered into with the National Bureau of Standards for the development of a program and the processing of the domestic passenger survey in the fall of 1959. The contract provided for the production of the survey on a quarterly basis with an annual summary on a time schedule that would complete the production within 3 months following the period to which the data applied.

Unfortunately, however, the programming of this project turned out to be enormously difficult and substantially more costly than had previously been estimated. The initial impact, therefore, was to greatly increase rather than to decrease the timelag of the survey before the production program could actually be gotten underway. It was not until January 1961 that the first successful run could be made.

Once the program was proved and tested, however, the production backlog was eliminated at a tremendous rate of speed so that the entire program was current by midyear 1961. At about this time, the Bureau of Standards decided to retire its 704 computer and to replace it by an IBM 7090 computer. This necessitated a conversion of the 704 program to the 7090 program at an additional cost in the production of the remaining two quarters and annual summaries of the 1961 survey and competition study. This program, nevertheless, proceeded in accordance with expectations, and the conversion was completed in a relatively short time and production resumed. The period for production on the 7090 was considerably less than on the 704. Accordingly, the survey program was again current by early 1962.

In the course of working out the program for the production of the domestic survey, the Board's staff had discovered that a number of small research-type computers were available at a rental price compatible with the Board's budgetary provisions. It was also found that some of these computers could be adapted to the performance of arithmetic edits of carrier form 41 reports, and the production of various other computations such as unit cost and comparative profit analysis which had previously been done manually at a considerable expenditure of time. Accordingly, a small LGP-30 computer was acquired later in calendar year 1958. During the next 2½ years, the applications of this computer and other auxiliary equipment were extended progressively to such additional projects as (1) recurrent monthly traffic reports, (2) correlation of aircraft unit costs with hop lengths, (3) current analysis of changes in carrier's profit positions, (4) traffic route analysis in connection with the Board's "use it or lose it" program for local service carriers, and (5) the plotting of simulated flight paths of aircraft involved in accidents. The experience with this small computer turned out to be very valuable, not merely as a means of expediting the work of the Board, but also as a basis for gaining useful experience in the field of EDP procedures. Through this experience, it was possible to develop a nucleus within the staff of experienced programmers and systems analysts which was to be of extraordinary value at a later period when full conversion was made to an EDP facility.

#### PRELIMINARY STUDIES OF BOARD EDP NEEDS

The Board's in-house experience with the LGP-30 and the outside contract experience with the IBM 704 and 7090 computers clearly demonstrated both the adaptability to, and the advantages from, the use of EDP procedures by the Board in its accounting and statistical activities. Moreover, it quickly became apparent that the outside contract production of the origin and destination survey did not fully meet the Board's requirements. The survey publication consists of roughly 11,500 pages per year with hundreds of thousands of items of source data which must be manually resorted, transcribed, and summarized for each end product use. But with a properly developed program and an in-house EDP facility of its own the Board could readily produce directly from the machine the end product needs of the staff, thus avoiding completely the manual production from the survey publication. It was clear that only by such direct servicing of staff needs could the Board achieve significant savings from the use of EDP, and also materially expedite the performance of its regulatory activities. Accordingly, the decision was reached to make a thorough study of the practicability both from a cost and use application point of view of the Board's installing its own EDP facility.

The first step taken in this direction was to call in representatives from the various manufacturers to discuss our processing problems and invite the submission of proposals of equipment configurations with costs and supporting specifications designed to meet the needs of the Board. As a result, proposals were submitted by International Business Machines, Remington Rand, and Radio Corp. of America. All three proposals were within a price range only moderately higher than the amount being paid for the Board's own limited facilities, and the outside contract for processing the passenger survey. Positive assurance was given by all the manufacturers that facilities proposed could produce directly the end product needs for the major work areas of the Board. Moreover, the management firm of McKinsey & Co., Inc., had only recently performed a study of the Board's operations, and had recommended the extension of ADP to additional activities of the Board's work.

As a further step in exploring the problem, a staff committee was appointed with representatives from each of the Board's bureaus and offices with instructions to make an overall study of the Board's need for an EDP facility and to make recommendations as to further procedure. In preparation for the work of this committee, short seminars for orienting the committee members were first conducted by each of the three manufacturers, together with a rather complete review by the Board's own data processing staff of its experience on the small computer and under the outside contract in the use of EDP procedures.

The committee developed a rather complete inventory of all of the different types of work actually currently performed or expected to be needed in the foreseeable future that would reasonably be adaptable to EDP production. The data collected was then grouped and analyzed in terms of the expenditure of time required for manual performance of the tasks and the best estimates that

could be made of the time required for machine processing of the projects based upon the specifications set out in the equipment configuration submitted by the manufacturers. The major work areas in which it was believed substantial benefits would accrue from the use of EDP procedures were (1) route and adequacy of service cases, (2) subsidy and guaranteed loan cases, (3) rate and tariff cases, (4) "use it or lose it" local service cases, (5) subsidy billings verification, (6) merger cases, (7) support data for bilateral negotiations.

As a result of these findings, the committee made the firm recommendation that the overall benefits of an EDP facility to the Board would fully justify the installation of a facility within the cost range and of the performance capabilities set forth in the various proposals submitted by the equipment manufacturers. It further recommended that an outside contract be let for the performance of an equipment feasibility study and the recommendation of the exact facility configuration best adapted to meeting the full needs of the Board.

#### DECISION TO INSTALL EDP FACILITY

The recommendations of the staff committee were adopted by the Board in March 1961. The Board also gave full staff clearance to develop final recommendations for the early selection of an EDP facility and the development of a conversion program for carrying out these recommendations.

The next step was to request bids on an equipment feasibility study. The contract for such a study was let to CEIR on the basis of the lowest bidder. This study was completed and submitted on June 30, 1961, with a detailed analysis of comparative equipment performance and a recommendation as to the specific equipment best suited to the Board's need, and the configuration of the facility that should be selected. After detailed analysis of this study and further discussion with manufacturer representatives, the staff adopted the CEIR recommendation for the selection of an IBM 1401 system with four tape drives and an 8-K memory capacity.

The staff then developed a detailed cost estimate for the program, a schedule for the conversion, and recommendations to the Board that the program be adopted. This program called for the delivery and installation of the equipment on or about May 15, 1962, and for the system to become operational in respect to the leadwork areas by late July or early August. These recommendations were adopted by the Board in July 1961, and the conversion program immediately got underway with all possible staff that could be diverted for this purpose.

#### THE CONVERSION PROGRAM

The members of the staff committee which had developed the original plan for the EDP facility provided a valuable nucleus for the planning and general direction of the conversion program. In developing the conversion program, the work areas most readily adaptable to EDP procedures were selected for initial implementation. These included in order of time priority (1) the "use it or lose it" and subsidy billing activities, (2) the domestic passenger origin and destination survey, and related competition studies, (3) international passenger origin and destination survey, (4) carrier form 41 financial and traffic reports, and (5) carrier flight schedules. As projected in the initial conversion program, all of these areas were to be developed to an operational basis by the end of October 1962. Over the next several years, it is anticipated that EDP will be extended to various other areas.

It became readily apparent that the Board's own staff was not adequate to meet this program on the basis of the schedule adopted. Accordingly, bids were requested for the development of systems and programs to carry out the conversion of item (4), the carrier form 41 financial and traffic reports, which constituted one of the major problems in the conversion program in terms of magnitude of the task to be performed. This contract was awarded to the Service Bureau Corp. of IBM on the basis of the lowest bid with the provision that the work should start immediately.

The preparation of the site constituted the first date to be met in the conversion program. This involved the installation of new electrical wiring, false floors, soundproofing, supplementary air conditioning, and numerous minor modifications. This work was accomplished on schedule, and the equipment was installed and checked in by May 23, 1962.

The "use it or lose it" and subsidy billings programs were developed entirely by the Board's staff. These programs had been completed and the projects

were placed in actual production before the end of July. The passenger survey and carrier flight schedules were to be worked out jointly by Board staff and programmers provided by the manufacturer of the equipment. These programs are in advanced stages of completion, and are presently in process of being debugged, and certain stages of the production have already been started.

The programs for the carrier form 41 financial and traffic reports have been substantially completed, but the debugging and testing procedures have been delayed somewhat by lack of available data with which to test the program. In preparation for these programs, it has been necessary to punch back data from the carrier reports to the extent of some 500,000 cards. This project is also being done under an outside contract.

While some of these programs are lagging slightly behind the projected schedule that had been originally established, it is nevertheless believed that the entire group of programs will become operational by November 1962, or less than a month behind schedule. In fact, our conversion program has proceeded exceedingly well in that we have so far met no major problems or difficulties of an extraordinary nature.

#### ANTICIPATED COSTS AND BENEFITS

As indicated initially in this statement, the Board's EDP facility is just barely beginning to become operational at the present time. It is not possible to speak from experience as to the actual benefits although the costs themselves are quite well defined.

The total overall equipment rental for the new facility is \$7,350 per month, of which \$6,445 is for the 1401 EDP system. (See table 1 for detailed listing of costs.) The overall cost of the new facility, including both the technical and administrative staff, is \$232,300 as compared with \$185,932 prior to conversion, or an increase of \$46,368 for the new facility over the old facility. (See table 2 for detailed breakdown of costs.)

In the utilization of the new facility, every effort is being made to reduce rather than increase paperwork. In accomplishing this result, particular care is being taken to tie the machine work directly to the production of end products needed by operating staff rather than produce intermediate summary publications for manual use by the operating staff. With the very great productive speed of the new facility, it can produce more paperwork than all the staff of the Board could use as source material for manually producing specific end products needed.

To accomplish this end, all our programs have been developed with a view to making it possible to produce the full end product needs of the Board's operating staff in the areas to which the equipment is now being applied which would involve the expenditure of substantial staff time if produced manually. Generalized report generator programs have been developed in all areas of application in order to maximize their adaptability to the production of specific end products with a minimum of additional programming time required at the time requests are submitted. Through this procedure, it is hoped that the very time-consuming use of the origin and destination publications previously distributed to the staff will be substantially eliminated in carrying out the Board's regulatory program. If these objectives are met successfully, the overall staff productivity should be significantly increased and the Board's regulatory program should be accordingly expedited. (See table 3.)

Another benefit of an entirely different type, but potentially of very great value to both the Board and the industry, is the experimental program now underway looking toward the better integration of Board and industry EDP practices. An informal program has been initiated for supplementing the carrier reports with punchcards or electronic tape which will make it possible for the Board to put the form 41 reports immediately on the machines. The experiment will be directed toward utilizing the best knowledge in the industry in the development of the least burdensome procedures for the communication of data on punchcards or electronic tape. Carriers will be allowed to experiment with different methods, if feasible suggestions are made. Ultimately, the knowledge gained from this experience will be used in revising the form 41 reports, looking toward the elimination of various computations now included in the reports, as well as simplification of the forms. Duplication of data will be eliminated wherever possible, and information which may be directly derived from other statistics reported may be eliminated and produced from the machine instead. It is believed that ultimately the program will result in greatly

expediting the work of the Board by making it possible to tie in the processing procedures directly to punched cards and electronic tape submitted by the carriers, while at the same time substantially reducing the reporting burden to the carriers. In addition, there will be experimentation with the production by the carriers of the reports themselves by machine processes, and such methods adopted wherever feasible.

There is still another source of substantial mutual advantage to both the Board and the industry through the substitution of tape as a means of distributing the statistical information to the industry and other users for publications now used. This may have the advantage of making the information available both in much greater detail, and at a much earlier time than would otherwise be possible. In fact, the Board and the industry have common needs for statistical information in many areas. In these circumstances, the tapes used in producing information needed by the Board could also serve as a convenient medium for making highly useful information readily available to the industry.

In this connection, it might be pointed out that since the Board does not have authority to charge for its services, the fullest realization of the benefits from cooperation between the Board and the industry may not be possible of realization. As experience is gained with the cooperative program, it is believed that many opportunities for exchange of information between the Board and the industry not now apparent will be developed. It is anticipated that this cooperative program will ultimately disclose many areas in which statistics of greatly increased value can be provided by the industry at minimum cost and timelag, and which, in turn, can be made available to the industry in the form of tapes or other machine-oriented media on a time basis and at a cost which will greatly enhance the value of statistics to users in the industry.

