NEW RECORDING MEANS AND COMPUTING DEVICES

In a special report last fall, the Committee on New Recording Means and Computing Devices outlined a "Consolidated Functions" approach for applying electronic computers to the operating practices of one company:

A. In what respects would such an approach need modification to make it applicable to your company?
B. Is there any other approach which appears better suited to the practices of your company?
C. What is now being done in your company to determine the potential of computers and other electronic equipment?

MR. M. E. DAVIS referred to the system outlined by the Committee in its September 1952 report as one which illustrates the degree to which procedures now being applied separately, in different departments, can be combined into a consolidated operation with modern electronic equipment. He described the system briefly as consisting of three basic policy files: a Notice Writing file for preparing premium notices; a Calculation file for developing individual policy figures as well as totals for groups of policies; and a History file to serve as a record of the account with the policyholder. The History file is not essential to the system but it was included to supply a visual record which most companies would undoubtedly wish to maintain at this time.

Mr. Davis said that one of the features of this plan was an operation in which a punched card electronic computer was used to develop practically all the policy figures required to administer the insurance. Since last September, a test of this process was made using a magnetic tape computer. This indicated that such a computer could manage this key operation at very high speed. He also reported that a procedure for preparing premium notices by a photoelectric scanning machine had been demonstrated to several life insurance companies. Details on these two developments are contained in a supplement to the September 1952 report which was distributed at the meeting.

Mr. Davis stated that the Committee welcomes a general discussion of the topic by the members of the Society.

MR. M. R. CUETO stated that the New York Life formed a committee headed by the Executive Vice President to study electronic computers and their applications, with an eye to attaining some kind of a consolidated functions approach to the work in their office. Various fields of interest are represented on the committee so that over-all principles and

procedures throughout the company may be openly discussed. While this study will not be limited to existing punch card files, they have recently completed a tabulation of all such files presently maintained in the company. This tabulation shows by department the type of card used, the purpose of the file and the information contained on the card. In this way it was felt that the problems of consolidation of certain records, possible elimination of certain files and the establishment of new procedures, including possible extension of mechanical equipment to other phases of the work, or modification of current practices with savings in expense of operation, could be best approached, keeping in mind the possible eventual use of magnetic tapes.

They have been using I.B.M. 604 electronic computers for a little over a year and in that time have altered the procedures so that their entire dividend illustration booklet for 1953 and the major portion of their 1952 valuation was prepared on these machines. The machines are also being used to compute dividend rates and the dividend information appearing on the dividend notice for each policy. They are at present in the process of converting their dividend cards to punch cards and consolidating the dividend notice with the premium notice. All the premium data are at present on punch cards, and premium notices are prepared from these cards by means of billing machines.

The electronic computers have also been used for calculating tables of nonforfeiture values and at present they are experimenting with foreclosure calculations, having established all the necessary procedures to do this work mechanically.

In order to better determine the potentialities of electronic equipment generally for use in an insurance office, outside firms have been encouraged to conduct studies with them, which are now under way without their having to take any responsibility for purchase or rental of any particular type of equipment.

It is evident that before the advantages of a consolidated functions approach in the application of electronic equipment can be attained, considerable detailed study and review of existing records and procedures is necessary.

MR. L. F. SLEZAK stated that the Occidental Life of California has adopted the "consolidated functions" approach for all present and future planning of home office operations.

To keep the discussion as simple as possible he confined his remarks to the life insurance business of his company, consisting of insurance in force of slightly less than $2\frac{1}{2}$ billion dollars under about 500,000 policies. About 10% of this business is on participating life and endowment plans

and this appears to be the most difficult to handle under the consolidated approach because of the problems arising from dividends and nonforfeiture benefits. Of the rest of this business (all nonparticipating) a substantial volume is on life and endowment coupon plans with problems quite similar to the participating business, and the balance is on term plans without nonforfeiture benefits, the term business appearing to be the easiest to handle under the consolidated approach.

This company uses both general agencies and branch offices. For its business within the continental United States, it uses a home office premium billing and collection system. The home office also prepares each month detailed statements of the agents' earnings and issues the checks in payment. (For Canadian, Hawaiian, Philippine and certain other foreign business the procedures are somewhat different.) Selection of the automatic premium loan provision is permitted on any policy having loan values.

