

*Future Outlook*

- A. What use is contemplated for electronic computers in the area of Operations Research and simulation techniques?
- B. Normally computers are applied to routine functions which are not top managements' usual daily concern. How and where can computers be utilized to test hypotheses, analyze the consequences of various courses of action, and in general aid top management in its daily tasks?
- C. Does the ultimate economic advantage of computers now being installed or in use appear larger or smaller than when feasibility studies were made and initial orders placed? To what extent are savings being currently realized? At what point does the "break-even" point appear to occur (a) in terms of current costs, and (b) cumulatively? On the later basis, what one-time costs are included and which, if any, are excluded?

MR. PETER W. PLUMLEY remarked that, with the coming of large-scale computer systems and their ability to perform extensive detail calculations in a short period of time, it will now be possible to simulate the future operations of a company in far more precise detail than heretofore was possible. He stated that such a simulation system is now being developed at The Travelers.

The input to the system is of two types. The first type consists of actual data on the company as it presently exists. Thus they will feed into the system a complete analysis of business currently in force and gross premiums to be collected on this business. Also, an analysis of their present investment portfolio will be entered, as well as their surplus position and certain other items necessary for federal income tax calculations.

The second type of input consists of assumed data such as mortality rates, lapse rates, interest rates, expense rates, amounts and distribution of new business, etc. The input to the simulation system will express these data in the most basic manner possible. For instance, only the future interest rate on new investments will be used as input and the average rate of return on all investments then can be calculated.

Mr. Plumley stated that the simulation system will be able to develop almost any type of estimates, such as future profits by line of insurance, amounts of insurance in force, premium income, distribution of assets and federal income tax. It should be a tremendously valuable management tool and well worth the large amount of planning required.

MR. LUMIR F. SLEZAK stated that Occidental has made some rather unsophisticated federal income tax projections showing the effect of changing the proportion of various components. In these studies the tax was calculated and distributed by line of business, using an IBM 650.

On section B, he had long been impressed with the editing and selecting

power of computers. He felt that many of the reports now prepared for management are too voluminous and that reports of only the exceptions requiring attention would be more useful. This would take advantage of the editing and selecting power of computers.

On section C, he stated they have always underestimated development and conversion costs and machine running time. They have also underestimated the results that the machine would produce, so that the over-all economic gains have been greater than anticipated. They have found that projects have always expanded between the time of feasibility study and the time of completion. They have also found that machine loads have increased more rapidly than anticipated.

Mr. Slezak also noted that it has been their experience that program maintenance costs are substantial.

MR. NATHAN F. JONES of the Prudential, speaking on section C, summarized papers presented to the LOMA by himself and Mr. Byrne of the Metropolitan. These dealt with the application of statistical and operations research techniques such as linear programming, Monte Carlo methods, and waiting-line or queuing theory to actuarial, marketing, financial, and administrative problems of life insurance.

MR. DAVID H. HARRIS mentioned that the Equitable started on full-scale conversion to E.D.P. for ordinary insurance work about five years ago. At present, their large volume E.D.P. procedures in this field cover policy issue, including the preparation of records at issue; premium billing and collection processing; commission work; dividends; and file maintenance generally. The operations have been organized as parts of an integrated processing system, but for the most part the actual consolidation is still to come.

By doing this work on electronic equipment, they have been able so far to eliminate about 440 clerical jobs, by comparison with job requirements as they existed when they started. They estimate that growth since that time would, in the absence of the new systems, have required perhaps 90 more jobs. About 530 jobs, therefore, can be regarded as saved if allowance for growth is included. The saving in salaries and related costs corresponding to this number of jobs is substantially more than sufficient to pay for all of Equitable's current E.D.P.M. operating and programming costs in the ordinary area, including five year amortization of the purchase price of the machine components they bought and of the costs of site preparation. There have also been some savings, although much smaller, in E.A.M. rentals, in regular overtime associated with year-end work, and in other costs.

