

THE CHECK PAYMENT AND RECONCILIATION PROGRAM OF THE U. S. TREASURY: PRESENT STATUS AND FUTURE PROSPECTS

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INTRODUCTION

On October 14, 1955, the Secretary of the Treasury, the Comptroller General of the United States, and the Director of the Bureau of the Budget, jointly announced the adoption of new procedures involving the use of electronic data processing equipment, for the "payment" and "reconciliation" of the 350 million checks drawn annually by over 2,300 individual government disbursing officers against the Treasurer of the United States. They announced that they expected these new procedures to save the government \$1.75 million in administrative costs annually and that further decreased costs of about \$500,000 could result in the Federal Reserve Banks.

Actually, adoption of the new system resulted in an annual savings of about \$4 million and involved a reduction of about 800 employees. In testifying on the appropriation for the Office of the Treasurer of the United States before the Subcommittee of the Committee on Appropriations, House of Representatives, in March 1966, Secretary Fowler said:

Fiscal year 1967 will mark the 10th anniversary of the use of electronic data processing equipment by that office in support of its check handling activities. By the end of this 10-year period, the use of that equipment will have saved the Government over \$30 million. Fiscal year 1967 will also mark the full recovery of the capital investment expended in prior years for the purchase of electronic equipment. Savings resulting from owner-

ship rather than leasing will then equal the cost of the equipment.

When this equipment was installed in fiscal year 1957, the annual check volume was 363 million; in 1967 a check volume of 522 million is expected. The same equipment used to handle the 522 million checks will also be used to process an estimated 210 million postal money orders for the Post Office Department on a reimbursable basis.

There is attached as Appendix B a synopsis and cost analysis of the EDP program in the Office of the Treasurer, U. S. This information was furnished the Appropriations Subcommittee of the House of Representatives on March 3, 1966, at its request.

DEFINITION OF PAYMENT AND RECONCILIATION

"Payment" and "reconciliation" of checks involve control processes with which almost everyone is familiar. Everyone who has a checking account at a bank understands that the bank "pays" the checks drawn by him by charging them against his account. He knows further that in this "paying" process the bank must set up controls to avoid, among other things "paying" checks: (1) which do not contain an authorized signature, which contain evidence of alteration, or are otherwise improperly drawn; (2) when the bank has previously been supplied with a "stop-payment" notice; and (3) when there is an insufficient balance in the drawer's account.

The holder of the checking account is also quite familiar with the operation of "reconciliation" of the checks drawn by him with the checks "paid" by the bank and returned to him with his statements of account. He knows he must effect a proof of the paid checks with his issue records and that he must develop the amount of outstanding checks in order to reconcile his balance with that shown by the bank statement.

The processes of "payment" and "reconciliation" of government checks are basically the same as these simple processes. Therefore, a study of the basic features of the program for use of electronic data processing in this area provides a rather unique opportunity of exploring the implications of these advanced techniques in terms of application to simple and widely understood control processes. Such a study should bring out the fact that even the simplest of procedures must be completely "re-thought" in terms of their objectives, as distinguished from existing routines, to provide a basis for application of electronic data processing. Of further interest will be the great amount of research and study which is involved in this "re-thinking" process and in the development and installation of the electronic procedures to meet established objectives. The organizational impact which results from the adaptation of these advanced techniques to even these simple processes will be another matter of special interest. The effect of the installation of these new procedures on traditional concepts of auditing and internal control will also be discussed in this paper. Finally, there is discussed also very briefly the future prospects of a checkless-no-money-economy.

GENERAL OUTLINE OF PREVIOUS PROCEDURES

There is no fundamental difference between the functions of "payment" and "reconciliation" of checks in the Federal government and commercial practice. It seems necessary, however, to provide a general outline of the areas of responsibility involved in the government's disbursing processes so that such similarity can be recognized in terms of the organizational structure of the Federal government.

The outline, which is included as Appendix A, is intended only to provide general background with respect to the basic processes, and related alignments of responsibility. It does not deal with many different procedures which cover various special problems in this general area.

SUMMARY OF PRESENT SYSTEM

The government now issues an average of two million checks daily. The checks are payable at Washington, D. C. The payment and reconciliation functions are performed through the use of an electronic system composed of one large transistorized computer, a smaller auxiliary-type computer, and a battery of card-to-tape (specially designed) converters, which are operated off line.

Each disbursing officer is required to furnish either listings or reels of magnetic tape of all checks written. These listings or reels of tape, which contain the detailed information on each check plus certain block totals, are submitted at least monthly directly to the Treasurer of the United States and subsequently are used for reconciliation.

Following encashment of a check by the payee, it is deposited sooner or later in a commercial bank. The bank will honor the check after proper examination and then will apply to its cognizant Federal Reserve Bank for the reimbursement, which usually takes the form of a credit to the bank's reserve account. The Federal Reserve Bank then applies to the Treasurer of the United States for reimbursement of the amount which it has credited to the commercial bank. When the Treasurer has electronically examined the check to determine that it bears an authorized disbursing officer's symbol and serial number and that there is not a stop-payment notice against it, the check is considered "paid." Checks are received in batches of about 1,000 checks, accompanied by detailed listings.

Card-to-tape conversion:

The first step in machine processing consists of the following operations:

- a. A front-end audit is done on each batch.
- b. Double punch, blank column and other error checks are separated.
- c. A record on magnetic tape is written for each accepted check.
- d. A locator number is printed on each check, which is also incorporated into the tape record.

The purpose of the front-end audit is to establish that the total dollar amount of the checks in each batch corresponds to the charges in the transmittal letter. Imperfectly punched checks are not acceptable

to the system. The converter will route these checks into a separate pocket and not write them on tape. Later on, replacement cards are key-punched for such items, after which they are re-entered.

Checks arrive in random sequence and a batch may contain checks from many disbursing offices. It is necessary that the tape records be sorted in sequence by disbursing officer's symbol and serial number which eliminates the necessity of physically sorting the checks. It is essential, however, to maintain physical access to all checks so that any check can be located and examined for signature, endorsement, etc., upon demand. The converter prints a consecutive "locator" number on the face of each check and simultaneously writes the same number as part of the tape record. The checks are then physically filed in locator number sequence having been handled only once. When the tape records are sorted by disbursing officer's symbol and serial number, the locator number for each check is carried along. Thus, when it is necessary to make a physical examination of a check, the check record on tape can be easily located in its logical sequence by disbursing officer's symbol and serial number and it will show the locator number which will pinpoint the location of the check in the file.

Card-to-tape converters are also used, incidentally, to enter all the other types of transactions, such as issue information and stop payment notices, that are required by the system. Each item bears a transaction code for the computer to use in identifying the type of record.

Computer functions:

After operations are completed on the converter, the check records are ready for processing on the computer. The following major steps are essential in accomplishing the three objectives of payment and stop payment, reconciliation, and check status reporting:

- a. Balance and Condense
- b. Sort
- c. Pay and Stop Payment
- d. Detailed File Maintenance
- e. Reconciliation

Balance and Condense is a preparatory run which normally involves processing a group of 14 to 18 converter reels. Further "grouping" is accomplished during this run, which is designed to reduce the amount of tape handled without reducing the amount of information. There is still process time left over,

and this time is used to do some initial sorting, in preparation for the next run.

Sort is a run which completes the operation of placing the records in sequence by disbursing officer's symbol and serial number. Normally, the Balance and Condense Run and the Sort Run are performed twice daily, with the number of transactions processed ranging between 1.6 and 2 million.

Pay and Stop Payment is the daily ledger maintenance run. A master file is updated which contains a history record for each disbursing officer, showing the disbursing officer's symbol and authorized range of check numbers. The master file also contains all stop-payment notices which are active. Checks from the Sort run are matched against this master file and are either paid, intercepted by a stop payment, or rejected for unauthorized disbursing officer's symbol or range of serial numbers. Paid checks are written out on another tape for use in subsequent runs. Unaccepted checks are written out on a separate tape for analysis. When a stop payment has intercepted a check, the event is recorded on a "print" tape. New stop payments enter the system in the same manner as checks and are placed in proper sequence on the master file. They are also sent forward with the accepted checks to search the detail file in order to determine whether the check was paid prior to receipt of the stop payment.

During the Pay and Stop Pay run, the computer starts to collect and organize information for use in controlling reconciliation. The decision of when and how to reconcile is a fairly complicated one, and a good decision invariably involves a compromise. Treasury has adopted the management by exception technique of reconciling by blocks of checks, and only examining individual checks or issue records when the blocks fail to reconcile. This technique has proven to be a highly efficient and economical method of audit control. In order to use this technique, however, it is necessary to strike a balance between two opposing forces. On one hand, it is highly desirable to reconcile a block as soon as possible, in order to detect error conditions early and to minimize the amount of information which must be carried in float. On the other hand, it is desirable to postpone reconciliation of a block to allow time for the individual checks to arrive. Otherwise, the number of checks which are still outstanding at the time of reconciliation would be unreasonably large and the system would defeat itself. A great deal of thought and statistical analysis have been devoted to this question.