It may well be that the ultimate benefits to be derived from EDP through speeding up the collection and distribution of statistics in a form which directly serves user needs may be even greater than the benefits derived from the speeded up process of producing statistical summaries and publications for general distribution to users. If this is true, the EDP should operate to reduce substantially the paperwork involved in the use of statistics rather than increasing it as has so commonly been the case.

TABLE 1.—*Configuration of board's processing equipment*

Model or feature number	Component	Number of units	Monthly rentals
<b>EDP equipment:</b>			
1401-E-4	Processing unit	1	\$2,130
1406-1	Additional memory	1	575
1402-1	Card reader-punch	1	550
1403-2	Printer, 132 positions	1	775
7330-1	Magnetic tape units	4	1,800
1060	Advanced programing	1	105
4575	High-low equal compare	1	75
5275	Multiply-divide	1	325
5540	Print, control, additional	1	60
6040	Read-punch release	1	25
7600	Sense switches	1	15
3550	Card-read device	1	10
Total EDP equipment			6,445
<b>EAM equipment:</b>			
024	Key-punch machine	4	160
056	Verifier	3	150
077	Collator	1	135
083	Sorter	1	110
082	do	1	55
514	Reproducer	1	175
031	Duplicating punch	1	30
552	Interpreter	1	90
Total EAM equipment			905
Total equipment			7,350

TABLE 2.—Comparative annual recurrent costs of old punchcard and new EDP facilities

Type of cost	Punchcard facility	EDP facility	Net increase or decrease (—)
Machine operators.....	\$16, 105	\$17, 240	\$1, 135
Machine programmers.....	16, 375	53, 535	37, 160
Card punch staff.....	18, 155	29, 435	11, 280
Direct administrative staff.....	15, 305	21, 090	5, 785
Machine rentals.....	46, 092	88, 200	42, 108
NBS service contract.....	58, 500	-----	—58, 500
Supplies.....	3, 800	12, 000	8, 200
Space rental.....	11, 600	10, 800	—800
Total.....	185, 932	232, 300	46, 368

TABLE 3.—Workload areas served and nature of benefits from early EDP applications

Workload area	EDP benefits
(a) Route and adequacy of service cases.....	Reduces both calendar time and processing costs.
(b) Subsidy and guaranteed loan cases.....	Produces facts and analyses of substantially broader scope at reduced calendar time on substantive issues.
(c) Rate and tariff cases.....	Full cost, investment, and return data readily available.
(d) "Use it or lose it" program.....	Provides detailed route segment traffic and flight load analyses on current basis—not possible manually.
(e) Subsidy billings verification.....	Produces substantial savings through verification largely as a byproduct of "use it or lose it" program.
(f) Merger proposals.....	Permits wider scope analysis of advantages and disadvantages in substantially less time.
(g) Bilateral negotiations.....	Makes available complete support data in all cases instead of present limited data in special cases.

STATEMENT OF THE FEDERAL AVIATION AGENCY

AGENCY ADP POLICIES AND PROCEDURES

The Federal Aviation Agency has established policies and guidelines to insure proper review and coordination of ADP activities and applications within the Agency and to provide for implementation of Bureau of the Budget directives as they pertain to automatic data processing. The basic Agency policy on ADP states:

"It is the policy of the Federal Aviation Agency to explore the potential applications of automatic data processing concepts, techniques, systems, and equipment throughout the Agency, and to capitalize on advantages of such applications wherever they are economically, operationally, and technically feasible. This policy shall be pursued within the framework of a coordinated program, developed and administered so as to insure maximum total advantage to the Agency, the Government and the public. The Agency will be sensitive to the human implications of ADP in the administration of this policy."

The Deputy Administrator for Administration is responsible for insuring that ADP is effectively applied and utilized and for the administration of related Agency policies. The Deputy Administrator for Development is responsible for the determination of feasibility and applicability of ADP techniques and equipment to the common military-civilian system of air navigation and air traffic facilities and for research and development activities necessary for this determination.

Under the general direction of the Deputy Administrator for Administration, the Office of Management Services is responsible for coordinating the development and administration of the ADP program. Basically, the functions of this office are to:

1. Develop and recommend Agencywide ADP plans and policies.
2. Develop and issue Agencywide standards and procedures for analysis, planning, development, procurement, installation, and management of ADP systems.
3. Provide technical advice and assistance to organizational elements within the Agency.

4. Coordinate and plan development of ADP systems throughout the Agency.

5. Review and approve or recommend action on proposed applications of ADP, including the economic, managerial, and technical feasibility of proposed systems, selection of equipment, and proposed contracts for ADP equipment or services.

6. Conduct studies or analyses related to automatic data processing.

7. Monitor the installation and utilization of ADP equipment and systems. The Office of Personnel and Training is the principal staff office concerned with the impact of ADP on Agency personnel. This office is concerned with—

1. Providing leadership to Agency efforts to anticipate and plan action programs to meet training problems which may be associated with installation of ADP systems.

2. Prepare guidelines and instructions for communicating with employees and dealing with employee groups on the personnel impact of ADP.

3. Provide for or arrange training (other than on-the-job training) required in conjunction with ADP activities, including the retraining of employees affected by ADP.

4. Approve the adequacy of consideration of personnel and training implications in ADP studies and proposals.

Within this overall framework, the Federal Aviation Agency is currently utilizing ADP techniques and equipment to support program activities. The following examples describe the major ADP applications now in operation as well as current planning for additional applications.

#### CURRENT MAJOR APPLICATIONS

##### *Semiautomatic flight inspection program*

A longstanding problem of flight inspection was the inability to check multiple navigational facilities simultaneously. The technique of inspecting one radial of one facility at any given time caused the flight inspection program to fall behind during a period when navigational facilities were rapidly expanding. In 1954, the Civil Aeronautics Administration began to explore the use of a grid flight pattern for inspecting facilities simultaneously. In 1956, the CAA obtained a Convair 440 which was equipped to permit inspecting of four stations simultaneously. Two distance measuring equipment receivers were installed along with digital counters and printers to permit the recording of two simultaneously measured distances. The actual bearing of the aircraft from the navigation stations being checked was computed from these dual distance recordings using a small-scale computer. Subsequently, bearing errors were obtained and plotted by essentially the same manual procedures previously used. Through these techniques, the inspection of multiple stations was operationally explored and demonstrated to be practical.

In 1957, a contract was awarded to study the intermediate altitude flight inspection system (10,000–24,000 feet). The purpose of this contract was to develop more refined and automatic procedures for simultaneous inspection of intermediate altitude navigational facilities. The resulting report recommended a method to semiautomatically inspect these facilities using a grid concept. Instead of flying the radials of a station, the flight inspection aircraft would fly a grid pattern and record data from the sides of the station. Using this method, all stations in the United States could theoretically be inspected each 40 to 60 days. This represented a vast improvement over the existing process. An integral part of this proposal was a land-based computer which would be used to prepare flight tapes to control the flight of the aircraft and the operation of the airborne recording equipment. It would also be used to reduce and analyze the data received and recorded in the aircraft. Basically, the recommendations provided for a "closed loop" system of operation with direct input from the computer to the aircraft and from the aircraft to the computer. Based on these recommendations, a contract was awarded in 1958 to develop the necessary equipment and computer programs to implement the system. As a part of the implementation, four additional aircraft were placed on order in 1958.

By early 1960, enough work had been done so that experimentation could begin using the land-based computer and the airborne recording system. While technical complexities made many time-consuming adjustments to both the computer and the airborne system necessary, by the end of 1961 the system was in production operation.

*Air traffic control operation*

In 1955, the Civil Aeronautics Administration began to explore possible applications of digital computers to air traffic control problems. The purpose of this initial effort was to learn how computers could be used to lighten the burden on air traffic controllers. Based on results of investigations, a program was developed to evaluate the use of a computer system in the Indianapolis Air Route Traffic Control Center environment. In 1956, the computer and necessary associated equipment were installed at Indianapolis. The results of this test and the evaluation program affirmed the use of data processing equipment in control center operations.

In conjunction with this program, a computer was also installed at the Technical Development Center to provide an experimental and research facility for obtaining more detailed technical and operational data for computer data systems and to investigate new programs as they arose. This experimental facility was also in operation at Indianapolis until 1959 when the activities were transferred to the newly formed National Aviation Facilities Experimental Center (NAFEC) at Atlantic City, N.J.

During 1958, computer systems were installed in the New York and Washington Air Route Traffic Control Centers. In 1959, systems were also installed in the Boston, Pittsburgh, and Cleveland ARTCC's. Several improvements have been made since the installation of these six systems. They are presently operating on line (i.e., transferring data between adjacent computer equipped centers) and provisions have been made for supervisory data and flow control information. In addition, electric typewriters have been replaced by high-speed printers as a flight progress strip printing device, and computer programs have been modified, condensed, and in general greatly improved. The preparation of computer programs is a continuing task producing many challenges. Ideas and program logic diagrams are exchanged between computer centers for incorporation into the ADP system. Certain areas are and will continue to be standardized to alleviate this situation. However, it is not conceivable that one standard program could perform efficiently at all facilities.

In addition to the following functions which are performed by all air route traffic control computers, each system is programed to perform many special subroutines necessitated by geographic peculiarities and special operational procedures employed.

*Operational routines*

1. Acceptance of flight data both on line from adjacent computer equipped centers and internal insertions such as flight plans, air files, and data received from adjacent noncomputer equipped centers.
2. Determination as to type of message; i.e., whether it is an en route (active) flight, proposal, departure, continuation, cancellation, modification, etc.
3. Determine the manner in which the aircraft is proceeding, such as via airways, direct point-to-point, rho-theta, distance and direction, specific points defined by latitude and longitude, great circle, etc.
4. Determine the navigational fixes or junctions each particular flight passes over and whether a flight progress strip is required for different fixes, depending on the fix itself and the altitude structure the aircraft is operating in, such as intermediate or low altitude structure.
5. Determine the mileage between all fixed points.
6. Determine wind direction and velocity from previously stored data appropriate to the altitudes and routing of each aircraft.
7. Calculate the aircraft's arrival over the required fix, based on the aircraft's true air speed, direction, and winds aloft.
8. Print all required data on flight progress strips.
9. Eliminate from succeeding progress strips all routes of flights already transversed and no longer required.
10. Forward necessary flight plan information to adjacent computer equipped centers if aircraft will enter their area of jurisdiction.

Included in the limited amount of statistical data obtained are the number of flight plans processed by each of the systems, the total number of flight progress strips produced, and the number of flight data messages transmitted between adjacent computer equipped facilities. Monthly workload for each facility averaged 38,000 messages processed; 173,000 flight strips printed; and 10,000 intercenter messages transmitted during the period July 1961 through April 1, 1962. Between 80 and 90 percent of the flight strips printed in a 24-hour

period are computer generated. Since April, there has been a steady upward trend in the average monthly computer workload.

While it is anticipated that eventually all ARTCC's will be equipped with automatic data processing, no extension of these systems to other facilities is planned at this time pending final analysis and recommendations which will be made as a result of the Beacon report. However, equipments which are presently installed are being improved. For example, a solid state computer system, capable of handling a much greater volume of air traffic control problems and functions is scheduled for installation in the new Air Route Traffic Control Center in New York (Islip) which is scheduled for commissioning in June 1963. This will replace the present center and equipment located at Idlewild. Additional functions this equipment will carry out include the capability for control personnel to update stored or display data from the control sectors and in turn receive updated information on aircraft under jurisdiction of the air traffic controller; recover data within the system should a malfunction occur; and print flight strip progress strips directly at or adjacent to the appropriate sector position. Other equipments are being modified to provide core memory units in place of high-speed drums which will allow more rapid processing of flight data, thus enabling a greater volume of data to be handled with existing systems.

#### *Research and development*

The Technical Development Center at Indianapolis, Ind., was the initial facility for research and development efforts associated with automatic data processing. Tests were conducted to determine the applicability of a magnetic drum storage unit used in conjunction with existing teletype circuits to transfer flight information from one controlling facility to another. The results of these tests were published in 1954. During 1955 and 1956, further testing and simulation work was undertaken to explore the use of automatic data processing in air traffic control operations.