Within the limits of the "consolidated functions" approach, the following considerations influenced their conclusions:

1. They now have an efficient centralized punched card installation. However, the adoption of the consolidated approach would undoubtedly increase the effectiveness of this installation.
2. The adoption of a single large-scale electronic computer, including the necessary reorganization, training, etc., would be the equivalent of a capital outlay of about $2,000,000. This would be more than 6% of their capital funds, including unassigned surplus.
3. Because of the large amount of funds available for computer development, together with scientific and governmental pressure in the defense effort, they feel that development in the next few years will be quite rapid, thus indicating a high obsolescence rate.
4. They believe it would be extremely difficult to develop and train a suitable technical staff and, because of the competitive demand for such staff, their salary scales would be out of line with other members of the home office professional staff.
5. They seriously question their ability to program their work so as to keep a computer operating 45 hours a week. This appeared to be about the minimum time required to justify the capital outlay.
6. They found the problem of the change-over to a single computer operation quite difficult and doubted whether they could effect such a change-over in less than two years. Meanwhile, both their old and new installations would be most inefficient.

From these considerations, and with regard to the character of their business and methods of operation, they were motivated to look for a compromise procedure. As this compromise, they developed the concept

of what might be called a "channelized" system. In this system each channel would be devoted to a particular segment of business. They could then make the change-over a channel at a time, starting with that segment of the business which is most easily converted to the consolidated approach. A single channel could be operated for a suitable length of time on an experimental basis, making modifications as necessary before the system is applied to all channels. It is their concept that each channel be equipped with its own small-scale computer and have associated with it the necessary auxiliary equipment taken from present installations. As experience is gained and technique is developed, two or more channels could be combined, using a larger computer, and finally it might be possible to combine these larger channels into a large-scale single computer operation. In their thinking, this final step, if taken, would be in the order of ten years in the future.

Their business might be channelized as follows: (1) nonparticipating term business; (2) nonparticipating life and endowment business; (3) participating business; (4) foreign business; (5) monthly premium business, using special methods for premium billing and accounting. Additional channels might be developed for: (6) personal accident and sickness business; (7) group business; (8) special studies, statement work, etc. The types of equipment used might be, for the first simple channels, the I.B.M. 604 or 607 computer together with the associated sorters and tabulators, progressing perhaps to equipment similar to the Card Programmed Calculator and then finally to a large-scale computer suitable for insurance operations.

They are now conducting studies as to the feasibility of this concept and some preliminary planning has been done. They feel that this system, if practical, will have the following advantages:

1. Will permit a gradual transition from present methods, meanwhile allowing time for training of staff and development and testing of techniques.
2. Will avoid the large initial capital outlay and, if a large-scale computer is the final solution, defer its purchase to such time as development stabilizes, thus avoiding high obsolescence costs.

MR. J. C. DAVIDSON pointed out that the Confederation Life Association, for its size, operates a relatively complicated business, having eight different basic rate books, twelve different currencies, twelve different dividend scales and a considerable number of reserve and nonforfeiture value bases. They believe, however, that the "consolidated functions" approach to such a complicated business will lead to a much higher proportionate saving than would result in a company with a relatively simple premium rate, dividend, nonforfeiture structure.

The Association will move toward the "consolidated functions" approach in a number of steps. This they believe will make it easier to operate their business during change-over and it will also mean that all reorganizational problems will not arise at once.

Last year the Association set up a new I.B.M. dividend routine in order to handle its numerous dividend scales and options. The basic machine used is a 602A I.B.M. calculator. All necessary numerical calculations irrespective of the dividend option and dividend scale are made by the passage of the cards through the calculator once. Sometime in the future they hope to simplify this procedure further by punching on factor cards basic actuarial functions such as the net premium, reserve, paid-up addition conversion factor, etc., and working out for each policy the required dividend from the actuarial formula. The net result of this change in dividend routine has been a saving in cost of roughly one-third, as far as salaries and rentals are concerned.

In line with the policy of the Association to get all its policy records in a machinable form, they are now changing their loan routine to an I.B.M. system and they are investigating the precomputation of cash surrender values. When this is completed, the next move will probably be to set up a new I.B.M. record card with complete information as to loans and C.S.V.'s to be kept by the same department as dividend information. This file will be of considerable help in the administration of automatic premium loans (the nonforfeiture option contained in the Association's contracts) as well as in contract settlement and servicing work. If this consolidated record works successfully, they will then look forward to the addition of dividend information to the same record card.