Mr. Harris stressed that in making comparisons of current savings

against current costs, they included all present programming expenses in the latter. Most of today's programming expense is related to future developments, from which additional savings will arise in the future. This method of analysis tends to compensate for the fact that there were major out-of-pocket programming and conversion costs for the jobs now in production, before those jobs started to produce the present savings. The other large initial expenses—purchase of a part of the equipment and site preparation—are being charged as current costs through amortization; the same is true of what has become a substantial investment in magnetic tape.

They anticipate that the consolidation of files and of the file maintenance programs will reduce machine time and hence reduce E.D.P.M. operating costs to accomplish the same end-product results. A more important contribution to savings from this source probably lies in the simpler external requirements of an integrated system, since each policy transaction will have to be analyzed and entered into the system only once, instead of separately for each functional area affected. With this improvement still to come, a number of important areas of work not yet in the system at all, and the savings already achieved, they are satisfied that the adoption of E.D.P. for ordinary policy administration is resulting in the economic advantage initially expected of it.

Mr. Harris mentioned that the Equitable is also introducing E.D.P. systems for group work, for both insurance and annuity administration, but that these are still at a much earlier stage of development than in the case of ordinary.

MR. RUSSELL M. COLLINS, JR., indicated that Minnesota Mutual has obtained useful results from the following applications of their Datatron 205 in the area of Operations Research:

1. A Monte Carlo program to simulate mortality experience in a given group of lives.
2. A program to compute marginal tax rates under the new federal income tax law.
3. A program to revalue a substantial portion of ordinary life business on the net level premium basis, which they expect will result in significant savings in federal income tax.
4. A program to calculate certain parameters of a multivariate distribution.
5. A program to calculate asset shares.

Mr. Collins was intrigued by the concept of a program which can be utilized to maximize the achievement of company objectives by optimiz-

ing such variables as premium rates, dividends paid to policyholders, amounts spent for agency development, investment portfolio, amounts held in special reserves, etc. In this direction they have begun an attempt to synthesize the life column of the Gain and Loss Exhibit, using the model office technique. The further investigation he makes in this direction, the more he is impressed by the possible use of management games for the purpose of experimentation as well as encouragement of management orientation and participation.

MR. NORMAN S. KESSNER of New York Life discussed a computer solution where the general problem under analysis was to determine the appropriate staff level and overtime policy in the underwriting and issue operations so as to obtain the shortest possible processing time consistent with cost and with other practical considerations. The problem involved knowledge of the interrelations between number of cases received, staff size, overtime policy, average number of unfinished cases at the end of each day, processing time and cost.

A series of mathematical models was prepared in an effort to gain some knowledge of these interrelations. These models were developed on an IBM 607 computer. A set of 249 punched cards was prepared, one for each working day in the year, by punching into each card the actual number of cases received that day. Thus the cards represented a year's receipts, with all of the normal fluctuations due to holidays, campaigns, and random influences. They then instructed the IBM 607 to process a certain number of cases a day, and to work overtime whenever the number of unfinished cases at the end of the day reached a specified, predetermined level. The 249 cards were then run through the machine, producing, in about 2 minutes, a complete record of an entire year's operations—number of cases received and processed each day, number of days where overtime was required, number of unfinished cases at the end of each day, the cost of operating, etc. All told, over forty of these models were run, with various staff sizes and different overtime rules.

Mr. Kessner briefly outlined the main principles established from the analysis of these models:

1. For an operation with a fluctuating work-load, the optimum staff size is one which would require overtime from time to time. Any attempt to completely eliminate overtime in any such operation would only result in overstaffing or excessive processing time.
2. Overtime should, in general, not be postponed. Such a practice merely builds the unfinished cases to a higher level, after which the same amount of overtime is required to maintain even this higher level.

3. Their models indicated that with optimum staff size and use of overtime, there will be periods of idle time, *i.e.*, time during which there are insufficient cases to support the normal work load. It is important to realize that a certain amount of idle time, when appearing in a well-controlled operation, is indicative of a good operation, not a poor one.