In 1956, the Technical Development Center, in conjunction with air traffic control, installed and evaluated the first air traffic control computer for operational use in the Indianapolis Air Route Traffic Control Center. This operational installation led the Technical Development Center to install a computer system which could be utilized to carry out tests and experiments to investigate extension of automatic data processing to more of the air traffic control operations.

In 1959, the Technical Development Center was moved to Atlantic City, N.J., where the National Aviation Facility Experimental Center (NAFEC) was established. With the previous knowledge gained and the guidance provided by the Curtis report, "Modernizing the National System of Aviation Facilities," the approach to utilizing automatic data processing in air traffic control operations was considerably expanded to provide for en route and terminal control functions.

In 1961, the "Report of the Task Force on Air Traffic Control" (Project Beacon) reemphasized the role of automatic data processing in air traffic control. This report states:

"General purpose computers should be employed in both the en route and terminal area portions of the system to process flight plans, issue clearances, make conflict probes, generate display information, establish landing sequences, and perform other routine tasks of assistance to the control function."

The Beacon report not only emphasized automatic data processing, but outlined an air traffic control system based on capabilities achievable with automatic data processing. In order to evolve an evolutionary implementation of the major Project Beacon recommendations, a program has been established to provide an engineering model of the prototype system. A terminal test bed is being established at NAFEC where automatic data processing equipment will undergo experimentation and evaluation. An en route test bed is being established at the Boston-Lexington test facility with contractual assistance. These test beds will be completed approximately November 1, 1962, and actual experimentation and evaluation will then begin. Features such as automatic tracking, radar-aided tracking, flight-plan tracking, beacon tracking, desired alpha-numeric features, velocity and direction vectors, metering (spatial positioning) of aircraft, sequencing of aircraft, and scheduling of aircraft are a few of the computer functions that will be tested.

As desired functions and equipments are tested and evaluated, they will be incorporated as part of the engineering prototype model of the national air-

space utilization system (NAUS) which will be operating at NAFEC by approximately January 1, 1964, and proposed for field installation by January 1, 1966.

In addition to computer capability required to support research and development activities for air traffic control, the expanded research program undertaken at NAFEC involved increased requirements for mathematical analysis and reduction and analysis of data to support other project activity. To accomplish this, automatic data processing equipment was installed as part of the establishment of NAFEC. During May 1962, computations were processed for 47 projects.

Current plans are to incorporate existing computer capability into the terminal test bed being established at NAFEC to support the development of the national airspace utilization system.

#### SUPPLY OPERATIONS

In 1957, a study was undertaken to establish a more efficient and economical supply management program. At that time, each regional office operated warehouse facilities and generally carried out the supply activities required to support regional operations. The results of this study indicated a centralized supply and inventory control operation offered the greatest opportunity for increased economy and efficiency. In 1958, the aviation facilities supply depot was established at the Aeronautical Center, Oklahoma City, Okla., to provide agencywide supply services.

To support the centralized supply management program, conventional punchcard equipment was installed for inventory and stock-control purposes. With the establishment of the Federal Aviation Agency and the rapidly expanded program, existing equipment did not provide the speeds and processing flexibility necessary to meet agency supply requirements for service to field facilities and stock management and fiscal control.

Based on an analysis of the alternatives of expanding conventional punchcard equipment or installation of computing equipment, it was determined that computing equipment with capability for "random access" storage provided the best approach to meet expanding supply program requirements. In February 1960, computing equipment was installed at the supply depot. This system is currently being utilized on a three-shift basis.

Basically, the automatic data processing equipment is used in conjunction with an inventory control and distribution system for general stocks and stores and aircraft stocks and stores. There are approximately 50,000 line items in general stocks, and 28,000 line items in aircraft stocks. Records for these items are maintained on disk files. As requisitions are received or allowance items processed, the master records are updated and notices are forwarded to the warehouse for shipment of the required stock. As minimum levels of stock are reached, notices are produced or purchase orders prepared in order to replenish stock levels. When items on order are received, the appropriate master records are updated. During this processing, information is accumulated for accounting and fiscal control purposes. While this describes the basic processing involved, the system provides for a number of refinements to take care of exception situations and to assist in reducing manual processing. Economic order quantity techniques have been incorporated and preparations are now underway to convert stock numbers to the Federal Stock number system.

While recent studies of the agency's materiel programs have recommended organizational changes, they reaffirmed the decision to establish and operate a centralized type of supply support system. In this connection, analysis of supply data processing operations and requirements have been initiated with the objective of further improving the adaptation of automatic data processing techniques to supply and materiel management operations.

#### CURRENT PLANS FOR AUTOMATIC DATA PROCESSING APPLICATIONS

##### *Regional mechanization program*

While the agency has, for a number of years, utilized automatic data processing for certain administrative and statistical activities, no concerted effort was made to review data-processing requirements at both Washington and regional levels until 1961. For the past several years, regional offices have had contractual arrangements with data-processing service bureaus, primarily to process accounting work. For more than 15 years, the FAA and predecessor agencies have had a centralized automatic data processing facility in Washington with conventional tabulating equipment.

During January 1961, a preliminary review was made to identify existing data processing applications and to assess the potential uses of automatic data process-

ing techniques in regional offices. Based on this information, a comprehensive analysis was initiated in June 1961. This analysis identified the major administrative functions which warranted conversion to automatic data processing based on volume of work, economics, and requirements for management and operating data. In March 1962, a program to establish basic punchcard installations in six of the seven regional offices was approved. The objectives of this program are to:

1. Provide each region with the facilities to meet immediate data processing needs.
2. Improve the efficiency of operations and reduce operating costs.
3. Establish compatible or standard data processing systems for common agencywide functions.
4. Establish a basis for developing longer-range plans for meeting data processing and information requirements of the region and the agency as a whole.

Initial automatic data processing applications to be carried out by the regions will be to convert work done on contract to FAA facilities, payroll processing, and personnel statistical reports.

Future applications will include cost accounting, data processing to support the facilities and aircraft maintenance programs, as well as other administrative activities.

At the present time two regions have automatic data processing installations in operation. Installations in other regions will be completed in July and August 1962. One region has completed conversion to a standard mechanized payroll system that has been developed and a second region is currently in the process of converting to this system.

#### *Medical records system*

To assist in discharging the Agency's medical responsibilities, the Aviation Medical Service:

1. Establishes medical certification standards for different classes of airmen to meet safety requirements.
2. Provides for examining airmen initially and periodically to determine whether they can be certified as meeting applicable medical standards, and
3. Constantly improves the medical standards and their mode of enforcement.

For these and ancillary purposes, essential medical information on the civil airman population must be maintained in readily available form. Such records are indispensable for: resolving issues surrounding questionable or pathological cases; conducting biometrical studies to establish or modify medical standards; evaluating performance of aviation medical examiners; conducting medical phases of accident investigations; and, such other essential uses as providing managerial statistics and obtaining information for replying to the daily average of 200 requests for general or specific information.

The certification activity involves the daily processing of approximately 1,100 applications and related physical examination reports. At present, these are reviewed and filed manually with a limited amount of data being converted to punchcards for statistical and record location purposes.

The present manual process is time consuming and inflexible. The records are not and could not easily be organized so as to adequately study individual cases and groups of cases and to perform other activities essential to improving the certification and standards program.

A detailed analysis of medical requirements for processing and information determined that conversion to ADP was feasible and justifiable. It was also determined that the most economical approach was to utilize existing computer facilities at Oklahoma City for the necessary machine processing.

In order to prepare the existing records for input to ADP and establishment of master records, a service contract was made with the Census Bureau to code, verify, and key punch approximately 600,000 existing medical records.

In addition, the existing name file of approximately 700,000 punchcards were converted to magnetic tapes.

Each medical application received will be reviewed for accuracy and completeness and coded. Punchcards will be prepared (four per medical application) and introduced into the system daily, together with file maintenance and general inquiry requests. The total number of input cards will amount to approximately 5,000 daily.

The medical information on approximately 350,000 airmen will be in sequence by social security number on magnetic tapes. These will be updated daily and record print-out furnished when necessary or as requested.

In addition, the system will also provide the following:

1. Identify airmen whose certificates have expired or will expire within a given period of time and produce a notice of due date for the next medical examination.
2. Obtain data to reply rapidly to inquiries for information.
3. Quickly produce medical histories on airmen involved in accidents or incidents.
4. Determine the optimum number and distribution of aviation medical examiners.
5. Evaluate the quality of performance of aviation medical examiners.

The basic data available from this system will also be used for the following types of research work:

1. To determine the safety implications of various and numerous conditions involving (a) the cardiovascular system, (b) visual and auditory acuity, (c) age and flying experience, and (d) other normal and pathological conditions that have prevailed in the airman population over a number of years.
2. To check each new physical examination report or groups of reports against previous reports on the same individual or group to determine whether earlier conditions or trends might require limiting, denying, or granting a certificate or altering standards.
3. To correlate and analyze medical records of airmen involved in accidents to provide data related to causes and preventative actions.

#### *Airman certification system*

The Federal Aviation Agency and its predecessors have been responsible for issuance of airman certificates to United States and foreign citizens since 1927. These certificates authorize individuals to act in various capacities related to civil aviation such as pilot, navigator, flight engineer and instructor, mechanic, parachute rigger, control tower operator, and so forth.

At the present time, no adequate method exists to retire airman records from the files. Since 1927, approximately 1,800,000 certificates have been issued which remain in the present system. Further, each certificate contains a different number and, since airmen may hold multiple certificates, the only means to associate multiple certificates by airman is by individual name. This has not been adequate.

As a result of these factors, the present record system has become progressively outdated and inadequate and current data on airmen have not been available for regulatory, safety, management, or statistical purposes. In a coordinated effort, the affected services and offices of the Agency have been working since early 1961 to develop and install an integrated certification system to meet the Agency's needs for regulatory, medical, research, workload, and statistical data. One of the objectives is to be able to automatically associate selected medical information contained in the medical record system previously discussed with the information in the airman certification system. The requirements of the system have been analyzed, consolidated, and defined and action is in progress to effect the necessary rule changes for implementation. Based on data and information requirements, volume, and complexities involved in the processing, ADP techniques provide the most feasible and economical method of achieving the desired objectives.

The system will contain records of all certified airmen and other FAA certificated personnel associated with civil aviation activities. Records will include information on medical status, knowledge, skill, violations, accidents, activity, and experience.

The basic system incorporates the following:

1. All certificates presently held by an individual airman including the medical certificate, if applicable, will be converted and consolidated into one certificate.
2. A master record for each individual will be established on magnetic tape. An estimated total of 500,000 airman records will result from the conversion process. This conversion process will be accomplished over a 2-year period.
3. Certificate holders will be identified through use of the social security number.
4. Changes will be processed to the master file daily. Changes include: Changes of address, added or deleted privileges, periodic renewal by the certificate holder upon fulfillment of the renewal requirements, violations, accidents, etc.

The renewal cycle will be 6 months, 1 year, or 2 years, depending on the type of airman privilege. Inquiries for individual certificate holder data will also be processed on a daily cycle.

5. Inactive records after a period of time to be determined will be retired from the ADP system.

6. Periodic statistical runs will be made to meet the Agency and industry requirements.

The implementation date for the airman certification system depends upon a number of interrelated factors. On the basis of present plans, the system will not be operational before July 1963.

Both the medical records and airman certification systems will be processed by the FAA computer installation located at Oklahoma City, Okla.

#### IMPACT OF ADP ON AGENCY EMPLOYEES

Major areas where ADP systems have been and will be utilized by the Federal Aviation Agency, such as air traffic control and associated research and development, flight inspection and medical research, are not characterized by massive routine clerical operations. Consequently, these applications have not displaced any employees and are not expected to do so. The primary objectives in applying ADP have been to meet increasing workloads more efficiently and expeditiously, improve safety or to carry out programs that would be impractical to attempt by other methods. The increased speed and complexity of aircraft, the growth of the aviation population, and the increasing number and complexity of facilities necessary for air traffic control have made it essential to experiment and develop new techniques and methods to carry out Agency responsibilities now and in the future. To accomplish this has required an increase in the employment of individuals with specialized training, knowledge, and experience.

The application of ADP to administrative and record maintenance functions of the Agency will result in some employee displacement. For example, conversion of payroll operations is expected to reduce staffing requirements by three to five positions in each of the regional offices. However, these displacements are not concentrated geographically and will be spread out over a sufficient period of time to allow normal attrition or employee training and transfer to take care of staffing adjustments.