The complexity of operations requires that any equipment to handle their business must have a considerable amount of storage and selecting capacity as compared with that for the company outlined in the report of the Committee. That report referred to the use of one factor card which would contain the details of the dividends, cash surrender values, etc., per $1,000, while in their business they visualize a need for several factor cards. A possible solution to this problem is to have electronic machines make more calculations from basic actuarial functions rather than tabular values as used in the usual factor card approach.

They consider the so-called giant type of calculator beyond the requirements of a company of their size, since it would probably only be used to a small fraction of its capacity. It would appear that the answer lies in a simpler, cheaper type of machine which they can keep busy most of the time, but requiring more preparatory work before feeding into the

calculator. At present they are looking into the potentialities of the I.B.M. type 607 calculator.

MR. G. C. STREETER stated that he would hesitate to take any formal steps toward the possible use of electronic equipment for two main reasons:

1. The mere suggestion that electronic equipment could be used would, in his opinion, disturb many persons unfamiliar with its limitations. A great many people might start worrying about major changes in office routine and reassignment of work. It would not seem worth taking the risk of this disturbance until it is reasonably clear that electronic equipment can economically be used for the types of work now done so successfully by old-fashioned hand and mechanical methods. A multiple-line company, such as the Aetna, would find a very difficult problem in internal reorganization if any major segment of the work were to be adapted to electronic equipment.
2. The use of electronic equipment necessitates a complete exposition of the job to be done, including all the exceptions. There are many types of work in his company where there are numerous exceptions and the procedure study and programming required to standardize their methods would be immense. It would seem possible that even if they were successful in adapting their methods to the fixed requirements of an electronic program, they would, in eliminating the exceptions, lose perhaps in the quality of service offered their policyholders.

He agreed with those who point out that one of the advantages of electronic programming is that it requires a re-evaluation of the job, but he preferred to re-evaluate the job first and then at some future time perhaps consider electronic equipment.

MR. C. G. LINCOLN pointed out that the plan outlined by the Committee is designed for a participating life company. The Travelers' affiliated companies operate on a nonparticipating basis and issue almost all types of insurance. He presumed that a different approach would be required.

The so-called "annual policy service" occupies a sort of keystone position in the Committee's plan. In fact, the use of an electronic computer is concentrated at this point in a subdivision entitled "key computer operation." This operation includes three computations: the annual dividend computation, the annual loan service and an annual cash value determination. The first two of these probably run naturally on an annual cycle in many companies. In the Travelers, neither does. There is, of course, no dividend on nonparticipating insurance and, furthermore, they collect loan interest in advance and at the same time the premium is collected, annually, semiannually, quarterly or monthly. This means that "annual

policy service" is an artificial concept to them. The absence of the dividend problem elsewhere should in general permit simplifications.

In considering the implications of multiple-line operation, he said that handling renewals is a major problem in lines other than life. Recalculations are very frequent because of base rate changes plus changes in classifications and limits. The premium period may vary from a fraction of a year to several years. In spite of this, it has been possible in these other lines to do the calculations and even write new policies in the field. The collection of a life insurance renewal premium may be considered as one of the rather simpler modifications of the over-all premium collection problem and life premiums on individual policies represent only about 16% of their over-all premium income.

The casualty and fire lines introduce many complications. Some have no direct relation to the problem—for example, various reports to bureaus are required at specified times in specified forms. On the other hand, some are of concern. There are complications in their field structure to be considered. They operate through a combination of branch offices, general agents, district agents and brokers. A particular agent may report different lines in different ways and even through different branches.

This shows that they cannot use the Committee plan as it stands, although there will be many parts of it which will be useful. He felt that anyone who goes through the Committee's outline carefully will find it valuable even though his ultimate approach turns out to be quite different. He was more concerned at this stage with learning exactly what the problems are than finding the solutions.

MR. KERMIT LANG mentioned that one of the most costly and time-consuming file maintenance jobs in the life insurance home office is that of individual ledger history cards, as in the case of mortgage loans, policy loans, dividends to policyholders and premium accounting.

Magnetic tape file maintenance systems are being designed without provision for history cards and therein lies the secret of much of the apparent savings. With the exercise of the same kind of logic and ingenuity, he believed that we should be able to consolidate the accounting and statistical functions and thereby eliminate the history cards without shifting from punched cards to magnetic tape.

