

**TRANSACTIONS OF SOCIETY OF ACTUARIES
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**DIGEST OF SPECIAL PRESENTATION BY THE COM-
MITTEE ON NEW RECORDING MEANS
AND COMPUTING DEVICES**

**ADAPTATIONS OF ELECTRONIC MACHINES TO
LIFE INSURANCE OPERATIONS**

MR. MALVIN E. DAVIS introduced this presentation by saying that a great deal of progress had occurred in the development of electronic machinery suitable for business use. Electronic computers can now be regarded as sufficiently reliable and versatile to be used effectively in day-to-day office work of an insurance company. Available electronic computers do not yet do certain operations as well as is desired, but their importance as complete procedure applicers overrides such limitations by a wide margin. One of their shortcomings is their inability to sort much more economically than is possible with the regular line of punched card equipment. Another is their inability to manage on an economical basis the automatic maintenance of policy files. These limitations may be somewhat exaggerated, however, because certain studies suggest that substantial gains can be achieved with machinery which does not include much in the way of improved filing and sorting facilities.

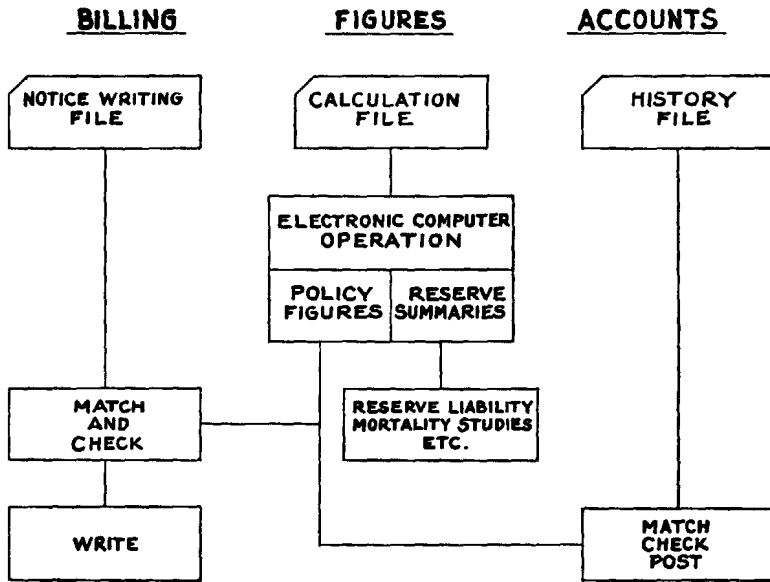
To use electronic computers effectively in insurance work, some far-reaching changes in current-day methods and organizations appear necessary. The industry-wide development of such changes can probably best be promoted by continuous reporting on the manner in which these new electronic tools can be and are being used productively, he indicated. As a start in this direction, the Committee on New Recording Means and Computing Devices would present a system for handling Ordinary life insurance to illustrate in fairly concrete terms the large amount of work which can be performed automatically with machinery already available to business. This system is one of many possible solutions but it does serve to illustrate the underlying considerations involved. The manner in which it would be managed by both a punched card electronic computer and a magnetic tape computer would be indicated, he said.

MR. WILLIAM P. BARBER continued the discussion by first describing briefly the binary system for handling numbers and by supplying examples of how electronic machines "write" and "remember." Then he proceeded to a description of the approach to an electronic operating system for Ordinary insurance which is outlined in Plate 1.

The system can be thought of as a three-department approach; one department to do the billing, another to do the figuring, and the third department to keep a record of the account with the policyholder. Each month, a selection of cards would be made from the Calculation file for all policies whose anniversaries fall within a particular month. These cards would be machined through an electronic computer to obtain on Policy Answer cards the individual policy figures needed for regular service work,

PLATE 1

ORDINARY INSURANCE SYSTEM



and to obtain on Classification Answer cards summarized totals of the insurance and benefits outstanding. These latter cards would be used for determining the reserve liability and mortality experience, and for a variety of other such calculations. To verify the completeness of the selection and to extract the additional information needed for policy service work, another selection of cards for the same group of policies would be made from the Notice Writing file. These cards would be brought together and merged with the Policy Answer cards and the combined file of cards used to prepare premium notices mechanically. A third selection of cards for the same policies would be made from the History file. The policy

figures produced in the computer operation would be posted mechanically on the History card.