A second aspect of the impact of ADP has been the requirement for specialized training for Agency employees. This training is generally of two types. For example, employees experienced in air traffic control operations and functions have been assigned to program and operate the ADP equipment used in air traffic control centers. The Agency utilizes equipment manufacturer's training courses and on-the-job training to provide the necessary ADP experience and knowledge required for the ADP work.

In other cases, individuals with ADP experience are employed by the Agency who require specific training in Agency operations and functions. This is provided both by formal classroom training such as courses in basic air traffic control conducted at the FAA Academy at Oklahoma City and by concentrated on-the-job training where necessary.

FEDERAL AVIATION AGENCY,  
Washington, D.C., October 3, 1962.

HON. DAVID N. HENDERSON,  
*Chairman, Subcommittee on Census and Government Statistics,  
House of Representatives, Washington, D.C.*

DEAR MR. HENDERSON: As you requested in your letter of September 19, 1962, we are furnishing supplemental information concerning feasibility studies prior to installation of equipment and consideration given to lease versus purchase.

With reference to feasibility studies conducted by this Agency, we have followed the guidelines established by Bureau of the Budget Bulletin 60-6 dated March 18, 1960, and Circular A-54 dated October 14, 1961, which deal with the studies preceding the acquisition of ADP equipment and policy on selection and acquisition of ADP equipment, respectively. Although most of our computing equipment was procured prior to 1960, studies were conducted to determine if ADP equipment could be effectively applied to our operations and the specific equipments available evaluated to determine the selection.

The computer used in the semiautomatic flight inspection program was recommended as a part of the contract referred to in our previous report. This con-

tract was awarded in 1957 to study the intermediate flight inspection system and the resulting recommendations provided for the type of airborne equipment and ground-based computers necessary to implement the operation. Because of the experimental character of this program initially, the computer equipment was acquired on a lease basis.

In 1959, the decision to install ADP equipment as a part of our supply support activity was based on a study of different systems in order to determine the most economical equipment available to meet our requirements. The equipment was selected on the basis of an analysis of costs and operating capabilities.

The study conducted in 1960 for the medical records system was completed in accordance with the Bureau of the Budget guidelines. The detailed analysis of the medical requirements for processing and information purposes supported the decision to convert medical records to ADP for the medical certification and medical research activities of the Agency. After consideration of approximately 50 computer manufacturers and service facilities, including the computing capabilities existing within the Agency, it was determined that the most economical approach was to utilize computer facilities operated by the Federal Aviation Agency at Oklahoma City, Okla.

Installation of computers in the air traffic control centers was based on a comparative operation of two computers from different manufacturers. The operation of these computer systems and the subsequent evaluation program resulted in the installation of additional computers in other air route traffic control centers as discussed in our previous report.

With reference to lease versus purchase of equipment, Bureau of the Budget Circular A-54 directed all executive departments and establishments to review their leased ADP equipment to determine whether purchase would be more beneficial to the Government than current leasing. This review was completed by this Agency as of June 30, 1962. The expanding nature of our current ADP applications, and the fact that all major areas are in the process of being re-evaluated with respect to equipment needs, makes it apparent that lease versus purchase should be taken into consideration when replacement equipment or new applications for ADP are approved. We recently reevaluated our equipment needs in Oklahoma City. As a result of this, the Agency plans to replace one of the computer systems currently installed in the flight standards installation. Purchase of the new equipment had been recommended as well as purchase of the supporting computer which is now installed. Budgetary review is now underway to implement these recommendations. Concurrently the Agency is re-evaluating the ADP support requirements in connection with our supply system. Lease versus purchase will be one of the factors considered as a result of this study.

With regard to purchase of equipment associated with research and air traffic control operations, the rapidly changing state of the art and the substantial research effort underway to implement the recommendations contained in the beacon report support continued leasing of the equipment rather than purchase. At such time as the equipment characteristics and requirements to support the national airspace utilization system are determined and prototype and operating installations are made, the determination with regard to lease or purchase of these systems will be made.

I hope the above information provides you with data necessary for your scheduled hearings on electronic data processing.

Sincerely,

ALAN L. DEAN,  
*Deputy Administrator for Administration.*

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HOUSING AND HOME FINANCE AGENCY,  
OFFICE OF THE ADMINISTRATOR,  
*Washington, D.C., August 13, 1962.*

HON. DAVID N. HENDERSON,  
*Chairman, Subcommittee on Census and Government Statistics of the Committee on Post Office and Civil Service, House of Representatives, Washington, D.C.*

DEAR MR. HENDERSON: The following statement on automatic data processing in the Housing and Home Finance Agency is furnished the subcommittee in response to its request of May 28, 1962.

I shall first relate our total data-processing costs to the HHFA gross administrative budget. Then, because I believe a good picture of the gradual develop-

ment of the data-processing activity in HHFA describes its current status better than fragmentary cross sections, I shall dwell somewhat on history. It is significant that the events which arise by chronology point directly to the aspects of automatic data processing which you emphasized in your request.

#### 1. DISTRIBUTION OF AUTOMATIC DATA PROCESSING COSTS IN HHFA

Estimated 1962 fiscal year expense for all automatic data processing (rental, contract, and directly linked personal services) for all constituents and programs of HHFA is \$1.65 million. This is 1.4 percent of the total cost of all HHFA operating expenses in fiscal year 1962. Of this total, 72 percent is in the Federal Housing Administration, where direct program operations have been mechanized for many years. Two other constituents—the Public Housing Administration and the Federal National Mortgage Association—expend 25.5 percent of the total for combined automatic data processing operations and statistical byproducts. The remainder, less than 3 percent, applies to other HHFA constituents which either now or soon will require data processing to varying degrees. (See attachments 1 and 2.)

#### 2. HISTORY OF AUTOMATIC DATA PROCESSING IN HHFA CONSTITUENTS

The HHFA constituents started their automatic data processing programs—before there was a name for them—as soon as they had significant volumes of work convertible to early-type tabulating machines. In the Federal Housing Administration since 1934 and until recently, the work has been almost exclusively a direct output production operation.

In the Public Housing Administration, conversely, the activity quite early developed around the need for massive data detail derived from statistics of property management, rental income, and tenant qualifications. Like FHA's, it is strictly centralized.

The Federal National Mortgage Association's field installations of card-type accounting equipment, although available for housekeeping, are primarily concerned with the flow of portfolio summary data into a national report. This report supports management's major decisionmaking processes.

##### *a. Federal Housing Administration—28 years of automatic data processing*

(1) *First electronic conversion.*—FHA was forced by increasing workloads during the early 1950's to abandon conventional card-actuated electric accounting machines which it had used for nearly 20 years. Card-type electronic calculators, to which the agency converted after a thorough study, met for a time the rising volume of posting and billing in the home mortgage insurance premium account file. The switch from old to new came in time to avoid major personnel acquisitions, otherwise inevitable, and by the same coincidence of events, averted significant retraining and redeployment problems.

(2) *Second conversion: IBM 650.*—However, by 1954, FHA's case-volume increase was still at a rate which predicted the time when calculators in turn would fail to meet requirements, no matter how well scheduled their use. Thus warned, FHA, in April of 1954, launched a full-scale feasibility study on an application of the office-type computer to the major working account areas. The application proved feasible, along with several collateral uses, so a decision to convert was made in November 1956.

System design and programing were completed, and an IBM Type 650 computer installed by the spring of 1958. Again, the change was so tied to program growth that no significant impact developed on personnel. Necessary minor reassignments served, in fact, to relieve, in a small way, some of the recruiting problems of that period.

(3) *Third conversion: IBM 7070.*—But the rate of volume increase did not taper. Rather, true to budget-based predictions of the period, case volume increased in FHA at an average annual rate of 9 percent during the 4 years ending July 1, 1960.

Based on those predictions, FHA had launched a third feasibility study in October of 1959. The purpose this time was to review the total FHA data-processing problem and present recommendations for a completely automated processing and information system. This was done. The task force reported in June 1960, and FHA began operations on its high-speed tape-oriented computer system (IBM Type 7070 with Type 1401 auxiliary output) in January 1962.

The major 7070 conversions are now complete. Byproducts, and certain related processes, are scheduled for full operation at yearend. A random-access

disk file unit, scheduled for installation in November, will complete the present system.

(4) *The immediate future.*—Recent studies in the matter of lease versus purchase for FHA's computer needs revealed a situation now recognized as common in both government and industry. The 5- or 6-year point of yield on a purchase transaction covering present equipment was significantly beyond the point of probable conversion to new equipment required to meet predicted growth.

Equally common to a majority of large computer installations was the need in FHA to consider within the coming year not whether, but how soon, to develop data preliminary to expansion of computer capability once more.

The point in time which dictates expansion of any system is that point at which, operationally, regular rental time and overtime exceed base rent for a system of greater speed, flexibility, or both. For FHA's existing system, that point appears now to be midway in fiscal year 1963. Thus, whereas rental was the obvious answer for the present configuration with its known limitation of potential for greater output, purchase or lease with option to purchase becomes a definite possibility for a successor system with at least double that potential. The related factors of speed and relative obsolescence are, of course, weighable in this context against predicted increases in workload and decreases in rent as still faster equipment enters the marketplace. (See exhibit I for FHA configuration, manpower, and product detail.) (Retained in subcommittee files.)

#### *b. Public Housing Administration*

PHA's use of data-processing techniques fits the management information pattern, but by reason of the nature of that agency's programs would not foreseeably find major application in operations. PHA predecessor agencies were applying mechanized data-handling procedures to the statistical needs of their programs during the early 1940's. FPHA (immediate forerunner) established its own punched card statistical data system in 1944. The statistical methods were continued under PHA, and have since been extended to accounting, property control, and budget. The agency is currently converting from a manual to a punched card central payroll covering some 1,400 employees.

PHA, like FHA, finds itself through these conversions almost precisely in phase with the problem of growth. There has been virtually no instance of direct manpower displacement through the introduction of automated procedure. Processes demanding additional manpower, which was unavailable, were converted to machines at the critical point in time and were then continued under either EAM or EDP technique, as appropriate.

One of PHA's basic statutory missions is the periodic review of low-rent housing compliance with tenant income qualifications. Reports customarily were by schedule, and action took the form of a combined editing and auditing function. The product of the review was a communication to the local authority calling attention to discrepancies as indicated.

Acting cooperatively with available programing staffs at the National Bureau of Standards, and using second-shift machine time in a nearby Department of Defense computer installation for program testing, PHA has recently developed a computerized version of the audit-edit routine which now produces these letters to local authorities. They are direct computer output, with all text of the letter itself derived as a function of input validation against stored memory. We believe this to be one of the more sophisticated office-type computer applications in this area. (See exhibit II.) (Retained in subcommittee files.) The activity is carried on as a reimbursable service at the Bureau of Standards. Programing for this, and the continuing service-bureau type of relationship with the Bureau of Standards, have been quite satisfactory.

Again, in this as in its other applications, PHA faced no major disruption of either its personnel or its organization. There were no reductions in force necessary in consequence of automating the audit-edit processes, but the several man-years released by the increased efficiency of the new system have been of major benefit to closely associated activities which had significant backlogs of substantive work.

#### *c. The Federal National Mortgage Association*

FNMA has five field-based electrical tabulating machine installations which are used primarily as a management data resource for the production of current program statistics. The system is also set up to run agency payrolls, personnel analyses, and related administrative tabulations. Studies are

planned currently either to extend the usefulness of these installations, or to contract their operating basis, in recognition of the relative ease with which they now produce more than 50 basic reports for which the system was initially scheduled at optimum capacity.

The FNMA system is relatively modern, although not classed as a computer-type, data-processing activity. It was placed in operation in its present format about 6 years ago to meet the increased urgency, from a time-and-volume viewpoint, for mortgage loan activity data, and discount trends nationally. It is capable of producing the full mortgage portfolio of FNMA; full schedules of mortgages sold and to be sold; mortgages purchased; and daily, weekly, and monthly summaries of mortgages transacted, all to the total dollar accountability exceeding \$6 billion cumulatively. (Exhibit III.) (Retained in subcommittee files.)