To achieve this, the punched cards should be designed to serve both as individual ledgers and as an accounting medium from which journals could be prepared, monthly or annually as well as daily. If the entries are first sorted into contract number order, the monthly or annual listings of journal entries should serve as an adequate historical record, taking the place of the old manually posted ledger history cards.

By following these principles the history cards have been eliminated from the mortgage loan and policy loan accounting systems in the Equitable Life of Iowa, and they are hopeful of extending the same work elimination principles to premium and dividend accounting.

He mentioned the mortgage loan accounting application in particular because it represented a calculating job comparable in size to that involved in dividend calculations and commission accounting, and all three overshadowed the annual valuation work, which was probably the first computing job to come to mind to most actuaries.

The Equitable Life of Iowa's mortgage loan accounting system is built entirely around the Type 604 calculator, which does not only the calculations but the punching as well, at high speed and with great accuracy. Even with this small-scale electronic machine, they have found that there is enough storage capacity and "programming" facility to permit the splitting of each monthly payment between interest and principal and the calculation of the new principal balance, step by step, for as many periods as desired. The answers are in punched cards, which is exactly the form in which they are needed for subsequent accounting and statistical operations.

A system for dividend calculations and dividend accounting can likewise be built around the 604. If dividends are subject to reduction or increase on account of the presence or absence of certain disability or accidental death benefits, the calculation will be somewhat more complicated but could probably still be handled by the 604, or at least by the lowest priced model of the new Type 607 electronic calculator.

His point was that there is a reasonably-priced, widely used and very reliable electronic calculator already in the field and it does not take a Univac or a Card Programmed Calculator to do the jobs which account for most of the computing in a life insurance office.

The manufacturers state that magnetic tape systems of record keeping and file maintenance, or data processing systems, as they are called, are now under intensive development in their laboratories, but the indications are that such systems will be more expensive than most people realize. Because of greatly increased development and engineering costs, the tentative price quotations seem to be going up rather than down, so that the manufacturers face a real danger of pricing themselves out of the commercial market.

Furthermore, the magnetic tape approach to the solution of the file maintenance problem implies a high degree of centralization and consolidation of operations, whereas the trend in some of the larger life insurance

companies is in the opposite direction—toward decentralization—in order to achieve faster and better service to policyholders.

This brings up the pertinent question of whether it is more desirable and more economical—all things considered—to have one large multi-function machine, or whether it is better to have one or more tabulating rooms each equipped with a number of smaller special-purpose machines, in the sense that sorters, collators, electric accounting machines and electronic calculators are special-purpose machines. Many people favor separate component units to meet the customer's particular problems and also in order to have stand-by equipment in case of a breakdown.

His own conclusion was that in the long-range process of further mechanization and of preparing for the possible use of data processing systems in the life insurance home office, it will be necessary to consolidate many files and to centralize a number of functions that are now in different departments. Along the way, perhaps, most of the economies held out as an inducement for the use of magnetic tape equipment will already have been achieved.

When this necessary preliminary step has been completed, it will be time to take a fresh look at the question of the comparative advantages of doing the job with the tried and tested electronic machines which we already have available as against the cost of magnetic tape equipment (or whatever else may have been developed in the meantime).

MR. J. W. RITCHIE told of the work of the committee appointed in the Sun Life of Canada to study the possible application of electronic equipment to their operations. This company committee consists of an actuarial officer, an accounting officer and an administrative officer who is also an actuary. Under this committee, which might be described as the senior committee, they have a three member junior or working committee, the members of which devote all of their time to electronic applications. Results to date are encouraging the company to intensify its exploration of this field.

While the "consolidated functions" plan can be carried out on one of the large magnetic tape computers, it is their opinion that a computer of this type is not essential for the successful operation of the plan. In their investigations they have been working from the premise that, in order to make the purchase or rental of a large magnetic tape computer an obviously economical proposition, even more consolidation is required than is present in the "consolidated functions" plan.

An abbreviated description may give a fairly good general idea of their plan. Their system for the processing of ordinary insurance business uses three input magnetic tapes as follows:

1. *Instructions Tape.* This tape contains in coded form the instructions telling the computer what to do in all circumstances which may arise during the processing of policies and also contains certain constants which are used in different parts of the calculations.
2. *Master Tape.* This tape contains complete information on each policy and any rider attached thereto including, in addition to many other things, dividend factors, dividend option, amount of dividend, amount of dividends under option, policy loan interest rate, policy loan balance, valuation mortality table and interest rate, amount of reserve, periodic required interest, periodic expected mortality, premiums paid in advance, type of cash value, amount of cash value, periodic change in cash value and type of automatic nonforfeiture option.
3. *Change Tape.* This tape contains information on alterations in the policy data on the master tape other than those which arise as part of the computing program as a policy becomes older. Examples of the information which would appear on the change tape are data on a change in address, a change in plan, a change in amount, cancellation of policy, revival of a policy, withdrawal of dividends on deposit, a new or additional policy loan, a repayment in part or full of a policy loan, and new business.