In general, the factors governing reconciliation are:

- a. The elapsed time since the first check was filed in the block.
- b. The number of checks in the block which have been received.
- c. The relationship between total payments and total issues.

Even though reconciliation is performed on a block level, it is still necessary to maintain a complete record of individual checks, so that they may be located and examined in the event that a block fails to reconcile. During the first month or so following the issuance of a block of checks, the rate of arrival is quite high, and it is logical to maintain the detailed records right in the system. Sooner or later, a point is reached where most of the checks are in and it may take months or even years for the remaining few to get cashed and presented for payment. At this point, it makes more sense to remove from the system and print the records of the checks which have arrived, while maintaining in the system records of only those few checks which are still outstanding, and a skeleton record which may be used to identify the listings upon which the checks were printed.

An edit tape is prepared during the Pay and Stop Pay run which is later used in conjunction with an auxiliary computer/printer system to produce various accounting reports reflecting the scope of the day's business.

Detail File Maintenance covers one-fifth of the total file on a daily basis. As previously stated, checks which are found to be acceptable update the Pay and Stop Pay Master File and are recorded on an output transaction file which is divided into five segments. The reason for performing this segmentation is that the Treasurer's Detail File Maintenance operations are cycled in such a way that one-fifth of the files are serviced each working day, with the entire file being serviced every five days.

Corresponding output transaction file segments of paid checks and related transactions from each of the five preceding working days are merged into a single sequence, in order by disbursing officer's account and check serial number. This combined segment, representing a week's accumulation of paid checks for the accounts encompassed in one particular fifth of the file, is now ready for posting to the corresponding segment of the detail file. Each segment of the detail file is quite large, in that it contains data for about 40 to 50 million checks which have been paid but have

not yet been reconciled, at any given time. Since the basic purpose of the file is to show which checks have arrived and where they have been physically filed, the information carried for each check is the locator number which was assigned back in the card-to-tape conversion operation. Each check which has arrived will have a locator number stored in this file. By the same token, the absence of a locator number for any given check number is proof that the check itself has not yet arrived.

In order to conserve space on tape, a technique was developed for storing all this information without having to record the serial numbers for each check. For each group or block of 100 checks, the serial number of the block alone will be shown; the locator numbers for the individual checks are placed in predetermined positions during the posting process in such a way that when the record is eventually printed on a matrix or grid type of form paper, the locator number for any given check may readily be determined by reference to the matrix coordinates. Before the locator number of any check is stored or posted to the detail file, however, the predetermined position is examined to see if a locator number is already there, in which case a duplicate check condition has been discovered, and the computer will branch into another routine to initiate an investigation.

The printout, which is eventually made for all blocks, also contains line and column totals of amounts which will assist a clerk in tracking down out-of-balance conditions.

The technique which has been described considerably reduces the size of the file since the serial number for each check can be deduced and need not be recorded. The ratio of condensation is 30 to 10.1.

Reconciliation is performed for each block of checks. When any given block of checks is "flushed out" of the detail file (for later printing on form paper), each locator number "pocket" is examined and an "outstanding check" serial number is generated for each position which is blank. These outstanding serial numbers, along with the block totals, are recorded on an output reel of magnetic tape which is used later to update an Outstanding Master file. In subsequent weeks, when any of these outstanding checks arrive, they are processed through the Pay and Stop Pay run and the Detail File Maintenance run. They pass through the latter run and are written on an output tape which will be run against the file of outstanding numbers. There, they

will match up with previous outstanding serial numbers, thereby reducing the number of items carried in the system as "outstanding."

When the age of the block indicates that reconciliation is imminent, the computer is programmed to cause the remaining outstanding check serial numbers, in the case of non-tape accounts, to be punched out on mark-sense type punch cards. These cards are routed to a reconciliation clerk who has on file the original issue list submitted by the disbursing officer. This issue list contains the check serial number and amount for each check plus an amount total for each block. Each punch card is marked with the appropriate amount and this amount is subsequently automatically punched into the card. Such cards, now completed as to outstanding amounts, are converted to magnetic tape and are then reintroduced into the system. (The preceding steps are unnecessary of course for the "tape-accounts," as the amounts of outstanding items are preserved on tape as furnished by disbursing officer.) This technique has not only made it possible to reconcile each block of work in the system automatically, reporting out for investigation only those few blocks found to be out of balance, it also furnishes the advantage of future protection by immediately disclosing any straggler check received

that has been altered or raised in amount and which might otherwise remain undetected until such time as the block became overpaid.

During the entire process, amount totals at various levels and other accounting controls are continuously generated and compared to assure complete audit protection of the system.

SIGNIFICANT TECHNIQUES

In retrospect, the new system embodied some significant techniques which came about by "re-thinking" some of the procedures previously followed in terms of their objectives.

File locator number:

Probably the most significant technique in the new system is the file locator number shown in Fig. 1. This is a progressive number and is printed on each paid check and added to tape record by the card-to-tape converter. It may be viewed as the second serial number. This technique permits us to handle the checks only once and eliminates the necessity for sorting the documents by symbol and serial number. Under previous procedures they were handled 15 to

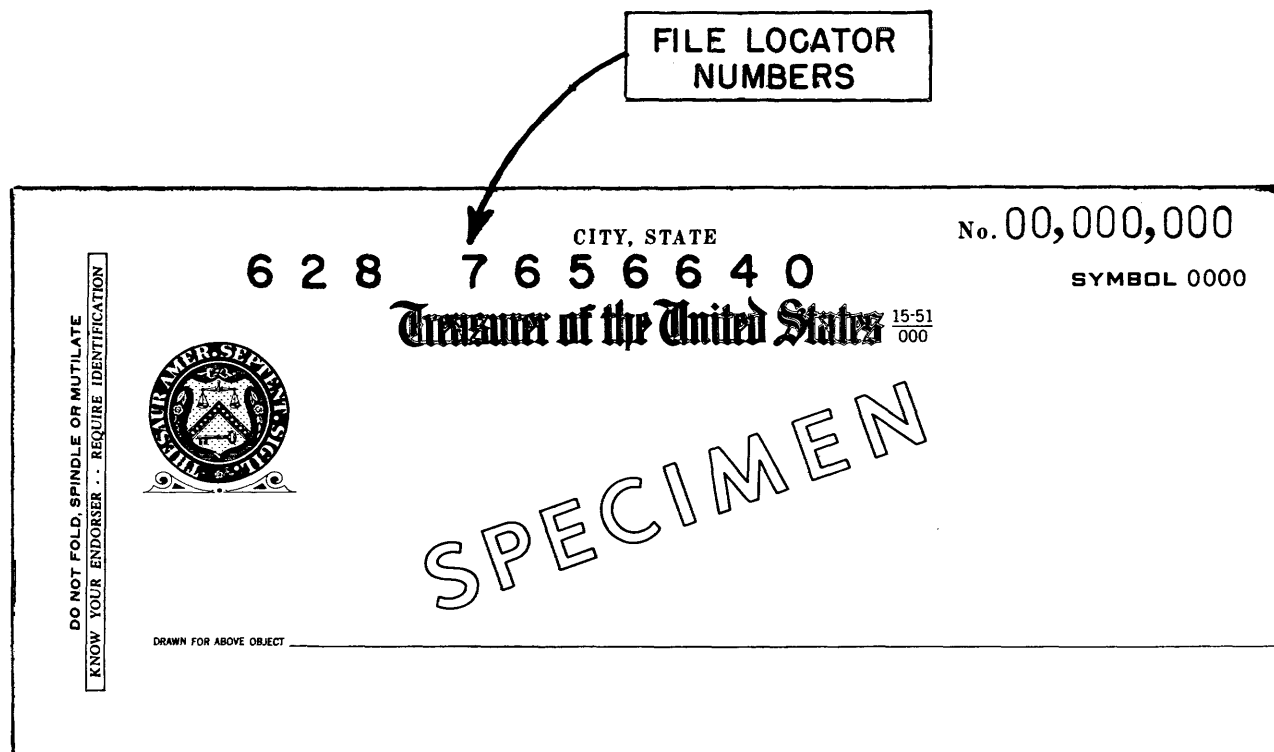


Figure 1. File locator numbers.

20 times during the payment and reconciliation functions.