#### *d. Urban Renewal Administration*

The programs administered by the Urban Renewal Administration—urban renewal, demonstration grants, urban planning assistance, and open-space land acquisition—are each programs heavily dependent on analytical, historical, and current comparative reports covering socioeconomic and industrial economic data from affected parts of the country at both State and municipal levels. Fiscal and project controls, inherent in grant and loan programs, are closely linked to these data.

URA, taking a long view on its needs, has placed a contract with a private service bureau to develop computer programs and produce reports on critical aspects of its most urgent activity areas. An important aspect of this project is the built-in provision for expansion of data with the growth needs of the Administration. Another vital element in this effort is its potential capability for interrelating bits of information which under conventional methods could not practicably be associated.

The URA contractor has completed 4 of what are estimated to be approximately 30 computer "runs" which will produce a compact battery of reports deemed basic to orderly conduct of the programs mentioned. The first of these reports has already been produced on a quarterly basis, covering data on relocation of families displaced in urban renewal projects throughout the country. Such a report, although many weeks in programing, once finished takes less than 2 hours per quarter to run on a suitable computer. Additional data tabulations, available on demand, can be produced with equal facility (exhibit IV). (Retained in subcommittee files.)

#### *e. Community Facilities Administration*

The Community Facilities Administration is an example of an agency with relatively new programs, wherein the need for extensive data analysis is already recognized, but the program for processing the data has yet to be fixed. For example, CFA deals with college housing, and public facility loans in a medium-sized system of data handling which spreads cases by population group, location, type of facility, and amount of loan. At present this is a manual operation. At a certain point, both the timeliness and the analytical values of such a system better serve management by the application of automatic data processing techniques. CFA is now studying these trends and will probably enter the automatic data-processing arena sometime next year.

#### *f. Voluntary home mortgage credit program*

Already operational, and in its third active year, is the data breakdown on the voluntary home mortgage credit program. Here it was found feasible at the outset to bring the data in from the field, entered manually on a tabulating card. The card was then punched to the detail needed for subsequent analyses, and those analyses were produced on conventional tabulating equipment in such spreads by loan type, by locality, and by program, as the administrative officers could demonstrate they needed.

This work was done reimbursably by another Government agency (Bureau of Labor Statistics). With assistance from that group, the reports were converted early this year to a more efficient process, using a Type 1401 computer and printer. The card-type report is still used, and the data are still entered into the record via the punched card. The cost will be about \$2,500 per year, approximately half what it was previously, for the same series of reports (exhibit V). (Retained in subcommittee files.)

## 3. MANPOWER UTILIZATION

As I have stressed in my discussion of automatic data processing history in the agency, mechanized paperwork has quite generally been parallel to or in the immediate wake of increases in program volume. Because of this close relationship between work volume and mechanized procedures, we find a consistent pattern of "timely technological rescues."

I do not pretend that the agency should take undue credit for the timeliness or the efficiency of the results. One principal officer, with more than usual candor, has expressed it to my staff this way: "We sometimes simply blundered into a good thing because we had no alternative. \* \* \* We were strictly at the end of our rope for manpower to meet the workload, and we found a machine that could do it."

On the other hand, I do not think any significant portion of our automated data processing could or would have been developed to its present level as a result of chance. The planning effort, for example, in the FHA computer conversion project was strictly in line with manpower utilization principles expressed in current Budget Bureau and related releases. The FHA systems study that preceded the acquisition of the IBM 7070 and 1401 system recognized that there would be a personnel impact, in some manner, on a number of organizational elements in Washington, and in all of the FHA field offices.

The immediate impact in Washington was to introduce new needs for skills and knowledge, for which training sessions were scheduled and held to develop appropriate resources from among our own employees. Tabulating machine operators whose jobs would be affected took aptitude tests to determine those qualified as computer console operators. Qualified employees were then trained at facilities provided by the vendor prior to installation.

In all, a savings of about 73 man-years was projected at the Washington level when the full system potential had been realized. To date, about one-third of this savings is real; the balance is still expected to be picked up by the end of the year. As of June 30, 47 positions had been eliminated, 28 new positions created, and a net decrease of 19 positions recognized. We abolished 11 positions as vacancies occurred in them, and reassigned 28 employees to new positions. We reassigned the other eight incumbents to areas of work not affected by the ADP system. Thus, while up to now no employee has been adversely affected in terms of employment or salary, the gains established for the plan are approximately on schedule.

Further, because of employee turnover in clerical work areas, the abolishing of 200 positions in over 100 offices under the plan in the next 12 months will not, we believe, adversely affect the employment status of any individual. The positions in question relate to the manual fiscal and statistical reporting procedures which the data system ultimately eliminates.

FHA probably provides our best example of a "before and after" manpower study. Those areas in FHA's departmental services that were affected by ADP last year used 1,132 man-years of actual time in the prior year to do the work that came to them. Using actual production rates of that year, and actual 1962 work items, it would have required 1,335 man-years to produce manually the volume of work turned out by the ADP equipment. Based on the average salaries of employees who would have been so engaged, potential personnel costs of more than \$993,000 were not in fact expended for personal services.

Offsetting this, of course, were equipment costs which rose to \$447,000 from the prior year level of \$163,000. Support costs were \$100,000, so the savings reduces to about \$600,000 as a result of ADP—a savings which is not against the earlier year, but against the current year basis if ADP were not in use.

In effect, ADP as an operational matter moves in at the critical point and reduces the rate of growth in employment that would otherwise occur as existing programs are expanded, or new programs enacted, by the Congress. It does not, in our experience, when the transition occurs in a period of program growth and is properly planned, result in significant dislocations among existing employees—although some employees may have to be retrained.

In the areas of management information, ADP appears to open up new resources for keeping decisionmakers informed at just about the rate (or perhaps a little behind the rate) of growing complexity of the decisions they are called on to make. This application of ADP, incidentally, usually involves information which could not by any practical approach be produced manually.

## 4. BYPRODUCT UTILIZATION OF DATA

HHFA has developed relatively few housekeeping applications for automatic data processing. The constituent group without exception first recognized its need for ADP within its substantive and statistical work areas. This was almost entirely responsive to the fact that the basic program assignments from the Congress, susceptible to ADP techniques, properly demanded larger segments of manpower than did the administrative and housekeeping functions. Accordingly, higher priority went to the areas with the larger return on investment.

However, several examples of data processing in the administrative areas, and of byproduct data found useful by management, can be reported. All are conventional.

In the Public Housing Administration, the usual "property control record" has been for several years a punched card file containing item number and description; date, manner, and cost of acquisition; location of item by building; person to whom charged, if relevant; and at terminal control, date and manner of disposition. Products of this file include monthly property status change actions and an annual prelisted physical inventory checksheet prepared at staggered intervals for the several PHA locations.

PHA also has on punched cards its budget and fiscal controls, with appropriate periodic reports and analyses available to management as conventional byproducts. Payrolls are a new application now pending.

FHA prepares payrolls and personnel lists on its EDP-EAM system. Byproducts include machine-written check transmittal sheets; check-issue cards for all employee pay; and auxiliary data on withholding in all categories. Basic fiscal accounts are also in the system. (See exhibit I.)

FNMA, again operating a relatively small EAM system geared primarily to program, prepares pay-period timesheets from punched card files of employee names. Time saved in this machine-writing process is significant. A pilot study is scheduled later this year in FNMA's Atlanta, Ga., field office to explore for additional applications.

## 5. INTERAGENCY COMMITTEE ON AUTOMATIC DATA PROCESSING

HHFA's constituents have been represented on this committee since its inception. During early years of the committee's work, when many agencies and some departments were interested in but did not use ADP actively, FHA, our principal constituent, found quite helpful the exchange medium offered by this group. Later, the exchange potential became more reciprocal as FHA pioneered certain aspects of computer usage. More recently, as there have been developed approaches to standards for programmer performance and evaluation, common symbols for computer operations, and a glossary or vocabulary for the exchange of ideas our agencies have found value in the committee. We believe it continues to have potential, in ways not yet even identified.

So that none of these values may be missed, we are entering the current year of committee activity with special vigor. We do this with the natural concern of a relatively smaller agency of Government that its interests can be served to the maximum by the newer technologies. We view ADP in this category.

Sincerely yours,

ROBERT C. WEAVER, *Administrator.*

## ATTACHMENT 1

ADP related to total costs in HHFA (preliminary fiscal year 1962)

Constituent	Year-end employee level	Operating expenses (thousands)	ADP employee percent of total employment	ADP costs as percent of total operating expenses
Office of Administrator, Community Facilities Administration, and Urban Renewal Administration.....	2,260	\$19,975	( <sup>1</sup> )	1.5
Federal Housing Administration.....	5,538	71,520	1.43	1.68
Public Housing Administration.....	1,508	15,135	1.5	1.02
Federal National Mortgage Association.....	1,048	7,575	4.0	3.7
Total, Housing and Home Finance Agency.....	13,354	114,205	1.657	1.36

<sup>1</sup> Not relevant.

Source: Division of Budget and Management, Office of the Administrator, July 1962.

## ATTACHMENT 2

Housing and Home Finance Agency ADP cost elements, fiscal year 1962 (estimated)

[Dollars in thousands]

Constituent	Salary (computer operation and support)	Rent EDP	Rent EAM	Contract services	Other costs	Gross operations	All cost including site preparation	Man-years
Federal Housing Administration.....	\$605	\$252	\$152	-----	\$175	\$1,184	\$1,244	122
Public Housing Administration:								
EDP.....	-----	-----	-----	\$10	3	13	13	0
EAM.....	-----	-----	145	-----	-----	145	145	20
Federal National Mortgage Administration.....	-----	-----	280	-----	-----	280	280	43
VHMCP.....	-----	-----	-----	5	-----	-----	5	0
Urban Renewal Administration.....	-----	-----	-----	30	-----	-----	30	0
Total, Housing and Home Finance Agency.....	605	252	577	45	178	1,622	1,717	185

Source: Division of Budget and Management, Office of the Administrator, July 1962.

## PREPARED STATEMENT OF RUPERT L. MURPHY, CHAIRMAN, INTERSTATE COMMERCE COMMISSION

Mr. Chairman and members of the subcommittee, my name is Rupert L. Murphy. I am the present Chairman of the Interstate Commerce Commission and have served in that capacity since January 1 of this year. I am appearing today to discuss the Interstate Commerce Commission's use of electronic data-processing equipment. I am glad to have this opportunity to describe to your subcommittee the efforts of our Commission over the years to utilize modern techniques in the performance of our work. Forty years ago the Commission began using mechanical accounting punchcard equipment to handle financial and other statistical data from reports submitted by the regulated carriers.

Compared with the present installations of some larger executive agencies, our use of automatic data-processing equipment is relatively small. However, the Commission has progressively adapted these techniques to help it do a more effective job in regulating transportation. The introduction of electronic processes has increased the efficiency and economy of our operations and enabled us to perform many necessary duties impossible of accomplishment by manual means. In some instances, automation of time-consuming clerical duties has

permitted the assignment of employees to other important projects. Automatic data processing has undoubtedly contributed to more expeditious and efficient regulations issued pursuant to the Interstate Commerce Act.

I will now address myself to the five areas of particular interest to your subcommittee listed in the chairman's letter of May 28, 1962:

#### I. AGENCY PLANNING PRIOR TO INSTALLATION OF EQUIPMENT

Beginning in 1922, the Commission started to use mechanical accounting punchcard equipment to verify, sort, and tabulate statistical data from annual, quarterly, and accident reports filed by regulated carriers in compliance with regulations issued pursuant to the Interstate Commerce Act.

In 1947, when the Commission was authorized funds to develop traffic characteristics based on a 1-percent sample of all railroad carload waybills, or about 300,000 waybills a year, it began utilizing an electronic calculator and punchcard equipment for processing the data. In 1955, it became apparent that the basic punchcard equipment in use was inadequate for processing the data from the waybill study. It also appeared that newly developed automatic or electronic data-processing equipment could be applied advantageously to additional operations of the Commission. After a thorough study of all equipment then available for which delivery could be effected near the end of 1957, we selected what we considered to be the most economical computer for our purposes, the IBM RAMAC 305. Accordingly, plans were developed for an installation of the IBM RAMAC 305, in February 1958. This was the first such unit to be installed in the Washington, D.C., area.