These concepts were put into operation in New York Life by means of an overtime "trigger" whereby overtime is employed whenever the number of unfinished cases at the end of the day exceeds a certain pre-set amount. The use of this new system has resulted in a very substantial reduction in the average number of unfinished cases at the end of the day and, of course, in the corresponding processing time. These reductions were achieved with practically no increase in the frequency of overtime or in the over-all cost of the operation.

MR. MANUEL R. CUETO reported that in the course of New York Life's preliminary studies of equipment and areas of operation, it was clearly indicated that the undertaking of actuarial work for the initial application presented the opportunity to approach at the outset, with distinct advantages, an area of immense and complex work activities. Moreover, an analysis of the number, size and character of their several actuarial files of individual records (each maintained for different purposes) suggested that they could properly consolidate such records with a resulting increase in efficiency of operations and, therefore, savings to the company.

In their preinstallation feasibility study, they anticipated that from initial application there would be a net savings of perhaps 110 persons and over 13,000 square feet of office space. New York Life's anticipated rental for large-scale electronic equipment was estimated at \$421,000 per annum, which they assumed would be partially offset by the release of punch card equipment renting for \$137,000 per annum. After taking into account the release of such equipment, savings in space requirements and savings in personnel salaries, they estimated a net annual savings of approximately \$230,000.

Mr. Cueto pointed out that they now know from actual experience that if their initial application had been activated as originally envisioned, the anticipated savings would have been realized. However, the scope of initial application has, of necessity, been greatly expanded by extensions into other areas directly affected by the work produced by their computer, and by further integration of operations. Accordingly, the actual savings have been substantially greater than those originally estimated.

"Savings" over costs are currently emerging at the rate of about \$600,000 per annum. In April of this year, not quite four years after date of installation, they reached the "break-even" point where accumulated costs, including initial costs of installation, conversion and programming, were completely amortized by their offsets to costs, that is, savings.

The major one-time costs which they have amortized on a cumulative basis include such items as the following:

1. Preparation of the site
2. Conversion of records, including additional temporary punch card equipment required therefor
3. Systems design and programming costs
4. Temporary operation of two systems in parallel.

The major items entering into their recurring costs include the following:

1. Rental of equipment
2. Amortization of purchased equipment, including maintenance charges
3. Continuing systems work, programming costs and research work
4. Operational costs
5. Company overhead.

Mr. Cueto said that the entire problem of "savings" is somewhat complex and not always susceptible of exact determination. Exclusive of intangible benefits obtained from a computer to which dollar value can seldom be attached, this occurs (1) because of changing patterns of work resulting from natural integration of operations and (2) because of the introduction of certain new jobs on the electronic equipment which could not have been done without such equipment or where the cost of doing the job by other methods would have been prohibitive. In both these cases, the motivation is, of course, to exploit fully the potentials of these machines. Nevertheless, the addition of such work, while it presents a problem as to the determination of costs and corresponding offsets to costs, produces certain dollar savings in operations as compared to prior methods which should be taken into account. It requires an accurate calculation of costs by previous methods, which will vary according to the degree of efficiency present in the prior operation. However, where a job is undertaken that would not have been previously possible without the computer, the question of prior costs of operation becomes further complicated. In such a case, it is necessary to make certain reasonable assumptions in preparing estimates of such costs to use against those by the new equipment.

Where a company expands its computer operations along the lines

previously indicated, it will find larger ultimate economic advantages of computers than those originally anticipated.

MR. J. STANLEY HILL reported that when Minnesota Mutual ordered their Datatron 205, they made projections showing that their investment would be recovered in four years and that they would have a net savings of one million dollars at the end of ten years. They found that costs were more than anticipated and, as a result, it will take about one year longer to break even than originally expected. He felt the ultimate savings will be about as great as had been projected.