Elimination of sorting checks:

Historically speaking, it was always necessary under previous procedure to physically sort paid checks at least in order by disbursing officer to obtain the total amount of payments to be posted to the drawer's account. In view of the large volume of government checks, particularly in some disbursing accounts, it was necessary to further arrange the paid checks for each drawer in serial number sequence. The arrangement in serial number sequence was required to facilitate reconciliation of paid checks with issue records and to provide a basis to locate paid checks subject to claim of non-receipt by the payee.

Each working day about 2,000 claims (stop payments) are received which require an examination of the subject check (if previously paid) to determine whether an investigation of forgery is to be made by the Secret Service.

Again the use of the file locator number eliminated the necessity for sorting paid checks in sequence by drawer's account and check serial number which represents 12 digits of numerical information for

each record. It is interesting to note that at the time of conversion in 1956 there were more than 150 numerical card sorters used for this purpose.

Construction of master file:

The master file of paid checks on tape has been designed to record each paid check in a matrix format which is illustrated by a sample print out on Fig. 2. The "matrix" permits reduction of about 66 percent of the numerical digits comprising each paid check record obtained from the card-to-tape conversion. More specifically, originally each paid check record is represented by 30 digits of numerical information. When filed in the (matrix) master file of paid checks each record requires an average of 10 plus numerical digits.

One will observe that what has been accomplished is the elimination of repeating the (1) disbursing officer's account symbol, (2) check serial number, and (3) individual amount. Again, the file locator number, which is recorded in prepositioned spaces on the master tape depending on the check serial number, is the factor which permits this substantial reduction in the number of required digits of data.

In brief, the file locator number technique is un-

RECONCILIATION STATEMENT											
ISSUED:		D/O SYMBOL	BLOCK	DATE OF ISSUE		AMOUNT	DATE		LIST NO.		
		3000	12345	09 - 55		\$10,000.00					
		3000	12345	10 - 55		\$9,550.00					
				TOTAL:		\$19,550.00					
	00	127 7290483	399 9890497	399 8909271	399 8908301	399 8903812	127 3001493	127 3009556	399 8903785	399 9007983	\$ 1,119.62
	01	127 3000834	127 2907392	127 3006983	127 2908134	127 2908422	399 9006895	127 3005619	399 9007038	127 3003395	198.90
	02	127 3001503	127 3002025	399 9007026	127 3000444	127 2908567	127 3004387	127 3002485	399 8904945	399 8905597	307.53
	03	399 9001439	399 8908263	127 3006358	399 8908593	127 3009642	399 8908243	399 9001423	127 3004687	127 3000602	1,608.06
	04	127 3003442	127 3004765	399 8904652	399 8904711	127 3009164	127 3003175	127 3006573	127 3008013	399 9002613	203.09
	05	399 8908788	399 8901453	127 3003764	127 3006375	399 9002158	127 3001168	399 8909203	127 3001175	399 8904799	144.14
	06	127 2902604	399 8905498	127 3005483	399 8905484	399 9008379	127 3007834	127 3009203	399 9002911	399 9008457	786.48
	07	127 3009347	127 3005496	127 3005678	399 8907768	399 8909673	399 8905511	127 3009377	399 8905523	399 9008356	414.79
	08	399 8909216	399 9009347	399 9002166	127 3006063	399 8905501	399 8908312	127 3009366	399 8907993	399 9008341	318.56
	09	399 9000485	127 3000526	399 9009729	127 3001013	127 3001655	399 8900766	399 8909288	399 9002333	399 9007434	122.44
	TOTALS	\$ 442.21	\$ 568.13	\$ 815.86	\$ 846.87	\$ 414.41	\$ 803.02	\$ 608.06	\$ 357.03	\$ 98.91	\$ 269.11
	10	399 8901784	399 9008356	399 8901772	127 3006895	127 3002739	399 9008746	399 8908911	127 3001678	127 3000573	127 3005077
	11	127 3002315	127 3005555	127 2908543	399 9006926	399 9008214	399 9008367	127 3005048	127 3009198	127 3003285	399 8909682
	12	399 8908435	399 9008398	127 3000596	127 3000611	127 3005505	399 8905195	399 8907776	399 8908673	127 3000586	127 3003934
	13	127 3004746	399 8905534	399 8907712	399 8904975	127 3007651	127 3000103	127 2907966	399 8908934	399 8905897	127 3006369
	14	127 3001026	399 8908172	399 9009279	127 3009523	127 3006597	127 3008715	399 8907378	399 9000496	127 3006973	127 3004580
	15	399 8909187	399 8905888	399 9001467	127 3003772	399 9007016	399 9006912	127 3001294	399 9000885	127 3000885	127 3000885
	16	399 9008401	399 8905182	127 3003417	127 3006003	399 9000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885
	17	127 3004735	127 3005976	399 9000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885
	18	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885	127 3000885
	TOTALS	\$ 282.72	\$ 50.42	\$ 226.95	\$ 226.81	\$ 359.13	\$ 222.32	\$ 686.53	\$ 380.33	\$ 200.00	\$ 300.00
	GR. TOTALS	\$ 13,550.00	\$ 13,571.00	\$ 679.00							

Figure 2. Printout of master file matrix.

doubtedly the most significant factor in the entire process and its use has been the major factor in realizing very substantial economies in operations.

EFFECT ON EMPLOYMENT

Probably no single change in procedure involving a simple repetitive operation ever had as large an impact on organization and employment in the Federal government as the introduction of an electronic data processing system for the payment and reconciliation of checks. Once the recommendation was approved to use the electronic data processing method, our problems in personnel became very real.

More than 50 percent (net) of personnel required under previous procedures was eliminated. The new function required testing, selecting, and training of employees for the new system. In order to place the personnel, whose services were not required under the new plan of operation, a program of testing and retraining employees for other types of employment was carried out over a period of more than a year.

Among many questions which faced us, were—How were we to obtain qualified programmers and console operators? Where would we relocate the majority of our people whose positions were being abolished by the installation of the electronic data processing equipment? In the event we could not produce sufficient qualified programmers, to what sources would we go? To what extent should we go in attempting to train some of our people in other lines of work? What was to be an adequate rate of pay for programmers and operators? You must bear in mind that until this time there had been no positive reason for us to be concerned with the potential of our employees in other than non-technical types of work. A great many of our people had been with us since World War I and over the years had advanced to higher graded clerical and administrative types of positions which did not require, in most instances, formal education beyond high school nor aptitude for scientific type positions. Briefly, they composed the nucleus of dependable public servants who were dedicated to the performance of their jobs in an efficient manner.

Our first order of business was to determine who of our employees were considered potential programmers and console operators. By memorandum, an invitation was made to employees in the Check Payment Division of the Treasurer's Office and the

Check Reconciliation Branch of the General Accounting Office to qualify for training as programmers and console operators. A battery of aptitude tests which consisted of arithmetic reasoning, association of symbols, etc., was administered to 82 employees of the Check Payment Division and 130 employees of the General Accounting Office. Of this group, 24 (8 from Treasurer's Office, 16 from General Accounting Office) were selected for training. Since we were unable to obtain a sufficient number of employees to send to Programming School from the immediate areas affected by the conversion program, an invitation was extended to employees in other areas of the Treasurer's Office and the General Accounting Office to take the aptitude test. 95 additional employees of the Treasurer's Office took the test, 7 being selected for training. 37 employees of the General Accounting Office took the aptitude test and 10 were selected for training. At this point, supervisory evaluations were obtained on each employee who passed the aptitude test which developed such information as their dependability, attitude, ability to work under constant pressure, ability to accept frequent changes in assignments, etc.

Personal interviews were held between applicants and operating officials during which the applicants were apprised of the difficulties under which they would work, the rigid deadlines, strenuous training sessions, prolonged and indefinite periods of overtime, etc., so that those who were inclined would have an opportunity to withdraw from competition. Arrangements for the training were made with the manufacturer of the data processing equipment to give a four-to-six week intensive course in the fundamentals of programming. Two identical courses were given to the selected employees, 20 employees attending the first course and 21 the second. Of the 41 participants, 18 made acceptable marks. Weekly progress reports were furnished by the instructors indicating those employees who should be withdrawn because of an inability to grasp the fundamentals of programming, those employees who should be continued in the programming field, and those who would better serve in the capacity of console operators. Upon completion of their intensive training the successful candidates were immediately assigned to develop phases of basic programs including the introduction of their programs into the electronic data processing system so that as many weaknesses as possible would be eliminated before the conversion was effected.

During the period when our programmers and console operators were being trained by the manufacturer, we were concerned with the problem of establishing the organization, developing job descriptions and classifying the positions, which in effect determines the salaries to be paid for specific duties. Since the Treasurer's Office was a pioneer in this field in Government, we actually had very little to work with in the way of precedents for determining salaries. For the benefit of those not familiar with personnel regulations pertaining to Federal Government, it should be explained that in most series or categories such as accountants, stenographers, tabulating equipment operators, claims examiners, etc., guide lines known as Classification Standards are promulgated by the Civil Service Commission. These standards which define responsibilities of work at each grade level are used as a means of evaluating the duties of a particular position under consideration in order to arrive at a proper grade classification.