By processing these three input tapes through the computer they hope to combine the following functions: (1) premium billing (including dividend and loan notices); (2) calculation of dividends and dividend options; (3) calculation of policy loan interest and loan balances; (4) calculation of valuation reserves; (5) calculation of cash surrender values and other nonforfeiture values for branch office use; (6) recording of the foregoing for accounting and statistical purposes.

It is their intention to pass all master tapes through the computer once each month in conjunction with the instructions tape and the appropriate change tapes. The instructions and constants from the instructions tape are passed into the computer's memory at the beginning of the operation. The other two tapes, in policy number order, then come into operation. While the processing is taking place, if the next policy number on the master tape is lower than the next policy number on the change tape, the computer will perform immediately whatever processing is necessary for the policy on the master tape. If, however, the next policy numbers on the two tapes coincide or if the next policy number on the master tape is higher than the next policy number on the change tape, the computer, in accordance with instructions, will process the change first, making the consequential alterations in the data recorded on the input master tape, and will then do whatever further processing is indicated.

The processing varies in accordance with the position of the policy in the current billing month. The computer determines for each policy

whether the current month is a policy anniversary. If so, the computer carries out a detailed anniversary routine to bring the policy data on dividends, policy loans, reserves, premiums paid in advance, cash values, etc., up to date. The computer then tests whether a premium falls due in the current month. If so, a detailed billing routine is followed to obtain the required billing data. Moreover, necessary changes in the policy data for reserves, cash values, etc., arising from the premium then due are also made by the computer. Policy data thus revised and brought up to date are read out onto a new master tape, the output master tape. The data for policies which do not have an anniversary or premium due date in the current month are read out directly onto the new master tape once any changes have been processed. The output master tapes replace the input master tapes as the current-in-force file. Hence, by passing all policies through the computer each month whether or not an anniversary or premium due date is involved, the recorded data for each policy are kept up-to-date by the inclusion of the change tape routine. They estimate that each month the data for 75% to 80% of the policies will pass from the input master tape to the output master tape without any processing taking place because no change or anniversary or premium due date is involved. This may seem rather wasteful as regards computer time but it appears to be the most efficient procedure, everything considered.

In summation, with one pass through the computer, for a policy anniversary case there will be calculated dividends and dividend options, policy loan interest and loan balances, reserves, required interest and expected mortality, cash values and other nonforfeiture values.

The output magnetic tapes are four in number.

1. *Master Tape.* As already indicated the output master tape with all the policy data up-to-date becomes the current-in-force file.
2. *Billing Tape.* This tape provides full information for premium billing purposes and for accounting transactions which normally take place at a premium due date.
3. *Transactions Tape.* This tape furnishes a record of and accounting information on transactions which may occur at any time during the policy year, *e.g.*, policy changes, loans, dividend withdrawals and premiums paid in advance.
4. *Schedule Tape.* This tape provides information for anticipating contractual provisions in the policy requiring action, *e.g.*, contractual change in amount of premium, termination of benefits, maturities.

The final answers have not yet been given to some of the important questions which have arisen during their investigations. For example, in their system the maintenance of a visible history or record card at head

office is not essential. Their branch offices maintain history cards for each policy and the listings which they intend to make at head office from billing and transactions tapes will mean that the up-to-date status of each policy will be available. However, other people such as State Insurance Department examiners have to be considered and they will therefore give some further thought to this question. Under their system, reserves are calculated from basic functions by an accumulation method which actually amounts to a seriatim valuation, and agreement to the use of this method by a company of their size will have to be secured from the interested Insurance Departments.

They are reasonably sure that the large computers now available will carry out their part of this program expeditiously and economically for a company of their size, over $5,000,000,000 of business in force. Their satisfaction with the central computers themselves is not based on imagination, for in the recent past they carried out a successful test of the computing part of the system on one of these machines. However, before they can make any final decision on the practicability of large-scale electronic computers for their work they have still to do a considerable amount of further investigation on such matters as auxiliary equipment, costs, conversion problems and application of electronic equipment to other parts of their work.