Early in 1960, the Commission again reviewed its ADP operations in the light of equipment becoming available and potential applications. In August 1961, we undertook to determine specifically whether our data processing installation could be replaced with a more modern system at no increase in annual equipment rental costs. The equipment of 18 manufacturers was considered, and invitations were sent to 3 manufacturers which could meet our specifications. The manufacturers submitted detailed proposals that described four basic considerations: the equipment and its characteristics, the systems to be used in implementing our present operations, the training and services to be performed, and the annual costs. The Commission held separate meetings with representatives of each manufacturer to discuss the specific details of the three proposals. A final determination to approve the bid by RCA for a medium-sized computer, RCA 301, was made after an extensive study of the proposals, the oral presentations, and an evaluation by the Commission's staff. The equipment selected had the lowest rental costs of the three, will process our present automated programs at the lowest unit cost, and will give the Commission the capacity to add new operations as they are developed. We anticipate that the new computer will be installed sometime this fall. A great deal of work in retraining personnel and in revising systems and programing is underway in contemplation of this conversion. Although considerable difficulty and hard work is involved, we are finding it possible to continue present operations and at the same time prepare for the conversion without increasing the staff.

#### II. EFFECTIVENESS OF POLICIES OUTLINED IN THE BUREAU OF THE BUDGET CIRCULAR A-54 AND AGENCY COMPLIANCE THEREWITH

The Bureau of the Budget Circular A-54 was issued nearly 3 months after our project to improve the Commission's ADP capabilities was initiated. However, we reviewed our actions in accordance with the circular's requirements and, in our opinion, conformed to the criteria therein set forth. We concluded that leasing would be more advantageous to the Government than purchasing and that the most efficient usage, considering present and potential applications, required the installation of our own computer instead of part-time use of a shared computer.

As I have stated, a study of the capabilities of current equipment offered by manufacturers was commenced in August 1961 to determine if more modern equipment could be obtained at no increase in costs in order to permit us to increase and improve our automatic data-processing applications. We took into consideration the fact that our longrun needs might require a larger computer than the one selected. We concluded, however, that it would be more economical to rent the computer selected and, for an interim period, to use, on a contract basis,

the equipment of the National Bureau of Standards to augment the medium size computer which we will lease.

### III. MANPOWER UTILIZATION IN INITIAL PLANNING, INSTALLATION, AND OPERATIONAL PHASES AND LATER IN CURRENT PLANNING AND ROUTINE OPERATIONS

Extending ADP techniques in the Interstate Commerce Commission has provided us with the capability of performing expanding programs and has enabled us to handle the increasing workloads without commensurately increasing personnel requirements. For example, there has been a reduction in employment in some programs, such as payroll operations, where a staff of 11 employees was reduced to 5 through the application of ADP techniques. In addition, the handling by ADP equipment of the expense schedules from class I railroad annual reports, which formerly required 120 workdays on a manual basis, now requires only 20 days.

Probably the most significant accomplishment, based on the installation of our present ADP equipment in 1958, was the greatly improved capability for processing the waybill sample (300,000 waybills a year). For example, this equipment made it possible to apply an electronic means, developed through mathematical research, of determining the short line railroad distance between origin and destination. This was previously handled manually. This miling system has not only resulted in time savings, but has enabled the Commission to assign more than 12 skilled employees to other critical work areas.

When our present computer is replaced with the new medium-size unit, we will have the capability of (1) again improving the quality of the waybill sample; (2) materially improving our central proceedings case control system and analysis of steps involved in processing proceedings cases; (3) expanding the analyses of examiners' work; (4) improving the processing of an inventory of motor carrier operating authorities; and (5) greatly expanding the machine processing and improving the quality and timeliness of transportation statistics.

Generally, the Commission has progressively provided for the training of its own employees who were assigned to the basic punchcard equipment operation prior to the time of the installation of our present computer. These employees received much of their training through the contractor's training facilities and were assigned to the new work. No employees were displaced. The transition to our first computer was accomplished smoothly and without measurable difficulty due in large measure to the high caliber of the staff. Since 1958, we have utilized other available training facilities to increase the skills of employees directly assigned to operations and those who participate indirectly in computer applications. These have included the Graduate School of the Department of Agriculture, seminars conducted by the Civil Service Commission, and various training programs offered by others. Whenever it has been necessary to augment our staff, we have experienced little difficulty in obtaining qualified employees with the required aptitudes. However, because of the rapid growth in ADP installations in Government and business, it is vital that adequate training programs and courses be readily available since there has been a shortage of job applicants with complete computer systems experience and knowledge.

We have found the Civil Service Commission's standards for the digital computer series reasonably satisfactory and have experienced no particular difficulties with grade structure.

In our opinion, automation has opened new avenues of opportunity for our employees, and they have responded with enthusiasm.

### IV. EFFORTS TO INCREASE USE OF BYPRODUCT STATISTICAL DATA IN MANAGEMENT DECISIONS—EFFORTS TO REDUCE AND SIMPLIFY BUSINESS REPORTING REQUIREMENTS BY USE OF MACHINE TAPES, ETC.

During the period from 1922 to 1955, the machine capabilities available in the Commission were used primarily to tabulate financial and operational data from reports submitted to the Commission. In 1956, the Commission initiated a program to improve its statistical operations, to provide data for substantive uses and research, to make data available more quickly, and to automate management operations.

Our ADP operations are primarily program oriented. Although we do use our equipment for administrative and internal management purposes, as I shall describe, the machines are used for these purposes for only a small portion of available time.

During fiscal year 1961, representatives of the National Bureau of Standards assisted the Commission in conducting exploratory and feasibility studies for ADP application. The Commission desired to determine possible additional applications of automatic data processing equipment and techniques to its activities and operations. As a first step, we made an exploratory inventory and survey of our activities and operations. The purposes was to determine in which activities and operations it would be most advantageous to proceed with detailed examinations of data flow patterns and procedural activities.

After considering the recommendations of the NBS-ICC study team, the Commission established priorities for those areas which appeared to lend themselves to ADP techniques. I have attached, for the record, a description of current and projected machine uses for program or substantive operations.

With respect to the use of our machines for internal management purposes, I should point out that we have extended mechanization to fiscal accounting matters, whereby reports of allocations, obligations, and unobligated balances by the various sub-objects are developed, and to personnel administration, whereby various data with respect to individual employees or employees in general are made readily available. Such use has also been extended to property and inventory controls, whereby we are provided with various data as to value, age, and condition of all property assigned to the Commission, and to budgetary matters, whereby data with respect to available manpower are recorded, thus providing us with comprehensive analyses of manpower utilization.

The Commission's payroll is mechanically processed every 2 weeks. For each of the approximately 2,400 employees, the base pay and appropriate deductions are computed and the output provides the payroll, bond issues, and monthly, quarterly, and annual reports.

A central status system, providing for controlling, and reporting information regarding the progress and status, on a monthly basis, of approximately 7,000 formal docket matters, is a significant management tool. With this system, it is possible at any given time to determine the consist of the formal docket and the progress of cases to decision. In addition to data on all pending cases, a history file of the 7,900-plus cases closed annually is maintained for use in analyzing closed cases for administrative control, budgetary analysis, and other uses.

We are planning to expand the use of computers for projecting workload and determining budgetary and staffing requirements, for supervisory and control purposes, to assist in improving procedures and processes, to speed up the disposition of work, to eliminate duplication of records and files, and generally to improve administrative management to provide timely facts for effective decisions.

#### V. THE PROGRESS OF INTERAGENCY COMMITTEE AS A FEDERAL CLEARINGHOUSE OF ADP INFORMATION

The Commission's representatives have participated in the activities of the Interagency Committee on Data Processing from its inception, and the experiences of this endeavor have been rewarding.

The forum type of meeting has provided a valuable means of discussing mutual problems among agency representatives and much information which is useful in the furtherance of ADP techniques in the Commission has been obtained. The papers which have resulted from the task forces provide valuable guidelines and we are pleased that our representatives have had occasion to participate in their development. The task force study approach to projects of mutual concern are opening new avenues for developing solutions to our specific problems. We endorse the continuance of this Committee.

#### GENERAL

The Commission has recognized the values of ADP in its operations and foresees a rapid expansion of its use in the immediate future.

The joint Bureau of Standards-Commission study started on priority assignments last September. At the present time substantial progress has been made in three priority areas, particularly in the area of cost finding operations. The two cost formulas for rail and motor carrier rate determinations which have been previously calculated on a manual basis involving thousands of individual mathematical operations, are now programed for a computer. After only limited

use, these operations have given definite proof of greatly increasing our capabilities for providing timely data that is important in so many facets of the Commission's activities. A cost comparison with previous manual procedures indicates substantial unit savings that will probably increase as automation of several special studies used in the cost formulas is completed.

The use of ADP for cost formulas is generally indicative of the type of endeavor being pursued at the Commission. It makes possible the accomplishment of tasks, previously curtailed by manpower limitations, in a more economical and timely manner. In many cases, we have either used the employees formerly associated with the manual operation to prepare input for the automated system, to edit the output, or to perform work formerly found to be impossible because of the difficulty in deriving information manually. In other cases, we have also been able to accomplish results that were formerly impossible. The central status system is such an example. This has enabled us to make excellent progress in developing controls over the increasing number of proceedings which come before the Commission each year. As Chairman of the Commission, I realize that the Congress is vitally concerned with eliminating unnecessary delays in processing cases. We are continuing to improve this system.

In converting to the RCA 301 computer, our staff has expanded each of the present operations to utilize the added capabilities of this advanced equipment. For example, the inventory of motor carrier operating authorities is an information retrieval system capable of providing extensive data on the thousands of rights outstanding. This unique information system, which contains 750,000 cards, provides our only systematic method of finding operating authorities with given characteristics, as, for example, what carriers have authority to transport general commodities between Washington, D.C., and New York City? Information contained in the system has fundamental significance in many areas of the Commission's regulatory activities. The system, which recently became operational on the basis of its original design, is now in process of adaption to automatic data processing techniques which will provide a more expeditious means of recovering information.

In the area of processing reports data, the conversion to the new equipment is taking advantage of two available capabilities, other than mere reduction of manual processing. First, it will be possible to print directly the data to be used in publications, thereby eliminating a substantial amount of editing, checking, typing and the like which, at best, is time-consuming and conducive to errors. Secondly, tests can be applied rapidly to the reported data to determine its validity, thus providing a means of verifying carriers' reports more completely and rapidly. In some areas of reports, this has been a critical problem.

Regulatory agencies face some serious problems in carrying out their complex and vital work. Automatic data processing may well provide the key to resolving some of them.

The sizes of the workloads and the complexities of matters handled by regulatory agencies have grown to such an extent that new techniques and systems for handling the decisionmaking process must be developed to improve upon and avoid deterioration of the regulatory process. We believe that developing technologies associated with automatic data processing offer great promise as new tools for application to decisionmaking. The major problem confronting a regulatory agency is the making of timely, well-reasoned, and equitable decisions of high quality in the face of large and continually mounting workloads. We are desirous of determining whether we can reduce the time required to make decisions and still maintain a high quality level and consistency of decisions, through application to the decisional process of operations research combined with automatic data processing techniques.

For example, in making decisions in proceedings we should consider current and historical aspects of operations, economics, safety, service, finance, convenience and necessity, rates, etc. In rate matters, consideration should be given to portions of files of this agency consisting of 90,000 tariffs and tens of thousands of supplements thereto, hundreds of millions of rates; to more than 100,000 grants of certificates of convenience and necessity (requiring 60,000 or more pages just to index); to complicated cost formulas and comparisons; to commodity and classification definitions; to traffic characteristics and movements; to balance sheet and profit-and-loss items, routes of travel, etc. Also to be taken into consideration in these rate cases and other rate matters are parts of thousands of annual and other reports, including many millions of financial and operating items. In addition, interrelationships between various types of carriers and

thousands of industries operating throughout the United States may have to be considered.

These cases must be processed, using many disciplines, including accounting, economics, statistics; expert knowledge in various modes of transportation; mathematics; knowledge of rates and tariffs; knowledge of commodities, geography, products; interrelationships between industries, ports, business, national defense, safety, etc. Also to be considered (suggesting the use of automatic data processing retrieval methods for identification) are precedents based on previous cases decided, related, or embraced (more than 350,000 pages have already been published); guidelines contained in letters, memorandums, statements, orders, and reports; previous solutions to problems; and criteria for processing similar and related cases.