At the time we were developing the job descriptions for our programmers and console operators there were no Class Standards for the series to which we would allocate these positions. This greatly increased the problem because we were entering the area about which we knew relatively little and, therefore, were hampered in our attempt to be objective in determining grade values. Our classifiers visited one or two existing small installations but received little assistance because the programming in those installations was being performed by operating officials, which was not in our plan. We evaluated the quality of the duties against the quality of comparable duties in other series such as Methods Examiners, for which standards existed, and determined what we considered to be adequate grade evaluations for our positions. Interestingly enough, the Civil Service Commission subsequently has issued Class Standards for these series and to a great extent incorporated the duties of our positions as typical at the various grade levels to which we assigned them. Our job descriptions have channeled into about every Government agency which either plans to install electronic data processing equipment or has such an operation now in effect.

In the latter part of 1956, as the need for additional qualified employees developed in the electronic data processing operations, invitations were issued again to all employees of the Office of the Treasurer who were interested in being considered for posi-

tions in electronic operations. Seventy-eight employees took the aptitude tests and 16 were selected to attend four weeks of formal training. Upon completion of this training, 7 were reassigned to electronic operations.

In the middle of 1958, a further attempt was made to determine those employees in the Office of the Treasurer who were interested in receiving training in electronic operations. Sixty employees made application, 48 were given an aptitude test, 12 were considered on the basis of scores made in previous tests and a total of 20 was selected for training. Six employees made acceptable grades and were detailed to attend additional courses in programming.

Briefly, in the Treasury, 303 employees were tested for aptitude, 51 were selected for training and 15 successfully completed instructions and were assigned to electronic operations. Of the General Accounting Office personnel involved, 167 employees were tested, 26 selected for training, and 8 finally assigned to electronic operations.

In addition to the aptitude tests, it was mentioned that a supervisory evaluation was obtained on each employee tested; however, the aptitude test was the principal guide for selecting candidates to attend the classes of instruction in programming. Final selections of employees to become regular programmers or console operators were made on the additional basis of marks achieved in Programming School and satisfactory performance of programming duties on subsequent detail assignments.

Generally speaking, the use of the aptitude test as the main guide for selecting employees to receive training in electronic programming has been satisfactory. Our experience establishes the fact, however, that final selection of the employee for regular electronic operations should not be made until the employee has demonstrated acceptable completion of programming classes and progress while detailed to actual programming work. It is interesting to note that, based on our experience, a person who passes the aptitude test with an acceptable rating and has a good background in conventional tabulating operations appears to comprehend a little more quickly the problems inherent in developing computer programs. Another interesting fact is that a number of employees considered by their former supervisors as doing only a satisfactory job are among the best programmers we have developed.

In short, the experience of the Treasury in this matter leads to the conclusion that employees with

an aptitude for programming as indicated by acceptable scores achieved in this aptitude test, and who make acceptable marks in formal classes in programming and who show sufficient interest and effort on their part, have an excellent chance of becoming good electronic personnel.

Probably, the most difficult task we experienced was in translating or defining the requirements of the integrated check payment and reconciliation process to the personnel selected to program the job. It pointed up the necessity for systems people to describe proposed processes in much greater detail than had ever been required previously for conventional type of equipment.

Again for the benefit of those not familiar with Civil Service regulations, we are obliged to work within a framework of rules and regulations which protect the rights of employees to retention under certain conditions. When it is necessary to separate employees because of retrenchment, consolidation of functions, etc., a Federal agency must observe reduction-in-force procedures in determining which employees are to be released from employment. Usually, in private industry when a similar situation occurs, employees may be separated on the basis of seniority primarily, without regard to the type of appointment, veterans preference, etc. In Federal Service employees with a non-permanent type of appointment must be separated before non-veterans with permanent appointments and veterans with permanent appointments. This involves establishing various retention categories and within each category determining relative standing by length of service.

In order to avoid displacing any employees (which would necessitate following the procedure outlined above), we determined to exhaust every other possibility at our command.

First, we reviewed the files of all our employees and categorized them by specializations, i.e., accountants, correspondents, typists, clerks, tabulating equipment operators, etc., based on past training and qualifying experiences. As vacancies occurred within the Treasury first consideration was given to those qualifying for the specific vacancy. This resulted in the reassignment to permanent positions of several employees.

Next, a memorandum was addressed to employees in the Check Payment Division in grades GS-1, 2, and 3, whose positions were being affected by the installation of the electronic system, announcing a refresher course in typewriting for employees having

some basic typing knowledge. The offer for this course, conducted on the employee's own time, by one of our training assistants, brought in about 50 applications. Proficiency tests were given and approximately 30 employees were selected to participate in the course. About 26 participants improved their typing technique to the point that they passed typing examinations and were assigned to positions requiring trained typists or where a knowledge of typing was of value in the performance of the particular duties.

Perhaps in a way this conversion was a blessing in disguise to some of these people. For a number of years they had operated in positions which did not require them to use skills long forgotten and at a level perhaps below their ability. This training was, in effect, a challenge to them to prove what they could do and in some instances strengthened their self-confidence. There were several cases where, because of a lack of urgency, employees continued to perform a rather routine uninteresting clerical function, all the while within themselves harboring a feeling that they were not being used to their full capacity. Being faced with the necessity to qualify for other positions, their hidden talents came to light and resulted in placement in positions for which they are well suited. These employees apparently are contented in their present assignments.

As one reviews the pattern of organizational relationships and the organizational changes required to make possible a system for centralized electronic processing of over 500 million checks annually, it seems remarkable that it was accomplished. It could only have been accomplished by the fullest cooperative spirit of the personnel of many organizational units.

ORGANIZATIONAL EFFECTS

Organization structure is one of the more rigid aspects of administration. This is by reason that changes in such structure are infrequent in most organizations. However, adoption of an electronic data processing system requires basic changes in personnel and procedure which in turn necessitates change in the formal organization structure. Also, substantial changes in working relationships between organizational units must be anticipated. This is the lesson we have learned from the adoption of an EDPS for the payment and reconciliation of Treasury checks.

Principles covering the payment of checks by the Treasurer of the United States:

From the inception of the joint accounting improvement program, instituted by the Secretary of the Treasury, the Comptroller General of the United States, and the Director of the Bureau of the Budget in December 1947, one of the major fields of work has dealt with simplifying and improving procedures and operations relating to government disbursements and collections. A major segment in this area concerns the issuance, payment and reconciliation of more than 500 million checks drawn annually on the Treasurer of the United States by more than 2,000 government disbursing officers. While many improvements were made in the disbursements and collections area during the first few years of the program, it became apparent at an early date that there were real potentials for savings by integrating the check reconciliation operations performed by the General Accounting Office, as a function of external audit, with the payment operations of the Treasurer of the United States. This contemplated a reorganization of the payment function of the Office of the Treasurer of the United States in accordance with the following principles:

- a. It should be a function of accounting and internal control on the part of the Treasury Department, which is charged with disbursement and custody of the public funds, to effect a proof of checks paid in relation to the checks which are issued.
- b. The General Accounting Office, from the standpoint of its responsibilities in connection with accounting systems and independent audit, and the Treasury Department, from the standpoint of its operating responsibilities, should be in complete agreement on the procedures necessary to accomplish such proof of checks paid and the incorporation of these procedures into the accounting system of the Treasury Department as an integral part thereof.
- c. In the light of a revised system of accounting and internal control by the Treasury Department, it should be possible to eliminate the detailed reconciliation of checking accounts of disbursing officers as a function of *independent audit*, substituting therefor

reliance upon the effectiveness of internal control as reviewed in actual operation and the furnishing of such data as may be required for comprehensive audit purposes.

Centralization versus decentralization:

It is significant to record that while the study for installation of the new system was being conducted the predominant emphasis of the joint program to improve the accounting in the Federal Government was one of decentralization of accounting for management. At first glance it might appear that the centralization of check payment reconciliation operations was inconsistent with this general policy and trend. It might be, and has been, argued that reconciliation of disbursing accounts, which involves comparison of paid checks with issue records, is a basic element of internal control of the agency responsible for making the disbursements. Hence, it could be contended that paid checks should be sent back by the Treasurer of the United States (the government banker) to the agencies responsible for making disbursements for reconciliation of their disbursing accounts as a part of the internal control. Fundamental analysis of the problem, however, disclosed that the clerical work involved in handling the processing of paid checks at these diverse points would contribute nothing of substance to the real objectives for decentralizing accounting for management needs. On the contrary, by injecting necessity for the clerical effort involved, it would tend to becloud the real purpose of decentralization of accounting which should emphasize providing management, as a basis for decisions, with useful and reliable data with regard to the programmed and actual costs of the operations for which it is responsible and the effectiveness with which assigned responsibilities are being carried out.