MR. J. S. HILL pointed out that policy reserves, expected mortality, required interest, incurred net premiums, and other items of gain and loss analysis have been determined traditionally by methods which are independent of the accounting system; and the reconciliation of the two is accomplished by only the most approximate methods. In this respect, the life insurance business is almost unique among big businesses. He believed we would do well to examine carefully into the validity of continuing this approximate relationship into the electronic era. His own modest investigations led him to believe that time and money can be saved by applying the mental muscles of electronic equipment to distribute each item of premium income into its actuarial components. Some of the sources of savings are:

1. Elimination of sorting detail files into plan-age-year order. The factors required for the direct distribution approach are so few that they can be stored in modest storage capacity; and the random access method becomes practical.
2. Elimination of projections and calculations to obtain figures for interim statements and independent checks of year-end reserves. Instead, a straightforward process of checking the reserve "balance" for each policy against the tabular reserve on, say, a five year cycle is performed by the same machine, a

few pennies "drift" being automatically corrected by making the appropriate debit or credit to expected mortality and larger discrepancies being printed out for further analysis.

3. Elimination of actuarial analysis now required to prepare the analysis of increase in reserves. These figures come as by-products of the automatic distribution.
4. Elimination of strain on the actuary and, in many companies, a considerable portion of his precious time at year end, determining whether the reserves "check in," and if not, why not.
5. Elimination of deferred premium calculation and due and unpaid inventories, since reserve liability would be obtained for the exact premiums paid.
6. Better control against undiscovered overpayment of values.

The collateral advantages of the "consolidated functions" approach are still obtainable, since cash values and dividends can be developed by the same process as is used in obtaining the reserves.

The full accomplishment of such a program would extend over many years, since a number of breaks with tradition are indicated; and their acceptance by company officers and supervisory officials will take time. It seemed to Mr. Hill, however, to accord with the fundamental principle enunciated by the Committee, that we look now toward what our ultimate destination might be, then make sure that each step we take leads in that direction.

Activity in the Minnesota Mutual has been limited to informal investigations of the most suitable direction for development. The principles described in the preceding discussion have been fully applied to supplementary contracts not involving life contingencies. The resultant savings in expense and time, particularly of skilled personnel, and the increased control obtained has led them to investigate the application of the same principles to supplementary contracts with life contingencies and annuities. No insurmountable obstacles have appeared and they plan to proceed with the installation as soon as time permits.

Some investigations have been made into the possibility of a general purpose "memory unit." Such a machine, capable of storing half a million decimal digits and having a random access time of about half a second to any group of digits, could replace the use of master files and eliminate the necessity of a great deal of sorting and collating which now precedes many calculator operations. The price of such a machine appears to lie just above the level of economic justification at present; but the increasing efficiency of design and production techniques should make it a reality before too long.

MR. H. W. JONES stated that the Mutual Benefit writes Ordinary insurance, disability insurance in connection with life insurance policies,

and annuities. The number of policies in force is approximately 700,000. The company has mechanized on punch cards practically all of its actuarial department operations and its renewal commission accounting. It is in the process of mechanizing premium billing and the analysis of agency collections. Various other minor and miscellaneous processes have also been converted to punch card operation.

They have studied the possibilities involved in tape processing equipment, with particular reference to file maintenance as well as the performance of other ordinary work operations. There are four areas of thought developed, in which, as yet, they have not done too much thinking and are moving very slowly because of the radical concepts that are involved.

The first of these is in the matter of file maintenance. They understand that alterations, deletions, and additions will be made in the file through the complete rewriting of the file tape in each work cycle. This immediately raises in their minds the question of accuracy. Under existing methods, any change in the data pertaining to a case requires the rewriting only of the item changed or, at the most as in the case of a punch card, all the data on the card. The remainder of the file on the case is not exposed to rewriting at that point. They have every reason to believe that the error ratio in the electronic equipment will be fantastically low but, even so, the exposure is so much greater that conceivably it might give less satisfactory results in the aggregate.

The second area of thought is in connection with the work cycle. The company has operated to a large extent on a daily basis; that is to say, they have felt heretofore that there should be a daily output of completed work, particularly as it relates to some of the operations proposed to be converted. In their case it looks very much as though that concept may have to be changed. If it is, and the company should go to a two or three day cycle, they will get the benefit of more mass in each operation and will cut down on the error possibilities involved in the complete rewriting of the file, but policyholder service undoubtedly will suffer to some degree.