Furthermore, reliance on the usual methods of handling the evidence in the record of a large case, with the necessity of resorting to the use of highly skilled attorneys and other professionals to extract, brief, and cross-reference voluminous accumulations of testimony and data, and physically to search through mountains of facts, is, to say the least, not an easy, economical, or speedy task, but the only available method at this time. The handling, sifting, and analysis of case records by these methods certainly appears to be susceptible of improvement. In the light of present day technology, operations research and other scientific developments combined with automatic data processing offer hope for insuring high quality, uniform, and expeditious exercise of the several regulatory functions, by providing, among other things, a mechanized storage and retrieval system for bodies of substantive information.

Government regulatory processes must be developed in the near future to match the increasingly complicated national and international commercial structure.

We believe that we have indicated above the difficulties faced by the Commission in handling its current and projected increasing workload over the years. If the Commission is to continue to handle its workload and make well-reasoned and proper decisions, it must make use of new techniques and methods for handling its work, especially in the decisional area. Accordingly, we have been discussing with the Bureau of the Budget the provision of sufficient funds, possibly from the President's Management Fund, to study, define, and outline the dimensions of the problem discussed above. We believe that new techniques and automatic data processing will assist us in the decisional process.

In our opinion, it is unquestionably worth a year's investment of study and analysis to determine whether it would be advantageous to proceed on the development of specific applications of techniques and automatic data processing to develop new aids to modernize the Commission's decisional process. Success in this area would be publicized so that other regulatory agencies could also benefit.

#### ATTACHMENT

##### 1. LIST OF CURRENT EQUIPMENT USAGES FOR PROGRAM OPERATIONS

(a) Railroad and motor carriers annual and other periodic reports data, on a selected basis, are balanced and summarized mechanically;

(b) One percent sample of carload waybills; and

(c) Inventory of motor carrier operating rights, underlying data for rail cost burden study, etc.

##### 2. LIST OF PROJECTED EQUIPMENT USAGES FOR PROGRAM OPERATIONS

###### (a) Priority

(1) Automation of cost finding operations;

(2) Development of automatic data processing techniques to recover, more expeditiously, information from the inventory of motor carrier authorities by eliminating certain of the present manual routines. This unique information-retrieval system contains data on each of the permanent rights granted motor carriers of property. It was established to provide a method of identifying rights having particular characteristics, e.g., place served, commodity transported, etc.

(3) Expansion of the central proceedings case status system and its accessibility.

*(b) Long range*

(1) *Enforcement of tariff rules and regulations.*—All tariff handlings by the Commission are performed manually; the operations consist of receipt, examination, filing and indexing of approximately 180,000 tariffs annually and a continuing search of the tariffs for data. It is believed that much of the examination, indexing, and retrieval operations can be adapted to automatic data processing, thus permitting a more efficient operation.

(2) *Cost finding studies.*—Some of the basic data for cost studies are being processed on the computers. It is anticipated that there can be further automated processing of these data in order to eliminate manual operations and provide more timely studies.

(3) *Compilation of reported data of monthly, quarterly, and annual reports.*—Some of the input data in these reports (selected schedules) are being mechanically processed, but a substantial amount of data are still processed manually. The operations involve editing for omissions, errors, inconsistencies, and the compiling of data from the various reports into regional and/or national totals. Such operations can undoubtedly be more effectively accomplished by automatic data processing systems.

(4) Increased automation of annual and other periodic reports matters.

(5) *Car service and railroad safety matters.*—Various reports and records in these work areas are processed manually. Preliminary study discloses that these matters can be effectively processed by automatic data processing methods.

(6) *Enforcement of carrier insurance regulations; valuation accounting and reference services.*—These areas are performed by manual methods. Automatic data processing applications can provide measurable improvement.

(7) Extension of the use of automatic data processing in reporting and analysis of motor carrier safety data.

(8) Adaptation to computer techniques of the filing and indexing of tariffs, concurrences, powers of attorney, and related data.

(9) Machine processing of railroad safety matters including locomotive inspection.

(10) Indexing and retrieval of ICC decisional information.

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STATEMENT OF THE RAILROAD RETIREMENT BOARD

1. *Background on installation of electronic computer system*

The Railroad Retirement Board administers the Railroad Retirement Act and the Railroad Unemployment Insurance Act. The retirement act provides for payment of retirement and disability annuities to railroad employees, annuities to their spouses, and annuities or other benefits to their survivors. The Unemployment Insurance Act provides for paying unemployment and sickness benefits to eligible beneficiaries, and for securing reemployment of unemployed railroad employees.

When the Board began operations under the Railroad Retirement Act, a punchcard system was established to maintain currently for each railroad employee a record of service and compensation needed in making benefit determinations. The record was started in 1937, with less than 2 million individual earnings records of railroad employees, and the system was entirely adequate at that time. However, the number of employees who worked at some time in the railroad industry since 1936, and the volume of information accumulated for each such employee increased over the years. This increase, together with periodic legislative changes to improve the benefit structure, brought about record-keeping requirements that severely taxed the capacity of the punchcard system.

By the end of 1955, the file had grown to approximately 18 million punchcards covering some 10 million accounts, and had reached a dimension which would definitely require expansion or change in the system within a few years. A preliminary study of the problem made it apparent that two alternatives were available: (1) to continue to expand the punchcard system until it reached completely unwieldy dimensions, or (2) to turn to the use of the newly available electronic data processing equipment.

In April 1956, six of the Board's top management analysts were assigned, full time, to develop information on the possible use of electronic computers in the Board. In its feasibility studies this group concentrated on the Board's major punchcard recordkeeping activities: recording railroad employee earn-

ings and using those earnings records for benefit program operations; compilation of data for research and actuarial studies of the earnings and service of railroad employees; and the accumulation and analysis of data used in research and actuarial studies under the retirement and survivor benefit program. Other areas of Board activities where a computer might be used also were reviewed, although extensive detailed studies were not made. (Subsequently, when it became apparent the computer required to handle the Board's major recordkeeping activities would have sufficient capacity to handle additional applications, plans were formulated for adjudicating on the computer unemployment and sickness benefit claims on a trial basis.)

In the course of their study, the Board's analysts prepared detailed analyses and graphic presentations of the work required in accounting for employee earnings and for research and actuarial activities. Three major equipment companies in the electronics field were invited to study these analyses and presentations and to recommend appropriate equipment. Each of the manufacturers recommended a medium size computer.

After careful consideration of the information developed by its analysts during 2 years of intensive study, the Board concluded in June 1958, that an IBM 650 should be installed. In arriving at this conclusion, it was considered that small scale computers were obviously too small; conversely, that the Board did not need the capacity of large scale computers. At that time it was recognized that intermediate scale equipment was being developed rapidly and it was apparent such equipment would be adequate for all Board needs. In September 1958, the IBM 7070 was announced. A study of this computer showed it had sufficient advantages to merit its use in place of the less versatile IBM 650. All computer planning was then directed toward the ultimate installation of the 7070.

An IBM 650 was leased on April 1, 1960, on a temporary basis, to convert the 18 million punchcards comprising the Board's records of railroad employee earnings to magnetic tape records—at the same time establishing adequate controls—and, on a test basis, to process unemployment and sickness insurance claims in one of the Board's seven regions. In January 1961, an IBM 7070 computer was leased to replace the IBM 650 that had been installed on a temporary-use basis 9 months earlier. In July 1961, the Board's basic computer configuration was completed by the addition, also on a rental basis, of an IBM 1401 system. The IBM 1401 system is used as the input-output system for the larger, completely tape-oriented 7070 computer and for some processing work. The time-consuming operations of transferring data from punchcard to magnetic tape and of preparing punchcards and printed listings from tape are performed on this smaller, less expensive component of our computer system. This frees the larger, more expensive 7070 for the more complicated, more sophisticated, high speed computer processing of data on tape.

## 2. Present computer operations

(a) *Maintaining records of railroad employee earnings.*—The first task performed on a computer in the Board was the conversion of 18 million punchcards covering 10 million railroad employee earnings records to a "master record" magnetic tape.

Establishment of the master tape record made it possible to process magnetic tape reports in lieu of punchcards for employer reports of railroad employee earnings for calendar year 1961. In March 1961, seven of the larger railroad employers having computer systems which would produce magnetic tape that could be processed on the Board's computer system were invited to participate in the development of a mutually satisfactory tape reporting system. All employers contacted accepted the opportunity to participate, and they were furnished special instructions and specifications for preparation of reports on tape for entry directly into our computer.

More than 275,000 employee earnings items were reported on tape for 1961; these comprised over 25 percent of the total items reported for the year. The tape reporting system proved to be very satisfactory and the plan has been extended to additional employers. We expect that over 45 percent of all employee earnings for the calendar year 1962 will be reported on magnetic tape for direct input to our system, and that an even higher proportion will be reported on tape in the future.

Master earnings records are updated quarterly for earnings reported on a quarterly basis and for adjustments in data previously reported. The updating of the master tape for the fourth quarter also gives us the yearend

balances and control totals which in former years were not obtained until after an earnings ledger had been prepared in ensuing time-consuming operations.

As a byproduct of the fourth quarter updating, a tape record is created for preparation of annual statements of service months and compensation which are furnished employees each year. The statement shows the months of service and amount of compensation credited to the employee's account for the last completed calendar year and the total credits for the period from 1937 through the last completed calendar year. This gives employees an opportunity to compare their personal records with those of the Board. The statement also is used in determining entitlement to, and the daily benefit rate at which any unemployment or sickness benefits will be paid. The certificate is sent to the last railroad for whom the employee worked in the calendar year for delivery to the employee. Use of the tape not only allows earlier distribution of the annual statements, but also makes it practicable (through sorting the data on tape) to furnish the statements in the sequence (usually according to payroll locations) requested by employers. This simplifies the work of the employers in distributing the statements to employees.

(b) *Annual wage study.*—Annually, data on all active employees in the railroad industry are compiled showing service, taxable compensation, occupation, and class of employer. Also, tabulations are made on a sample basis of all employees who have worked in the industry since 1936. Much of the information needed for this study is developed as a byproduct of the fourth quarter updating of the master tape. These data are basic to many statistical and actuarial analyses, and are also used by both railroad labor and management in wage negotiations, and by other public and private officials. By using the computer, the study is completed at a much earlier date, and many of the tables are printed in final form on the 1401 system. Also, the processing of some 1.5 million punchcards, necessary under the best procedure available before the computer was installed, has been eliminated.

(c) *Extracting and certifying records of employee earnings.*—The 10 million employee earnings accounts now on tape are searched electronically to extract the earnings information needed by the Board to pay retirement, survivor, unemployment, and sickness benefits, and by the Social Security Administration to pay benefits based in whole or in part on railroad earnings. Some 600,000 such searches and certifications were made in fiscal year 1962. The use of the electronic equipment enables the Board to perform this job more accurately and quickly, and at less cost.

(d) *Compilation of statistical information on retirement and survivor benefit program.*—The punchcards formerly used in compiling data needed for research and actuarial studies have been converted to magnetic tape, and the statistical information used in analyzing retirement and survivor benefit operations is now produced on the computer. Selected data on benefit operations are obtained on a monthly and annual basis. These data are used to provide information on the benefit programs of the Board.

The monthly operation alone involved the handling of 50,000 punchcards each month, and took 200 hours on conventional equipment. On the computer, the actual processing time averages about 18 hours each month. In addition, many statistical tables previously prepared manually are now assembled and printed at high speed, in final form with increased accuracy.

The information developed through the computer is included in the Board's annual report; in calculations required under the financial interchange provisions of the Railroad Retirement Act and the Social Security Act; in recalculations of benefit amounts required by amendments to the Railroad Retirement Act and the Social Security Act; in the development of data for actuarial valuations; and in preparation of data requested by railroad management and labor, by congressional committees and others.

(e) *Verifying continuing eligibility of beneficiaries to receive benefits.*—Beneficiaries receiving survivor benefits and some of the beneficiaries receiving retirement and spouse benefits under the Railroad Retirement Act are subject to earnings restrictions (or work deductions), and benefits payable to them in some situations are affected by their eligibility for benefits under the Social Security Act. Through the use of questionnaires, the Board obtains information from these beneficiaries to determine their continuing eligibility to receive benefits under the Railroad Retirement Act. In addition to approximately 210,000 beneficiaries covered by annual questionnaires, the Board also checks,

at the time awards are made, as to the eligibility of certain beneficiaries for benefits under the Social Security Act.