Thus, the centralization of these vast clerical processes involved in the payment and reconciliation of Government checks cannot in any way be regarded as incompatible or inconsistent with the established policy and objective of decentralization of accounting for management. On the contrary, it has facilitated real decentralization in the light of its true purposes.

Impact on organizational structure:

The payment and reconciliation of checks directly involved the Treasury Department, the General Accounting Office and the Federal Reserve Banks.

About 1,575 persons were directly involved in prior operations for payment and reconciliation of checks in these agencies. Of this number about 1,175 were engaged in operations pertaining to the "payment" of checks in the Treasury Department and Federal Reserve Banks, and 400 were involved in processes pertaining to the "reconciliation" of checks in the General Accounting Office. Under the electronic data processing system, the processes of "paying" and "reconciling" checks were brought together in one integrated system in the Treasury Department with a reduction of about 50 percent in overall personnel requirements. This reduction was accomplished notwithstanding that volume has increased in the past decade by more than 60 percent. These data are reflected in Fig. 3.

It is significant to point out here that while there has thus been, in effect, a transfer of processes from the General Accounting Office to the Treasury, there has been no real transfer of functions. The General Accounting Office continues to audit and settle disbursing officers' accounts, based on reconciliations of checks paid against checks issued, and other factors. It has been, however, relieved of the necessity for going through the detailed work involved in reconciling individual paid checks against related check issue records, etc., since this is performed as one part of the integrated electronic payment and reconciliation operation in the Treasury Department. Assurance that adequate controls are built into the Treasury system, as a result of cooperative systems development work and periodic reviews of procedures in operation, provides the basis for eliminating the many detailed processes then performed in the General Accounting Office in connection with its function of auditing and settling disbursing officers' accounts.

It is thus obvious that this change in basic approach to the performance of functions and the related transfer of detailed operations, reduction of personnel and general change in procedure has had a very significant organizational impact on both the General Accounting Office and the Treasury Department. In the General Accounting Office it resulted in the complete elimination of large-scale mechanical operations (on conventional punched card equipment) for reconciling card checks as well as the clerical processing involved in reconciling paper checks. In the Treasurer's Office, where the new integrated operations were established, a complete reorganization was involved. In the Check Payment Division of the Office of the Treasurer of the United

States, the Bookkeeping Branch with 15 employees was eliminated; the Card Check Branch with 49 employees was eliminated; the Electric Accounting Branch was increased from 15 to 50 employees; the Examining Branch with 61 employees was eliminated; The Proving Branch with 69 employees was eliminated; the Reconciliation Branch with 7 employees was eliminated; the Sorting Branch with 44 employees was eliminated; and the Statement Branch with 82 employees was eliminated. However, several new branches were formed: Receiving Branch; Electronic Branch (Data Processing); a new Reconciliation Branch; Files Branch, Control Branch, and a Messenger Branch.

The organizational influence extended far beyond the Treasury Department and the General Accounting Office. For example, provision had to be made for significant and fundamental changes in the processing of government checks by the 12 Federal Reserve Banks and 24 branches. These changes were all in the general direction of simplification. Among other things, the new procedures made it possible to eliminate (1) transfers of various checks from one Federal Reserve Bank to another; (2) the sorting and arranging of checks according to disbursing accounts, serial number, etc.; and (3) the preparation of statements (including listings of paid checks) for various disbursing accounts. These changes stemmed from the fact that under the new procedures all checks are "paid" by the Treasurer of the United States at the central point, whereas under previous procedures most of them were "paid" by designated Federal Reserve Banks acting as agents for the Treasurer. This centralization of "payment" was made possible by use of the electronic data processing procedures for an integrated payment and reconciliation operation and would not have been feasible, because of the large volume involved, with techniques used in the late '40s.

Reorganization of procedures for the issuance of checks:

In order to install the new system, it was also necessary to deal with the problem of integrating the procedures for preparing the checks with the basic changes that had been worked out in the processing of the checks after they had been disbursed. While the procedural changes in this area were not great, they involved the procedures for 2,500 disbursing accounts, which are subject to the administrative control of about 75 Federal agencies. These include

OFFICE OF THE TREASURER, U.S.
PAYMENT AND RECONCILIATION OF CHECKS
AND
PROCESSING CHECK CLAIMS

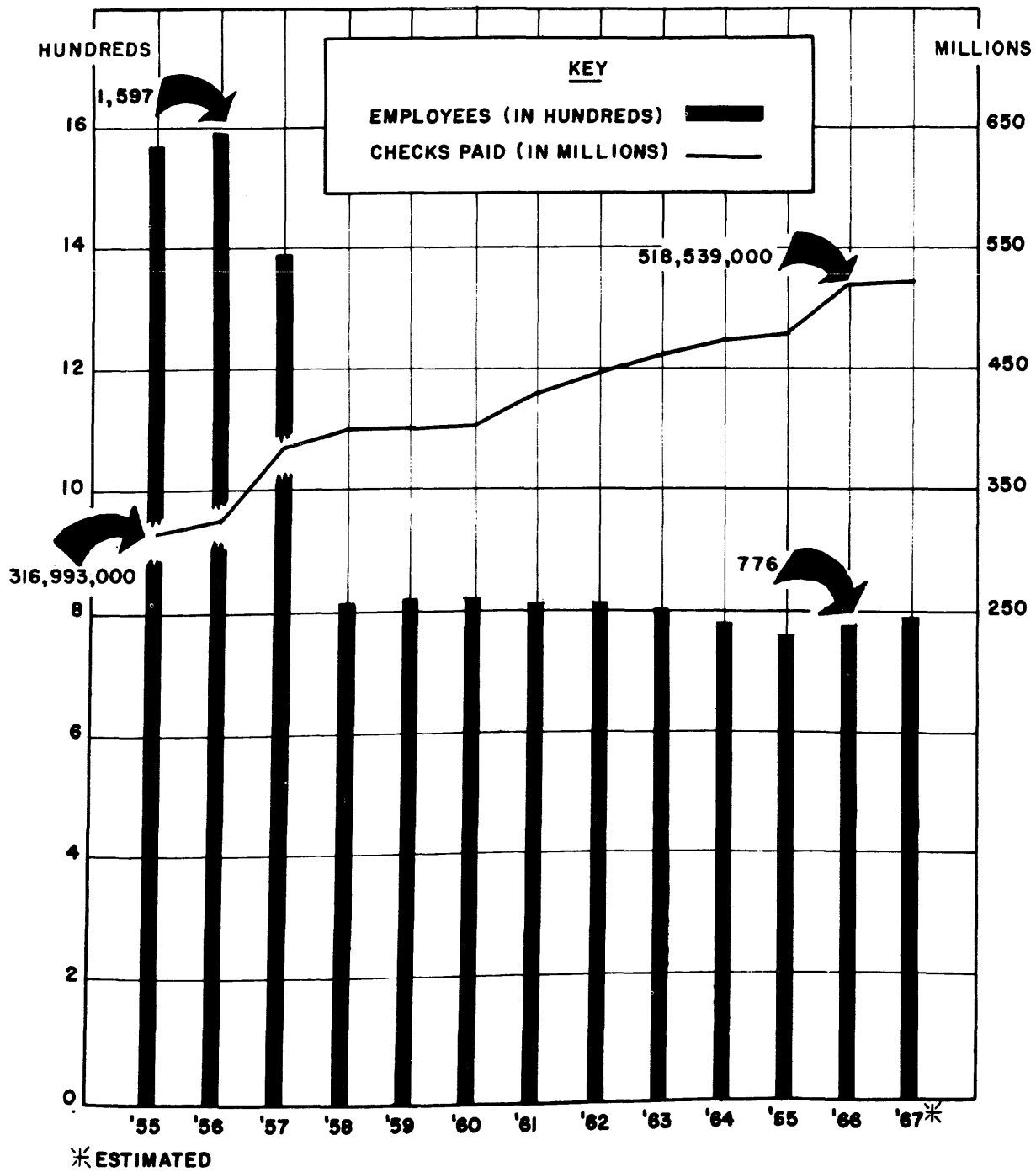


Figure 3. Personnel and volume data.

such far-flung activities as the disbursing accounts of Navy officers aboard ships, and Government officers drawing checks on the Treasurer of the United States in foreign countries.