Brief mention of the method of writing premium notices included in this plan was made by pointing out that the Notice Writing card has the name and address of the premium payer, together with the other necessary premium notice facts, typed on a punched card. By a photo-electric scanning device similar to that being used for addressing magazines, the typed information would be reproduced on premium notices. He also mentioned that the History card would be a rather complete source of policy information, showing such items as loan and policy cash value each year, thus making it possible to quickly accommodate inquiries from policyholders.

He concluded this brief description of the system by stressing four significant points. First, the system is one which has been designed for use with electronic computers now available to life insurance companies; it is not a system which depends on future developments in electronics. Each procedure necessary to its operation can be applied with machinery that can be obtained with a full knowledge of its limitations as well as its attributes. Second, the system attempts to satisfy the need for internal audits and controls through use of three independently maintained files—cross-checked once a year, for the most part. In any such highly automatic basis, it is advisable to build towards a higher degree of accuracy in record-keeping because the good sense and judgment of the clerks we now rely on to correct errors and absurdities would no longer be available to any material degree. Third, the system tries to satisfy the need for a readable historical account of the policy usable in court, if needed. Finally, and most important, the system relies for its practical value on the assumption that a company can and should recast its operations to consolidate functions now scattered over different departments. This would create the volume of work necessary to keep computers gainfully employed and would avoid much duplication that is otherwise necessary. Such a consolidation might run counter to some of the decentralization ideas often expressed and therefore causes one to consider these ideas in a new light.

MR. JOHN J. FINELLI drew attention to several noteworthy features of the Consolidated Functions plan which had just been described. He indicated the degree of consolidation of policy files involved by Plate 2. The Calculation file contemplated is a punched card file of an "Anniversary Point Status" kind. Since it would be used, in general, only for an annual servicing of the policy, this file would not be maintained on a day-to-day basis by pick and file methods. Instead, all changes to be made in the file would be recorded on punched cards and kept in an activity file separated by month of issue. Each year, when new policy figures must be created

from the Calculation file, it would first be brought up to date by mechanically recording the interim changes. It was emphasized that on such a consolidated basis of keeping the policy record, manual pick-outs would be greatly reduced. The average reduction would be in the approximate ratio of one to five, with some variation according to the type of transaction. In addition, the need for large volume handling would be minimized. This reduction in file maintenance and volume would permit workable techniques with relatively slow moving input and output components.

PLATE 2

FILES			
CURRENT	CONSOLIDATED		
KIND OF POLICY FILE			
1 NOTICE WRITING 2 DISTRICT INDEX 3 ACTUARIAL 4 LOAN UTILITY 5 LOAN HISTORY 6 LOAN CERTIFICATE 7 A.I. UTILITY 8 A.I. HISTORY 9 D.W.I. UTILITY 10 D.W.I. HISTORY	1 NOTICE WRITING 2 CALCULATION 3 HISTORY		
NUMBER OF MANUAL FILE PICK-OUTS			
DEATH CLAIMS SURRENDERS	6.4 5.6	DEATH CLAIMS SURRENDERS	2 2
TOTAL	25,500,000	TOTAL	5,000,000

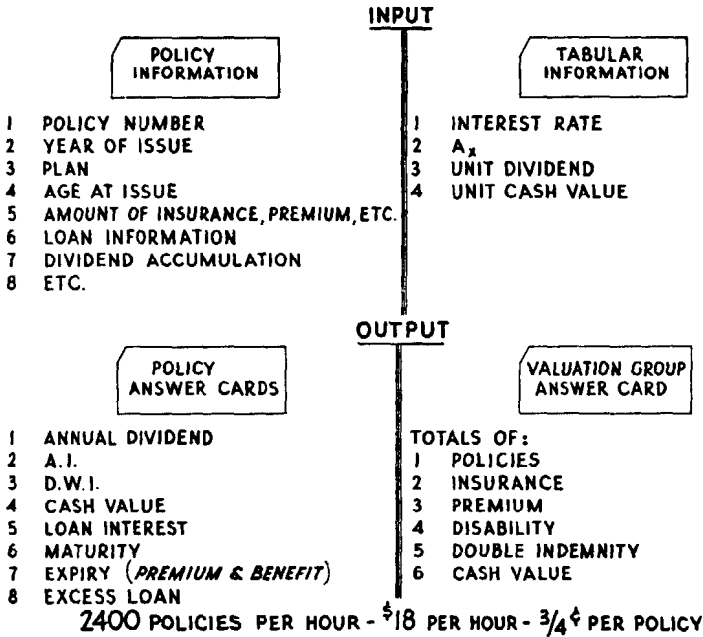
He then elaborated on the electronic computer operation indicated in Plate 3. To avoid the need for a computer with the large amount of storage sufficient to carry extensive tables, the policy cards would be arranged with master tabular value cards in valuation group order when they are fed into the computer. This would not involve any preliminary sorting of the Calculation file used because the file itself would be maintained in valuation order. The output from this computer operation would be in the form of two kinds of answer cards, one quoting the figures required to service each policy and the other supplying the group totals needed. A test run of this computer operation has actually been made from which it was possible to determine that this punched card computer would manage abou-