The third area is somewhat related to the second in that it would seem necessary, in their case at least, to employ a second, and possibly even a third shift under the present system of a daily cycle. As a general rule, persons who choose white-collar jobs have never been enthusiastic about other than the usual work shift, and he wonders whether these persons, few in number though they may be, will accept unusual working hours, as they now do in certain cases, when and if economic conditions change and some of the pressure on their personal budgets is lifted.

The fourth area for thought is in the so-called "consolidation of opera-

tions," which appears to be necessary in their case in order to develop mass and a minimum processing of the master file. It is not at all clear to them how the various operations which will be brought together will work with or against one another, but there is a definite feeling that by mingling routine internal work with work involving policyholder service the company may lose its present ability to declare a priority for one or another as circumstances may suggest.

He mentioned also the problem of orientation which will be involved in training existing staff to do business without the time-honored visual form of record, and the personnel dislocation or displacement that could take place if very careful timing is not used.

These various considerations have led them to the thought that they should proceed very slowly, being convinced that a company which is well mechanized on punch cards, as they are, will be in an enviable position from which to take advantage of the newer developments when the time comes. Meanwhile, they have appointed a committee of three, with the responsibility to keep completely informed on the developments as they take place, to study the handling of tape processing equipment as it would apply to file maintenance, and to use outside of the office, if necessary, for any sizable job that may come along, some of the smaller devices using magnetic tapes, the emphasis being on processing and calculating rather than file maintenance. They are prepared to move much more actively if some development should occur which is really significant to them.

MR. R. G. STAGG referred to the stress placed in the Committee's report on the desirability, in setting up a model operating procedure, of using equipment now actually available. There are, however, those who believe that a broader approach is advisable and that we should not confine our thinking to currently available equipment. Life insurance companies will presumably be in business for some little time to come, and since the installation of electronic equipment involves tremendous outlays of money, it can be argued that it is much more important to get the best possible answer, even if it takes a few years, than to get an early but possibly much less satisfactory answer.

In the Prudential the general view is that as close an approach as possible to fully automatic operation is desirable, even if it takes several years to bring it about. This type of approach presumably calls for the keeping of records in tape form with little or no visible record of a permanent type. There are possible objections to this which have not been fully explored, including the question whether such records will stand legal scrutiny. They do not believe, however, that it would be advisable to let such

objections stand in the way of making an all-out effort to develop electronic equipment for fully automatic operation. It may be that some or all of these objections can be met by maintaining visual records for only a limited time until insurance examiners and others have been fully educated to the use of tape records.

In his particular organization the question of decentralization of records, staff and equipment is a live and important one and is bound to have a material effect in the long run on the type or types of electronic equipment that they decide to use. A very expensive piece of custom-built equipment might not be economical if it had to be duplicated in all of their regional home offices. On the other hand, there is a possibility that, in spite of decentralization of many functions, certain other functions can be handled more economically from a central point. They are giving consideration to the handling of central premium billing and his own view is that various other functions will in time be handled centrally for almost any number of regional home offices whenever instantaneous transmission of information becomes available at modest cost.

It is obvious that electronics studies involve a great deal of expense to any participating organization and that it would be out of the question for small companies, and possibly also for medium-sized companies, to make their own independent studies. Joint studies of specific problems are difficult to develop and maintain, but there are many fields in which a cooperative effort could be developed profitably by a group of companies. This is particularly true of studies of new types of appliances and equipment in process of development but not yet on the market.

It is their belief that there is only one computer on the market at the present time which can approach the capacity needed for a fully automatic system. They do not believe that this approach is sufficiently close to justify the use of that computer in their organization, but are constantly alert to the possibility that this computer or a competitor will in time provide adequate capacity. There is much to be learned, however, from the use of smaller standard pieces of electronic equipment, and they have placed an order recently for such a machine, a sequence controlled computer with both card and tape input. In addition to experimental work, they hope to get practical operating experience with the machine and probably also to put on it two or three medium sized production jobs which, on the basis of "paper" planning, they think it will handle.

In anticipation of the purchase of this machine, they have found it convenient and profitable to organize a class of instruction for a group of junior and a few senior executives on the general subject of electronic equipment.