A key problem in synchronizing check issuing procedures with the revamped procedures for processing checks after they have been disbursed relates to the procedures of those disbursing officers who had not been issuing checks in punched card form. For over four years, representatives of the joint accounting improvement program of the three central fiscal agencies in consultation with representatives of major disbursing agencies where checks were still being issued in paper form—the Department of Defense, the Post Office Department, and certain others—had been working on this problem from two points of view: first, to convert all issuing operations where it was feasible from the standpoint of volume and other considerations to the issuance of checks in fully punched form; secondly, to develop procedures which would permit mechanization in the processing of paid checks for those disbursing officers where it was impracticable to issue the checks in the first instance in fully punched form.

Very substantial progress was made in the first area in bringing about conversion of paper checks to punched card checks. Between 1952 and 1955 an additional volume of about 33 million was converted from paper to fully punched card checks. In 1955 about 12.5 percent of the total number of checks issued was still in paper form. Incidentally, the cost for “paying” this 12.5 percent of the total checks was approximately 63 percent of the total appropriation to the Treasurer for “paying” all checks.

It is, of course, obvious that the electronic data processing procedures for paying and reconciling checks required a solution to the problem of getting the remaining 12.5 percent of paper checks into punched card form so that they would be compatible with the remaining checks. The problem was solved with the close cooperation of the Accounting and Check Subcommittee of the Federal Reserve System. Under the plan which was approved, all disbursing officers for whom it was impractical to install procedures for preparing checks in fully punched form issued a new form of card check which required no punching at the point of issue. From the point of view of the disbursing officer who issues the check, it is inscribed as to payee, amount, etc., as if it were a paper check. These checks are, however, pre-punched at the time of manufacture to identify the

serial number, disbursing office, and other constant information. The amounts are punched by Federal Reserve Banks when they receive the checks through the banking system during the course of their check clearance operations. Thus, when the checks are received at the central facility in the Office of the Treasurer of the United States for electronic processing for payment and reconciliation, they are completely compatible with all other punched card checks.

HARDWARE AND SOFTWARE EXPERIENCES

Early in 1953, the Secretary of the Treasury, the Comptroller General of the United States, and the Director of the Bureau of the Budget, designated representatives to serve as a joint government committee to study the feasibility of utilizing electronic equipment for a large accounting operation of the Federal government.

At the outset, the committee devoted its resources to making a comprehensive study of operations concerning the issuance, payment and reconciliation of the government checks with a view to making recommendations regarding:

1. The use of electronic data processing equipment for an integration of the check payment and reconciliation functions in the operations of Treasurer of the United States;
2. The manufacturer whose equipment is considered best suited for the proposed system; and
3. A course of action, including a timetable and financial factors.

The committee filed its report on September 1, 1955, recommending the use of EDP equipment to perform an integrated function of paying and reconciling government checks within the Treasury Department. The report was approved on October 14, 1955, and the committee was requested to supervise the implementation of the recommended procedures with a view of beginning operations on July 1, 1956. In this connection, budgetary considerations made it desirable to install the recommended system at the beginning of a fiscal year. Perhaps it is appropriate at the outset of a discussion of our experiences in hardware and software to mention the fact that operations commenced on August 1, 1956. The delay of one month was the result of unforeseen problems

involving hardware, training, planning, and many other factors which were encountered in the first eight or nine months of implementing the program.

Request for Proposals:

In the solicitation of proposals, the Fiscal Assistant Secretary of the Treasury wrote a letter to all known manufacturers inviting them to attend a two-day symposium in the fall of 1953. In announcing the symposium, he set forth detailed specifications of present requirements and requested interested manufacturers to submit proposals contemplating the use of machines and components thereof presently being manufactured or under development. Proposals were received from the following:

International Business Machines Corporation
Radio Corporation of America
Raytheon Manufacturing Company
Remington Rand, Incorporated
Underwood Corporation

Criteria:

The committee, with technical advice from representatives of the National 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 vs. purchase
3. Direct labor requirements
4. Cost of supplies (tape, paper, etc.)
5. Maintenance and service requirements
6. Building specifications and cost of installation
7. Availability of equipment

Evaluation of proposals:

Each proposal was analyzed in detail by the committee, with technical advice from representatives of the National Bureau of Standards and the National Security Agency. Following this detailed analysis, the committee met on numerous occasions with representatives of each manufacturer to discuss in detail certain points of procedure. Early in the evaluation of the manufacturer's proposals, the committee adopted the position that "proprietary interests" would not be permitted from any manufacturer. On

the basis of these discussions, four of the five proposals received 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.

Selection:

The final selection of equipment was narrowed to two manufacturers. The proposal of the International Business Machines Corporation was built around a 705 configuration which resulted in an annual savings of about \$200,000 below the next highest competitor's proposal. Actual tests of live data were performed on both types of equipment and the committee was satisfied that from an operating standpoint either system could adequately do the job. This type of equipment was selected only after detailed evaluation of each of the five proposals received.

Changeover considerations:

The original machine procedures for the payment and reconciliation of checks which were designed around the IBM 705 computer did not differ much from those in use today. However, the demands on the equipment in time outgrew its capacity and processing was transferred to two newly-installed IBM 7070 computers. The two major considerations which led to this changeover to more powerful equipment were: the lack of computer reserve capacity and the increasing difficulties being encountered in servicing check inquiries which had grown to about 1,600 daily in the fall of 1960. Three months of the year, March through May, the IBM 705 computer was in operation three shifts a day, seven days a week, and the annual increase in check volume was about 4 percent. In fiscal 1961 the volume of checks processed was 440 million; in 1962 it ran approximately 458 million; (in 1966 was 520 million). With the IBM 705, the master files had to be split into halves because their volume exceeded machine capacity. Each half was serviced on alternate weekends and thus two weeks might elapse before a report could be furnished on the status of a particular check.

A third consideration was the possibility of savings since the estimates for the new equipment indicated that rental costs would be somewhat less, despite improvements in the quality and quantity of output. Even if additional costs had been involved, however, the first two considerations would probably have led

to a decision to make the change to more powerful equipment, provided, of course, the increased costs were reasonable in relation to the potential improvements.

In planning for the installation of new computers there was one requirement that was paramount: there could be no cessation of operations during the period required for the changeover. Absolute continuity was mandatory. It was obvious, therefore, that a different physical location would have to be found for the new computer system and with the cooperation of the General Services Administration this was arranged.

Programming considerations:

Past experience in programming 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 be converted, it was felt that not less than three 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 for a period of several months. It is fortunate that this approach was taken, since it is now clear that a less conservative one would have led to rather serious difficulties.

At the time the decision was reached to make a changeover to more powerful equipment, the computer system in operation included several thousand reels of magnetic tape, a battery of specialized peripheral equipment and huge master files containing live data. It was most important, therefore, that the new computer system be compatible with the old one, particularly in regard to input and output tape requirements. Initially it was decided to update the system with an IBM 705, Model 3, which would provide urgently needed reserve capacity and at the same time afford an opportunity for improved check-claims servicing. Four months later, after about 40 percent of the programming for the IBM 705, Model 3, had been completed, the new IBM 7070 was announced. The 7070 is a fixed-word-length computer in contrast to the variable-word IBM 705 series computers. To switch to the IBM 7070 required some re-education of the programming staff, systems analysts and a number of the operating personnel. By ordering two of the IBM 7070 computers, not only

could sizable savings be effected but it would be possible to keep workload current by doubling the workload on one computer if the other were down for extensive repair.

Conversion of programming:

The check payment and reconciliation operations in the Office of the Treasurer require six major programs for the IBM 7070s—none of less than one hour duration on the computer—and six major programs for the IBM 1401. Initially programming responsibilities were divided between two lead analysts. One assumed control over the three programs involving Federal Reserve Bank balances, the clearance of checks against the ledger and the stop-payment file, while the other supervised the file maintenance operation—the merging and updating of the main check file and the updating of the outstanding file. The programming effort for the IBM 1401 was also equally divided. Due to the fact that system analysts and programmers were faced with not one but two new computer systems, these responsibilities were realigned as soon as the testing stage was reached to give supervision of the 7070 programs to one and supervision of the 1401 programs to the other.

Program aids provided by the manufacturer proved very helpful in the conversion of the previous IBM 705 programming. One outstanding example is the standard Input-Output-Control-System package program, called IOCS. This standard program contains all of the instructions needed to read and write tape records, including: routines for handling errors; end-of-file and end-of-job routines; tape-labeling routines; and check-point and restart routines. These thoroughly-tested instructions comprise about 40 percent of those required in most large programs and may represent as much as 60 to 80 percent of some. Their use not only enabled the programming staff to devote more time to the other areas but provided a standard input and output routine for all programming. Standard routines also simplified the console operations.