2,400 policies per hour. The operating cost is somewhere around \$18 per hour for a machine of this kind.

Under this method of operation, the inventories of outstanding business needed for reserve and experience study purposes would be obtained on a direct count basis each year. This would substitute for the Running Book

PLATE 3

PUNCH CARD COMPUTER OPERATION

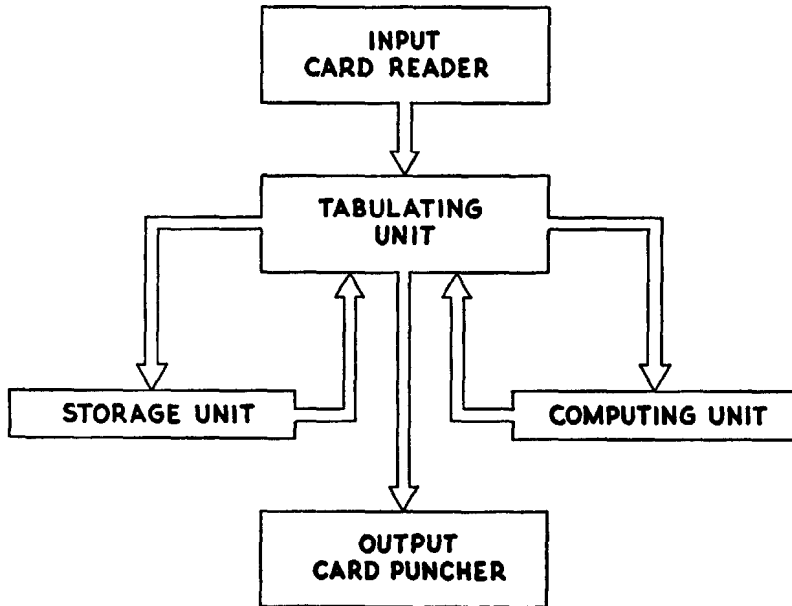


type of inventories now commonly used. He said that under the Consolidated Functions plan a reserve liability would be developed, in complete age detail, separately for each month of issue grouping, on or about the anniversary dates. From such a detailed calculation, average reserve factors by year of issue would be obtained. These would be applied to the net cancellations between the anniversary and the year end to adjust the anniversary date reserve to a year-end basis. Refinements would be applied to reflect the difference in average age between the anniversary in-forces and the net cancellations.

An organizational description of the punched card computer involved was given by showing Plate 4 and a picture of the machine was shown.

Mr. Finelli pointed out that it is generally regarded as a limited machine for the mechanization of office routines. It is relatively slow due to its punched card speeds of input and output; and its memory is very limited, having an internal storage capacity of about two punched cards worth of information. Limited though it is, however, it seems able to do a substantial job on insurance work. The explanation seems to lie in the ability of

PLATE 4

BLOCK DIAGRAM OF PUNCH CARD COMPUTER

the user to recast his problem into the form necessary to avoid the weaknesses of the machine.

The electronic scanning technique was explained, using Plate 5, which shows the Premium Notice Writing card which would be used. Some of the information is typed on this card and other policy information is punched thereon. The electronic scanner would receive this card and reproduce the typed information either on another piece of paper or on a multilith tape which in turn would permit several copies to be made. The important thing to note about this process is that a lot more information can be placed on one punched card by dealing with it as a record which can carry punched hole information as well as directly printed information. It is

significant also because it suggests that it may not be necessary to convert certain items of policy information into either punched hole or magnetic spot form in order to permit machine processing. The quality of the reproduction obtained by scanning is a function of speed, among other things, and can be varied to suit the needs of the particular application. Mr.