MR. D. H. HARRIS reported that the Equitable Life of New York has a small group of people devoting substantially full time to the study of large-scale computers and their potential in relation to their needs.

Their present program calls for the development on paper of a hypothetical plan of tightly integrated operation covering many work functions, based upon the use of one of the commercially available punched card or tape systems with a large-scale computer at its heart. This would correspond to the "consolidated functions" approach in concept, although not necessarily in detail. The basic question of whether such a method of operation would be feasible and desirable will then turn upon a comparison of this plan in all its ramifications with their present methods.

They are building up the hypothetical plan by dividing the over-all requirements of Ordinary Insurance administration into "blocks" of functions within each of which there is some natural relationship of processing characteristics; for example, the functions of premium and loan interest billing, dividend payment, and commission handling are mutually related through their all being based upon policy anniversary contact with the policyholder, and this group of functions therefore suggests the basis for one "block." After developing a suitable routine for one such "block," others can be studied; each will have to be considered as to its own requirements and as to its relationship with all of the others. The various "blocks" will certainly differ in the extent to which they involve mass computing, but despite the emphasis on computing ability which is a characteristic of present-day large-scale electronic equipment it is clearly necessary to consider the noncomputational functions along with the others in developing a plan which visualizes a wide degree of administrative integration. If a workable over-all plan can, in fact, be shown to have real advantages over their present methods, they believe that it will emerge from consideration of these "blocks"; further, this approach may give a key to the best way of making the eventual change-over if, as would probably be the case, it were to be made on a gradual basis rather than all at one time.

Concurrently with this long-range research, they are continuing to seek methods of improving their present mechanical procedures based upon existing punched card equipment or relatively simple adaptations of it. In fact, the research program itself sometimes suggests changes which seem worth while for adoption without waiting for possible future developments. Aside from the obvious advantages of economy in going ahead with such changes if they are not wholly incompatible with what is in prospect for later, there may be very valuable experience to be gained

from them if they are, in effect, small-scale models of the type of change visualized for the future.

MR. J. O. PROUTY reported that three years ago representatives of John Hancock discussed with one of the prominent concerns engaged in manufacturing and developing electronic equipment the possibility of designing a large-scale magnetic tape computing machine which would be especially designed for a multiple-line insurance company. Engineers from the manufacturing concern spent several months interviewing key personnel in the various departments of the home office. These conferences served to acquaint both the engineers and the home office personnel with the complexity of their individual and joint problems and both groups profited by the exchange of information.

Up to the present time there have been no specific plans drawn for a master machine that will solve all their calculating problems, write all their notices, do all their bookkeeping, and compute and make checks for all their payments. Further, the program at present is somewhat dormant, not solely because of the complexities of the problem, but perhaps because of the manufacturer's requirements to meet other commitments.

The following quotation from the formal report of the manufacturing company to the John Hancock is an interesting statement of the manufacturer's point of view. "A fairly detailed appraisal of the requirements of an insurance company has revealed no insurmountable obstacles to large-scale computer operation. As a matter of fact, it is the present conventional office and filing systems which seem to be faced with the more serious challenge as the volume of business increases."

The company has two committees which are designed to supervise and regulate the large volume of electronic equipment used in the various home office departments. The senior committee, composed of top executives representing those departments which have the largest machine installations, determines the over-all policy and passes on all new equipment. The secretary of the senior committee is chairman of the subcommittee, which is made up of junior executives who are closely associated with the actual operation of the machine units. This subcommittee designates technicians to study the potential and application of new electronic equipment to operations now on older type equipment and to investigate the possibility of mechanizing, on new equipment, procedures now performed manually. These interdepartmental committees are of the utmost value, since efficient utilization of the larger, more complex, and more expensive machines invariably requires reassignment of departmental functions.

A review of their present systems brought out the fact that from five to fifteen cards are now punched for each policy when issued and these figures do not include cards subsequently prepared for policy loans, dividend requirements or nonforfeiture options.

He was not prepared to say that magnetic tape and a "consolidated functions" approach are now the solution to the large and seemingly increasing number of different cards required to maintain home office records. On the other hand, it does appear that an interdepartmental study of the functions of the many card files now used might well lead to marked economies which would make less attractive, financially, a magnetic tape calculator, but which would, at the same time, be a step toward such giant machines, since the more mechanized and the more consolidated a company's current procedures, the more simple and direct the change to a complete electronic system.