In the programming conversion, the search for the most efficient programs was extremely thorough. When two million checks are processed daily, and this was a normal volume during the income-tax refund period, there is a daily total of 58 million operations. The records are read from tape into the computer ten times, processed ten times, and written from the computer onto output tape nine times—a

total of 58 million operations. If only 144 micro-seconds per operation were saved in each program, about \$4,800 would be saved yearly. Since each of the six major programs has from 4,000 to 8,400 instructions, the potential for savings was quite substantial. We used symbolic language throughout all of our programs.

Conversion lessons:

On the whole, the conversion undertaken in the Office of the Treasurer of the United States to change electronic processing from IBM 705s to IBM 7070s and an IBM 1401 was extremely interesting and highly satisfying. From the experience gained in this undertaking it can be said that anyone concerned with the conversion of a computer system would do well to consider:

1. Teaming an inexperienced or newly-trained programmer with an experienced programmer.
2. Giving careful consideration to master-file conversion programs.
3. Using good personnel on all assignments.
4. Guarding against overeagerness to test the new computer.
5. Allowing the engineers ample time to check the equipment thoroughly before taking over.
6. Spending as much time as possible in checking programs before actual machine testing is begun.
7. Planning parallel test runs to include as much volume as possible.
8. Providing generous allotments of time in planning conversion schedules—unforeseen problems do arise and machine failures on new equipment must be expected.
9. Using packaged programs furnished by the computer manufacturer and assigning a programmer to familiarize himself with each—they should become experts in order to see that the systems function properly and are currently maintained.
10. Avoiding undue overtime for any additional programmer—a tired programmer can cause much damage.
11. Having the machine testing controlled by one person who is made responsible for scheduling on a priority basis and for coordinating all operations.
12. Verifying the results of the parallel operation in minute detail—overlooking a seemingly minor detail may be costly.

PROCESSING POSTAL MONEY ORDERS

The Treasurer's electronic data processing facilities are also being used to service the Post Office Department's money order operations, on a reimbursable basis. This program involves the use of procedures and techniques which are quite similar to those described for the check payment and reconciliation operation. A major variation, however, is that the accounts of some 35,000 postmasters are involved, who issue approximately 210 million money orders annually. Our review indicates that about \$750 thousand is being saved on a recurring annual basis through implementation of this plan.

A LOOK INTO THE FUTURE

I have devoted considerable time to discussing the past and present systems for payment and reconciliation of government checks. Perhaps a peek into the future would be helpful. One might ask "How can you improve the present system?" Certainly we can't eliminate the one remaining handling. If we could, we wouldn't need checks at all. I'm sure you all have heard or read about the no check—no cash economy—or—the universal credit system. Much already has been written and much more will be. The day may come when we can eliminate or practically eliminate checks.

Undoubtedly, the technology to develop a universal credit system is available today. Whether such a system could be justified from an economic standpoint today or ever is another question. In order to explore the question of economic justification, one must first determine who among the users stands to benefit economically from a universal credit system. The users are merchants, banks, and customers. The benefit to customers is debatable when compared to today's credit system. Sure, it would eliminate the necessity for him to write checks, but at the cost of immediate loss of cash in his "no check" account at his bank. Of course, if the system provided for automatic overdraft coverage by the bank at an agreed rate of interest, the customer would pay a carrying charge (to the bank) for many purchases which are interest free to him inasmuch as he now pays by

check some time after he has deposited funds to cover such payments.

It will be contended that the immediate availability of credit will bring the merchants' prices down and the customer will benefit from reduced prices. This probably would be true if the system were truly universal and used by everyone. In other words, all merchants would be on a cash basis if immediate charge were made to the customer's bank account. I would, however, remind you we haven't yet considered the cost for this super network of communications linking millions of input-output gadgets. It looks as though customers would not benefit economically, at least the initial studies do not demonstrate that it would have any immediate economic value to customers.

The other users of such a system are merchants and banks. Both of these users have a motivation (profit) to the establishment of such a system. However, in the final analysis the customer's desire in the matter will prevail. I suggest that he will, at the outset, have the option to be billed monthly as at present or automatically to his bank. Bank billing may be daily or periodically. If these basic assumptions are correct, it would appear that a universal credit system will emerge only when the cost of operations is not prohibitive. Assuming that a system could be devised which would be profitable for the owners, the question then is "Who would be the owners?" Either banks or merchants or perhaps both. Will there be competitive systems similar to those in existence today or will there be a single one? Many questions are still unanswered and much more study must be given before we see the real beginning of a universal credit system.

Perhaps there may be something more important than the profit angle. I have in mind that any such study should possibly consider whether the government should operate such a system with eventual ownership passing to the public. I am not advocating government ownership. I am merely suggesting that consideration be given to such an arrangement. The government certainly has a major interest in credit and monetary policies of the country. I would suggest, in closing, that the establishment of a universal credit system will pose a lot of questions and problems with which the government has a concern.

Regardless of who owns and operates the system the initial step is to agree on the method of identification. The social security number, with the addition of a self-checking digit assigned at the time of birth, seems to me a basic requirement if we are ever going

to have a no check—no cash economy. If this step is not forthcoming, then I fear we will continue to romance with the idea. Both within and outside the government, this idea will continue to require study, research and development.

APPENDIX A

GENERAL OUTLINE OF PREVIOUS PROCEDURES

The following outline is a generalization of the principles observed in the Federal Government prior to adoption of the electronic system for the payment and reconciliation of Government checks.

The Treasurer of the U. S.:

In the Federal Government, the Treasurer of the United States occupies the same relative position in relation to an authorized government disbursing officer as the bank does, to the holder of a commercial or personal checking account in the business world. Checking accounts are established on the books of the Treasurer of the United States for those individuals who are authorized by their respective government agencies to make disbursements of government funds. Checks drawn by these individuals are "paid" only after they have been examined by the Treasurer's Office and charged against the appropriate checking account on substantially the same basis as checks paid by a commercial bank.

Issuance of checks:

Checks drawn against the Treasurer of the United States can only be issued by authorized "disbursing officers." For the greater majority of civilian agencies the issuance of checks is performed by another organizational unit of the Treasury Department—the Division of Disbursement. This Division maintains regional offices throughout the country where checks are issued on the basis of certified vouchers submitted by the agencies which incurred the obligations for which the payments are made. In the military departments and certain civilian agencies the disbursing officers are attached to the operating agencies which incur the liabilities which give rise to the payments. Such disbursing officers are located throughout the world but for each a checking account is established on the books of the Treasurer of the United States and all checks drawn by such officers are ultimately

charged against such accounts in the process of "payment." In all, about 2,400 checking accounts are maintained on the books of the Treasurer of the United States.

Each authorized disbursing officer is provided with an appropriate stock of blank checks, each of which carries the designation "TREASURER OF THE U.S." (at the place where the name of the bank usually appears on a commercial check). The checks also indicate in each case the disbursing symbol (identifying number) of the checking account on the books of the Treasurer of the United States against which the checks will be drawn. Most government checks were issued in punched card form (about 300 million out of a total of 350 million a year). Such checks were normally pre-punched at the time of manufacture with the disbursing officer's checking account number and the identifying serial number of the check. During the process of issue the amount and date of issue (and in some cases certain reference information relating to the disbursement) were punched into the check in addition to being inscribed on the face. Prior to installation of the new system, where it was impracticable or uneconomical (by reason of low volume or otherwise) to install punched card equipment at the check issue points, conventional paper checks were issued.

Basis of control over check-issuing operations:

The following is a brief summary of the principal features of the general plan of control over check-issuing operations which are important from the standpoint of a general understanding of the controls surrounding the check issuance, payment and reconciliation processes in the Federal Government:

- a. The disbursing officer is held accountable for all blank check stock with which he is supplied. That is, he is required to control the use of his stock, and make periodic accountability reports (which are subject to both internal and external audit), so that he can account for all check stock received as either (1) issued, (2) canceled or spoiled, or (3) on hand.
- b. The disbursing officer is required to support all checks issued by vouchers approved by an authorized "certifying officer" of the agency for whom he makes the disbursement, and his accountability for issuance of checks is determined on that basis. In this connection he prepares a monthly report (commonly referred to as his "Account Current") which shows, among other things, the total (supported by a listing) of (1) the checks issued (usually a copy of a machine

run showing check number and amount) and (2) the total of the certified vouchers he has as authority for such disbursements supported by the originals of the "certified" vouchers on the basis of which he made the payments. The procedures established for (1) controlling the "certifying officer" (i.e., with respect to the underlying legality, propriety, etc., of the authorization for the disbursement represented by the voucher) and (2) the comparison of the disbursing officer's record of checks issued with the related authorizing vouchers are beyond the scope of this discussion. We are concerned here with the procedures involved in the final step in the control of the disbursement process—i.e., proving through appropriate "reconciliation" procedures that the checks as actually "paid" are in agreement and reconciliation (through development of outstanding checks, etc.) with the checks reported by the accountable disbursing officers as having been issued and pinning down responsibility for any discrepancies.