PLATE 6

HISTORY CARD UNDER CONSOLIDATED FUNCTIONS PLAN
FRONT

JOHN DOE											
MARY DOE Beneficiary at Issue WIFE								POLICY DETAILS			
Loan and Interest	Dividend	Policy C.V.	A.I.	C.V. of A.I.	C.V. of A.I. Next Anniversary	Pol No	Check	YEAR			
5499	417	31800	16	1240	1275	555	36				
12500	522	35700	21	1715	1952	555	37				
13250	610	39750	31	2535	2594	555	32				

BACK

44 445 555 A POLICY NUMBER						POLICY HISTORY						
EFFECTIVE DATE	REPORT DATE	POLICY CODE	LOAN CASH AMOUNT	HISTORY PRINCIPAL	POLICY EFFECTIVE DATE	LOAN REPORT DATE	HISTORY PRINCIPAL	CASH AMOUNT	POLICY DATE	HISTORY DATE	POLICY HISTORY	
											SV 10 NR SV 12	SV 10 NR SV 12

MANUAL POSTINGS

BENEFICIARY CHANGES AND SPECIAL NOTES
JAMES DOE (SON) 6-15-51

Finelli showed a picture of the scanning machine and a chart of the scanning process which is currently being applied in magazine addressing.

He referred again to the History card shown in Plate 6. He expressed the opinion that a readable record of this nature would be an absolute essential in any conversion to the invisible type of record keeping expected in the future. The card provides for machine posting of policy figures on its face and for manual posting of figures for policy loan, beneficiary and other history on the reverse. The machine postings include cash values on all policies in order to permit the computation of cash surrenders, without

reference to cash value tables, on the relatively small number of policies for which it is needed. If an electronic computer were used to make these calculations only as needed, it would require, in order to calculate a very few values, reference to an extensive memory for table look-up. There is a fairly large difference of opinion as to whether or not a historical record of this kind needs to be maintained on an ordinary policy. The important thing to note, however, is that electronic computers do not require that a company forego any such kind of record keeping if it does not wish to.

The Consolidated Functions plan can be considered a perfectly general concept that can be adapted to many kinds of electronic computers. The amount of consolidation and integration of different activities appears to be the key to the large economies involved. The description reflects the form in which the plan can be dealt with by a punched card computer and takes on a concrete character in that it has been designed for the current practices of one company and tested on a computer which is already operating on day-to-day work.

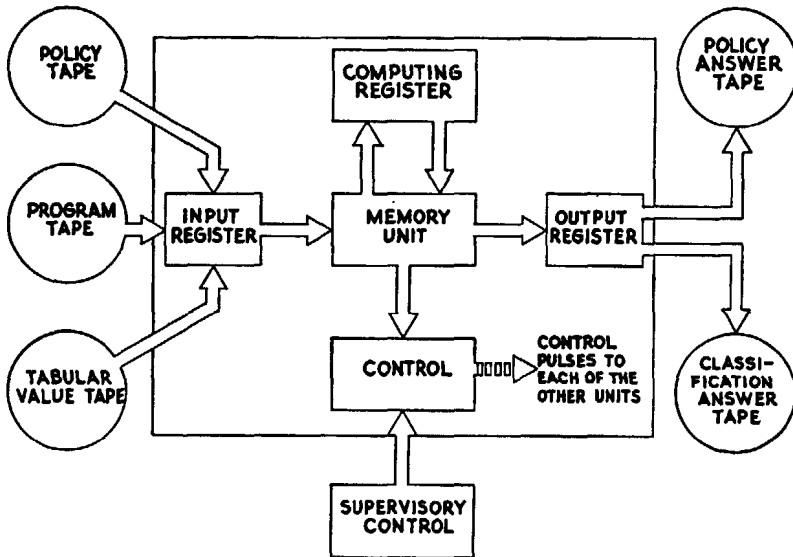
The plan has also been developed in the form necessary for use with a magnetic tape computer as shown in Plate 7. With such a computer the punched cards containing policy information and tabular values would first be converted to magnetic tape recordings through use of a special card-to-tape converter. The tapes would then be fed through the computer which would yield the same two kinds of answers on a policy answer tape and a classification answer tape. The answer tapes would then be converted to punched cards in order to permit the regular line of punched card equipment to do whatever notice writing or printing is necessary. This magnetic tape computer is also an existing machine which has actually been at work for well over a year now. An estimate of its production rate for an operation of this kind showed that approximately 50,000 policies per hour could be handled instead of the 2,400 policies per hour manageable by the punched card computer. This estimate, with sufficient detail as to the process, was referred to the manufacturer of the computer, who very thoroughly reviewed the program developed, checked the estimate and verified the fact that the particular process is well within the capacity of the computer at the production rates just indicated. The adequacy of this tape computer, therefore, can be regarded as having been verified to the greatest extent possible short of an actual test.