With the installation of the computer, it became practicable to check Social Security Administration wage records to verify the earnings reported on the questionnaires completed by some beneficiaries, and to recheck the eligibility status under the Social Security Act of other beneficiaries who are not required to report on annual questionnaires. It also became practicable to check Social Security Administration wage records to verify that annuitants have neither remained in nor returned to certain employment while on the beneficiary rolls. (The retirement benefits are not payable if an annuitant works for any railroad or for the employer, whether or not in the railroad industry, for whom he last worked at the time of retirement).

In the past year, the Board worked out arrangements with the Social Security Administration to exchange magnetic tape files so that this checking can be done on the computer systems available in our respective agencies. Checking on the beneficiaries under the Railroad Retirement Act for eligibility status under the Social Security Act as of the end of 1961, is about completed. The earnings record for calendar year 1961 of beneficiaries under the Railroad Retirement Act will be received by the Board in August 1962. Information on railroad earnings for calendar year 1961 reported for beneficiaries under the Social Security Act has been furnished the Social Security Administration.

Arrangements have been made to continue this interchange of tapes on a quarterly basis as earnings records are posted so that any possible overpayments or other involvements will be disclosed as currently as the earnings records are posted and the data can be exchanged.

The initial exchange of information under this procedure disclosed overpayments of more than \$2 million to beneficiaries under the Railroad Retirement Act. This represents an accumulation of cases for which there was no practical method of disclosure before the computer system was installed. The disclosure this year has prevented the further accumulation of the overpayments and the quarterly exchange of information will prevent any such accumulation in the future.

(f) *Computer adjudication of claims under the Railroad Unemployment Insurance Act.*—The Board paid benefits to some 306,000<sup>1</sup> beneficiaries on approximately 2,824,000 unemployment and sickness claims in fiscal year 1962. While most of this work was handled in the usual manual process, about 10 percent was handled on the computer.

Beginning in July 1960, all unemployment cases and some sickness cases in the Chicago region have been processed on the computer. Transferring this work to the computer has been probably the most challenging of any of the computer applications in the Board. Provisions for all the clerical activities and the adjudicative decisions necessary to the proper settlement of claims for unemployment or sickness benefits requires a complex set of machine procedures. While all of the conversion work has not been completed, results obtained thus far have shown not only the feasibility of the application but also that claims can be, and are, processed more accurately and more quickly so that claimants receive their benefits more promptly. In addition to greater accuracy and prompter payment of benefits, significant administrative cost reductions are expected from this computer application.

(g) *Compilation of statistical information on unemployment and sickness insurance program.*—Punchcard and manual procedures have been used since the inception of the unemployment insurance system in 1939 to compile data needed for statistical studies required under this program. Beginning in July 1962, these data are being produced electronically. In addition to the faster and more accurate compilation of data required, many statistical tables previously prepared manually will be prepared in final form on the computer.

(h) *Computer adjudication of claims under the Railroad Retirement Act.*—The Board paid monthly or lump-sum benefits to some 925,000 beneficiaries under the Railroad Retirement Act in fiscal year 1962. All the applications on which these benefits are based were processed manually.

A pilot test operation was begun in July 1962, to test programs for the electronic adjudication of retirement claims. The test covers claims for benefits under the Railroad Retirement Act based on age and service. If the test progresses satisfactorily, as expected, all such claims will be handled on the com-

<sup>1</sup> Excludes maternity beneficiaries.

puter, and the electronic adjudication process will be extended to include disability, spouse, and survivor claims.

Through computer adjudication of these claims, the Board expects to improve the service to applicants through faster handling of claims; to reduce costs; and to secure more accurate and uniform treatment of cases.

(i) *Storage of records.*—Conversion of the master wage record and the research and actuarial statistical files to magnetic tape has released for other uses cabinets and floor space formerly required to house the punchcards. It has also simplified preparation and storage of records which are essential to resumption of normal operations in the event of fire or other disaster.

Formerly, duplicate listings of master wage records were sent to security storage at the completion of wage record updating each year. Likewise, duplicate listings of the statistical files were sent to storage at the close of each year.

Under the computer system, a duplicate set of master wage records is sent to security storage each year. During the year, as the current master tape is updated, a quarterly tape also is sent to storage. Similarly, a duplicate set of statistical files is prepared annually for security storage.

### 3. *Machine utilization*

The 7070-1401 computer system has sufficient capacity to handle the Board's present electronic data-processing activities and provides, on an extra-shift basis, sufficient capacity to accommodate additional applications now in the planning stage. The first month the IBM 650 was in operation, it was in productive use on more than a full-shift basis. This also was the case with the IBM 7070. Since the installation of the equipment, almost every month has seen full-shift operation of the computer system on production work, and some months also have seen heavy extra-shift usage.

In addition to handling our own work, we have been able to provide time on the 7070 computer on an extra-shift basis, to the Commodity Stabilization Service of the U.S. Department of Agriculture; and have processed data for the U.S. Public Health Service and for the Presidential Railroad Commission.

The full potential of the computer system has yet to be realized. As mentioned earlier, long-range plans include extension of the unemployment and sickness insurance claims processing, and conversion from manual to electronic adjudication of claims under the Railroad Retirement Act. In addition, it is planned to gradually expand the computer system to include the retirement disbursement check-writing operation, and such administrative activities as budgeting and fiscal accounting, supply and service inventory, payroll, personnel, and report preparation.

Our budget for the current fiscal year provides for operation of our computer system, on a rental basis, for a one-and-a-quarter-shift operation. The transfer of additional activities to the computer probably will increase usage of machine time. Preliminary studies indicate the probability the Board could effect some savings through purchase of its computer system. During the next few months, we expect to conclude our studies to determine whether or not some or all of the components of our computer system should be purchased.

### 4. *Manpower utilization in the electronics program*

It is the policy of the Railroad Retirement Board to promote, from within, the organization whenever possible. Installation of a computer system did not change this policy.

There were three basic considerations for adhering to the long-established promotion policy in obtaining an automatic data processing staff. First, discussions with recognized authorities in the automatic data processing field, and with organizations having extensive experience in automatic data processing operations, indicated that the period of time required to familiarize a new employee with the complex operations of the Board would be many times greater than the time required to develop necessary automatic data processing skills in our own employees. Second, assignment of our employees to this work would ease possible problems of overstaffing as work is transferred to the computer. Finally, it is felt that qualified Board employees should be given the first opportunity to qualify for placement and advancement in the newly established technical field of electronics.

As soon as the decision was made to install a computer, training agreements were negotiated with the Chicago Civil Service Commission. These agreements were designed to provide an accelerated means for obtaining a top-level auto-

matic data processing staff by utilizing employees who were familiar with Board operations, who had indicated a potential for the work, and who, although otherwise qualified, lacked the specialized or specific experience required for immediate assignment to the automatic data processing work. Under these agreements, trainees received intensive training within the Board and classroom instructions at the IBM educational center. The latter included lectures, demonstrations, and workout problems concerning operating and wiring IBM equipment, digital computer concepts, and digital computer programming.

Board employees were encouraged to apply for automatic data processing training. Applicants were given an opportunity to qualify via aptitude tests and personal interviews, and those selected immediately began training under the training agreements. As anticipated, these employees were quickly trained, and they now comprise our entire staff of digital computer analysts, programmers, and equipment operators.

The Board has been able to reduce the use of manpower in the activities transferred to computer processing. The number of man-years spent on wage record handling activities and in clerical work related to gathering research and actuarial data in fiscal year 1962 was 175, as compared with 225 for fiscal year 1960.

While some of this reduction of 50 man-years is the result of improvements in other work operations, most of it is attributable to the transfer of work to the computer. This marked reduction would not have resulted had the computer not been installed, inasmuch as the punchcard system and conventional equipment would have reached maximum capacity by the end of 1960, and the manpower requirements would have been higher rather than lower.

No employee has been separated because of conversion of work to the computer. Employees affected by reduced personnel needs, in the two work areas mentioned above, have been assigned to vacancies arising through normal turnover. Since conversion of additional operations to the computer will be spread out over several years, the Board hopes to be able to provide, in the same manner, for employees who may be affected by transfer of work to the computer.

##### *5. Interagency Committee on Automatic Data Processing*

The Board has followed with interest the activities of the Interagency Committee from its inception in 1957. Since November 1960, the Board has had a voting member and an alternate on the Committee. Because our representatives are stationed in Chicago, while Committee activities have been centered in Washington, D.C., our people have not found it practicable to participate as actively in Committee work as we would like. They have, however, attended 6 of the last 10 Interagency Automatic Data Processing Committee meetings, and participated in surveys initiated by the Committee.

The Interagency Committee has spearheaded action in a number of areas, and it has served as an essential clearinghouse for interchange of ideas and information. The information and material developed and disseminated by the Committee has been helpful in keeping the Board abreast of current developments in the use of the computers.

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RAILROAD RETIREMENT BOARD,  
Chicago, Ill., October 8, 1962.

Hon. DAVID N. HENDERSON,  
*Chairman, Subcommittee on Census and Government Statistics, Committee on Post Office and Civil Service, House of Representatives, Washington, D.C.*

DEAR MR. HENDERSON: The following information is furnished in response to your letter of September 19, 1962, requesting a supplemental statement at the conclusion of our study of lease versus purchase of electronic data-processing equipment.

We have completed our study and we plan to purchase our system in fiscal year 1964.

At the time of purchase, our system will consist of an IBM 7070 main frame comprising 10,000 words of core storage, an IBM 1401 input-output system with 8,000 positions of core storage, a 1402 punch, a 1404 printer, 4 Model II tape drives, and 10 model IV tape drives.

Although the extent of usage of various components varies, we are using our system about 1¼ shifts at the present time, and we will be using it about 1¾ shifts in fiscal year 1964. The system is adequate to handle board activities now on the computer and those we plan to add. Our study indicates the

Board's investment in this computer system will be recouped in 3 years, i.e., at the end of fiscal year 1966. Thereafter, savings, in comparison with rental charges at present levels, of about \$500,000 will be realized each year the Board continues to use the system. I am enclosing a table projecting a comparison of the lease versus purchase costs of our computer system for fiscal years 1964 through 1969.

The policies and criteria set out in Bureau of the Budget Circular A-54 were followed in determining whether or not we should purchase or continue to rent our computer system, and the savings anticipated from purchasing the system were computed in accordance with guidelines provided in that circular.

When costs justify consideration of the purchase of electronic data-processing equipment, the question of service maintenance also is for consideration. The International Business Machines Corp. assures us that maintenance contracts provide service for purchased equipment identical with that provided under leased equipment contracts. Maintenance contract cost figures included in our analysis provide for charges for additional maintenance to the extent it is required for multiple-shift use of the system, and for the cost of engineering changes and replacement parts, as well as labor.

I will be glad to furnish any further information you may desire.

Sincerely yours,

HOWARD W. HABERMEYER, *Chairman.*

*Comparison of lease versus purchase costs IBM 7070-1400 system, with tape drives*

Fiscal year	Purchase basis			Lease basis		Cumulative difference in cost of purchase over lease
	Purchase price	Annual maintenance	Cumulative cost	Annual rental	Cumulative rental	
1964-----	\$1,331,000	\$39,000	\$1,370,000	\$525,000	\$525,000	+\$845,000
1965-----		40,000	1,410,000	525,000	1,050,000	+360,000
1966-----		41,000	1,451,000	525,000	1,575,000	-124,000
1967-----		45,000	1,496,000	525,000	2,100,000	-604,000
1968-----		47,000	1,543,000	525,000	2,625,000	-1,082,000
1969-----		47,000	1,590,000	525,000	3,150,000	-1,560,000

The rental amounts shown above are based on 2 shifts of use for the 7070, 1.5 shifts for the 1401, 1.1 shifts for the 1402, 1.2 shifts for the 1404, and 1.2 shifts for the tape drives.

Mr. HENDERSON. If there is nothing further, the subcommittee will stand adjourned.

(Whereupon, at 12 noon, Friday, October 5, 1962, the subcommittee adjourned.)