General flow of government checks through commercial channels:

Checks when issued are normally mailed directly by disbursing officers to the payees indicated. From the payees they, of course, find their way through normal business channels to a commercial bank. The commercial bank in turn sends the checks it receives to an authorized government depository (normally a Federal Reserve Bank). The Treasurer of the United States maintains funds on deposit (in an account known as the "Treasurer's General Account") at each of the thirty-six Federal Reserve Banks against which the checks can be charged as a basis for enabling the Federal Reserve Bank to extend immediate credit to the remitting commercial bank. The Federal Reserve Bank then sends the checks for "payment" to the Treasurer of the United States.

Former decentralization of "payment" function:

Due to the large volume of work involved (well over an average of a million checks a day), the Treasurer of the United States found it necessary under procedures previously followed to decentralize the "payment" function so that this large work load could be distributed to a number of different places. This was accomplished by designating various Federal Reserve Banks as her "paying agent" for specific checking accounts. Under this arrangement each Federal Reserve Bank maintained the accounts and per-

formed the related “paying” functions for a designated group of checking accounts. All checks drawn on such accounts carried, in addition to the Treasurer of the U. S. designation, the legend “Payable Through Federal Reserve Bank of ———.” Under this general arrangement, each Federal Reserve Bank was required each day to sort the Treasury checks it received from commercial banks according to the checking accounts against which they were drawn as a basis for enabling it to send them to the proper point of “payment” (sorting of punched card checks was, of course, done by machine; paper checks by hand). Those drawn on checking accounts for which the receiving Federal Reserve Bank was itself the paying agent were, of course, retained by the Federal Reserve Bank to which they were sent by the commercial bank. Checks drawn on other checking accounts for which other Federal Reserve Banks, or the Treasurer of the United States in Washington, were the designated points of payment were forwarded to such points. All checks received by each Federal Reserve Bank (or the Treasurer of the United States)—whether direct from commercial banks or from other Federal Reserve Banks—were combined for processing through the “payment” procedures outlined below.

Former “Payment” Procedure:

The following are the principal elements of the “payment” procedures as previously followed by the Federal Reserve Banks or the Treasurer of the United States for checks drawn on the checking accounts for which they were the responsible paying agents:

- a. All checks were sorted by serial number within the checking account symbol against which they were drawn (by machine in case of punched card checks; manually in case of paper checks).
- b. Active “stop-payment” notices were checked against the checks presented for payment by serial number and any checks thus intercepted returned through banking channels to the remitting bank.
- c. Checks were examined for genuineness of drawer’s signature, evidence of alteration, etc.
- d. Checks in order for payment were listed (by tabulating machine in case of

punched card checks and adding machine in case of paper checks) and related totals developed for posting to the checking account. This list served as support for the statement of the checking account (comparable to the customary bank statement of a commercial bank). It showed both the identifying serial number and amount of each check and was used for reference purposes for handling inquiries regarding claims of non-receipt of checks by payees and related requests for stop-payment, issuance of duplicate checks, etc.

Former Procedure for Reconciliation of Checking Accounts:

As in commercial practice, paid checks and related statements of checking accounts were sent from the point of payment (the bank in private business; the Treasurer of the United States or the paying Federal Reserve Bank in the Federal Government) to the point where a reconciliation of the statement could be effected with the corresponding records of checks issued. In business this is generally done in the accounting department of the business whose checking account is involved. Such reconciliation is, of course, subsequently reviewed as a part of whatever independent audit is conducted of the firm’s books as one phase of the review of internal checks and controls. In the Federal Government this reconciliation was heretofore performed centrally directly by the auditing agency—the General Accounting Office—as a part of its responsibilities for auditing and settling disbursing officers’ accounts for their accountability for proper disbursement of government funds. The extensive use of punched card checks made it possible to place a substantial portion of these operations on a highly mechanized, mass-production basis with the use of conventional punched card equipment. The reconciliation was ordinarily performed about three months after the close of the month of issue (at which time there were normally very few outstanding checks). The monthly statement of disbursing officers’ accountability (referred to in paragraph 3b) and which is supported by lists (i.e., usually copies of machine runs) of checks issued formed the basis for reconciling the statements of the paying agency (i.e., the Treasurer of the United States or her agent Federal Reserve Bank) with the

accountability records of the disbursing officer who issued the checks. Statements of differences, etc., developed during the course of these reconciliations, lists of outstanding checks (for reference use in processing claims for duplicates, requests for stop-payment, etc.) were supplied the issuing and paying agencies and appropriate adjustments effected.

Relationship of checking account reconciliation to other control and audit processes:

This paper deals only with the check payment and reconciliation processes. It is obvious, however, that these processes are but a small part of the total and much broader problem of control and audit of financial operations. In recent years the emphasis in the Federal Government has been on providing effective internal controls over all financial operations in the accounting systems and related procedures of the individual responsible operating agencies. External audit by the General Accounting Office is to a constantly increasing extent performed on the basis of a review of such internal controls and selective examination of individual transactions—employing much the same basic approach used by public accounting firms in the audit of commercial enterprises. The central reconciliation of checking accounts is, of course, readily coordinated with this broader audit (through the monthly accountability report of the disbursing officer) and avoids the necessity for much detailed clerical work at the sites of operation.

APPENDIX B

SYNOPSIS AND COST ANALYSIS OF EDP PROGRAM IN THE OFFICE OF THE TREASURER, UNITED STATES

In June of 1953, a committee was established, composed of representatives of the Bureau of the Budget, General Accounting Office, and Treasury Department, to study the feasibility of using electronic equipment for handling Government checks. Sixteen manufacturers of electronic equipment with the required capacity potential were requested to submit proposals, including the cost of equipment recommended. Proposals were received from five manufacturers and selection of equipment was made on the basis of comparative costs.

Conversion of check payment and reconciliation operations to the electronic system was started in August 1956 and completed in January 1958. Be-

fore conversion to the new system the committee estimated there would be an annual recurring savings of \$2.2 million. A comparison of costs for fiscal year 1959, the first complete year of operation under the new system, with costs under the old system in 1956, showed an annual recurring savings of \$2.9 million.

In March 1960, the Post Office and Treasury Departments initiated a study to determine the feasibility of expanding the electronic facilities in the Treasurer's Office to provide for processing postal money orders. Conversion of the money order operation to the electronic system was started in June 1962 and completed in April 1963. This resulted in additional savings to the Government of \$750,000 annually.

With the approval of the House and Senate Appropriations Subcommittees, a capital investment of \$2½ million was made during fiscal years 1963 and 1964 to purchase the electronic equipment. After recovery of this capital investment, which will occur this year, an additional annual savings of \$900,000 will be realized as a result of purchasing the equipment compared to what it would have cost to rent the equipment.

At the present time, the existing electronic system is considered adequate to meet the needs of this office in the foreseeable future. However, our representatives attend meetings at which are demonstrated advances in electronic machines and techniques of different manufacturers. Thus far, nothing has been developed which would improve our existing system in terms of service or cost, but we will continue these appraisals.

SHARING EDP EQUIPMENT

Amortization costs recovered from other bureaus and agencies for the use of our purchased equipment from July 1, 1962, through December 31, 1965—amounts recovered and deposited to the general fund as miscellaneous receipts are shown in Table I.

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The success of this application, embodying numerous technologies, is the result of the dedicated effort of many individuals. To these individuals the author extends his sincere appreciation. I wish to also acknowledge the contribution of Professor Walter Frese of the Harvard Graduate School of Business Administration who as Head of the Accounting Systems Division of the General Accounting Office was large-

Table I

Bureau or Agency	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966 through Dec. '65
Post Office Department	\$37,000	\$151,219	\$168,416	\$80,400
Agriculture Department	17,841	53,615	61,286	14,848
Railroad Retirement Board	3,200	5,801	6,604	3,200
Federal Reserve Board	—	83	2,575	—
Labor Department ..	5,433	—	247	—
Veterans Administra- tion	50	5	—	—
Navy Department ...	17	—	—	—
Treasury Department:				
Internal Revenue Service	2,358	1,135	1,688	—
Bureau of Public Debt	—	505	700	—
Bureau of Accounts	—	440	634	—
Office of the Secretary	—	343	328	—
Office of Interna- national Affairs .	—	170	203	—
Comptroller of Currency	—	—	5	—
Total	\$65,899	\$213,316	\$242,686	\$98,448

ly responsible for organizing the original study. His counsel to the committee was a major contribution to the success of the study.

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