Mr. Finelli then showed a picture of the magnetic tape computer indicating that it is a large machine requiring about 2,000 square feet of space to house it. The process for converting from punched cards to tape seems to be an operation which must be carefully controlled since it is subject to a certain amount of error. However, the computer itself is one which is

basically quite reliable and which has many built-in checking features. For example, an arithmetical operation is not permitted to yield an answer until it is performed in duplicate and compared. The machine is currently being used 24 hours a day for 7 days a week, some of which time is allocated to preventive maintenance.

Some of the practical considerations involved in deciding which one of

PLATE 7

BLOCK DIAGRAM OF MAGNETIC TAPE COMPUTER

various electronic computers a company should use were discussed by posing a series of questions and discussing each one. These questions indicated that

1. Proper servicing and maintenance are more likely to be obtained from an organization which has built several models of the same machine rather than only one.
2. Performance reports which are available on a particular machine must be very carefully analyzed and interpreted because difficulty is more often experienced with the auxiliary components than with the computer itself.
3. Obsolescence considerations are somewhat exaggerated in the case of large expensive machines because the equipment can probably be continuously modernized rather than completely displaced by newer devices.

4. In dealing with magnetic tape machinery, rather extreme dependence is placed on the operating effectiveness of one assembly of equipment. This can usually be offset by proper allowance of time for preventive maintenance and breakdown servicing.
5. Compatibility with punch card systems is a very important matter in considering a magnetic tape computer system. Although the electronic components of this type of equipment are very well advanced, the mechanical paper moving and tape moving devices still need further development. For some time to come it will probably be necessary to rely on existing systems of paper handling and recording.
6. An important question is whether or not a company should recast its procedures as the first step toward the use of electronic computers. A more prudent course might be to chart the manner in which the organization should be changed and move toward it in gradual steps. The first step might well be one that introduces the computer within the present organizational framework on a localized type of operation.

He concluded his remarks by observing that a substantial solution to insurance use of electronic devices can be currently achieved without an automatic policy file or high speed printer. At least so far as the life insurance industry is concerned, perhaps not more than 10% of the entire potential possible with electronic devices can be attributed to an automatic file. In addition, there is good reason to believe that the introduction of a printing machine which writes either one-half as fast or fifty times as fast as today's regular line of punched card tabulators will affect the electronic potential only slightly. The important innovation is the "complete procedure applier" character of automatic processing machinery and this exists to a substantial degree in machines already available. He suggested that potential suppliers might do well to examine quite carefully these points of view and concentrate on marketing accomplishments rather than expectations.

MR. MALVIN E. DAVIS concluded the presentation by observing that it was not the intention in this discussion to supply complete descriptions. The Consolidated Functions plan has been worked out in much detail but only a very brief outline could be offered here. This was done chiefly to emphasize three points: first, that practical electronic machinery is available for life insurance use; second, that its effective use seems to require extensive changes in Home Office organizations and procedures; and third, that moderate sized companies as well as large ones may be able to arrange their work in such a way as to be able to take advantage of these new tools.

He further observed that while companies have persons familiar with the insurance operation in general and also others intimate with proce-

dural detail within particular departments, it is seldom that both sufficiently comprehensive and sufficiently detailed knowledge of the over-all system is found in the same person. The development of insurance systems nowadays seems to demand both a fundamental understanding of the basic requirements underlying the existing procedures in many departments and a good understanding of ways of using mathematical machines to satisfy those requirements. However, this does not mean that extensive knowledge of computer operation is necessary. Insurance know-how is by far the most important ingredient, and actuaries might well supply the experience basis for determining what needs to be done and for judging the extent to which current objectives can be changed, modified or consolidated to make them more manageable with modern electronic devices.

MR. JOHN J. FINELLI arranged to have interested members visit the Computational Laboratory of the National Bureau of Standards. Many members availed themselves of this opportunity and were able to view the Standards Eastern Automatic Computer in operation. In addition, they listened to some very informative discussions which reflected viewpoints of persons concerned with the development of such machinery as well as those of persons who have had considerable experience in using machinery of this kind.